National Development Plan 2007 - 2013

Environmental Protection Agency
An Ghníomhaireacht um Chaomhnú Comhshaoil

STRIVE
Report Series No.47

Ireland's Sustainable Development Model

STRIVE

Environmental Protection Agency Programme

2007-2013

SSTI Strategy for Science, Technology and Innovation

Comhshaol, Oidhreacht agus Rialtas Áitiúil
Environment, Heritage and Local Government

Environmental Protection Agency

The Environmental Protection Agency (EPA) is a statutory body responsible for protecting the environment in Ireland. We regulate and police activities that might otherwise cause pollution. We ensure there is solid information on environmental trends so that necessary actions are taken. Our priorities are protecting the Irish environment and ensuring that development is sustainable.

The EPA is an independent public body established in July 1993 under the Environmental Protection Agency Act, 1992. Its sponsor in Government is the Department of the Environment, Heritage and Local Government.

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LICENSING

We license the following to ensure that their emissions do not endanger human health or harm the environment:

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- large scale industrial activities (e.g., pharmaceutical manufacturing, cement manufacturing, power plants);
- intensive agriculture;
- the contained use and controlled release of Genetically Modified Organisms (GMOs);
- large petrol storage facilities.
- Waste water discharges

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- Working with local authorities and the Gardaí to stamp out illegal waste activity by co-ordinating a national enforcement network, targeting offenders, conducting investigations and overseeing remediation.
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- Quantifying Ireland's emissions of greenhouse gases in the context of our Kyoto commitments.
- Implementing the Emissions Trading Directive, involving over 100 companies who are major generators of carbon dioxide in Ireland.

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- Co-ordinating research on environmental issues (including air and water quality, climate change, biodiversity, environmental technologies).

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- Assessing the impact of plans and programmes on the Irish environment (such as waste management and development plans).

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- Providing guidance to the public and to industry on various environmental topics (including licence applications, waste prevention and environmental regulations).
- Generating greater environmental awareness (through environmental television programmes and primary and secondary schools' resource packs).

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- Promoting waste prevention and minimisation projects through the co-ordination of the National Waste Prevention Programme, including input into the implementation of Producer Responsibility Initiatives.
- Enforcing Regulations such as Waste Electrical and Electronic Equipment (WEEE) and Restriction of Hazardous Substances (RoHS) and substances that deplete the ozone layer.
- Developing a National Hazardous Waste Management Plan to prevent and manage hazardous waste.

MANAGEMENT AND STRUCTURE OF THE EPA

The organisation is managed by a full time Board, consisting of a Director General and four Directors.

The work of the EPA is carried out across four offices:

- Office of Climate, Licensing and Resource Use
- Office of Environmental Enforcement
- Office of Environmental Assessment
- Office of Communications and Corporate Services

The EPA is assisted by an Advisory Committee of twelve members who meet several times a year to discuss issues of concern and offer advice to the Board.

EPA STRIVE Programme 2007–2013

Ireland's Sustainable Development Model

(2006-SDM-LS-11-M2)

STRIVE Report

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Prepared for the Environmental Protection Agency

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The EPA STRIVE Programme addresses the need for research in Ireland to inform policymakers and other stakeholders on a range of questions in relation to environmental protection. These reports are intended as contributions to the necessary debate on the protection of the environment.

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Executive Summary

The key objective of developing ISus, Ireland's Sustainable Development Model, was to relate environmental pressures to relevant economic developments. This helps to diagnose environmental problems, identify likely future pressure points, and target policy instruments.

The National Accounts are a vital input to economic decision making, but omit the environment. The ESRI Environmental Accounts are the most extensive for Ireland, comprising 63 substances for 20 sectors for the period 1990–2006. The data come primarily from the Central Statistics Office, the Environmental Protection Agency, and Sustainable Energy Ireland.

Between 1990 and 2006, some emissions have fallen, notably sulphur dioxide, carbon monoxide, and volatile organic compounds. Other emissions have increased, notably dioxins and carbon dioxide. Economic growth has increased all emissions. Changes in the structural composition of the economy has increased some emissions (carbon dioxide, sulphur hexafluoride) but decreased others (ammonia, methane, nitrous oxide[1]). Technological and behavioural change has reduced all emissions, and particularly sulphur dioxide, carbon monoxide, and volatile organic compounds.

1. Commonly known as laughing gas.

Carbon dioxide emissions were projected to fall by 8 per cent in 2009 and by 6 per cent in 2010, with emissions from cement production falling furthest. The drop in total greenhouse gas emissions is more muted. After 2011, emissions start to grow again, but Ireland will almost comply with its short-term obligation under the Kyoto Protocol. Between 2013 and 2020, an average growth rate for all emissions of 1 per cent is projected. Ireland is not likely to meet its target under the EU agreements for 2020. Almost €600 million may need to be spent on permit imports in 2020.

Ireland continues to generate increasing quantities of municipal solid waste, most of which is sent to landfill. The government will have great difficulty meeting EU limits on landfilling of biodegradable municipal waste over the next few years. This poses risks to the exchequer, which could face fines due to non-compliance with EU directives, and to the environment, since waste sent to landfill can give rise to emissions of methane and a range of other disamenities, e.g. visual, odour, dust and liquid pollutants.

Hazardous waste is dominated by the construction and demolition and the chemical and pharmaceutical sectors. Construction and demolition waste has fallen sharply, but there may well be a substantial resurgence in waste volumes later in the decade.

1 Introduction

Environmental science plays a crucial role in identifying the pressure points and threats to the environment from human activity. However, in formulating environmental policy it is important not only to know the nature of the damage to the environment but also to understand the link between these environmental pressures and human activity, in particular economic activity. In some cases, the different environmental effects may interact with one another. Understanding this link allows policy makers to predict where problems are likely to occur in the future and to prioritise their responses in developing policy on sustainable development. It also helps in understanding how policy measures can be best formulated so as to achieve the desired environmental effects at minimum economic cost to society.

While economic growth can very often result in pressure on key aspects of the environment, there is not a one-for-one relationship between environmental pressure and economic growth. When properly managed, the environmental pressure may be reduced or even eliminated at low cost in terms of reduced economic activity.

The key objective of this project was to develop a sustainable development model relating environmental pressure on key resources to relevant economic developments. When looking at the past, this will help in diagnosing why environmental problems have arisen. When looking forward, and combined with realistic forecasts for future economic trends, such a tool could help to focus the attention of environmental policy makers on likely future pressure points. In helping to understand the factors driving pressure on the environment it can help policy makers to better target their instruments and to assess the needs for additional infrastructure. The experience elsewhere suggests that, to be successful, any modelling framework needs to be useful to and used by key policy makers. It should build on models and research that are already available.

Based on the full range of available data and research, Ireland’s Sustainable Development Model (ISus) (Fig. 1.1) has been implemented as a series of

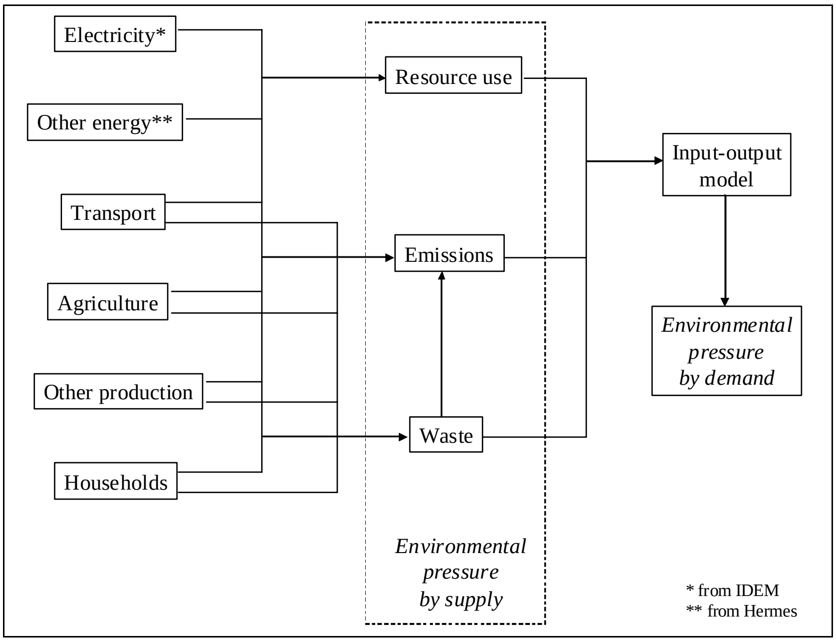

Figure 1.1. Flowchart of ISus.

submodels, each dealing with a specific area of environmental concern. Macroeconomic influences are taken from the ESRI (Economic and Social Research Institute) model of the Irish economy: Hermes. Each environmental submodel estimates the level of resource use and emissions to air, water, and land as a function of exogenous variables.

This modelling framework was chosen to:

1. Provide an integrating framework for research into the effect of economic and social activity on the environment;

2. Be a tool to forecast the environmental impact of economic and social activity; and

3. Allow policy makers to examine the potential effects of social, economic and environmental policies on the wider environment, facilitating the development of policy on sustainable development.

This synthesis report discusses key results from the study, including the environmental accounts (Chapter 2), selected applications of the model to greenhouse gas emissions (Chapter 3), and waste (Chapter 4). Some of the findings from supporting studies carried out to inform the model structure and parameters are then reported (Chapter 5) before setting out conclusions and suggestions for future research (Chapter 6).

2 Environmental Accounts

The National Accounts are a vital input to economic decision making. Many key statistics, such as the Gross National Product, the Balance of Payments and the Gross Government Deficit are derived from the National Accounts. Research on the National Accounts started in the 1920s and the system was fully developed and internationally standardised by the 1950s. These statistics are comparable over time and between countries.

Useful as the National Accounts may be, they leave many things unmeasured, including the environment. Research on environmental accounts started in the 1970s, and international standards were agreed in 2003. More and more countries now publish environmental accounts, and time series are available for a few countries, providing an increasingly sound basis for decision making on the environment. Some hope that the environmental accounts will one day generate the same intense media attention as do the National Accounts.

After briefly describing the principle of environmental accounts, their use is illustrated by discussing trends in emissions and resource use in Ireland, by comparing the trend in carbon dioxide emissions in Ireland with that of other countries, and, after a brief methodological interlude on downscaling, by discussing the geographic pattern of carbon dioxide emissions and waste in Ireland.

There are four parts to the environmental accounts:

1. Emissions and waste;
2. Resource use;
3. Expenditures on environmental protection; and
4. Economic value.

Data are given by economic sector. The ESRI Environmental Accounts are the most extensive accounts for Ireland, and the only ones that adhere to the international standards (Lyons et al., 2009a). There are 63 substances (26 emissions, 12 types of waste, and 25 resources) for 20 sectors (19 production sectors plus households) for the period 1990–2006. The data come primarily from the Central Statistics Office (CSO), the Environmental Protection Agency (EPA), and Sustainable Energy Ireland (SEI). Data on expenditure on environmental protection will be available shortly. Data on the economic value of the environment are scattered and inconsistent. While the amount of data on emissions and resource use is impressive at first sight, the ESRI Environmental Accounts are heavily biased towards climate and energy, with a reasonable coverage of waste and acidification. The use of land, water, and materials is largely omitted. Large groups of chemicals, including many potentially harmful ones, are ignored. This reflects the paucity of data.

Figure 2.1 shows the average growth rates for the period 1990–2006 for emissions to air and for energy use. Some emissions have fallen, notably sulphur dioxide, carbon monoxide, and volatile organic compounds. Other emissions have increased, notably dioxins and carbon dioxide from fossil fuel combustion. Biochemical oxygen demand (BOD) has also increased. Figure 2.1 also shows a decomposition of the growth rate. Economic growth has increased all emissions. Changes in the structural composition of the economy have increased some emissions (process carbon dioxide, sulphur hexafluoride) but decreased others (ammonia, methane, nitrous oxide[1]). Technological and behavioural change has reduced all emissions, and particularly sulphur dioxide, carbon monoxide, and volatile organic compounds.

Figure 2.1 shows that energy use[2] has increased across the board, with the exception of coal and peat (the changes in energy use partly explain the changes in emissions). Renewables, natural gas, and kerosene (jet fuel) have risen fastest. Economic growth has pushed up energy use across the board, while

1. Commonly known as laughing gas.
2. Note that Fig. 1.1 has a mix of primary and final energy use.

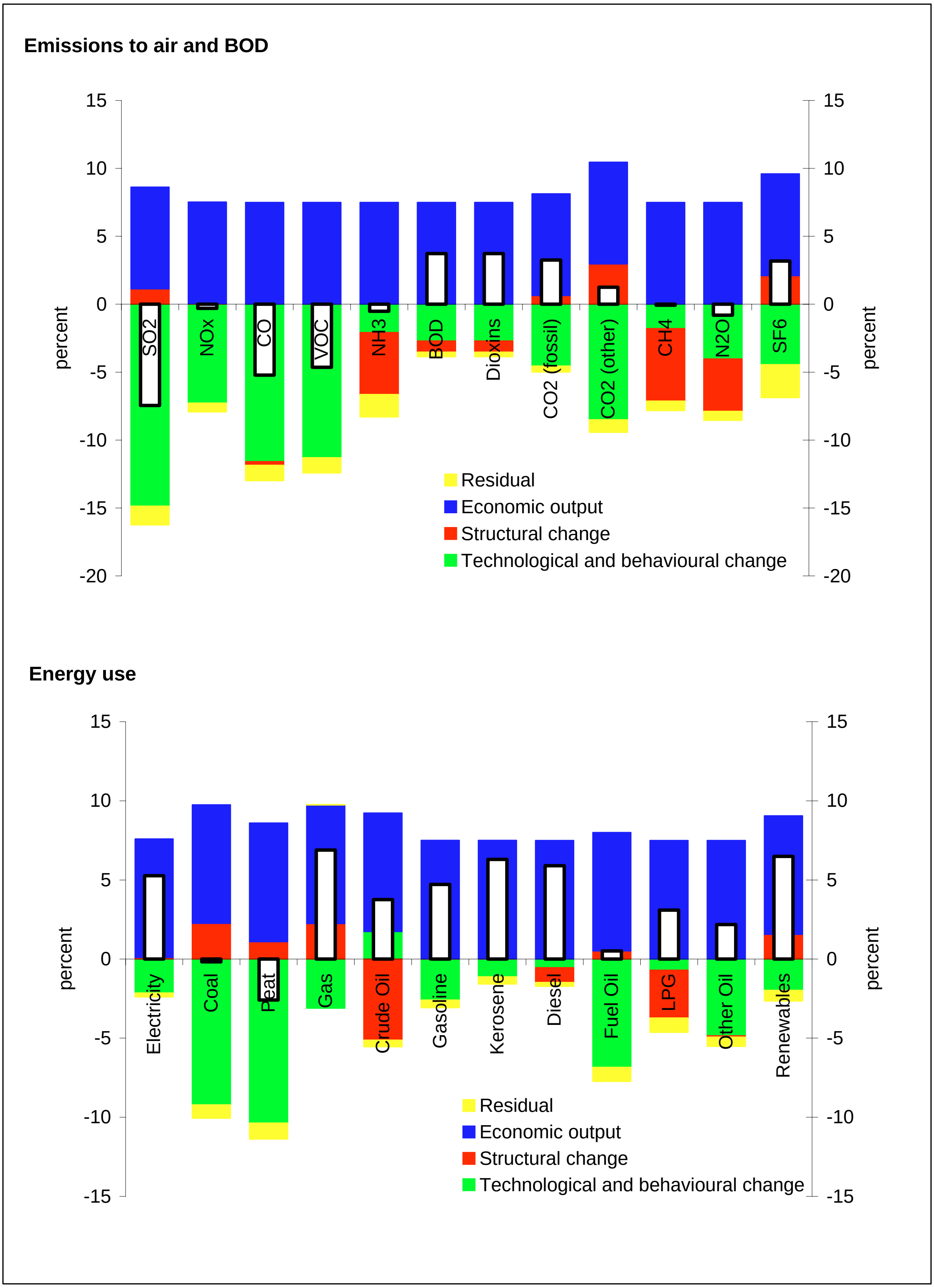

Figure 2.1. A decomposition of the growth rate of emissions and resource use.

Note: The average annual growth rate for the period 1990–2006 is presented as the white insert. The growth rate is decomposed into the economic growth rate, the rate of structural change in the economy, technological and behavioural change, and a residual.

structural change has increased some sources (coal, gas, renewables) and decreased others (crude oil, liquefied petroleum gas, diesel). Technological and behavioural change has decreased most energy uses (bar crude oil), particularly coal and peat.

For carbon dioxide, economic growth outpaced technological change. Emissions thus increased. Technological and behavioural change reduced emissions at a rate of 4.5 per cent per year, however. Figure 2.2 shows that this is unusually fast in an international context. While in 1990 Ireland emitted 50 per cent more carbon dioxide per euro value added than the rest of Western Europe, this difference had disappeared by 2005 (despite a low use of public transport in Ireland). Ireland's rate of improvement in carbon intensity was comparable with that of Eastern Europe.

The ESRI Environmental Accounts are at the national scale. This makes sense for some emissions – e.g. it does not matter whether greenhouse gases are emitted in Wexford or in Donegal – but other environmental problems have a clear regional dimension – e.g. drinking water is typically sourced locally, and a clean Liffey does not help the people of Galway. Furthermore, environmental policy may have a different impact on different regions. Data on local emissions and resource use may also be used to assess the sustainability of specific settlements or settlement patterns.

Regional accounts are needed, but data are rare. Household characteristics, however, are observed at the electorate district level, and can be used to impute energy use and waste. This has been done for a small number of emissions and resources uses (Tol et al., 2009).

Figure 2.3 illustrates the expected annual costs of a carbon tax per household, averaged over each electoral district. It assumes a carbon tax of €20/t CO_2 imposed on carbon dioxide emissions not covered by the EU Emissions Trading System (ETS). Such a tax may be introduced in 2010. The spatial pattern in Fig. 2.3 is the same as the pattern of direct emissions by households. Commuting is the dominant feature, although house size and income also play a role. The tax rate varies from €25 per household per year in the inner city to €275 in some parts of the commuter belt, but most households pay between €135 and €235 per year.

As another illustration of the power of regionalised environmental accounts, Fig. 2.4 shows estimated biodegradable waste from households. The pattern

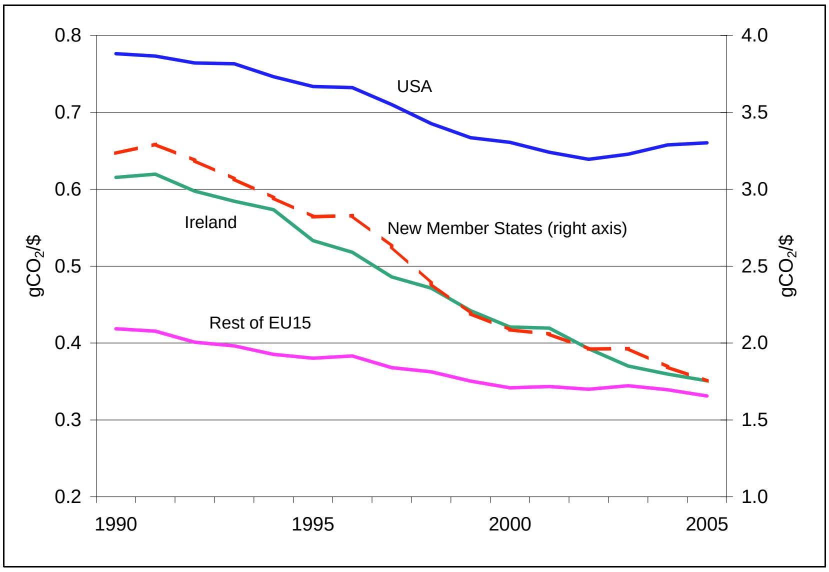

Figure 2.2. The carbon intensity of Ireland, other EU countries and the USA over the period 1990–2005. Note: EU countries are split into the 15 countries (EU15) that were Member States between 1995 and 2004 and the 12 countries that have joined since 2004.

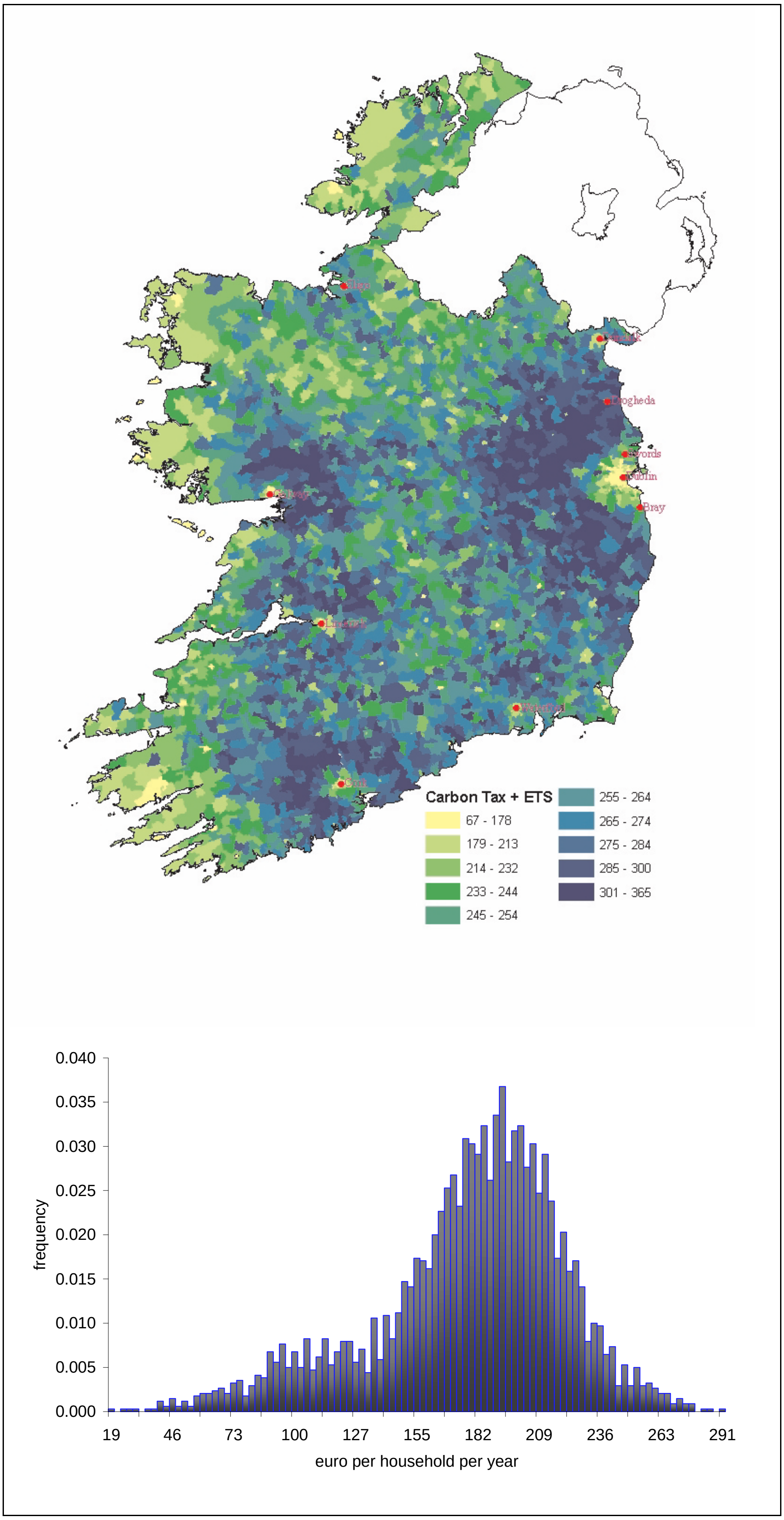

Figure 2.3. Average annual carbon tax per household by electoral district as a map and as a histogram.

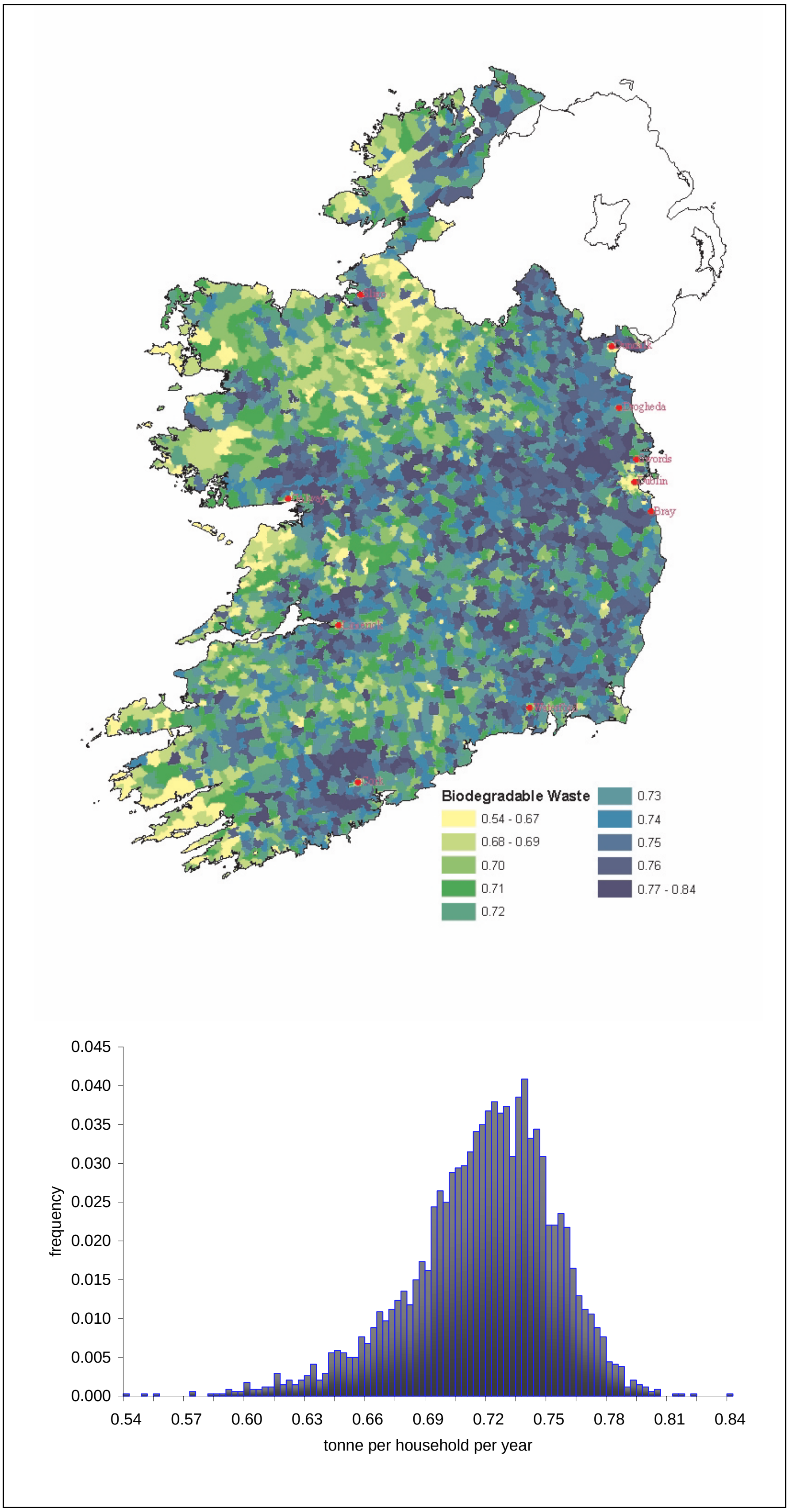

Figure 2.4. Average annual biodegradable waste generation per household by electoral district as a map and as a histogram.

resembles that of the average household size. There are distinct differences between the cities (small families), the commuter belt (large families), and the deep countryside (small families).

These examples show that environmental accounts provide useful information for environmental policy. They reveal trends in emissions, and thus highlight which areas of concern would be difficult to solve but also where the trends in economic development imply reduced pressure on the environment. Carbon dioxide emissions, for instance, have grown with the economy, while nitrous oxide emissions have fallen. Environmental accounts can also help to reveal the success (or lack thereof) of past policy. The drop in sulphur dioxide emissions is a clear example.

International standardisation of emission statistics allows for a ready comparison of Ireland's performance with that of other countries. Regionalisation of the national environmental accounts sheds light on the areas most affected by environmental policy and regional pressures on the environment. It is therefore important that high-quality environmental accounts be maintained and expanded into other areas.

3 Selected Applications of the ISus Model: Greenhouse Gas Emissions

Climate change is the problem that tops the environmental agenda. Ireland has signed up to ambitious international agreements on greenhouse gas emission reduction. A carbon tax on transport and home heating fuels may be introduced in the near future. Any excess emissions over the target will have to be paid for by buying permits from abroad. Climate policy is thus closely related to fiscal policy. This chapter outlines some results from the ESRI projections of greenhouse gas emissions.[3] For more details, see Lyons and Tol (2009).

3. Emissions are projected using ISus, version 0.3. The model uses a mix of techniques ranging from simple extrapolation of trends in emission intensities (e.g. for hydrofluorocarbon emissions) to detailed behavioural modelling (e.g. for waste and electricity). See http://www.esri.ie/research/research_areas/environment/isus/ for the model documentation.

In preparing these projections, it is assumed that the EU ETS will continue unreformed after 2012, that a carbon tax will be levied on all carbon dioxide emissions that are outside the ETS, and that the carbon tax will be €20/t CO_2 in 2010 and all following years. These macroeconomic assumptions are drawn from projections described in Bergin et al. (2009).

Figure 3.1 shows carbon dioxide emissions by sector. Emissions results from a mix of economic growth, structural change in the economy, energy efficiency improvement, and changes in the energy mix. Table 3.1 gives the values. In 2009, carbon dioxide emissions were projected to fall by 8.2 per cent, followed by a further fall of 5.6 per cent in 2010. Construction (including cement production) takes the biggest hit with a fall in emissions of one-third in 2009, but services and power generation are also down by

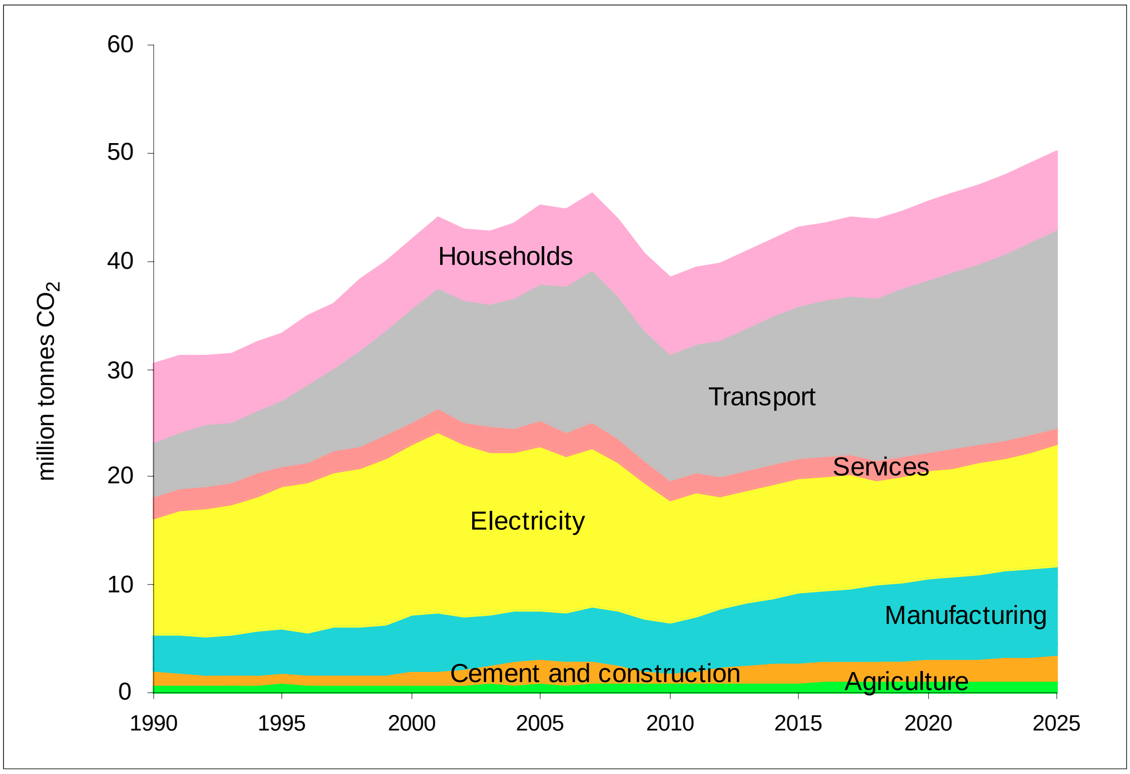

Figure 3.1. Carbon dioxide emissions per sector as observed (1990–2007) and as projected (2008–2025).

Table 3.1. Emissions of carbon dioxide (CO_2) by sector and emissions of other greenhouse gases (GHGs) for selected years as observed (1990, 2005) and as projected (other years), emission targets, emissions by regulation (ETS[1] vs non-ETS), carbon tax revenue and value of permit imports.[2]

	Observed		Projected					
	1990	2005	2008	2009	2010	2011	2012	2020
Carbon dioxide by sector								
Agriculture and food	1.7	2.0	2.0	1.9	1.9	1.9	1.9	1.8
Construction (incl. cement)	2.5	4.9	4.0	2.7	2.4	2.9	3.8	5.5
Manufacturing	3.4	3.5	3.8	3.7	3.7	3.9	4.4	6.7
Services	2.0	2.3	2.3	2.0	1.9	1.9	1.9	1.7
Power generation	10.9	15.1	13.7	12.6	11.2	11.6	10.4	9.9
Transport	5.0	12.8	13.1	12.2	11.7	11.9	12.5	16.0
Households	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.2
Total carbon dioxide	**32.5**	**47.7**	**46.0**	**42.2**	**39.9**	**41.1**	**41.9**	**48.9**
Other greenhouse gases								
Methane	13.4	13.2	12.9	12.9	12.9	12.8	12.6	11.7
Nitrous oxide	9.5	8.7	8.0	7.9	7.9	7.8	7.7	6.9
Halocarbons	0.0	0.7	0.9	0.9	0.9	1.1	1.3	3.0
Total greenhouse gases	**55.5**	**70.3**	**67.8**	**63.9**	**61.6**	**62.7**	**63.5**	**70.5**
Target			62.7	62.7	62.7	62.7	62.7	56.3
Distance to target			5.1	1.2	–1.1	0.0	0.8	14.2
ETS (CO_2)	14.0	21.3	19.4	17.1	15.4	16.4	16.4	19.4
Non-ETS (CO_2)	18.7	26.0	26.0	24.6	24.0	24.1	25.0	29.5
Non-ETS (other GHG)	23.0	22.6	21.8	21.7	21.7	21.7	21.6	21.6
Carbon tax revenue					479	482	500	591
Permit import			73	11	–13	0	9	569

[1]ETS, Emissions Trading System.
[2]All values are in million metric tonnes of carbon dioxide equivalent, except the tax revenue and permit imports which are in million euro.

some 10 per cent per year. After 2011, emissions start to grow again, by 3.0 per cent in 2011 and 2.1 per cent in 2012. Construction, driven by the National Development Plan, bounces back particularly rapidly. Between 2013 and 2020, the authors project an average growth rate of 1.9 per cent.

Figure 3.2 and Table 3.1 include the other greenhouse gases regulated by the Kyoto Protocol of the United Nations Framework Convention on Climate Change. The economic recession is muted in agriculture, the main source of methane and nitrous oxide. The same holds for pharmaceuticals and semiconductor manufacturing. As a result, the decline in total greenhouse gas emissions is 5.7 per cent in 2009 and 3.7 per cent in 2010, much less than the drop in carbon dioxide emissions. After 2010, emissions start growing again at an average rate of 1.3 per cent until 2020.

Recessionary conditions make it likely that Ireland will almost comply with its short-term obligation under the Kyoto Protocol, with only a limited requirement to purchase permits (Table 3.1). Cumulated over the period 2008–2012, emissions exceed the target by 5.9

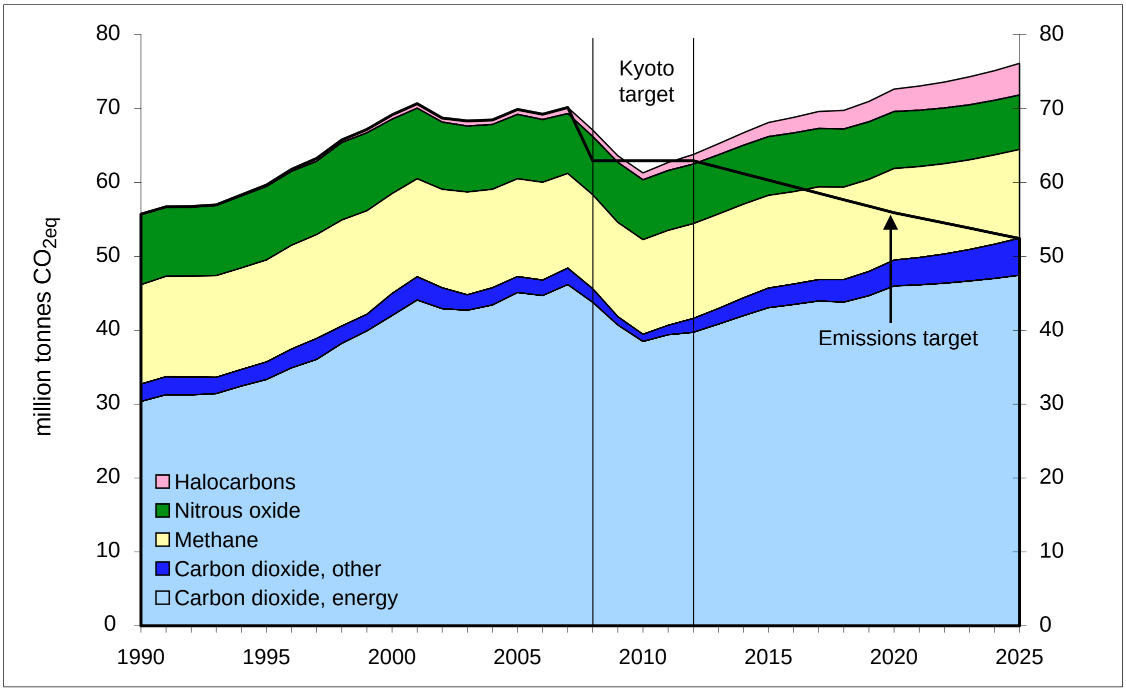

Figure 3.2. Greenhouse gas emissions per gas as observed (1990–2007) and as projected (2008–2025), and the emissions targets under the Kyoto Protocol and the burden sharing agreement of the European Union.

million metric tonnes of carbon dioxide equivalent ($MMTCO_{2eq}$). At the futures prices of 21 April 2009, 81 million euro will need to be spent on permit imports (Table 3.1), substantially less than the 270 million euro reserved for this purpose in the carbon fund.

Because emissions are projected to resume growth in 2011, Ireland is not likely to meet its target under the EU agreements for 2020, which call for a reduction of emissions by 20 per cent from their 2005 level. The projected distance to target is 14.2 $MMTCO_{2eq}$.[4] As the price of carbon permits may well rise to €40/t CO_2 in 2020, this implies that €570 million would need to be spent on permit imports, €450 million of which would fall on the exchequer (Table 3.1). Table 3.1 also shows that the carbon tax would raise €480 million in 2010, rising to €500 million in 2012, assuming that the carbon tax would increase to the price of ETS futures.

Figure 3.3 compares these projections with the ones in the *Medium-Term Review 2008–2015*[5] (Fitz Gerald et al., 2008) and to the latest projections by the EPA[6].

This publication uses more recent data, so it starts to deviate from the Medium-Term Review (MTR) in 2006. The gap between the two projections starts to grow rapidly in 2008 and reaches its peak in 2010 with a difference of 8.7 $MMTCO_{2eq}$, or 12.4 per cent below the MTR projection. After 2010, the two projections converge again with a gap of only 3.4 $MMTCO_{2eq}$.

The latest ESRI projections (62.7 $MMTCO_{2eq}$ on average for 2008–2012) are slightly below the latest EPA projections *with additional measures* (64.1 $MMTCO_{2eq}$) and substantially below the EPA projection *with measures* (67.6 $MMTCO_{2eq}$).[7] For 2020, the ESRI projection (64.1 $MMTCO_{2eq}$) is in-between the two EPA projections (61.0 $MMTCO_{2eq}$ and 70.5 $MMTCO_{2eq}$) but closer to the *with measures* one.

4. This gap has been substantially reduced from the figure of 17.6 $MMTCO_{2eq}$ as projected in Fitz Gerald et al. (2008).
5. Note that the review actually goes out to 2025.
6. http://www.epa.ie/downloads/pubs/air/airemissions/GHG_Emission_Proj_08_12_30032009.pdf
7. EPA projections with measures include only announced policies and targets, while EPA projections with additional measures also consider draft policies and targets. The ESRI projections only consider policies, disregarding targets that are not backed up by policy measures, but include likely yet unannounced policies such as a carbon tax.

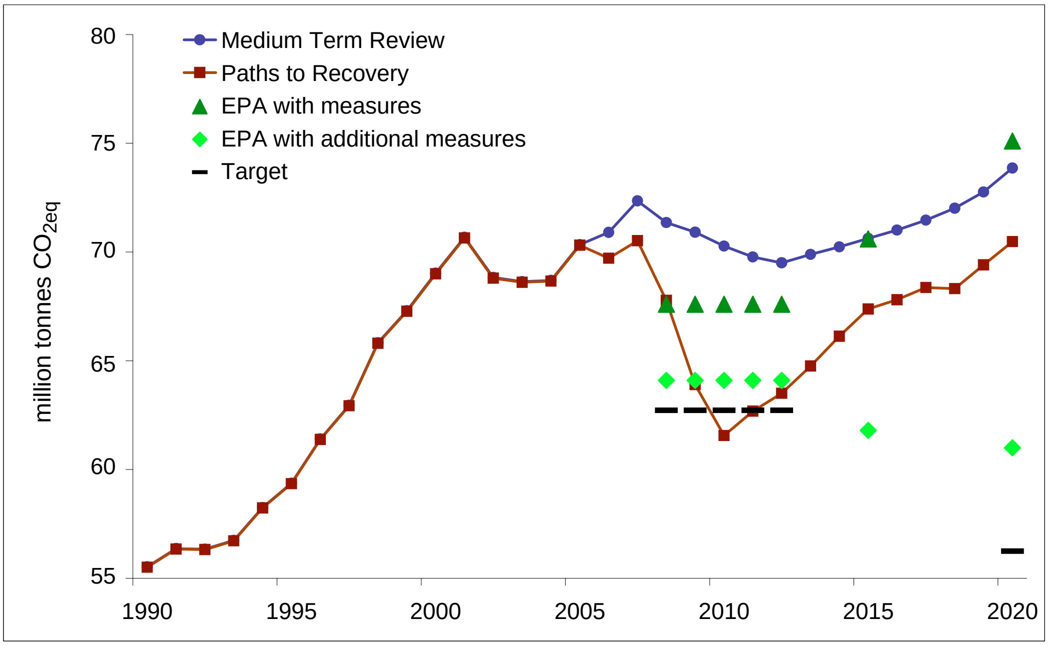

Figure 3.3. Alternative projections of total greenhouse gas emissions.

4 Selected Applications of the ISus Model: Waste

The ISus model and the ESRI Environmental Accounts separate waste into 12 categories, including three waste types (biodegradable municipal waste, hazardous waste, and other waste), each divided into four dispositions (landfill, incineration, recycling/ recovery and unknown). The model projects each waste type by applying behavioural parameters to measures of activity, starting with base-year emissions. This chapter shows the baseline projections for biodegradable municipal waste, construction and demolition waste, and hazardous waste. Further details of the research behind the modelling assumptions are available in Curtis et al. (2009).

Ireland continues to generate increasing quantities of municipal solid waste, most of which is sent to landfill. Figure 4.1 suggests that the government will have great difficulty meeting EU limits on landfilling of biodegradable municipal waste (BMW) over the next few years; these limits are illustrated in Fig. 4.1. Continued growth in – and landfilling of – BMW poses risks to the exchequer, which could face fines due to non-compliance with EU directives, and more importantly to the environment, since waste sent to landfill can give rise to emissions of methane (a greenhouse gas) and a range of other disamenities, e.g. visual, odour, dust and liquid pollutants.

Municipal waste volumes are divided between commercial waste, which is assumed to be proportional to the output of the service sector, and household waste, which in the baseline projection is mainly a function of the number of households, persons per household and disposable incomes.

Unlike some environmental emissions, for example methane, BMW generation in Ireland is primarily attributable to domestic demand. Figure 4.2 breaks down BMW emissions by category of final demand. Service sector emissions are primarily attributable to final demand from households, although exports provide the second largest component.

Hazardous waste, for which projections are shown in Fig. 4.3, is dominated by the construction and

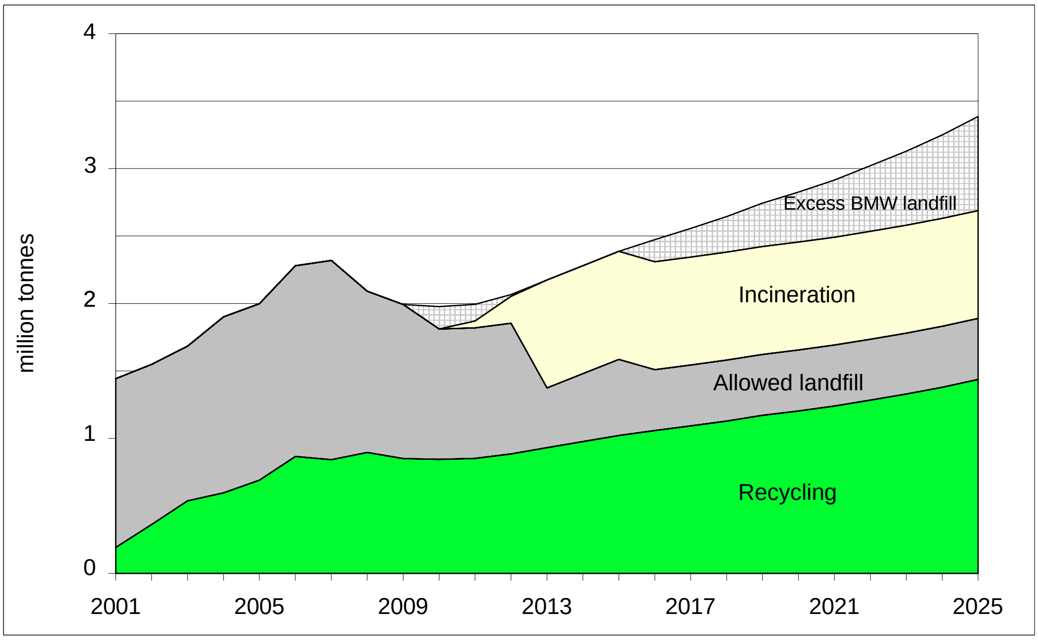

Figure 4.1. Biodegradable municipal waste by destination as projected by Ireland's Sustainable Development Model (ISus), version 0.4 (actual data to 2007). BMW, biodegradable municipal waste.

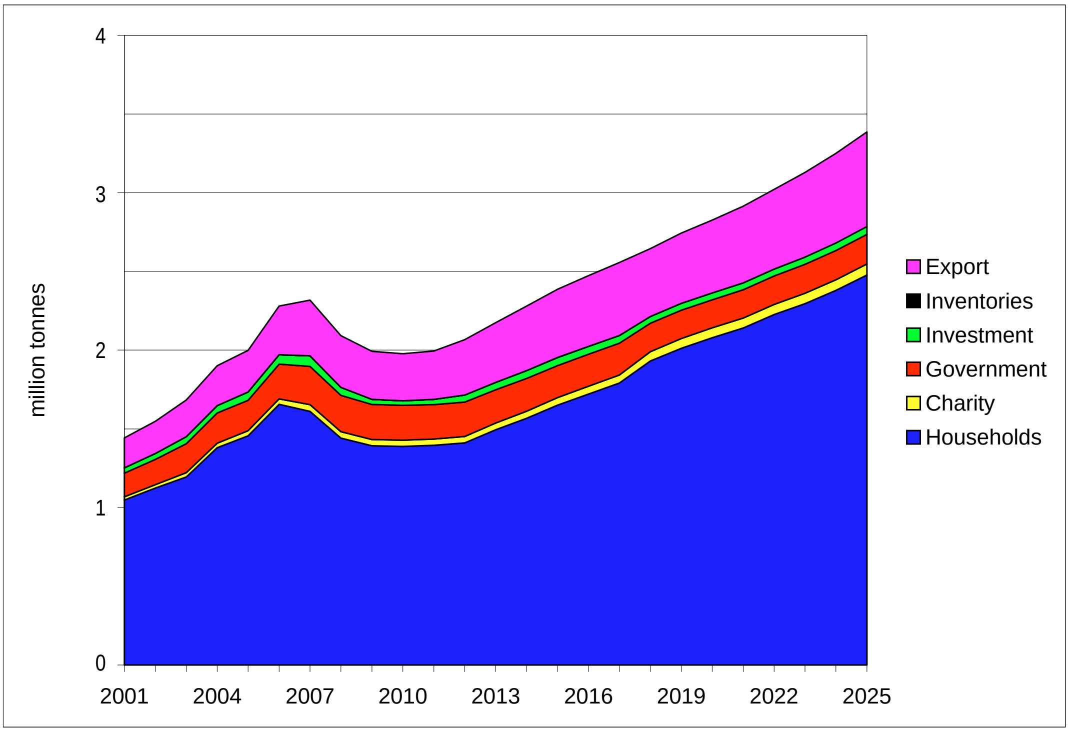

Figure 4.2. Biodegradable municipal waste by source of final demand as projected by Ireland's Sustainable Development Model (ISus), version 0.4 (actual data to 2007).

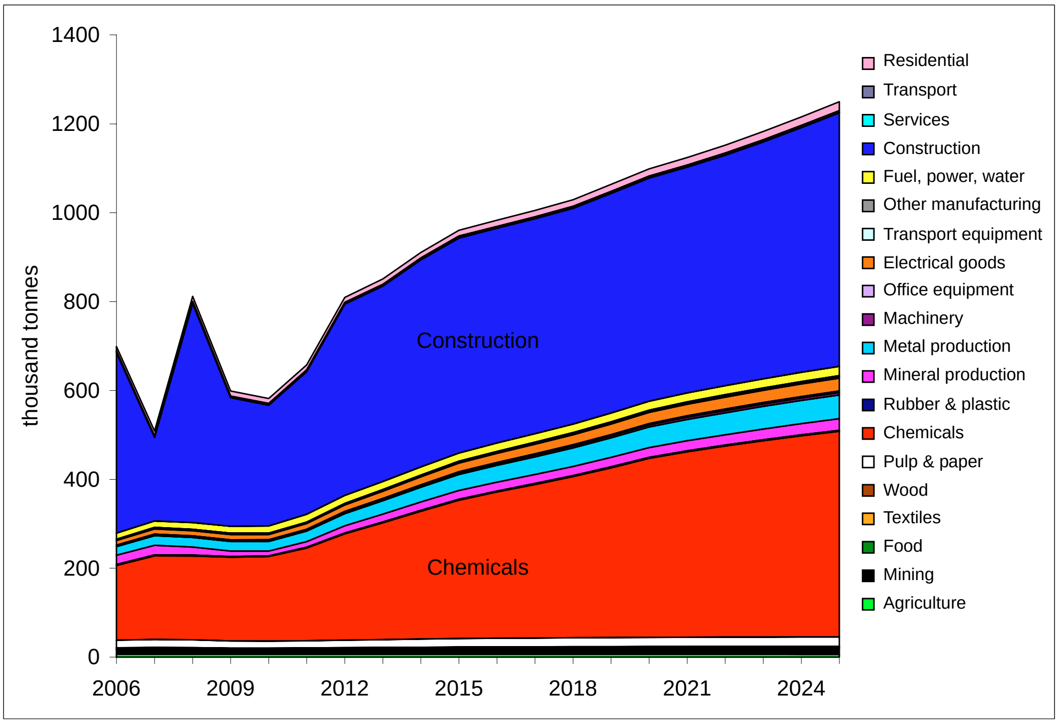

Figure 4.3. Hazardous waste by source as projected by Ireland's Sustainable Development Model (ISus), version 0.4 (actual data to 2006).

demolition sector (which produces contaminated soil) and the chemical and pharmaceutical sector. It is assumed that industrial waste arisings are proportional to sectoral output, so the projections show a strong association with the economic cycle.

Figure 4.4 shows projected construction and demolition waste quantities by source activity. Sharp reductions in housing construction dominate the early years, investment in social and productive infrastructure associated with the National Development Plan falls more gradually. With economic recovery, there is a substantial resurgence in waste volumes associated with renewed residential investment, but new residential construction remains a fraction of the 2006 levels during the period studied.

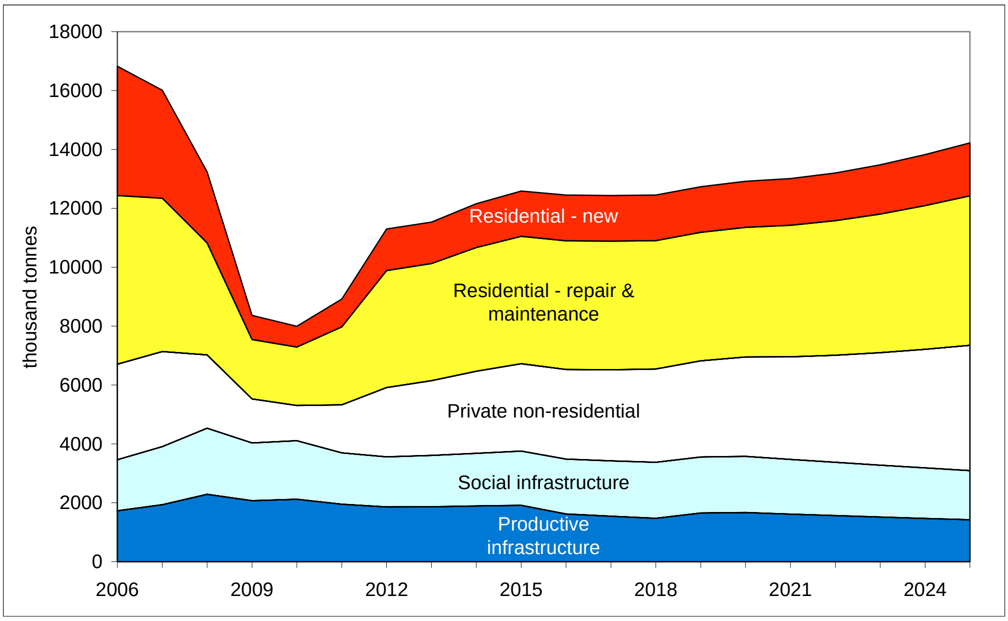

Figure 4.4. Construction and demolition waste by source as projected by Ireland's Sustainable Development Model (ISus), version 0.4, with detailed source activities shown separately (actual data to 2006).

5 Background Studies

In order to inform the structure and parameters used to predict emissions and resource use in the ISus model, a set of background studies was carried out. These fill some gaps in the Irish environmental economics literature, but many more gaps remain to be filled. This chapter lists some of the main supporting studies, and a full list of papers is provided at the end of the report.

5.1 Reducing Aviation Emissions

The impact of price policies on international aviation and its carbon dioxide emissions was investigated. A simulation model of international tourist flows was used to estimate the impact of a carbon tax on aviation fuel. The effect of the tax on travel behaviour is small: a global $1,000/t C would change travel behaviour to reduce carbon dioxide emissions from international aviation by 0.8 per cent. This is because the imposed tax is probably small relative to the air fare. A $1,000/t C tax would less than double air fares, and have a smaller impact on the total cost of the holiday. In addition, the price elasticity is low. A carbon tax on aviation fuel would particularly affect long-haul flights, because of high emissions, and short-haul flights, because of the emissions during take-off and landing.[8] Medium-distance flights would be affected least. This implies that tourist destinations that rely heavily on short-haul flights (i.e. islands near continents, such as Ireland) or on intercontinental flights (e.g. Africa) will see a decline in international tourism numbers, while other destinations may see international arrivals rise. If the tax is only applied to the European Union, EU tourists would stay closer to home so that EU tourism would grow at the expense of other destinations. Sensitivity analyses reveal that the qualitative insights are robust (incl. also to modal shifts to rail or road). A carbon tax on aviation fuel would have little effect on international tourism, and little effect on emissions.

The same is true for including carbon dioxide emissions from aviation fuels in the ETS, as is planned for 2012. The effect on global carbon dioxide emissions from international aviation is minimal: at current permit prices –0.01 per cent, and –0.13 per cent for the aggressive climate policy advocated by the Stern Review (Stern, 2006). In the latter case, total CO_2 emissions from fossil fuels would fall by 0.004 per cent, and total greenhouse gas emissions by 0.002 per cent. Tourist numbers in Europe would fall by up to 0.6 per cent, and would increase in the rest of the world. If the permits are grandparented, the airlines would receive a subsidy of €3 billion at current prices, and €40 billion for the Stern policy. If permits are auctioned, the effect on the airline industry would be minimal. Including aviation in the market for emission permits has almost no effect on the environment and may have a negative effect on the economy.

The Air Passenger Duty (APD) of the United Kingdom was also studied. Four different scenarios were considered (abolishing the APD, keeping the 2001 APD level, the 2007 APD and the UK Conservative Party's 'Green Miles' proposal where the APD would apply to flights in excess of an allowance), using base, high and very high elasticity levels as well as assumptions about the substitutability between domestic and international holidays and the effects of a carbon tax. The recent doubling of the APD has the perverse effect of increasing carbon dioxide emissions, albeit only slightly, because it reduces the relative price difference between near and far holidays. Tourist numbers arriving into the UK would fall slightly. The number of tourists travelling from the UK would fall in the countries near to the UK, and this drop would be only partly offset by displaced tourists from the UK. Tourists leaving the UK for countries further afield would increase. The proposal of the Conservative Party to exempt the first 2,000 miles (for UK residents) would decrease emissions by roughly the same amount as abolishing the APD altogether – but the number of tourists arriving into the UK would not rise. These results are reversed if it is assumed that domestic holidays and foreign holidays are close substitutes. If the same revenue were raised with a

8. The terms 'short-haul' and 'long-haul' are used in a broad sense.

carbon tax rather than a boarding tax, emissions would fall rather than rise.

Similar results were found for the Netherlands, although the Dutch air tax is less perverse because it is bilinear in distance rather than in EU membership. These findings carry over to the air tax in Ireland.

The EU–US Open Skies Agreement will result in increased competition between carriers and consequently falls in the cost of transatlantic flights. This will not only have implications for the size and structure of the industry but also for climate policy. Model simulations show that passenger numbers arriving from the US to the EU will increase by between 1 per cent and 14 per cent, depending on the magnitude of the price reductions. Because of substitution between destinations, the percentage increase in global emissions is much smaller (max. 1 per cent) than the increase in transatlantic traffic. In the current context of greenhouse gas control policies, any increase in emissions will make climate policy objectives more difficult to achieve and will attract more attention to aviation's contribution to climate change.

Between 2005 and 2100, international tourism could grow by a factor of 12. Not only do people take more trips but these also increase in length. The growth in tourism is mainly fuelled by an increase in trips from Asian countries. Emissions follow this growth pattern until 2060 when emissions per passenger-kilometre start to fall due to improvements in fuel efficiency. Forecasted emissions are also presented for the four *Special Report on Emissions Scenarios* (Nakicenovic and Swart, 2001) and maintain the same growth pattern but the levels of emissions differ substantially. The forecasts are sensitive to the period to which the model is calibrated, the assumed rate of improvement in fuel efficiency and the imposed climate policy scenario.

5.2 Household Energy Use

Energy usage and energy efficiency are of increasing concern in Ireland. Regression analyses on a large household micro-dataset, the *Irish National Survey of Housing Quality 2001–2002*, reveal that those homes that have more energy-saving features are also likely to have a high 'potential energy use'. Statistically significant dwelling features include location, value and dwelling type, and household features such as income, age, period of residency, social status and tenure type are also important. Regression analyses on another large micro-dataset, the CSO *Household Budget Survey 2004–2005*, confirm how household characteristics can help explain the ownership of energy-using appliances. The location of the household, the number of rooms and household income are important factors, as are certain characteristics of the highest earner in the household such as education level and age. Evidence is also found that household income, number of persons, accommodation characteristics, region, and age of the highest earner can help explain domestic electricity use, even after taking account of the household's endowment of appliances. The level of demand for domestic heating is also associated with housing tenure and the employment status of the highest earner.

5.3 Spatial Incidence of a Carbon Tax

Carbon dioxide emissions from households, private companies and the public sector for the 3,401 electoral districts of the Republic of Ireland were estimated, combining data from the Census, the CSO *Household Budget Survey 2004–2005*, the National Accounts, Environmental Accounts, and the Labour Accounts. The source data are available for many countries, but there are no other studies that combine these data to estimate the spatial incidence of environmental regulation. For consumption, currently regulated emissions are reasonably uniform over space, while currently unregulated emissions vary much more substantially and are spatially concentrated in the commuter belts. This suggests that new regulation may run into local opposition. The incidence of a carbon tax correlates negatively with votes for the Green Party in the 2007 General Election. Emissions from production are clustered around the cities but the spatial pattern is dominated by a small number of point sources (which are already regulated). Consumption emissions dominate total emissions in suburbs and the countryside. Production emissions dominate total emissions in the towns and cities as well as in those electoral districts that have a point source of carbon dioxide.

5.4 Drinking Water

Domestic water demand is influenced both by the number of households and their characteristics, in particular the extent to which they employ water-using appliances. Rapid economic and demographic change has put pressure on the water and sewerage infrastructure. Using a large household micro-dataset, discrete response logistic models are used to examine the determinants of the water and sewage mains connection status of Irish homes, identify the characteristics of households that are associated with having larger or smaller numbers of appliances, and investigate what types of households own particular combinations of appliances.

There are substantial differences in estimated household water use between counties, but there is also a substantial disparity between imputed water use by households and water supplied by treatment plants.

5.5 Holiday Destination Choice

Quarterly survey data of Irish households' travel destinations between 2000 and 2006 were used to estimate a McFadden choice model to measure the importance of destination, household and seasonal characteristics on the tourism destination choices of Irish households. In total, some 55,000 holiday trips were observed. Destination characteristics such as temperature, Gross Domestic Product (GDP) and coastline are found to positively influence choice probabilities, while population density and distance have a negative effect on choice. Household-specific characteristics such as the numbers of people over 60 and children in a household are found to be important. There are differences in preferences across seasons and a change over time of the effect of destination country GDP on Irish holiday destination choices.

A pooled travel model for the destination choice of tourists from the Republic of Ireland in 2006 was estimated, distinguishing between holidaymakers (further split into travelling with children, elderly, and other), visitors to family, visitors to friends, business travellers and other travellers. The different types of tourist have very different preferences. Elderly holidaymakers and family visitors stand out most from the 'average' tourist. Preferences for cultural heritage, population density, and temperature discriminate the most between tourist types. There is some evidence that destination preferences vary over the year, but limited data prevent a full investigation. All types of Irish tourists are indifferent to precipitation. Only holidaymakers respond to temperature differences. All holidaymakers dislike cold destinations, but only elderly holidaymakers dislike hot destinations as well.

5.6 Modal Choice for Commuters

Rapid economic and demographic change in Ireland over the last decade, with associated increases in car dependence and congestion, has focused policy on encouraging more sustainable forms of travel. In this context, knowledge of current travel patterns and their determinants is crucial.

Cross-section micro-data from the *2006 Census of Population* were used to analyse the influence of travel and supply-side characteristics, as well as demographic and socio–economic characteristics on the choice of mode of transport to work in the Greater Dublin Area. Those working in the city centre are significantly more likely to walk or cycle, or take public transport to work, indicating the effect of public transport availability and city centre parking difficulties and restrictions. The significant positive results observed for public transport use by those working in the city centre may also add weight to the argument for the development of a more concentrated employment district in the city centre, to reverse the trends of employment suburbanisation and urban sprawl, which are considered to increase car dependence. In addition, in comparison with those with poor access to rail facilities, persons living and working in areas with better access to rail facilities are significantly more likely to travel by rail (and indeed walk and cycle to work). This reflects the importance of public transport provision in influencing modal choice, even when car ownership, work location and travel time have been taken into account. Furthermore, the existence of park-and-ride facilities and bus lanes in an individual's area is associated with a significantly increased probability of travelling by public transport to work. Note, however, that bus lanes do reduce the probability of commuting on foot and by train. The insignificance of bus lanes for bicycle use indicates that they should not be considered as a substitute for dedicated cycle lanes.

The significance of gender, household type and marital status in determining choice of mode of transport to work highlights the importance of household or family interactions in determining modal choice. While women are significantly less likely to walk or cycle to work, they are significantly more likely than men to take public transport to work. Individual modal choice decisions are often made with reference to other members of the household, in particular with regard to the needs and schedules of school-age children and/or the availability of the household car. In recent years, the proportion of schoolchildren being driven to school has increased substantially, and while the results here are static, the results for household type and marital status to some extent reflect this situation, with individuals in households with young children being significantly less likely to walk, cycle or take public transport to work.

Between 1995 and 2001, the proportion of households with one or more cars grew from 74.6 per cent to 80.8 per cent. Income and previous car ownership are the strongest determinants of differences in household car ownership. Other important influences include household composition (in particular the presence of young children) and life-cycle effects. These matters are beyond the control of policy makers seeking to change travel behaviour.

Cross-sectional micro-data from the *2006 Census of Population* were used to estimate discrete choice models of the joint decision on car ownership and commuting mode choice for four subsamples of the Irish population, based on residential location. Empirical results suggest that travel and supply-side characteristics, such as travel time, costs, work location and public transport availability, as well as demographic and socio–economic characteristics such as age and household composition, have significant effects on these decisions.

5.7 The Value of the Irish Environment

Environmental accounts should include the value of the emissions and resource use. Monetary value estimates for environmental amenities are rare in Ireland. A start at estimating the value of forests, urban amenities, and biodiversity is being made.

The monetary value of the recreational use of Irish forests in 1998 was estimated using two different valuation methods on one dataset (the Travel Cost Method (TCM) and the Contingent Valuation Technique) and convergent validity, i.e. whether they are consistent with each other, was tested. Convergence cannot be established with these data. The Willingness-to-Pay (WTP) for entrance responses were stationary and tended to cluster around IR£1 per adult equivalent per trip. The TCM results of consumer surplus, which should be the same as WTP, were more variable depending on which sample was analysed and ranged between IR£2.38 and IR£5.95 per adult equivalent per trip. There is no correlation between these two variables. It seems that there are problems in getting people to state their true WTP. This is possibly due to a misinterpretation of the question by respondents as well as a tendency to revert to a common number. It is also likely that respondents used their WTP answers to make a political statement against the expansion of forestland using agricultural land. Finally, forests in Ireland are regarded as public goods and consequently there exists a stance among users that access to them should be free of charge, which might explain the large number of protest bids.

A hedonic house price model was used to estimate the value of rail transport networks to homeowners in the Dublin area. Using a dataset of house sales between 2001 and 2006 and combining it with available geographical data on the train and tram lines in Dublin, it is possible to assess the values assigned to different transport links by homeowners. The value of transport depends on how far from the property it is located and is also affected by the availability of alternative transport options in the area. There are differences in the values assigned to recently constructed tramlines compared with the traditional rapid transit train stations. The study also takes into account house characteristics and other environmental amenities.

Biodiversity can be measured by means of different indicators, and these can be used to assess the influence of the biodiversity profile of a region on the tourism flows towards it. Previous studies have considered environmental amenities as one of the determinants of tourism destination choice. The destination's biodiversity profile can be considered to be a key component of environmental amenities. Biodiversity and landscape indicators have a statistically significant effect on tourists' choices regarding the duration of their trip. As a result, policies pursuing biodiversity conservation appear to have a positive impact on the revenue of regional tourism.

5.8 Irish Consumption Patterns

Country-level panel data on consumption in Ireland and seven other Organisation for Economic Co-operation and Development (OECD) countries[9] were used to examine the evolution of Irish consumption patterns as Ireland underwent rapid macroeconomic growth. Consumption levels obviously increased due to substantially higher incomes, but it is less clear how the shares of different types of goods purchased have changed or whether Ireland's consumption mix has converged with that of other high-income countries. Rankings based on a simple distance measure of consumption similarity suggest that Ireland moved from a 'low-income' pattern similar to Portugal or Greece to a 'high-income' pattern like that of Canada between 1995 and 2003. Using static and dynamic Almost Ideal Demand System models, long- and short-run Irish price and income elasticities were estimated for nine categories of commodities between 1976 and 2003. These results provide evidence of substantial habit formation in aggregate consumption. A long-run cross-country model was estimated covering six aggregate commodity groups between 1975 and 2003. Ireland's demand parameters remain more similar to those of Greece than to higher-income OECD countries in the sample. Although Ireland has overtaken most other OECD countries in per capita income, it is still converging to a higher-income consumption pattern. Further convergence of Irish expenditure patterns towards a pattern typical of high-income countries is foreseen.

9. Australia, Austria, France, Greece, Italy, United Kingdom, United States of America.

5.9 Behavioural Parameters Governing Household Waste Generation and Disposition in Ireland

Ireland has signed up to ambitious targets for diverting municipal solid waste from landfill, illustrated in Fig. 4.1. These targets are likely to be very difficult to meet without substantial changes in the way household waste is collected and managed. Data on household waste management behaviour in Ireland are scarce, and policy making could benefit from improved data and market analysis. Data from the EPA and the CSO were used to estimate econometric models of household waste collection in Ireland, providing national estimates of income elasticities of demand, price elasticities where unit charges are in place, effects of imposing weight-based charging and effects of other important changes to service characteristics. These results were then used in a simulation model to illustrate the likely effects of some current policy options.

Demand for household waste collection services in Ireland exhibits roughly a unit income elasticity, which is unusually high by international standards. This suggests that waste quantities will be relatively sensitive to macroeconomic fluctuations. However, it has been noted that this parameter may not be stable over time.

In common with other studies, it is found that weight-based charges and availability of kerbside recycling have significant (negative) effects on mixed waste quantities. Introducing kerbside recycling reduces mixed waste quantities by about 15 per cent.

6 Conclusions

The primary goal of this study was to produce a tool to allow Irish emissions and resource use for a wide range of substances to be projected into the future, using a model structure that could facilitate testing of various policy options in the future. In order to do this, a set of environmental accounts was constructed that cover a longer period and more substances than any other environmental accounts for Ireland, and are true satellite accounts. The ISus model (implemented largely in MATLAB®) which allows these accounts to be projected into the future on a sectoral level was then built. Activity drivers were drawn from the ESRI Hermes macro-econometric model and other more specific models. Approaches to regionalising projections where suitable data are available were developed.

The study also included some applications of the model to provide policy-relevant information, notably in relation to greenhouse gas emissions and waste management.

A large number of background studies were carried out to fill gaps in the available literature concerning key sources of emissions, users of resources and valuation. This report summarises the research into aviation emissions, household energy use, drinking water demand and quality, tourism, modal choice by commuters, valuation of environmental goods, the evolution of Irish consumption patterns and drivers of household waste arisings.

Much more work of this kind will be required in the future if future researchers and policy makers are to have a robust evidence base for making environmentally relevant decisions. In particular, the ESRI Environmental Accounts need to be extended to include more emissions and more resources. The existing needs need to be regularly updated as new information becomes available, and new projections for future years need to be made using the Hermes and ISus models. Prime candidates for extensions include material flows[10], land use[11], water use and emissions to water[12], and emissions covered by IPPC licensing and the Annual Environmental Reports. Through the process of regular projections, a series of historical forecasts will also be built up. Comparing forecasts with one another, and with observations that were added after the forecast was made, will enable the estimation of forecast errors and thus improve the ISus model. Regional and distributional extensions of the ISus model would require a richer set of behavioural parameters to explain these variations – and this could be exploited to improve the dynamics and behavioural richness of the ISus model in its scenario-generating mode as well.

The ISus model projects the environmental accounts into the future based on assumptions about developments in the economy, in technology, and in policy. The model thus can also be used to test the implications of alternative policy proposals, as well as the effects of past policy interventions.

For many environmental issues, such as greenhouse gas emissions, national accounts are perfectly adequate. For other issues, such as air and water quality, national statistics are less informative. The limited regionalisation in the current project should be extended to other emissions and resources, where needed combining polygon data (electoral districts) with location data (e.g. for point sources of pollution) and grid data (e.g. for air quality or biodiversity).

Rich and poor put very different pressures on the environment, and are differently affected by environmental policy. The current version of ISus contains an input–output model with final demand per income decile. The indirect emissions per income decile for all substances in the ESRI Environmental Accounts can thus be derived. However, direct emissions are much larger than indirect emissions, and the distribution is more skewed – at least for

10. Drawing on Maguire and Curry (2008) and the forthcoming *Material Flow Accounts* of the CSO.
11. Using data from the CSO and the European Environment Agency.
12. Using data from the EPA and River Basin Districts.

carbon dioxide. Therefore, direct emission per income class should be estimated using a combination of micro-data on households and individuals (primarily the Census, the *Household Budget Survey*, and relevant modules in the *Quarterly National Household Survey*, all by the CSO) and engineering relationships between activities and emissions.

The input–output model can also be used to move seamlessly between production accounts and consumption accounts. Consumption accounts are not complete, however, without embedding the Irish input–output model into a multi-regional input–output model.

The ESRI Environmental Accounts should be extended to include expenditure on environmental protection, in line with international guidelines on environmental accounting. The data could be taken from the CSO *Census of Industrial Production* (CIP). Questions on environmental protection were first included in the 2006 CIP. These data should be analysed as to which sectors and which type of companies spend most on what sort of environmental protection. Based on that analysis, the survey results should be grossed up to estimates of the total expenditure on environmental protection per sector.

The ESRI Environmental Accounts provide a solid basis for computing the Green Net National Product (GNNP) of Ireland. Using the ISus model, the GNNP could be projected into the future for an alternative policy scenario, providing a unique tool for policy evaluation. To this end, however, more valuation studies of the Irish environment should be conducted.

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Acronyms

APD	Air Passenger Duty
BMW	Biodegradable municipal waste
BOD	Biochemical oxygen demand
CH_4	Methane
CIP	Census of Industrial Production
CO	Carbon monoxide
CO_2	Carbon dioxide
CSO	Central Statistics Office
EPA	Environmental Protection Agency
ESRI	Economic and Social Research Institute
ETS	Emissions Trading System
GDP	Gross Domestic Product
GNNP	Green Net National Product
Hermes	The ESRI's macro-econometric model
IDEM	Irish Dispatch Electricity Model
ISus	Ireland's Sustainable Development Model
$MMTCO_2$	Million metric tonnes of carbon dioxide equivalent
MTR	Medium-Term Review
N_2O	Nitrous oxide (laughing gas)
OECD	Organisation for Economic Co-operation and Development
SEI	Sustainable Energy Ireland
TCM	Travel Cost Method
WTP	Willingness-to-Pay

An Ghníomhaireacht um Chaomhnú Comhshaoil

Is í an Gníomhaireacht um Chaomhnú Comhshaoil (EPA) comhlachta reachtúil a chosnaíonn an comhshaol do mhuintir na tíre go léir. Rialaímid agus déanaimid maoirsiú ar ghníomhaíochtaí a d'fhéadfadh truailliú a chruthú murach sin. Cinntímid go bhfuil eolas cruinn ann ar threochtaí comhshaoil ionas go nglactar aon chéim is gá. Is iad na príomh-nithe a bhfuilimid gníomhach leo ná comhshaol na hÉireann a chosaint agus cinntiú go bhfuil forbairt inbhuanaithe.

Is comhlacht poiblí neamhspleách í an Ghníomhaireacht um Chaomhnú Comhshaoil (EPA) a bunaíodh i mí Iúil 1993 faoin Acht fán nGníomhaireacht um Chaomhnú Comhshaoil 1992. Ó thaobh an Rialtais, is í an Roinn Comhshaoil agus Rialtais Áitiúil a dhéanann urraíocht uirthi.

ÁR bhFREAGRACHTAÍ

CEADÚNÚ

Bíonn ceadúnais á n-eisiúint againn i gcomhair na nithe seo a leanas chun a chinntiú nach mbíonn astuithe uathu ag cur sláinte an phobail ná an comhshaol i mbaol:

- áiseanna dramhaíola (m.sh., líonadh talún, loisceoirí, stáisiúin aistrithe dramhaíola);
- gníomhaíochtaí tionsclaíocha ar scála mór (m.sh., déantúsaíocht cógaisíochta, déantúsaíocht stroighne, stáisiúin chumhachta);
- diantalmhaíocht;
- úsáid faoi shrian agus scaoileadh smachtaithe Orgánach Géinathraithe (GMO);
- mór-áiseanna stórais peitreail.
- Scardadh dramhuisce

FEIDHMIÚ COMHSHAOIL NÁISIÚNTA

- Stiúradh os cionn 2,000 iniúchadh agus cigireacht de áiseanna a fuair ceadúnas ón nGníomhaireacht gach bliain.
- Maoirsiú freagrachtaí cosanta comhshaoil údarás áitiúla thar sé earnáil - aer, fuaim, dramhaíl, dramhuisce agus caighdeán uisce.
- Obair le húdaráis áitiúla agus leis na Gardaí chun stop a chur le gníomhaíocht mhídhleathach dramhaíola trí comhordú a dhéanamh ar líonra forfheidhmithe náisiúnta, díriú isteach ar chiontóirí, stiúradh fiosrúcháin agus maoirsiú leigheas na bhfadhbanna.
- An dlí a chur orthu siúd a bhriseann dlí comhshaoil agus a dhéanann dochar don chomhshaol mar thoradh ar a ngníomhaíochtaí.

MONATÓIREACHT, ANAILÍS AGUS TUAIRISCIÚ AR AN GCOMHSHAOL

- Monatóireacht ar chaighdeán aeir agus caighdeáin aibhneacha, locha, uiscí taoide agus uiscí talaimh; leibhéil agus sruth aibhneacha a thomhas.
- Tuairisciú neamhspleách chun cabhrú le rialtais náisiúnta agus áitiúla cinntí a dhéanamh.

RIALÚ ASTUITHE GÁIS CEAPTHA TEASA NA HÉIREANN

- Cainníochtú astuithe gáis ceaptha teasa na hÉireann i gcomhthéacs ár dtiomantas Kyoto.
- Cur i bhfeidhm na Treorach um Thrádáil Astuithe, a bhfuil baint aige le hos cionn 100 cuideachta atá ina mór-ghineadóirí dé-ocsaíd charbóin in Éirinn.

TAIGHDE AGUS FORBAIRT COMHSHAOIL

- Taighde ar shaincheisteanna comhshaoil a chomhordú (cosúil le caighdéan aeir agus uisce, athrú aeráide, bithéagsúlacht, teicneolaíochtaí comhshaoil).

MEASÚNÚ STRAITÉISEACH COMHSHAOIL

- Ag déanamh measúnú ar thionchar phleananna agus chláracha ar chomhshaol na hÉireann (cosúil le pleananna bainistíochta dramhaíola agus forbartha).

PLEANÁIL, OIDEACHAS AGUS TREOIR CHOMHSHAOIL

- Treoir a thabhairt don phobal agus do thionscal ar cheisteanna comhshaoil éagsúla (m.sh., iarratais ar cheadúnais, seachaint dramhaíola agus rialacháin chomhshaoil).
- Eolas níos fearr ar an gcomhshaol a scaipeadh (trí cláracha teilifíse comhshaoil agus pacáistí acmhainne do bhunscoileanna agus do mheánscoileanna).

BAINISTÍOCHT DRAMHAÍOLA FHORGHNÍOMHACH

- Cur chun cinn seachaint agus laghdú dramhaíola trí chomhordú An Chláir Náisiúnta um Chosc Dramhaíola, lena n-áirítear cur i bhfeidhm na dTionscnamh Freagrachta Táirgeoirí.
- Cur i bhfeidhm Rialachán ar nós na treoracha maidir le Trealamh Leictreach agus Leictreonach Caite agus le Srianadh Substaintí Guaiseacha agus substaintí a dhéanann ídiú ar an gcrios ózóin.
- Plean Náisiúnta Bainistíochta um Dramhaíl Ghuaiseach a fhorbairt chun dramhaíl ghuaiseach a sheachaint agus a bhainistiú.

STRUCHTÚR NA GNÍOMHAIREACHTA

Bunaíodh an Ghníomhaireacht i 1993 chun comhshaol na hÉireann a chosaint. Tá an eagraíocht á bhainistiú ag Bord lánaimseartha, ar a bhfuil Príomhstiúrthóir agus ceithre Stiúrthóir.

Tá obair na Gníomhaireachta ar siúl trí ceithre Oifig:

- An Oifig Aeráide, Ceadúnaithe agus Úsáide Acmhainní
- An Oifig um Fhorfheidhmiúchán Comhshaoil
- An Oifig um Measúnacht Comhshaoil
- An Oifig Cumarsáide agus Seirbhísí Corparáide

Tá Coiste Comhairleach ag an nGníomhaireacht le cabhrú léi. Tá dáréag ball air agus tagann siad le chéile cúpla uair in aghaidh na bliana le plé a dhéanamh ar cheisteanna ar ábhar imní iad agus le comhairle a thabhairt don Bhord.

National Development Plan 2007 - 2013

Science, Technology, Research and Innovation for the Environment (STRIVE) 2007-2013

The Science, Technology, Research and Innovation for the Environment (STRIVE) programme covers the period 2007 to 2013.

The programme comprises three key measures: Sustainable Development, Cleaner Production and Environmental Technologies, and A Healthy Environment; together with two supporting measures: EPA Environmental Research Centre (ERC) and Capacity & Capability Building. The seven principal thematic areas for the programme are Climate Change; Waste, Resource Management and Chemicals; Water Quality and the Aquatic Environment; Air Quality, Atmospheric Deposition and Noise; Impacts on Biodiversity; Soils and Land-use; and Socio-economic Considerations. In addition, other emerging issues will be addressed as the need arises.

The funding for the programme (approximately €100 million) comes from the Environmental Research Sub-Programme of the National Development Plan (NDP), the Inter-Departmental Committee for the Strategy for Science, Technology and Innovation (IDC-SSTI); and EPA core funding and co-funding by economic sectors.

The EPA has a statutory role to co-ordinate environmental research in Ireland and is organising and administering the STRIVE programme on behalf of the Department of the Environment, Heritage and Local Government.

Environmental Protection Agency
An Ghníomhaireacht um Chaomhnú Comhshaoil

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SSTI Strategy for Science, Technology and Innovation

Comhshaol, Oidhreacht agus Rialtas Áitiúil
Environment, Heritage and Local Government