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Report on the in-depth review of the third national communication of Ireland

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I. INTRODUCTION AND NATIONAL CIRCUMSTANCES RELEVANT TO GREENHOUSE GAS EMISSIONS AND REMOVALS

A. Introduction

1. Ireland ratified the United Nations Framework Convention on Climate Change (UNFCCC) on 20 April 1994 and the Kyoto Protocol to the UNFCCC on 31 May 2002. Ireland's target under the burden-sharing agreement of the European Community (EC) for the Kyoto Protocol is to limit the increase in annual greenhouse gas (GHG) emissions in 2008–2012 to 13 per cent compared to the base year. The UNFCCC secretariat received the first national communication of Ireland (NC1) in 1994, the second one (NC2) in 1997, and the third one (NC3) on 3 December 2003.[1]

2. The Department of the Environment, Heritage and Local Government (DEHLG) coordinated the preparation of the NC3. Most of the required information was provided by relevant ministries (known as 'departments') and governmental agencies.[2] For some issues, inputs from universities, research institutes and consulting companies were used. Non-governmental organizations (NGOs) did not take part in the preparation of the NC3, but they participate in discussions of national climate-related policies and are familiar with the key policy documents used in the preparation of the NC3.

3. The in-depth review of the NC3 was carried out from September 2004 to January 2005, including a visit by the review team to Dublin from 1 to 5 November 2004. The team consisted of Mr. A. Rolle (Bahamas),[3] Mr. M. Soltanieh (Islamic Republic of Iran), Mr. I. Melinte (Romania), Mr. S. Wear (New Zealand) and Mr. S. Kononov (UNFCCC secretariat, coordinator). During the country visit, the review team met officials from ministries and governmental agencies, national experts involved in the preparation of the NC3, and representatives of business and environmental NGOs.

B. National circumstances

4. ***Location***. The island of Ireland is situated off the northwest coast of Europe, bordering the Atlantic Ocean in the west, south and north; in the east, the Irish Sea separates Ireland from Great Britain. The area of the island is about 84,000 km^2, shared between the Republic of Ireland (about five-sixths of the total area) and Northern Ireland, which is part of the United Kingdom of Great Britain and Northern Ireland.

5. ***Climate***. The climate is of the mild oceanic type, influenced by the warm waters of the Gulf Stream and south-westerly winds from the Atlantic Ocean. The average daily temperatures for the coldest months (January–February) are between 4ºC and 7ºC; the average daily temperatures for the warmest months (July–August) are between 14ºC and 16ºC.

6. ***Land use***. The total land area of the Republic of Ireland is about 70,000 km^2, of which agricultural land occupies about 64 per cent (2004 data).[4] About 80 per cent of agricultural land is under grass. The forested share of the land area increased from 7.5 per cent in 1990 to 9.9 per cent in 2004.

7. ***Government***. The Republic of Ireland is a parliamentary democracy. The national parliament (Oireachtas) consists of the Office of President, the Dáil (House of Representatives) and the Seanad

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[1] The submission date for the NC3 was 30 November 2001 (decision 11/CP.4).

[2] Such as the Department of Communications, Marine and Natural Resources (DCMNR); the Department of Enterprise, Trade and Employment (DETE); the Department of Transport (DT); the Department of Agriculture and Food; the Environmental Protection Agency (EPA); Sustainable Energy Ireland (SEI); Met Éireann; the National Council for Forest Research and Development (COFORD); and Development Cooperation Ireland (DCI).

[3] Ireland kindly provided funding for an additional expert from a developing country to take part in the review.

[4] Department of Agriculture and Food of Ireland, 2005. *Fact Sheet on Irish Agriculture*. Dublin.

(Senate). The Taoiseach (head of the Government) is appointed by the President of Ireland on the Dáil's nomination. The Dáil is the primary house of the parliament and the Government is answerable to the Dáil only. The Minister for Environment, Heritage and Local Government is responsible for leading in the formulation and implementation of Ireland's policy on climate change.

8. ***Population***. The population of the Republic of Ireland was about 3.9 million in 2002, 11.4 per cent more than in 1990 (table 1) – a much faster growth than in most other European countries, which is explained not only by the relatively high birth rate but also by considerable immigration.

Table 1. Main macro-economic indicators and GHG emissions for Ireland

	1990	2001	2002	Change 1990–2002 (%)	Growth rate 1990–2002 (%/year)	Change 2001–2002 (%)
Population (millions)	3.51	3.85	3.91	11.4	0.9	1.6
GDP (billions EUR 1995)	41.4	88.7	94.2	128	7.1	6.2
GNP (billions EUR 1995)	37.5	73.7	74.8	99.5	5.9	1.5
TPES (Mtoe)	10.6	15.1	15.3	44.3	3.1	1.3
GDP per capita (thousands EUR 1995)	11.8	23.0	24.1	104	6.1	4.8
TPES per capita (kgoe)	3.0	3.9	3.9	30.0	2.2	0.0
GHG emissions without LUCF (Tg CO_2 eq)	53.4	70.0	68.9	29.0	2.1	–1.6
GHG emissions/removals by LUCF (Tg)	–0.07	–0.63	–0.98	1300	25.2	55.6
GHG/capita (Mg CO_2 eq)	15.2	18.2	17.6	15.8	1.2	–3.3
GHG/GDP (kg CO_2 eq per EUR 1995)	1.29	0.79	0.73	–43.4	–4.6	–7.6

Sources: The data for population and TPES are from the International Energy Agency, <http://data.iea.org)>; GDP and GNP data are from the Central Statistics Office Ireland (<www.cso.ie>); GHG emissions are from the Irish GHG inventory of 2004.
Note 1: GDP = gross domestic product, GNP = gross national product, CO_2 eq = CO_2 equivalent, kgoe = kilograms of oil equivalent, LUCF = land-use change and forestry, Mtoe = millions of tonnes of oil equivalent, TPES = total primary energy supply.
Note 2: One teragram (Tg) is equal to 1,000 gigagrams (Gg) or one million tonnes.
Note 3: GHG emissions are the sum of CO_2, CH_4, N_2O, HFCs, PFCs and SF_6.

9. ***Economy***. The Irish economy developed remarkably rapidly in the last decade, by 7.1 per cent per year on average (see table 1).[5] In 1990, the gross domestic product (GDP) per capita in Ireland was about 20 per cent below the average for the European Union (EU); in 2002, it was approximately 30 per cent above the EU average.[6] Ireland has an open economy: the exports/GDP ratio was about 98 per cent in 2001 and the imports/GDP ratio was about 83 per cent.[7] A sizable portion of the GDP is exported (as profits of foreign companies operating in Ireland), but even with this factor taken into account the performance of the Irish economy remains impressive (see GNP data in table 1).

10. Agriculture has traditionally been important for the Irish economy, but its relative contribution to the GDP fell from about 9 per cent in 1990 to about 3 per cent in 2002. Simultaneously, industry's share of the GDP grew from about 30 per cent in the early 1990s to more than 40 per cent in 2002.[8] The nature of the industries also changed because the economic growth in the 1990s was driven by the rapid developments in information and communication technologies, computer manufacturing, the pharmaceutical industry, food production, engineering, financial services and tourism. As a result, the economy became less intensive in terms of energy requirements and emissions of greenhouse gases (GHGs). The GHG total still increased in 1990–2002 but more slowly than the GDP, only by about 2.1 per cent per year. This shows a notable degree of decoupling between GHGs and GDP, which was achieved not only through the structural changes in the economy but also through increasing use of natural gas (see the next paragraph) and improvements in energy use efficiency (see the section on policies and measures).

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5 The average GDP growth in 1990–2002 for the 15 members of the European Union was 2.0 per cent.
6 Energy and economic data of the International Energy Agency, <http://data.iea.org>.
7 World Bank country data, <http://www.worldbank.org/data/>.
8 The data are from the Central Statistics Office Ireland, <www.cso.ie/>.

11. ***Energy supply***. Table 2 shows that the Irish total primary energy supply (TPES) increased by about 45 per cent from 1990 to 2002 and its fuel composition changed: the use of coal and peat decreased and the use of gas and oil increased. The use of renewable energy sources (RES), combustible renewables in particular, increased, but RES still contribute only about 2 per cent to TPES.

Table 2. Primary energy supply in Ireland, 1990–2002

	Mtoe		Change	Share in TPES (%)	
	1990	**2002**	**(%)**	**1990**	**2002**
Oil	4.87	8.73	79.3	46.1	57.0
Solid fossil fuels including	3.66	2.57	–29.8	34.6	16.8
coal	*2.25*	*1.79*	*-20.4*	*21.3*	*11.7*
peat	*1.41*	*0.77*	*-45.4*	*13.3*	*5.1*
Gas	1.87	3.68	96.8	17.7	24.0
Hydro energy	0.06	0.08	33.3	0.57	0.51
Combustible renewables and waste	0.11	0.18	63.6	1.02	1.15
Non-combustible renewables	0.00	0.03	–	0.00	0.22
Other (electricity trade)	0.00	0.04	–	0.00	0.28
Total primary energy supply (TPES)	**10.58**	**15.30**	**44.6**	**100.0**	**100.0**

Sources: 1) International Energy Agency, *Economic and energy database* <http://data.iea.org>; 2) Sustainable Energy Ireland. 2004. *Energy in Ireland 1990–2002: Trends, Issues and Indicators*. Dublin.

12. Ireland has two domestic resources of fossil fuels: natural gas and peat. The main domestic gas fields became depleted in the 1990s. New fields have been discovered, but their capacity is known to be small. Therefore, most of the gas supply now comes, and will continue to come in the future, from the United Kingdom through two seabed pipelines. The high dependency on energy imports (table 3) makes the security of energy supply a key policy consideration.

Table 3. Energy production and energy imports in Ireland, 1990–2002

	Mtoe		Change	Imports to production (%)	
	1990	**2002**	**(%)**	**1990**	**2002**
Energy production	3.47	1.50	–56.8	–	–
Energy imports	8.08	15.31	89.5	233	1 021

Source: International Energy Agency, *Economic and energy database* <http://data.iea.org>.

II. GREENHOUSE GAS INVENTORY INFORMATION

A. Reporting issues

13. The GHG inventory presented in the NC3 contained 1990–2001 data for carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O), and 1995–2001 data for hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6). Summary tables and figures showing emissions by gases and by sectors were provided.[9] In general, the NC3 inventory was presented in accordance with the UNFCCC reporting guidelines.[10]

14. At the time of the review team's visit, the Irish inventory submission of 2004 was available, including tables in the common reporting format (CRF) and the national inventory report (NIR). This submission contained 1990–2002 data for CO_2, CH_4 and N_2O, and 1995–2002 data for HFCs, PFCs and SF_6.[11] The review team used the 1990–2002 data from the 2004 inventory submission as the basis for the in-depth review and for this report.

[9] The review team noticed that some figures contained editorial errors (incorrect titles or units of measurement).

[10] Here and elsewhere in this report, the UNFCCC reporting guidelines refer to document FCCC/CP/1999/7 (part II: UNFCCC reporting guidelines on national communications).

[11] The detailed calculation sheets in the CRF file also contained estimates of HFCs, PFCs and SF_6 for 1990.

15. The technical in-country review of the Irish GHG inventory in 2003[12] found the inventory to be of good quality and generally in conformity with the *Revised 1996 Guidelines for National GHG Inventories* of the Intergovernmental Panel on Climate Change (IPCC) and the IPCC *Good Practice Guidance and Uncertainty Management for National Greenhouse Gas Inventories (IPCC GPG)*.

B. Inventory preparation

16. ***Organizational arrangements***. The Environmental Protection Agency (EPA) of Ireland is responsible for the preparation and support of the inventory. The EPA follows an established procedure for the collection of activity data and compilation of emission factors (see Annex 2 of the NC3).[13] The National Council for Forest Research and Development (COFORD) estimates carbon emissions and removals from land use, land-use change and forestry (LULUCF). Estimates of natural gas losses are prepared by gas production and distribution companies, and the Electricity Supply Board (ESB) provides emission data on a plant-by-plant basis. An interdepartmental Inventory Data Users Group (IDUG), involving different stakeholders within Ireland such as the Central Statistics Office (CSO), Sustainable Energy Ireland (SEI) and others, acts as a useful discussion forum.

17. Ireland is strengthening the bases (legal, administrative, etc.) for data collection, improving quality assurance and quality control, and enhancing the data support systems. A project to determine an optimal design for the national inventory system under the Kyoto Protocol was recently initiated.

18. ***Methodology***. A combination of tier 1, tier 2 and tier 3 methods across the IPCC source categories is applied; both generic and country-specific methods and emission factors are used.[14] In most cases, emissions are calculated by multiplying the appropriate activity level by the relevant emission factor, but models are also used, for example for LULUCF (CARBWARE).

19. ***Level of uncertainty***. Uncertainty estimates were not included in the NC3 but are available in the 2004 NIR, where an overall uncertainty of 11.5 per cent was reported for GHG emissions in 2002. The total uncertainty is heavily influenced by the high uncertainty in N_2O emissions from agricultural soils. For these emissions, which accounted for 10.4 per cent of the GHG total in 2002, the uncertainty in the activity level is 32 per cent and the uncertainty in the emission factor is 100 per cent.

20. Irish experts are aware of the importance of reducing the uncertainty in N_2O and CH_4[15] emissions from agriculture. Research projects are ongoing to enable the replacement of default emission factors in agriculture with more exact and less uncertain country-specific factors. The outcomes of these projects will, as appropriate, be taken into account in the 2006 inventory submission.

21. ***Recalculations***. When required, the EPA conducts inventory recalculations taking into account, among other factors, results of technical reviews of the GHG inventory under the UNFCCC. The last major recalculation was done in 2002. Recalculations are usually applied to the whole time series from 1990 to the latest available year. Ongoing work may lead to some recalculations in the future, for example for energy-related emissions as a result of a project carried out early in 2004, which aims to improve subsectoral disaggregation of energy consumption, or for agricultural emissions as a result of the research projects mentioned in paragraph 20.

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[12] See document FCCC/WEB/IRI(2)/2003/IRL.

[13] The diagram in Annex 2 of the NC3 should be complemented by the addition of Sustainable Energy Ireland (SEI).

[14] Detailed information on inventory methodologies is available in the 2004 NIR, in table 1.2 in particular.

[15] Emissions of CH_4 from agriculture also have a relatively high degree of uncertainty, but their contribution to the uncertainty in total GHGs is much lower than that of N_2O emissions.

C. Overall emission trends

22. From 1990 to 2002, GHG emissions (without land-use change and forestry (LUCF)) in Ireland increased by 29.0 per cent (table 4). By gas, the growth in CO_2 emissions was the highest: 44.0 per cent from 1990 to 2002. Emissions of CH_4 increased much less (7.6 per cent) and N_2O emissions remained almost stable. Emissions of HFCs grew sharply, but the emissions of HFCs, PFCs and SF_6 in 2002 altogether accounted for less than 1 per cent of the GHG total. The share of non-CO_2 gases in Ireland's GHG total is relatively high (33.5 per cent in 2002), reflecting the high level of agricultural production. From 2001 to 2002, GHG emissions decreased by 1.6 per cent, mostly as a result of declining emissions of CO_2 and N_2O.

Table 4. GHG emissions in Ireland, by gas, 1990–2002

	GHG emissions (Tg CO_2 equivalent)					Change (%)		Shares by gas (%)	
	1990	**1995**	**2000**	**2001**	**2002**	**1990–2002**	**2001–2002**	**1990**	**2002**
CO_2	31.8	34.8	44.2	46.5	45.8	44.0	–1.5	59.7	66.5
CH_4	11.9	12.6	12.8	12.6	12.8	7.6	1.6	22.4	18.6
N_2O	9.5	10.1	10.8	10.4	9.7	2.1	–6.7	17.9	14.1
HFCs	0.02	0.02	0.19	0.23	0.25	–	8.7	–	0.4
PFCs	0.08	0.08	0.31	0.30	0.21	–	–30.0	–	0.3
SF_6	0.08	0.08	0.05	0.07	0.07	–	0.0	–	0.1
HFCs+PFCs+SF_6	0.18	0.18	0.55	0.59	0.53	–	–10.2	–	0.8
GHG total without LUCF	**53.4**	**57.6**	**68.3**	**70.0**	**68.9**	**29.0**	**–1.6**	**100.0**	**100.0**

D. Key emission sources and sectoral trends

23. Ireland has carried out a key source analysis reflected in the 2004 NIR. In 2002, five sources accounted for more than three quarters of the total GHG emissions: energy industries (CO_2 emissions), 23.5 per cent; transport (CO_2), 16.3 per cent; other sectors (CO_2), 15.0 per cent; enteric fermentation (CH_4), 13.8 per cent; and agricultural soils (N_2O), 10.4 per cent.

24. Table 5 shows that in the 1990s GHG emissions increased in all sectors and subsectors, with the exception of fugitive emissions. The highest growth, in both absolute and relative terms, occurred in transport where the emissions more than doubled from 1990 to 2002.

Table 5. GHG emissions by sector and subsector in Ireland, 1990–2002

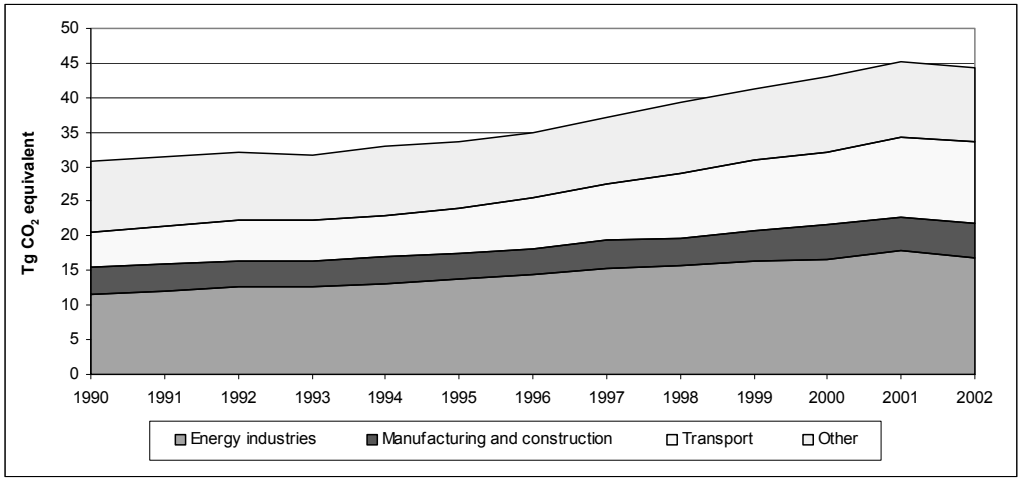
	GHG emissions (Tg CO_2 equivalent)					Change (%)		Shares by sector (%)	
	1990	**1995**	**2000**	**2001**	**2002**	**1990–2002**	**2001–2002**	**1990**	**2002**
1. Energy	31.0	34.0	43.1	45.3	44.4	43.2	–2.0	58.2	64.6
A1. Energy industries	*11.5*	*13.8*	*16.6*	*17.8*	*16.8*	*46.1*	*–5.6*	*21.5*	*24.4*
A2. Manufacturing and construction industries	*3.96*	*3.65*	*4.90*	*4.89*	*5.05*	*27.5*	*3.3*	*7.4*	*7.3*
A3. Transport	*5.14*	*6.58*	*10.64*	*11.53*	*11.68*	*127.2*	*1.3*	*9.6*	*17.0*
A4–5. Other	*10.14*	*9.68*	*10.79*	*10.87*	*10.75*	*6.0*	*–1.1*	*19.0*	*15.6*
B. Fugitive emissions	*0.290*	*0.297*	*0.173*	*0.237*	*0.148*	*–49.0*	*–37.6*	*0.5*	*0.2*
2. Industrial processes	3.15	3.03	4.00	4.05	3.84	21.9	–5.2	5.9	5.6
3. Solvents	0.09	0.10	0.11	0.11	0.11	22.2	0.0	0.2	0.2
4. Agriculture	17.9	19.1	19.7	19.2	18.7	4.5	–2.6	33.6	27.2
5. LUCF	–0.07	–0.05	–0.05	–0.63	–0.98	1300.0	55.6	–	–
6. Waste	1.22	1.43	1.28	1.34	1.77	45.1	32.1	2.3	2.6
GHG total (with LUCF)	**53.4**	**57.5**	**68.2**	**69.4**	**67.9**	**27.2**	**–2.2**	**–**	**–**

25. ***Emissions from energy industries***. These emissions increased by 46.1 per cent from 1990 to 2002, following the increasing energy demand due to economic growth (figure 1). From 2001 to 2002, the emissions decreased by almost 6 per cent because the two new combined-cycle gas-fired power plants, commissioned in 2002, replaced some part of oil- and coal-based electricity generation.

26. ***Emissions from manufacturing industries and construction***. Growth in emissions from manufacturing industries and construction was smaller than in energy industries but still considerable:

21.5 per cent from 1990 to 2002. These emissions grew much more slowly than economic output because of sizeable improvements in the efficiency of energy use, structural changes in the economy (with a move to less energy-intensive industries), and increased use of natural gas by industries.

Figure 1. GHG emissions from fuel combustion in Ireland, 1990–2002



27. ***Emissions from transport***. The growth of GHG emissions from transport was the highest of all sectors and subsectors, by almost 130 per cent from 1990 to 2002. The growth was driven by the sharply increasing emissions of CO_2 from road transport and the effect of 'fuel tourism'.[16] The review team noted that while the general reasons for the increase in these emissions were known (growing car ownership following the increasing personal incomes and growing freight transport following the increasing GDP), analyses of the driving forces behind the increase could be strengthened. For example, changes in GHG emissions could be linked to changes in the modal split of passenger transport (in passenger-km) and freight transport (in tonne-km), which, in turn, could be linked to policy measures in transport. Irish experts shared this opinion, and informed the review team about their efforts to improve statistical data and modelling studies for transport.

28. ***Emissions from the residential and commercial sectors***. These emissions (see line 'A4–5. Other' in table 5) were stable in the 1990s, the fluctuations by year in table 5 being largely attributable to the changes in average annual temperature. The impact of the large growth in population numbers and personal incomes on emissions was offset by the increased penetration of natural gas in the residential sector, phasing out of the combustion of bituminous coal in larger urban areas,[17] renewal of the building stock, more stringent building regulations, and the increasing efficiency of energy use in households.

29. ***Fugitive emissions***. The remarkable (49 per cent) reduction in fugitive emissions was mostly due to the replacement of old gas pipelines with new ones and to the termination of offshore gas extraction on the southwest coast of Ireland.

30. ***Emissions from industrial processes***. Altogether, these emissions increased by 21.9 per cent from 1990 to 2002. Within the total, the reduction of N_2O emissions due to technological improvements and the closure of ammonia and nitric acid production plants in 2002 was offset by the increasing CO_2 emissions from cement and lime production (increasing along with economic growth) – see figure 2.

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[16] In 1990, about 10 per cent of the road transport fuel consumed in the Republic of Ireland was imported because fuel prices were higher than in Northern Ireland and Britain. Later in the 1990s petrol and diesel fuel became cheaper than in the United Kingdom, and in 2001 about 15 per cent of the road transport fuel sold in the Republic of Ireland was used outside the State. Thus, 'fuel tourism' somewhat distorts GHG estimates for transport.

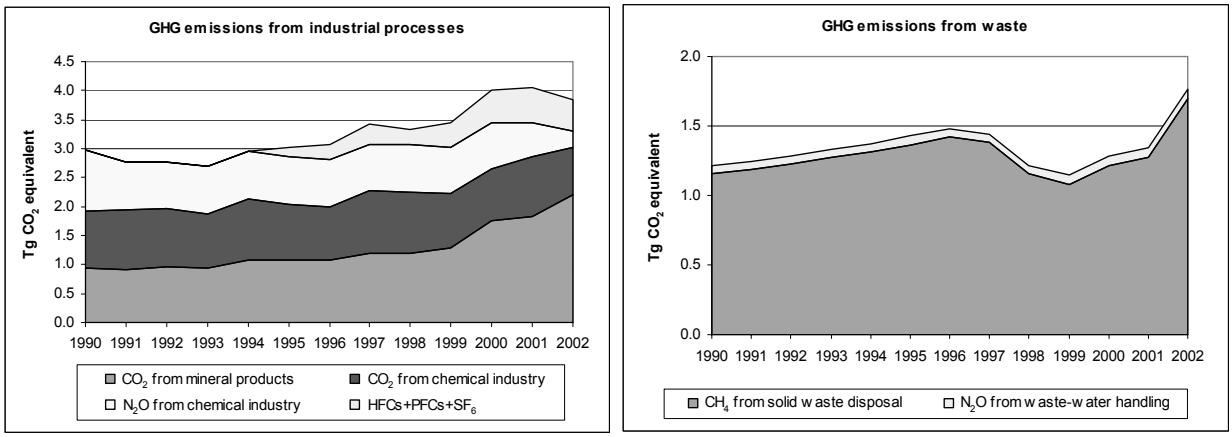
[17] Implemented as part of the measures to reduce air pollution.

High increases in HFCs (mainly because of the need to replace ozone-depleting substances) and PFCs (mainly due to the rapid expansion of semiconductor industries) also contributed to the overall growth.

31. ***Emissions from waste management***. The GHG emissions from waste management fluctuated in the 1990s (see figure 2) although the annual amounts of waste grew consistently. The key reason for the notable drop in 1997–1999 is the start of landfill gas collection and use at several large landfill sites. This effect faded out by the year 2000 and the emissions started to increase again.

32. ***Agricultural emissions***. Agricultural emissions increased from 1990 to 2002 by only 4.5 per cent. Two sources dominate these emissions: CH_4 from enteric fermentation (51 per cent of the total in 2002) and N_2O from agricultural soils (38 per cent). From 1998, agricultural emissions slightly decreased, which reflects a decline in livestock numbers and inorganic nitrogen fertilizer sales as a consequence of the implementation of the Common Agricultural Policy (CAP) of the EC.

Figure 2. GHG emissions from industrial processes and waste in Ireland, 1990–2002



33. ***GHG removals through LUCF***. CO_2 removals through LUCF increased remarkably fast – from only 0.07 Tg CO_2 in 1990 to 0.98 Tg CO_2 in 2002, with an almost 50 per cent growth between 2001 and 2002. These changes were driven by the consistent policy of afforestation that Ireland has been implementing since 1990. From 1990 to 2002, about 217,000 ha were afforested.

34. The review team noted that GHG emissions from peatlands were not included in the inventory (although the emissions from peat combustion were). Irish experts clarified that ongoing research projects are expected to provide the necessary information for the evaluation of such emissions/removals. The LUCF estimates do not take into account the effect of forest fires, but this effect is known to be small: annual losses due to fires are about 200 ha, and all burnt areas are reforested.

E. General comments on the GHG inventory

35. The review team was of the opinion that the GHG inventory of Ireland is of good quality and well supported. The remaining weaknesses are understood, and work is in progress to address them. However, the review team felt that the link between the GHG inventory and national policy-making could be strengthened. The EPA produces the annual GHG emissions estimate using the national sectoral breakdown of the National Climate Change Strategy (NCCS), which differs from the standard CRF breakdown. This information is provided at the request of the DEHLG for policy-making purposes. However, the review team could not see whether this information was used for assessing the actual efficiency of the policy measures defined in the NCCS.

36. Another example relates to transport. Although the transport section of the inventory is complete and consistent, the apparent absence of data or incompleteness of established relationships between GHG

emissions and key background data (such as a robust estimation of fuel tourism, the distances travelled and the shares of transport modes) makes it difficult to use inventory data for assessing the efficiency of policy measures in transport.

III. POLICIES AND MEASURES

A. Reporting issues

37. Although the NC3 generally followed the UNFCCC reporting guidelines on policies and measures, the review team noted some deviations from the guidelines such as the absence of a concise summary of policies and measures in the required format (paragraph 22 of the guidelines), the lack of clarity in the reported policy impacts on GHG emissions (paragraph 23), the absence of references to the measures reported in the previous communication (including an explanation of measures no longer in place), the absence of information on policies leading to greater levels of GHG emissions, and limited information on policy monitoring. Complementary information suggested by paragraph 24 of the guidelines (costs of policies and measures, non-GHG benefits of policies and measures, effects of the interaction of policies and measures) was not provided in the NC3.

38. The review team emphasized, in particular, that the summary table mentioned in paragraph 22 of the guidelines is vital for understanding the content, scope and progress of climate change policies.

B. Policy framework and objectives

39. In 2000, Ireland adopted the National Climate Change Strategy (NCCS). The NCCS identified a set of measures needed to achieve the national target under the Kyoto Protocol (Kyoto Protocol target) under the burden-sharing agreement of the EC, which aims to limit the increase in GHG emissions in the 2008–2012 period to 13 per cent above the base year level.[18] All NCCS measures were domestic because the strategy predated the finalization of an agreement on the detailed principles, rules, modalities and guidelines of the Kyoto Protocol's flexibility mechanisms; the implementation of domestic measures was expected to be sufficient to meet the target with a sizeable margin. The strategy did, however, anticipate the use of the flexibility mechanisms in order to achieve the Kyoto target when the international negotiations were finalized.

40. The elaboration of the flexibility mechanisms under the Kyoto Protocol in the Marrakesh Accords and the introduction of the EU Emissions Trading Scheme (EU-ETS) have changed the policy landscape since 2000. This has allowed for a re-focusing of the measures that were proposed under the NCCS. Consequently, since 2000 Ireland has reconsidered two key measures of the NCCS: the measure to close or convert to gas the country's largest coal-fired power station (the Moneypoint plant), and the measure to introduce a carbon tax by the end of 2003. The Moneypoint plant has now had its emissions capped under the EU-ETS and it is now planned to achieve the Kyoto Protocol target with both domestic measures and the use of the flexible mechanisms.

C. Cross-sectoral measures

41. According to the NC3, the two key cross-sectoral measures were carbon taxation and the trading of GHG emissions under the EU-ETS. The estimated GHG reduction from the introduction of a carbon tax was 1.2 Tg CO_2 equivalent per year (0.5 Tg in direct emissions reductions and an estimated 0.7 Tg of indirect reductions), or about 14 per cent of the total GHG reductions identified as necessary in the NC3 (15.4 Tg CO_2 equivalent per year). In September 2004 the Government announced that, following an extensive public consultation, it had concluded that the environmental benefits would not justify the

[18] Ireland defined the base year level as the 1990 level for the emissions of CO_2, CH_4 and N_2O, and the 1995 level for the emissions of HFCs, PFCs and SF_6.

adverse economic and social effects to which a carbon tax would give rise. The factors underpinning this decision included high international oil prices, the fact that a carbon tax would have applied to fuel oils already subject to excise duty, the potential negative impact on the national economy,[19] and other policy considerations. Options for obtaining the GHG reductions that were assumed to come from the tax are now under consideration.

42. The NC3 did not specify the impact of emissions trading on GHG emissions. According to the current version of Ireland's national allocation plan (NAP),[20] the gap between the average annual GHG emissions during the Kyoto Protocol commitment period of 2008–2012 and the projected GHG emissions in 2010 is 9.2 Tg CO_2 equivalent. Table 6 shows that GHG reductions of 4.3 Tg (almost half of the gap) are to be achieved through the EU-ETS. Domestic measures outside the EU-ETS are to provide the reduction of 1.2 Tg CO_2 equivalent; the nature of these reductions is not yet clear. The flexibility mechanisms under the Kyoto Protocol are expected to cover the remaining 3.7 Tg – about 40 per cent of the gap. The Government is in the process of determining what mechanisms – emissions trading (ET), joint implementation (JI) or the clean development mechanism (CDM) – will be used, and how.

Table 6. Current set of measures to close the projected gap to the Kyoto Protocol target

Category of emission reductions	Sector	GHG reduction (Tg CO_2 equivalent per year)	Comment
GHG reductions at less than 10 EUR/tonne CO_2	Trading[a]	2.2	Measures under 10 EUR/tonne CO_2 are assumed to be cost-effective
GHG reductions at less than 10 EUR/tonne CO_2	Non-trading[b]	1.2	Most of these reductions were assumed to come from carbon tax; their replacement in the absence of the tax has not yet been determined.
GHG reductions at more than 10 EUR/tonne CO_2	Trading[a]	2.1	ETS participants should either implement measures to achieve these reductions or purchase CO_2 quotas
Remaining gap	–	3.7	To be purchased by the Government using the flexibility mechanisms under the Kyoto Protocol
Total GHG reductions	–	**9.2**	The coverage of 1.2 Tg remains unclear at present

[a] The trading sector is defined as the sum of the installations participating in the EU-ETS.
[b] The non-trading sector is defined as the total economy minus the trading sector.
Source: Environmental Protection Agency. 2004. *Ireland's National Allocation Plan 2005–2007: 2nd Public Consultation (30 September 2004)*. Dublin.

43. The GHG mitigation measures that need to be implemented within economic sectors to achieve the reductions shown in table 6 could include[21] the reduction of clinker content in cement production (0.14 Tg CO_2 equivalent), optimization of heat recovery in clinker coolers (0.14 Tg), use of waste-derived fuels in the cement industry (0.28 Tg), and various reductions[22] in the emissions intensity per unit of energy in the power sector (0.81 Tg). Some of these measures were estimated to have a negative cost and might be implemented regardless of the actual price of CO_2 reductions on the ETS market; for others, the cost is not negative and the CO_2 price level may play a role for their implementation.

44. The review team observed that the gap shown in table 6 refers to the difference between a "with measures" scenario and the Kyoto Protocol target. The "with measures" scenario incorporates a sizeable package of policies and measures (most of them described in the sectoral sections below). If such

[19] The review team noticed that a recent study had shown that the economic cost of a carbon tax of EUR 20 per tonne of CO_2 would be small or negative, provided that the tax revenues were used to decrease taxes on labour (see A. Bergin, J. Fitz Gerald, I. Kearney. 2004. *The Macro-Economic Effects of Using Fiscal Instruments to Reduce Greenhouse Gas Emissions:* Final Report. *Report of the Environmental Protection Agency*. Wexford).
[20] Environmental Protection Agency. 2004. *Ireland's National Allocation Plan 2005–2007: 2nd Public Consultation (30 September 2004)*. Dublin.
[21] ICF Consulting and Byrne Ó'Cléirigh. 2004. *Determining the Share of National Greenhouse Gas Emissions for Emissions Trading in Ireland: Final Report*. London.
[22] See section III.D on energy supply industries for more information on such reductions.

measures are not implemented fully, or if their impact is smaller than expected, the size of the 'Kyoto gap' and the measures required to close it may need to be reconsidered.

D. Energy supply industries

45. The national energy policy has three core objectives: security of energy supply, environmental sustainability (which includes GHG mitigation) and economic competitiveness. National decision-makers strive to ensure balanced progress towards these objectives.

46. In the 1990s, Ireland achieved considerable reductions in the energy and carbon intensity of its economy. Emissions of CO_2 per GDP unit fell by almost 40 per cent from 1990 to 2002 (see table 1). In electricity production, CO_2 emissions per kWh decreased from 925 g CO_2 in 1990 to 721 g CO_2 in 2002.[23] At the same time, total GHG emissions from energy industries increased by 46.1 per cent from 1990 to 2002 (see table 5) as a result of increasing energy production to support economic growth.

47. In the future, the following policies and measures may be particularly important for limiting the growth of GHG emissions from energy supply: further penetration of natural gas, development of renewable energy sources, development of combined heat and power (CHP) generation, and investments in energy-related infrastructure.

48. ***Further penetration of natural gas***. From 1990 to 2002, the share of gas in the TPES increased from 17.7 to 24.0 per cent; in absolute terms, the supply of gas almost doubled, mostly through increases in imports (tables 2 and 3). This expansion, which was largely market-driven (new gas-fired power plants are highly competitive in comparison with oil- and peat-fired stations), had a beneficial effect on GHG emissions. However, further increase in the use of natural gas may be problematic because of energy security considerations. Such considerations have already led to the decision not to close the Moneypoint coal-fired power plant, although the closure was an important[24] part of the NCCS, and to the decision to retain peat-fired generation despite its relatively high GHG emissions and generation costs.[25]

49. ***Development of renewable energy sources (RES)***. The development of RES is an integral part of the Irish energy policy. Ireland has set a target of having 500 MW of additional RES capacity by 2005, and is also required, as part of the EC target, to provide 13.2 per cent of total electricity consumption by RES by 2010. . Following the receipt of state aids approval from the European Commission in 2004, the 500 MW target was revised upwards to 718 MW to include support for offshore wind power plants (two 25 MW demonstration projects), biomass CHP (28 MW) and additional support for other onshore technologies (mainly wind energy). The net impact from achieving these targets is estimated as annual GHG reductions of 1.0–1.5 Tg CO_2 equivalent.

50. In practice, the development of renewables (mostly wind energy) is carried out through competitive tenders, under the Alternative Energy Requirement (AER) programme whereby participants offer to supply renewable generation to the grid. The Electricity Supply Board (ESB) is obliged to purchase the AER-sourced electricity from tender winners for 15 years at the prices bid. The corresponding additional cost is passed to electricity consumers as a public service obligation levy. Six AER competitions have been conducted so far, and this mechanism appears to have met with moderate success, although there might be a delay in achieving the target set to 2005 for RES capacity.[26]

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[23] Sustainable Energy Ireland. 2004. *Energy in Ireland 1990–2002: Trends, Issues and Indicators*. Dublin.

[24] GHG reduction from the closure of the Moneypoint plant (3.4 Tg CO_2 equivalent annually) accounted for about 22 per cent of the total emission reductions under the NCCS (see Annex 3 of the NC3).

[25] Old peat-fired plants were recently closed and replaced by two new, more efficient peat-fired plants.

[26] A recent analysis suggests that the 500 MW target would be reached by 2007 rather than by 2005 (Sustainable Energy Ireland. 2004. *Renewable Energy in Ireland: Trends and Issues 1990–2002*. Dublin).

51. A consultation document "*Options for Future Renewable Energy Policy, Targets and Programmes"* was published in December 2003. The main purpose of this consultation was to set new targets for renewables for the period 2005 to 2010 and beyond to 2020 (the target to 2010 being to at least meet 13.2 per cent outlined in EC directive 2001/77). Furthermore, a Renewable Energy Development Group, chaired by the Department of Communications, Marine and Natural Resources (DCMNR) was established in May 2004. This Group will advise on future options on polices, targets, programmes and support measures, taking into account the submissions in response to the consultation document referred to above.

52. To help developers of wind energy projects, SEI has prepared an online wind resource map (http://esb2.net.weblink.ie/SEI/MapPage.asp). The map shows available wind resources across Ireland at various elevations, both onshore and offshore. The recent (2004) revision of the national Guidelines for Planning Authorities on Wind Farm Development is intended to remove remaining obstacles for planning wind energy projects.

53. ***Development of CHP generation***. In line with the relevant EU policy, Ireland has taken measures to increase CHP generation. CHP projects are part of the AER support scheme and SEI has CHP-supportive projects. As a result, from 1994 to 2002 thermal and electric outputs from CHPs increased by 50 and 143 per cent respectively.[27]

54. In the 1990s industrial CHP capacity grew slowly under the influence of limited support schemes and the open access to the market given to CHP. Recently, however, uncertainty over future fuel prices in the liberalized markets, short-term capping of electricity prices, uncertainty over conditions for electricity trading in the liberalized market, increase in the perceived risk for CHP developers (coupled with the long payback periods), lack of awareness of CHP, and some other barriers[28] led to stagnation in the market. The Government established the CHP Policy Group to make recommendations on possible future options, targets, removal of market barriers, and support measures to increase the deployment of CHP, and will be considering enhanced policies and programmes on CHP shortly.

55. ***Investments in energy-related infrastructure***. The ESB is implementing a programme to upgrade the electricity distribution network, including enhancements that might be necessary for grid stability when the capacity of wind energy generators becomes considerable. The gas supply and distribution networks are also being upgraded, which will reduce CH_4 losses and GHG emissions.

E. Residential, commercial and public sectors

56. In the 1990s, GHG emissions from the residential, commercial and public sectors in Ireland changed relatively little (see table 5) compared to the sharp changes in population numbers and personal incomes. The major reason for the stability of these emissions was the replacement of solid fuels (coal and peat) by natural gas and electricity. This change, which was partially induced by air quality considerations, had a marked beneficial impact on GHG emissions. The improved performance required under the building regulations, coupled with the relatively high rate of new house construction, provided an additional positive impact on energy use efficiency in buildings and, consequently, on GHG emissions. At the same time, a trend to larger apartments and houses became evident by the end of the 1990s.[29] This trend exerts an upward pressure on emissions, and its impact on GHG emissions may become important. The increase in the use of electricity in the residential and commercial sectors may also lead to increased GHG emissions.[30]

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[27] Sustainable Energy Ireland. 2004. *Energy in Ireland 1990–2002: Trends, Issues and Indicators*. Dublin.

[28] Other constraints for CHP development include the absence (or inadequacy) of a heat distribution infrastructure, the absence of a sizeable industrial market for heat, and insufficient transparency of electricity and heat tariffs.

[29] Sustainable Energy Ireland. 2004. *Energy in Ireland 1990–2002: Trends, Issues and Indicators*. Dublin.

[30] Sustainable Energy Ireland. 2004. *Energy in Ireland 1990–2002: Trends, Issues and Indicators*. Dublin.

57. Sustainable Energy Ireland (SEI), established in 2002 as a governmental agency on the basis of the former Irish Energy Centre, implements measures to improve energy use efficiency in the residential, industrial, commercial and public sectors.[31] Among the relevant SEI programmes in the residential sector, the three that may have the highest impact on GHG emissions are Home Energy Rating, Low Income Households and the House of Tomorrow:

- ***Home Energy Rating***. The original objective of this programme – to find ways to make energy efficiency in homes explicit and transparent – has been expanded considerably to embrace the requirements of the Energy Performance in Buildings Directive of the EC, which applies to all building types. A detailed action plan has been developed (as a consultation draft) by the Energy Performance in Buildings Working Group which comprises SEI (secretariat), DEHLG and DCMNR. The plan, which takes into account the activities of other EU member states through the Concerted Action Project, has been presented for ministerial approval, with a view to commencing implementation immediately thereafter. Some essential studies have already been commissioned and are under way.
- ***Low Income Households***. This programme aims to facilitate co-ordinated action to ensure that homes which are subject to fuel poverty have access to cost-effective heating, hot water and lighting through the installation of energy efficiency measures. Actions in low-income housing are designed to actively develop, promote and champion responses to fuel poverty issues within the context of national housing and sustainable energy policies.
- ***House of Tomorrow***. The programme stimulates the uptake of energy-efficient practices in building design and construction. The programme funds designers and architects who work on "clusters" of buildings (normally 10–100 buildings) with considerably improved energy use parameters, typically 20–40 per cent better than under the current Building Regulations.

F. Transport

58. Emissions from transport have been increasing rapidly since 1990 (see table 5), much faster than in any other economic sector. This resulted in a marked increase of the share of transport in the national GHG total:[32] from 9.6 per cent in 1990 to 17.0 per cent in 2002. The number of private cars per 1,000 persons increased from 226 in 1990 to 370 in 2002;[33] the passenger-km travelled by car increased from 18.1 billion in 1990 to 33.3 billion in 2000; the tonne-km travelled by freight vehicles increased from about 5.1 billion in 1993 to 15.9 billion in 2003.[34]

59. The importance of limiting the growth of GHG emissions from transport is well recognized in Ireland. It is also recognized that no single measure can address this problem sufficiently and a portfolio of measures is required. The NCCS and the NC3 list such measures, both implemented and planned, which can be classified in three broad categories: measures to increase fuel efficiency, measures to encourage modal shift in transport and demand management measures.

60. ***Measures to increase fuel efficiency***. Such measures include the voluntary agreement of the EC with European, Japanese and Korean car manufacturers to reduce CO_2 emissions from new cars,

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31 SEI also has activities for the development of RES and CHP, contributing to GHG mitigation in energy supply.

32 Though, as noted, national GHG estimates, based on fuel sales data, are distorted by the effect of fuel tourism.

33 This is still below the EU average of 488 cars per 1,000 persons in 2001.

34 The data in tonne-km are from Central Statistics Office (CSO) of Ireland, 2003. *Road Freight Transport Survey 2003*, CSO, Dublin (see <www.cso.ie>); the data in passenger-km are from Directorate-General for Energy and Transport, 2002. *European Union Energy & Transport in Figures 2002*, Brussels (see <http://europa.eu.int/comm/dgs/energy_transport/publication/index_en.htm>).

acceleration of car fleet turnover through a tax rebate,[35] fuel efficiency labelling of new cars, biannual vehicle inspections, governmental incentive to promote hybrid vehicles, and some other measures. These measures have definitely had an effect on energy consumption and GHG emissions, and will continue to do so. However, recent analyses by Irish experts indicate[36, 37] that – at least for the period from 2000 to 2002 – the fuel economy achieved was outweighed by the increased consumer preference for larger cars.

61. The review team noted that in addition to measures to increase fuel efficiency Ireland could also consider measures to increase the proportion of diesel-fuelled cars in the fleet (in 2002, 87 per cent of all cars were petrol-fuelled), measures to support the market penetration of cars using alternative fuels (natural gas, bio-fuels and, in a longer perspective, hydrogen), and measures to further support hybrid vehicles.

62. ***Measures to encourage the modal shift in transport***. Under the national Economic and Social Infrastructure Operational Programme (ESIOP) for 2000–2006, about EUR 3 billion have been allocated for investments in public transport and rail networks. The Dublin Transportation Office (DTO) published an integrated transport strategy, "Platform for Change", in 2001. This strategy includes such developments as a new metro network (currently under consideration), improvements in the availability and quality of the bus network (especially the Quality Bus Corridors[38]), two new light rail lines (which became operational in 2004), new park-and-ride facilities, and measures to improve bicycle routes and traffic management. Given the continuing dominance of cars in transport (see table 7), measures to change the modal split seem to be highly relevant.

Table 7. Shares of modes in passenger and freight transport in 1991 and 2001

	Passenger transport (percentage share of passenger-km)			Freight transport (percentage share of tonne-km)	
	1991	2001		1991	2001
Private cars	78.1	81.8	Trucks	89.5	96.0
Other modes	21.9	18.2	Other modes	10.5	4.0

Sources: The data in tonne-km are from Central Statistics Office (CSO) of Ireland, 2003. Road Freight Transport Survey 2003, CSO, Dublin (see <www.cso.ie>); the data in passenger-km are from Directorate-General for Energy and Transport, 2002. European Union Energy & Transport in Figures, Brussels (see <http://europa.eu.int/comm/dgs/energy_transport/publication/index_en.htm>).

63. ***Demand management measures***. Demand management measures include various initiatives to decrease the need to use a car. The link between transport and land-use planning is particularly important in this respect, which is taken into account in the Planning and Development Act (2000), Regional Planning Guidelines (2004) and Retail Development Guidelines (2001). Information technologies are used, within the INSTANT and STREETWISE projects,[39] to better manage road and non-road traffic. The carbon tax was also planned to be among demand management measures.

64. Creating and supporting a sustainable pattern of land use may have an impact on GHG emissions in Ireland, because the rate of new building construction is high – about 68,000 houses per year in 2003

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[35] The scrapping of older, less efficient motor vehicles was encouraged through a subsidized programme whereby owners of vehicles more than 10 years old were provided with a rebate of about EUR 1,270 for the motor registration tax when purchasing a new vehicle.

[36] Sustainable Energy Ireland. 2003. *Analysis of New Car Registrations in Year 2000*. Dublin.

[37] Sustainable Energy Ireland. 2004. *Energy in Ireland 1990–2002: Trends, Issues and Indicators*. Dublin.

[38] Quality Bus Corridors (QBCs) are partnerships between bus operators and road authorities. The operator agrees to provide a high-quality service along specified routes, whereas the authorities provide the required infrastructure such as bus lanes. QBCs have proved successful in Dublin and more are planned.

[39] The INSTANT project (to be implemented in 2005–2006) aims to improve multimodal traffic between Dublin and Belfast using a trip pre-planning tool, dissemination of travel-related information in real time and better traffic management. The STREETWISE project targets travelling among Ireland, Northern Ireland and mainland Britain; high quality traffic monitoring and data exchange between national authorities are considered.

(a sharp increase from about 20,000 in 1990). Also, the population is growing, and people tend to prefer living in detached or semi-detached houses; simultaneously, the average household size is declining (from 3.34 persons per household in 1991 to 2.97 in 2002). Irish experts recently estimated (using the statistics of new connections to the electricity grid) that individual housing in rural areas is increasing,[40] which, if confirmed, may lead to an increase in individual travel by road and in GHG emissions.

G. Industry

65. Since 1993, large industrial energy consumers have been sharing information on energy management within a voluntary Large Industry Energy Network (LIEN). About 80 large industrial companies, accounting for about 40 per cent of industrial energy consumption in Ireland, are now members of LIEN. The 2002 Annual Report of LIEN concluded that LIEN helped to achieve considerable additional savings in energy (285 GWh/year) and GHG emissions (0.12 Tg CO_2/year).

66. In the context of the planned introduction of a carbon tax SEI carried out a pilot voluntary negotiated agreements project, launched in February 2002, with 26 industrial enterprises. Three types of negotiated agreement were tested: an individual agreement with a company (with Aughinish Alumina), a collective agreement (with 10 companies) and a technology agreement (with 15 companies). The agreements included energy audits, comparison with best international practices and actions to improve energy use efficiency.

67. The final report of the pilot project[41] concluded that the project was successful. The costs of participation were considerably lower than the benefits associated with the energy savings and CO_2 reductions achieved, which indicates that negotiated agreements helped to find economically viable investments in energy efficiency and CO_2 reduction. It was proposed that companies participating in negotiated agreements would be exempt from the proposed carbon tax. However, despite the decision not to introduce a carbon tax, Irish experts believe that, with some reshaping, negotiated agreements can still be attractive for companies in view of the cost savings they help to achieve.

H. Agriculture

68. Agriculture remains an important economic sector in Ireland and, correspondingly, GHG emissions from agriculture are relatively high (27.2 per cent of total GHGs in 2002, see table 5).

69. Ireland has already implemented a number of measures to reduce GHG emissions from agriculture. For example, with respect to CH_4 emissions, the eligibility criteria for livestock premiums were changed to encourage farmers to farm at lower stocking densities. The headage grants under the Disadvantaged Areas Compensatory Allowance Scheme were decoupled from production, with payments now based on areas instead of livestock numbers, which removes some of the incentives to maximize herd densities. Measures to reduce the age of the herds have been also taken. The Cattle Movement Monitoring System (CMMS), a national bovine traceability database, can monitor trends in the age profile in the national herd.

70. For N_2O emissions, the implementation of the EC Nitrates Directive, the enforcement of the Good Farming Practice (GFP) rules (published in 2001) and the strengthening of the Rural Environmental Protection Scheme (REPS) are of particular relevance. The GFP rules include nutrient management guidelines covering the application of fertilizers. The REPS incorporates higher environmental standards than the GFP. The number of participants in REPS reached 45,500 in 1999 and is projected to increase to 59,000 by the end of 2006. Slow-release nitrogen fertilizers and more efficient management of slurry and wastewater-related measures have the capability to further reduce N_2O

[40] Irish Environmental Protection Agency. 2004. *Ireland's Environment 2004*. Dublin.
[41] Sustainable Energy Ireland. 2003. *Negotiated Energy Agreements Pilot Project. Final Report*. Dublin.

emissions from soils. Some development of organic farming has taken place since 2000; currently about 0.7 per cent of agricultural land is farmed using organic production methods.

71. Following the recent reforms of the EC CAP, Ireland decided to decouple livestock premiums and agricultural subsidies from agricultural output. Ireland opted for the "full decoupling" option and all direct payments for cattle, sheep and arable crops (currently linked to the production level) will be replaced with a single payment, decoupled from production, from 1 January 2005. According to estimates by Irish experts (based on all EU countries engaging on full decoupling), this is projected to lead to reductions in agricultural output and GHG emissions; the delivery of GHG reductions of 2.4 Tg CO_2 equivalent per year in the period 2008–2012 (as envisaged in the NCCS) appears to be likely based on the projected agricultural output. However, it is anticipated that the FAPRI-Ireland Partnership will revise its projections shortly for the impact of the recent CAP reform on Irish agriculture.

I. Waste management

72. Since 1995, Ireland's efforts to minimize the amount of waste and to improve waste management have been consistently strengthened by the Waste Management Act (1996), the policy statement "Changing Our Ways" (1998), the policy statement "Preventing and Recycling Waste: Delivering Change" (2002), and the policy statement "Taking Stock and Moving Forward" (2004). As a result, the number of recycling centres increased from 28 in 1995 to 61 in 2004 and the share of recycled municipal solid wastes increased from 7.8 per cent in 1995 to 28.4 per cent in 2003. Ten regional waste management plans were adopted in 2001 and a new Environmental Fund, financed through waste levies,[42] started operation in 2001 with the aim of supporting various projects in waste management. The completion of the first comprehensive national waste database in 1995 created a solid basis for the monitoring of the various categories of waste and their GHG emissions. Data from roadside collections and microchipping will further improve monitoring of the waste policy and increase the incentives to reduce wastes.

73. The number of landfill sites consistently decreased, from 110 in 1993 to only 35 in 2004, with a simultaneous improvement in the quality of their management. In 1997, the collection and utilization of landfill gas was introduced; in 2001, five landfill sites had gas utilization systems (with a total electric capacity of 15 MW) and six sites had systems for gas flaring. The capacity of gas utilization systems is planned to be expanded by 5.8 MW by 2005 and by a further 10 MW by 2010.

74. Despite the successes described, the need to continue efforts in waste management is recognized in Ireland. The link between the amount of waste and economic growth has not yet been broken, and GHG emissions from waste have been increasing since 1999 (figure 2).

J. Forestry

75. The current Irish forest policy, "Growing for the Future", was adopted in 1996. According to this policy, forest coverage of 17 per cent of Ireland's land area is considered to be sustainable, and this level should be achieved by 2030 by the afforestation of 20,000 ha per year from 2000. The policy has been consistently implemented, leading to a distinct increase in the forest area (see also paragraph 6), although, for various reasons, the actual rate of afforestation has been below the planned rate (between 15,000 and 16,000 ha per year from 2000 to 2002 and only 9,000 in 2003). Along with the increase in forest area, wood cuttings and wood use have been increasing.

76. Afforestation is implemented by farmers under a grant and premium scheme. The land under plantation and planting rates are well monitored. The first phase of the preparation of a comprehensive national forest inventory was completed in 1998 and the second phase is in progress.

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[42] A landfill levy of EUR 15 per tonne of waste has been in force since June 2002.

77. Ireland intends to use carbon sequestration for achieving its Kyoto Protocol target. According to the NCCS, carbon sinks should remove 0.76 Tg CO_2 equivalent per year on average in 2008–2010. Current estimates indicate that carbon sequestration may provide even higher emission reductions – up to 1.7 Tg CO_2 equivalent per year on average in 2008–2012.

K. General comments on policies and measures

78. The preparation of the NAP for the EU-ETS in 2004 meant a substantial *de facto* revision of the NCCS of 2000. Two key GHG mitigation measures – carbon tax and the closure of the largest coal-fired plant – were abandoned; the purely domestic set of GHG mitigation measures was replaced with a combination of domestic GHG reductions and purchase of emission allowances abroad. A formal revision of the NCCS now appears to be desirable, possibly in the framework of the 2005 review of the NCCS and/or in the preparation of the next national communication.

79. When the NCCS was adopted, it was planned to monitor its implementation every two years. In 2002, the DEHLG published a progress report on the implementation of the NCCS[43] and ongoing monitoring of the NCCS is undertaken primarily through the Interdepartmental Climate Change Team. The review team considered that that monitoring of implementation could be strengthened in terms of comprehensiveness and consistency. The review team was informed that Ireland would be undertaking a comprehensive review of the NCCS in 2005, followed by biannual reviews of both GHG projections and GHG-related policies and measures. This will help to streamline the preparation and submission of relevant information both to the EC under its GHG monitoring mechanisms and to the UNFCCC.

IV. PROJECTIONS AND THE TOTAL EFFECT OF POLICIES AND MEASURES

A. Reporting issues

80. The NC3 contains "with measures" and "with additional measures" projections for CO_2, CH_4, N_2O, HFCs, PFCs and SF_6 for 2002–2012; the projections are consistent with the national GHG inventory data for 2001. In presenting the projections, the NC3 generally followed the UNFCCC reporting guidelines, although the review team noted that the correspondence between the projections (chapter 4 of the NC3) and the policies and measures (chapter 3 of the NC3) was not altogether clear. The team also observed several deviations from the guidelines, for example:

- The projection period was limited by the year 2012 and not by 2020 as required.
- The NC3 did not contain several items defined in paragraphs 43 and 45–48 of the guidelines, some of which are mandatory: a description of the models used, a summary of the major strengths and weaknesses of the models, a comparison with the previous set of projections (from the NC2), information about key assumptions, a sensitivity analysis, and an explanation of the behaviour of key variables. Such information is an important element of transparency in projections.
- The NC3 did not compare the projections in the NC3 with those in the NC2, although the UNFCCC guidelines require this (paragraph 45).
- Projections of GHG emissions from international bunker fuels were not provided (paragraph 36).

81. The NC3 projections were developed as part of the preparation of the NAP under the EU-ETS but they were provisional at the time of NC3 submission. Finalized national GHG projections were available at the review team visit to Ireland. As they differ from the NC3 projections, this report concentrates on these, finalized GHG projections (hereafter referred to as the NAP projections), on the

[43] Department of the Environment, Heritage and Local Government. 2002. *Progress Report on Implementation of the National Climate Change Strategy*. Dublin (available at <www.environ.ie>).

basis of the information provided by Irish experts to the review team during the country visit. The review team noted with appreciation that this information was transparent and comprehensive.

B. Organizational set-up and projections methodology

82. The preparation of the NAP projections was coordinated by a steering group composed of representatives of key governmental departments. The projections were based on the national GHG projections prepared in 2003 by the Economic and Social Research Institute (ESRI)[44] and sectoral GHG projections prepared by the FAPRI–Ireland partnership[45] for agriculture, by DEHLG for waste and by COFORD for LULUCF.

83. ESRI used a comprehensive macro-economic model, HERMES,[46] for projecting national GHG emissions. The model database for the energy sector and industries was calibrated using national historical data; power generation facilities were modelled in detail and opportunities for fuel switching were taken into account; known policy interventions were incorporated in modelling. The projections for transport were based on assumptions for future levels of car ownership and fuel consumption in transport (the distances travelled were not explicitly included in the modelling); the phenomenon of "fuel tourism" was taken into account, based on expert estimates.

84. The projections for agriculture were prepared by the FAPRI-Ireland partnership using a special model to simulate the impact of the decoupling of agricultural subsidies from agricultural output on GHG emissions. COFORD prepared the projections of carbon removals by LULUCF with the CARBWARE model. DEHLG projections for GHG emissions from waste were based on assumptions about the future changes in waste quantities, composition and treatment methods.

85. To obtain the NAP projections, the ESRI projections and the sectoral projections mentioned above were revised within a special project implemented by two consulting companies.[47] The consultants retained the energy demand part of the ESRI projections but noticeably modified the energy supply part and some sectoral projections. The principal revisions were:

- For the power sector, ESRI results (obtained with HERMES) were replaced by the results obtained with ICF's electricity system model IPM (Integrated Planning Model). IPM was used to reflect better the impact of the common EC electricity market on electricity generation in Ireland. The recent decision not to close the Moneypoint coal-fired plant was taken into account, but the ICF/BOC study still included a carbon tax.
- Some revisions for the industrial sector were introduced on the basis of latest information, including a revision of the projections for HFCs, PFCs and SF_6 based on EU trends in such emissions and investment plans in Ireland's semiconductor industry.
- The NCCS estimates for GHG reductions in transport were revised downwards, from 2.67 to 1.14 Tg CO_2 equivalent, before being included in the "with measures" scenario.

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[44] A. Bergin, J. Cullen, D. Duffy, J. Fitz Gerald, I. Kearney, D. McCoy. 2003. *Medium-term Review: 2003–2010*. Economic and Social Research Institute. Dublin.

[45] FAPRI is the Food and Agricultural Policy Research Institute of the University of Missouri, United States of America; the other participants in the partnership are TEAGASC (the Irish Agriculture and Food Development Authority), five Irish universities and the Queen's University of Belfast, Northern Ireland.

[46] J. Fitz Gerald, J. Hore, I. Kearney. 2002. *A Model for Forecasting Energy Demand and Greenhouse Gas Emissions in Ireland*. Working Paper No.146. Economic and Social Research Institute. Dublin.

[47] ICF Consulting and Byrne Ó'Cléirigh (ICF/BOC). 2004. *Determining the Share of National Greenhouse Gas Emissions for Emissions Trading in Ireland: Final Report*. London.

C. Scenario definitions and key assumptions

86. The NAP projections are structured into three scenarios: "without measures", "with measures", and "with additional measures":

- The "with measures" scenario includes all policies and measures implemented or adopted by 2004, including the expected increase in GHG removals through LULUCF in 2008–2012. This scenario excludes the effect of the EU-ETS but includes the estimated effect of a carbon tax of 10 EUR/tonne CO_2 (about 1.2 Tg CO_2 equivalent per year on average in 2008–2012). The inclusion of a carbon tax is inconsistent with the definition of the "with measures" scenario but the tax was abandoned only recently, after the completion of the projections studies. Based on the analysis of marginal GHG abatement costs, measures under 10 EUR/tonne CO_2 equivalent were included in the "with measures" scenario.
- The "without measures" scenario was constructed by deducting the effect of the following measures from the "with measures" scenario: increased penetration of renewables in electricity generation, changes in LULUCF, decoupling of subsidies from production in agriculture, and some measures in transport.
- The "with additional measures" scenario differs from the "with measures" scenario by the addition of the estimated impact of the implementation of the EU-ETS on GHG emissions.

87. Table 8 shows key assumptions and representative macro-economic variables that are common for the three scenarios.

Table 8. Key assumptions and variables used for GHG projections for Ireland

	Average growth rates (%/year)		
	1990–2000 (historical)	2000–2005 (projected)	2005–2010 (projected)
Population	0.9	1.4	1.1
GDP / GNP (in constant prices)	4.8 / 3.1	5.7 / 5.4	3.3 / 3.5
Primary / final energy	5.3 / 6.1	1.5 / 2.0	1.6 / 2.4
Total exports / imports	4.4 / 2.4	7.4 / 6.7	3.7 / 3.7

Source: A. Bergin, J. Cullen, D. Duffy, J. Fitz Gerald, I. Kearney, D. McCoy. 2003. *Medium-term Review: 2003–2010.* Economic and Social Research Institute. Dublin.

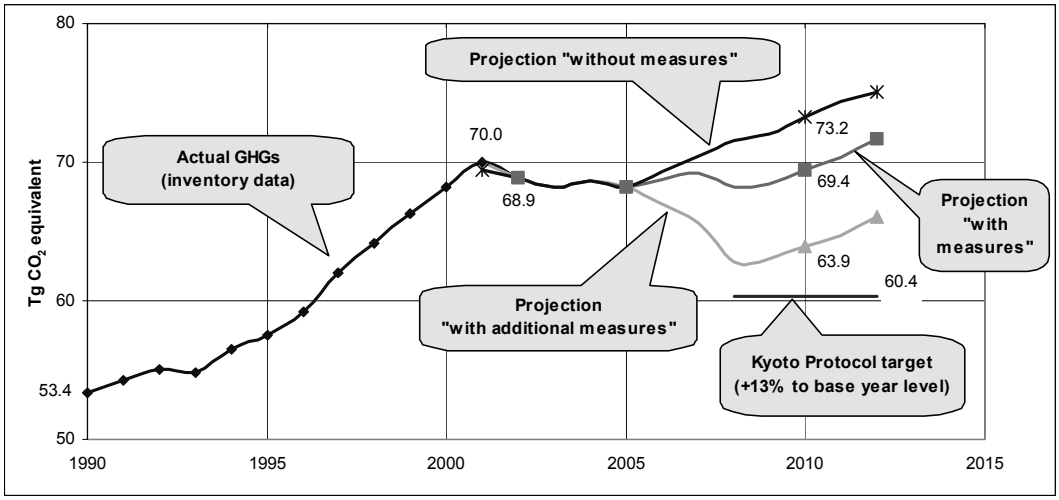
D. Projected changes in total GHG emissions

88. Figure 3 shows that after a small decline in the early 2000s, Irish GHG emissions are projected to increase gradually after 2005 reaching, under the "with measures" scenario, 69.4 Tg CO_2 equivalent by 2010 (30.0 per cent above the 1990 level). The implementation of the EU-ETS leads to notably lower emissions: 63.9 Tg CO_2 equivalent in 2010 (19.7 per cent above the 1990 level).

89. With additional measures, Irish emissions are also projected to be above the national GHG target under the EC burden-sharing agreement for the Kyoto Protocol (+13 per cent compared to the base year level). Table 9 compares the average annual of GHG total in 2008–2012 with the Irish GHG target and shows the remaining gap of 3.7 Tg CO_2 equivalent per year. The Irish Government plans to purchase the required emission quotas using the flexibility mechanisms of the Kyoto Protocol.

90. Table 9 also shows the possible impact of the absence of the carbon tax on GHG emissions and, consequently, on the gap. With such adjustment, the gap would increase to 5.0 Tg CO_2 equivalent.

Figure 3. Actual and projected GHG emissions in Ireland



Note: The difference between the GHG emissions in 2010 and the Kyoto Protocol target shown on the graph does not correspond fully to the gap shown in table 9 below because in table 9 the gap was calculated using five-year averages.

Table 9. Projected gap between GHG projections and the Kyoto Protocol target

	Tg CO_2 equivalent per year								
Projection	Base year	2008	2009	2010	2011	2012	2008–2012 average	Kyoto Protocol target	Gap
"Without measures"	53.4	71.6	72.0	73.2	74.4	75.1	73.3	60.4	12.9
"With measures"	53.4	68.2	68.4	69.4	70.3	71.7	69.6	60.4	9.2
"With additional measures"	53.4	62.8	63.0	63.9	64.7	66.0	64.1	60.4	3.7
Adjustment for absence of carbon tax	53.4	–	–	–	–	–	64.1+1.2 = = 65.3	60.3	5.0

E. Projected changes in GHG emissions by sector

91. ***Energy***. Under the "with measures" scenario, GHG emissions from the energy sector (excluding transport) are projected to increase by 61.1 per cent (between the base year level and the 2008–2012 average) – see table 10. With the EU-ETS in place, the increase is limited to 37.5 per cent. The impact of the EU-ETS on energy emissions is large – 2.8 Tg CO_2 equivalent – which underlines the key role of this sector in the framework of the EU-ETS.

92. ***Transport***. The emissions from transport in 2008–2012 are projected to remain far above the base year level, for both "with measures" and "with additional measures" scenarios. The impact of additional measures is minor (0.1 Tg CO_2 equivalent) and this effect includes the carbon tax which was not implemented. The projections indicate a drastic reduction in the growth rate for these emissions: from 1990 to 2001, the emissions from transport increased by 6.4 Tg CO_2 equivalent but from 2001 to 2008–2012 they are projected to increase by only 1.7–1.8 Tg CO_2 equivalent. The review team emphasized the importance of improvement in the modelling approach used for projecting GHG emissions in transport, such as explicit modelling of changes in the modal split and in the distances (passenger-km, tonne-km) travelled.

93. ***Industry***. Industrial emissions (from both combustion and industrial processes) are projected to continue to increase, exceeding the base year level by 50.6 per cent ("with measures") or 38.9 per cent ("with additional measures") by 2008–2012. The impact of the EU-ETS is considerable: a reduction of 1.2 Tg CO_2 equivalent, which is about 10 per cent of the sectoral emissions in 2001.

Table 10. Projected changes in GHG emissions by sector

	GHG emissions ($Tg CO_2$ equivalent)		Projected 2008–2012 averages ($Tg CO_2$ equivalent per year)			Change compared to base year level (%)	
Sector	Base year[a]	2001[a]	"Without measures"	"With measures"	"With additional measures"	"With measures"	"With additional measures"
Energy	11.8	18.1	19.5	19.0	16.2	61.1	37.5
Transport	5.1	11.5	13.6	13.3	13.2	158.4	157.2
Industry	9.6	12.2	14.5	14.5	13.3	50.6	38.9
Residential	7.0	6.7	7.1	7.1	6.2	1.4	–11.1
Agriculture	18.7	20.1	17.9	16.7	16.3	–10.3	–12.7
Waste	1.2	1.3	0.7	0.7	0.5	–41.7	–57.3
LULUCF	–	–	–	–1.7	–1.7	–	–

[a] For consistency with the projections, the base year level and the 2001 level are as used in the projection study; they correspond to the 2003 inventory submission and slightly differ from the data in the 2004 submission.

Sources: 1) ICF Consulting and Byrne Ó'Cléirigh. 2004. *Determining the Share of National Greenhouse Gas Emissions for Emissions Trading in Ireland: Final Report*. London. 2) Presentations of Irish experts during the country visit.

94. ***Residential sector***. Residential GHG emissions are projected to increase by less than 2 per cent by 2008–2012 compared with the base year. With additional measures, a decrease is projected. These projections assume the existence of a carbon tax; without additional measures to compensate for the absence of the tax, they should be considered with caution.

95. ***Agriculture***. The main factor for GHG emissions from agriculture is the implementation of the reform of the EC CAP. The "full decoupling" option of the CAP is projected to lead to a decrease in cattle numbers and, consequently, to the decrease in GHG emissions shown in table 10. It is anticipated that the FAPRI-Ireland Partnership will revise its projections shortly for the impact of the recent CAP reform on Irish agriculture.

96. ***Waste***. The projections indicate a large reduction in the emissions from waste, with the overall decreases by 41.7 ("with measures") or 57.3 ("with additional measures") per cent from the base year level. This would mean a reversal of the historic trend from 1990 to 2002. The review team noted that these projections were sensitive to such assumptions as an annual 10 per cent decrease in the amount of waste starting in 2003, and a 50 per cent rate of CH_4 recovery. The correspondence of these assumptions to actual developments should be monitored.

97. ***LULUCF***. LULUCF is expected to provide GHG reductions of about 1.7 Tg CO_2 equivalent per year on average during the commitment period of 2008–2012. This estimate is based on the current afforestation policy. The projections appear robust, despite some uncertainties in the LULUCF methodologies and key data (such as biomass expansion factors). Recent research suggests that the effect of sequestration might be even higher than the 1.7 Tg CO_2 equivalent per year currently estimated.

F. General comments on projections

98. The review team was impressed with the projections work presented during the country visit. Robust, state-of-the-art methods were used based on consistent, up-to-date information. The review team was of the opinion that GHG projections could be reported more thoroughly in the next national communication to show the quality of the work and share experience with the international community.

99. The team underlined the importance of reviewing GHG projections on a continuous basis. Regular revisions of projections can help to identify situations when actual developments differ from the assumptions used and to take timely corrective actions. The planned establishment of a biennial cycle for the preparation and review of GHG projections seems to be an appropriate measure in this respect.

100. The GHG projections were prepared assuming a carbon tax of 10 EUR per tonne CO_2 from 2005. This assumption is no longer valid. New projections should exclude a carbon tax and include, if relevant, policy measures to compensate for the absence of the tax.

V. VULNERABILITY ASSESSMENT, CLIMATE CHANGE IMPACTS AND ADAPTATION MEASURES

101. ***Reporting***. The NC3 covers the issues of vulnerability and adaptation in accordance with the UNFCCC guidelines. Information is provided on expected impacts of climate change (for agriculture, biodiversity, coastal zones, fisheries and water resources, see table 11) and on adaptation. Economic impacts of climate change were not studied because of the large uncertainties involved; for health impacts, a study started only recently and results are not yet available.

Table 11. Main areas of climate change vulnerability and adaptation in Ireland

Vulnerability area	Examples / comments / adaptation measures reported
Agriculture	For cultivation, impact varies by crop type: increased yields for barley, maize, soybean, decreased yields for potato; irrigation may become more important. For livestock, various impacts are expected (need to supplement grazed grass, shorter housing in winter, etc.)
Biodiversity	Habitat conditions may be affected, e.g. for mountain heaths and peatlands
Coastal zones	The coastline is vulnerable to sea level rise (1 m land retreat for 1 cm rise in sea level) ***Adaptation***: integrated coastal zone management
Fisheries	Salmon farming may suffer from increased sea temperature
Forests	Beneficial effect of increased CO_2 concentration is combined with decreased water availability, increased frequency of storms, increased pest and disease incidence ***Adaptation***: reassessment of the national tree-breeding programme
Water resources	Winter runoff would increase and summer runoff would decrease; seasonal flooding may become more frequent and severe; possible decrease in water availability ***Adaptation***: monitoring of water pollution; groundwater protection

102. ***Climate change impacts***. Irish experts applied a global climate model (GCM), HadCM3, downscaled[48] its results to Ireland (in a 10×10 km grid) for 2041–2070 and 2061–2080, and evaluated climate change impacts with sectoral models (for hydrology, agriculture, and some others). The study[49] projected the following climate changes in Ireland: (a) increases in the average summer and, especially, winter temperatures; (b) increases in winter precipitation; (c) decreases in summer rainfall. The local values for both temperature and precipitation may deviate considerably from the average values; the "continental" effect (the difference in local climate between the coastal and inland areas) is expected to become more pronounced. These results have considerable uncertainty.

103. In another study, Irish experts developed a set of indicators of climate change in Ireland.[50] The indicators were divided into primary indicators (temperature and precipitation) and secondary indicators specific for sectors or areas of vulnerability considered. Such indicators could be useful in the formulation and implementation of climate-related policies, particularly for adaptation measures.

104. ***Adaptation action***. The NC3 provides limited information on adaptation. The preparation of a draft policy for coastal zone management in 1997 and the adoption of a Planning System/Planning and Development Act in 2000 were mentioned as steps taken to reflect the climate change risks in infrastructure design, long-term sectoral planning processes, regulations and legislation. During the review, Irish experts reported that adaptation measures are also being built into mainstream policy-making through, for example, the 2004 Report of the Flood Policy Review Group.[51] This report incorporates recommendations on policies, institutional arrangements and funding in order to provide for

[48] A statistical downscaling technique was applied, which is based on establishing relationships between global climate variables available from GCM models (such as upper air parameters) and local climate variables. Once the relationships are established and calibrated, GCM results can be transformed into changes in local climate.

[49] J. Sweeney, T. Brereton, C. Byrne *et al*. 2003. Climate change scenarios and impacts for Ireland. *Report of the Environmental Protection Agency*. Wexford.

[50] J. Sweeney, A. Donnelly, L. McElwain, M. Jones. 2002. Climate change indicators for Ireland. *Report of the Environmental Protection Agency*. Wexford.

[51] Office of Public Works, 2004, *Report of the Flood Policy Review Group,* Dublin.

an effective response to future flooding events. Climate change is identified as one of the elements that should be considered when assessing future flood relief measures in Ireland.

105. The review team remarked that the NC3 did not describe linkages between expected climate change impacts and the national climate change strategy. For example, the NCCS of 2000 deals only with GHG mitigation. Irish experts indicated that the planned revision of the NCCS is likely to result in a greater emphasis on planning for adaptation action. The review team also felt that there was a need for institutional strengthening in the development and implementation of adaptation measures. Promoting partnership and cooperation among key stakeholders should be considered as an important aspect of vulnerability and adaptation.

VI. FINANCIAL RESOURCES AND TRANSFER OF TECHNOLOGY

106. ***Reporting***. The NC3 chapter on financial resources and transfer of technology follows the UNFCCC guidelines, except for the absence of table 6 of the guidelines ("Description of selected projects or programmes…") and limited reporting on technology transfer issues.

107. ***Official development assistance***. Ireland's official development assistance (ODA) has grown considerably in recent years, along with the country's rapid economic growth. For example, from 1997 to 2003 the total ODA grew almost threefold, from EUR 158 million, or 0.31 per cent of GNP to EUR 450 million (0.41 per cent of GNP). According to the NC3, much of this increase should be considered as "new and additional" funding. By the ODA/GNP ratio, Ireland has become one of the leading donors and remains committed to achieving the United Nations ODA target of 0.7 per cent of GNP in the future.

108. ***Bilateral development aid***. For the most part, Ireland's assistance to developing countries is administered by Development Cooperation Ireland (DCI). Recently DCI reformulated the strategy of providing bilateral development aid. The key new principle is that bilateral assistance must be aligned with the national poverty reduction strategy (PRS). Only those activities that are part of the national PRS can now be supported. Funding of individual projects is no longer supported, which explains why Ireland was able to provide only a small amount of project-specific information in the NC3.

109. This strategic change was introduced in order to streamline the provision of funds, align them with the overarching objective of poverty reduction, and make the impact of aid more sustainable. Ireland pays particular attention to poverty reduction because all Irish partner countries for development assistance are least developed countries: Ethiopia, Lesotho, Mozambique, Sudan, Tanzania, Timor-Leste, Uganda and Zambia. The review team understood the rationale for the change, but commented that it might have implications for bilateral climate-related funding. Irish experts noted that to date none of Ireland's partner countries had prioritized climate change within their PRS, and emphasized that climate-related funding is and will be available through relevant multilateral institutions, such as the Global Environment Facility (GEF).

110. ***Multilateral development aid***. Ireland will contribute USD 5.71 million to the third replenishment of the GEF – an increase compared to the first (USD 2.4 million) and second (USD 5.5 million) GEF replenishments. Ireland plans to participate in the provision of the additional USD 410 million annually under the UNFCCC, as pledged by several donor countries in 2001.[52]

111. ***International mechanisms of the Kyoto Protocol***. Ireland intends to use the international mechanisms of the Kyoto Protocol but has not yet decided what mechanisms – ET, JI or CDM – it will use and to what extent. The required funding will be provided through a separate item in the national

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[52] See document FCCC/CP/2001/13/Add.1, decisions 7/CP.7 and 10/CP.7.

budget; ODA will not be used for this purpose. To minimize the administrative burden, Ireland is likely to work through relevant multilateral institutions, such as the World Bank Prototype Carbon Fund.

VII. RESEARCH AND SYSTEMATIC OBSERVATION

112. ***Reporting***. Climate-related research and observation were presented in the NC3 in accordance with the UNFCCC guidelines. The information on research on GHG mitigation technologies was, however, limited and placed mostly in the NC3 chapter on policies and measures; additional information on such research was obtained during the country visit.

113. ***Research policy and organization***. Research in general, and climate-related research in particular, receive prominent support in Ireland. Both national research and participation in international research, in particular within EU research programmes, are well developed. The Centre of Excellence (COE) under the EPA makes information on research results available through a database containing information about climate-relevant projects (<http://coe.epa.ie/coe1/index.html>). Since 2000, about EUR 32 million has been allocated for 2000–2006 for the Environmental Research Technological Development and Innovation Programme (ERDTIP) managed by EPA, including an estimated EUR 6 million for research relating to climate change.

114. ***Climate-related research***. The NC3 describes ongoing and completed projects on regional climate modelling, air quality modelling, indicators of climate change, climate impact assessments (covering physical, economic and social impacts), palaeontology, the radiation balance, carbon sequestration, advanced techniques to study N_2O and CH_4 fluxes from soils, and others. Some of these projects provide feedback to the national GHG inventory (such as research on CH_4 and N_2O emission factors in agriculture) and to the national climate policy (such as studies on carbon taxation).

115. ***Research on GHG mitigation technologies***. SEI is active in the research of opportunities for GHG mitigation, with emphasis on efficient use of energy, CHP and renewable energy sources. The NC3 notes that for the industrial and commercial sectors research on energy savings is at an early stage, because of underprovision of funding in the past. New programmes address this problem by supporting the research, development, adaptation and demonstration of new energy efficient technologies and energy management systems.

116. ***Climate observation***. Ireland has a well-developed network of meteorological stations, consisting of 16 synoptic, 83 climate and 491 rainfall stations. Met Éireann has primary responsibility for weather and climate observations; it receives, analyses and archives data from meteorological stations. For research purposes, such data can be obtained from Met Éireann free of charge. Responsibility for terrestrial and oceanographic observations is divided among a number of state agencies including the EPA, Marine Institute, universities and some other organizations. Ireland participates in the Global Climate Observing System (GCOS).

117. At present Met Éireann is deploying logger-based online automatic weather stations (AWS) for the United Climatological and Synoptic Observational Network (TUCSON). The AWS are being deployed at the rate of five per year, aiming to achieve the planned capacity of 25 stations.

118. ***Support to research in developing countries***. The NC3 provided little information on the support of climate research in developing countries. Some educational and capacity-building projects with relevance to climate change have been implemented by various agencies,[53] but there is no dedicated national programme for such support.

[53] For example, University College Galway developed an M.Sc. programme in hydrology for students from developing countries. Its costs were covered by DCI.

VIII. EDUCATION, TRAINING AND PUBLIC AWARENESS

119. The NC3 chapter on education, training and public awareness is short and, while being formally in compliance with the reporting guidelines, does not reflect adequately the country's achievements in this area. The country visit considerably helped the review team's understanding of the actual situation. The team was particularly impressed with the work carried out by the Environment Information Service of the DEHLG (ENFO), the National Sustainable Development Partnership (COMHAR[54]) and SEI.

120. **ENFO,** established in 1990 with the mission to promote environmental awareness and a sustainable lifestyle, has various outreach activities, such as preparation of information leaflets; organization of thematic exhibitions, lectures and seminars; participation in public events; appearances on radio and television; support of a web site (<www.enfo.ie>); and others. Most of the services are provided free of charge. ENFO also provided EUR 3 million for promoting environmental awareness, training and education in Africa.

121. ENFO currently covers about 120 environmental topics. Climate change is one of them, and it receives prominent attention. For example, ENFO prepared and distributes a number of leaflets on climate change, such as "Global warming", "Greenhouse effect" and "Sea level changes in Ireland". Every year, ENFO hosts exhibitions relating to climate change.

122. **COMHAR** was established by the Government in 1999 in order to promote sustainable development across economy and society. COMHAR's 25 members are appointed (by the Minister for the Environment, Heritage and Local Government) from the "five pillars": the state/public sector, economic sectors, environmental NGOs, social/community NGOs and the professional/academic sector. COMHAR organizes its work around seven themes: satisfaction of human needs by the efficient use of resources, equity among generations, respect for ecological integrity and biodiversity, equity among countries and regions, social equity, respect for cultural heritage/ diversity, and good decision-making. COMHAR actively cooperates with other councils for sustainable development in Europe.

123. Since 2002, COMHAR has had a working group on climate change, which prepared publications on climate change such as "Subsidies and emissions of greenhouse gases from fossil fuels" and "Options for carbon taxation expenditure in favour of renewable energy and against fuel poverty in Ireland", developed recommendations to the Government on the NCCS and on the introduction of carbon/energy taxation, and acted as a forum for dialogue on climate-related issues among various stakeholders.

124. **SEI** promotes sustainable supply and use of energy. Within the "Built Environment" programme, SEI provides training on efficient use of energy in buildings, prepares and distributes information leaflets and organizes public consultations. The "Industry" programme targets specific needs of the industry sector through demonstration and dissemination of best practices in energy saving; preparation of training guides and case studies; and organization of topical exhibitions, seminars and conferences. Other relevant activities include a curriculum-based schools programme; preparation and distribution of various printed materials on efficient use of energy; support of an energy hotline; support of the SEI web site (<www.sei.ie>); and organization of national campaigns such as the annual Energy Awareness Week (since 1998) and the annual Car Free Day (since 2000).

125. **DEHLG** communicated the message on climate change in the context of the national Environmental Awareness Campaign, focusing mainly on the domestic sector to show people where they contribute to increasing GHG emissions. The climate change element of the campaign included a communication on straightforward steps the individual can take to decrease emissions through the climate change part of the broader "10 Steps" campaign;[55] a burst of television advertising backed up by

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[54] The abbreviation of COMHAR is from the Irish version of the organization's name.

[55] See <http://www.10steps.ie/climate/index.htm>.

a series of radio advertisements; development of both general and technical web-site material on climate change to allow easy access to the information required; a leaflet raising awareness of climate change, particularly in relation to driving habits, for mail-out with motor taxation renewal forms; and a poster campaign. In addition, a climate change logo was developed to be used across the full spectrum of media and communication tools. The logo will have longevity for use in future campaigns.

126. Irish NGOs play an important role in raising public awareness of climate change. **Environmental NGOs** were active during the preparation of the NCCS, aiming to increase its environmental efficiency. Following up the implementation of the NCCS, environmental NGOs criticized the Government for certain economic and social developments, such as the abolition of a carbon tax, continued operation of the Moneypoint coal-fired plant, expansion of the road network, increasingly dispersed character of settlements, and support for the use of peat for energy production.

127. Of the **business NGOs**, the Irish Business Employers Confederation (IBEC) has been active in climate change issues. During the preparation of the NAP under the EU-ETS, IBEC emphasized that measures to comply with the Kyoto Protocol should take into account the limited choice of competitive non-fossil sources of energy in Ireland and its export-oriented economy.

IX. CONCLUSIONS

128. For the most part, Ireland's NC3 is in compliance with the UNFCCC reporting guidelines. The large amount of information provided by Irish experts during the country visit helped the review team to understand better those issues for which the information in the NC3 was insufficient or outdated.

129. The GHG inventory of Ireland is of good quality, complete and well supported. The remaining weaknesses are understood, and work is in progress to address them.

130. The Irish economy performed remarkably well in the 1990s, with the GDP growing by about 7 per cent per year on average. Emissions of GHGs increased at a much slower rate, by almost 30 per cent from 1990 to 2002 or 2.1 per cent per year on average. Economic growth has thus been to some extent decoupled from GHG growth, mostly through structural changes in the economy; increasing use of natural gas instead of oil, coal and peat; and improvements in energy use efficiency.

131. The growth in GHG emissions from transport was the highest among all the economic sectors: by almost 130 per cent from 1990 to 2002. GHG-related policies in transport seem to require particularly close monitoring supported by detailed data and expert analyses through, for example, an improved modelling approach to project GHG emissions, such as explicit modelling of changes in the modal split and in the distance (passenger-km, tonne-km) travelled.

132. In 2000, Ireland adopted the NCCS with a set of measures to achieve the national Kyoto Protocol target under the burden-sharing agreement of the EC (the limitation of GHG growth by 13 per cent compared to the base year level). The elaboration of the flexibility mechanisms under the Kyoto Protocol in the Marrakesh Accords and the introduction of the EU-ETS have changed the policy landscape since 2000. Following this change, Ireland recently decided not to implement two key measures of the NCCS: the measure to close the largest coal-fired plant and the measure to introduce a carbon tax by the end of 2003. The Moneypoint plant has now had its emissions capped under the EU-ETS and a new approach to meeting the Kyoto Protocol target is being formulated, involving a mix of domestic measures and the purchase of emission credits through the flexibility mechanisms.

133. According to the current version of the Ireland's NAP, the gap between the required level of GHG emissions during the first commitment period of 2008–2012 and the projected GHG emissions is about 9.2 Tg CO_2 equivalent. Ireland plans to close the gap by GHG reductions from the implementation of the EU-ETS (4.3 Tg), additional domestic measures outside the EU-ETS (1.2 Tg, but the nature of

these reductions in the absence of a carbon tax is not yet clear), and the use of the flexibility mechanisms under the Kyoto Protocol (3.7 Tg). The Government is in the process of determining what mechanisms – ET, JI or CDM – will be used, and how.

134. The review team supported the current efforts of Ireland to strengthen the monitoring of GHG mitigation measures and the preparation of GHG projections. The introduction of biennial reporting of GHG projections and GHG-related policies and measures under the EU Monitoring Mechanism (Decision 280/2004/EC) will be helpful in this regard.

135. To evaluate climate change impacts, Irish experts conducted a comprehensive study involving statistical downscaling of GCM results and evaluation of climate change impacts with sectoral models. The study projected increases in summer and winter temperatures; increases in winter precipitation; and decreases in summer rainfall. Impacts were evaluated for agriculture, biodiversity, coastal zones, fisheries, and water resources. According to the analysis, some vulnerability exists but measures to alleviate negative impacts are possible. Information on adaptation in the NC3 was limited and some strengthening in the development and implementation of adaptation measures appeared desirable.

136. Ireland's ODA has grown considerably in recent years, along with the country's rapid economic growth. From 1997 to 2003 the total ODA grew almost threefold, from EUR 158 million (0.31 per cent of GNP) to EUR 450 million (0.41 per cent of GNP). Ireland has increased its contributions to the GEF.

137. Climate-related research, with respect to both national programmes and participation in international research, receives prominent support in Ireland and is well advanced. Ireland has a well-developed network of meteorological stations and participates in the GCOS.

138. The NC3 chapter on education, training and public awareness is short and, although formally in compliance with the reporting guidelines, does not adequately reflect Ireland's achievements in this area. The country visit helped the review team to understand the actual situation, in particular the impressive work on climate change carried out by such organizations as ENFO, COMHAR, SEI, and by environmental and business NGOs.

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