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

Review team:

Joseph Njihia, Kenya
Christo K. Christov, Bulgaria
Håvard Toresen, Norway
Lucas Assunção, UNFCCC secretariat, Coordinator

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Under Articles 4 and 12 of the Convention, Parties are required to prepare national communications on their implementation of the Convention. Guidelines for the preparation of national communications and the process for their review were agreed upon by the Intergovernmental Negotiating Committee for a Framework Convention on Climate Change, by its decisions 9/2 and 10/1, and by the Conference of the Parties, at its first session, by its decisions 2/CP.1 and 3/CP.1 (see FCCC/CP/1995/7/Add.1). In accordance with these decisions, a compilation and synthesis of the first 33 national communications from Annex I Parties was prepared (FCCC/CP/1996/12 and Add.1 and 2).

When reviewing the implementation of the Convention by Parties, the subsidiary bodies and the Conference of the Parties will have this report available to them in English as well as the summary of the report in the six official languages of the United Nations. (These bodies will also have before them the executive summary of the first national communication of Ireland and country-specific information drawn from a compilation and synthesis report covering all countries that have submitted national communications.)

Summary^{1/}

1. The in-depth review was carried out between January and August 1996 and included a visit to Dublin from 29 January to 2 February 1996. The review team included experts from Kenya, Bulgaria and Norway.
2. Ireland has experienced very high growth rates of gross national product in the 1990s, an average rate of approximately 4.5 per cent being expected for this decade, bringing economic growth to a historical high. This growth trend is enabling Ireland to approach steadily the average per capita income levels of its European Union (EU) partners. Ireland's convergence process towards EU economic standards has been accompanied by changes in the structure of the economy. This structural change, coupled with a sharp increase in private consumption, inevitably impacts on total energy requirements. Given its island location and limited endowment of energy resources, Ireland's main energy policy goals are to ensure security of supply, reduce dependence on imported fuel, improve energy efficiency in all economic sectors and develop its indigenous energy sources, mainly offshore natural gas and peat.
3. Natural gas is a relatively new energy source in the Irish market. It is however a commercially competitive energy carrier, with oil being its main competitor. Further growth in the use of natural gas, partly at the expense of more carbon-intensive alternatives, is expected to contribute significantly to a limitation in the growth in carbon dioxide (CO₂) emissions. Although dependence on imported oil and coal for total energy requirements is not expected to be reduced, natural gas is anticipated to have an increasing role in electricity production and in the residential heating market.
4. Due to the predominance of coal, peat and oil in the primary fuel mix, and limited non-fossil fuel generating capacity, Ireland's energy-related CO₂ emissions per unit of gross domestic product are considerably higher than both the OECD and the EU averages. The level of energy-related CO₂ emissions per capita equals that of the EU average. Most of the growth in emissions over the past few years has come from increased electricity production and the transport sector. There is no nuclear generating capacity in Ireland and peat represents approximately 14 per cent of total primary energy supply. Although this share is expected to decline to 9 per cent in 2000, it will remain the highest for this energy carrier in a country's energy balance among Annex I Parties.
5. Ireland is meeting its reporting commitments under the Convention and will play its part in fulfilling the EU commitment to stabilize CO₂ emissions in the Community as a whole at 1990 levels by the year 2000. Within the framework of the overall EU policy on climate change, Ireland launched a national CO₂ abatement strategy in June 1993. Ireland's own CO₂ abatement strategy aims at limiting the growth in CO₂ emissions to 20 per cent over 1990

^{1/} In accordance with decision 2/CP.1 of the Conference of the Parties, the full draft of this report was communicated to the Government of Ireland, which had no further comments.

levels by the year 2000. During the review, the team was provided with a draft update of the national CO₂ abatement strategy, which greatly improved the level of information about the implementation of climate change policies and measures in the country. Ireland's development needs and its focus on energy security have so far led to the implementation of measures which are mostly "no-regrets" and voluntary in nature. Although these measures are expected to generate important results, additional measures leading to further limitation in greenhouse gas (GHG) emissions are either at an early stage of implementation or still under examination. Ireland's recent structural development has apparently involved some important gains in energy efficiency and indicated a possible decoupling of CO₂ emission trends and economic growth. This may lead to further limitations to the growth of CO₂ emissions at the national level and contribute positively to the achievement of the EU-wide CO₂ stabilization target.

6. National inventories were prepared using the standard CORINAIR^{2/} methodology and converted to the Intergovernmental Panel on Climate Change (IPCC) format. Emission levels are most reliable for CO₂ since they are derived from fuel combustion processes that are well understood and have been independently documented for years. For methane (CH₄) and nitrous oxide (N₂O), however, emission estimates are far less reliable, both because of their inherent uncertainty and the fact that collectively they have never been documented to the level of detail requested by the IPCC inventory methodology. The team felt that GHG inventories were not always presented in a transparent way, owing to resource constraints.

7. During the review, considerable additional information was provided on Ireland's forests and its ongoing afforestation programme. Although Ireland is one of the least forested countries in the EU and does not seek to offset emissions exclusively through CO₂ uptake in its forests, it would be important to report on 1990 emissions and removals from this sector, as requested by the FCCC reporting guidelines. Furthermore, it is recommended that future projections be provided for the forestry sector. Ireland is also encouraged to report on emissions of other gases whenever these occur in the country, examples being sulphur hexafluoride (SF₆) and hydrofluorocarbons (HFCs), and possibly perfluorocarbons (PFCs) from aluminium smelting.

8. Ireland is to be commended for establishing the Irish Energy Centre as a mechanism to promote energy conservation and energy efficiency improvements in the industrial, commercial and residential sectors. The Centre has a great potential to influence industry behaviour and consumers' choices and give support to future mitigation measures. It is charged with the task of coordinating and implementing the national energy conservation programme and of raising energy awareness. The team noted the renewed support by departments concerned for existing energy conservation programmes, as well as Electricity Supply Board's (ESB) commitment to demand-side management (DSM) programmes.

^{2/} CORINAIR is the component dealing with air emissions inventories of the European Community's CORINE (Coordinated Information System on the State of Natural Resources and the Environment).

9. Emission projections were based on standard regression models, without the use of macroeconomic and energy models. The team felt that additional resources could usefully be allocated to improve emission monitoring and modelling capacity. The review team recommended that estimation methods used and assumptions made in emission projections be clearly stated in the second communication in 1997. Additionally, the team encouraged the Government to consider reporting on a baseline ("without measures") scenario for 1990-2000. During the review, additional information was provided on the methodology used in the projections of CO₂ emissions based on national energy figures. The primary assumptions and methods used to estimate energy requirements in 2000 seem plausible and transparent. Revisions were made during the review regarding the allocation of energy requirements among the various sectors of the economy. Primary energy demand is expected to increase significantly in the electricity generation and transport sectors. It is expected to fall in the industrial, commercial and agricultural sectors and remain roughly stable in the residential sector. Based on information received during the visit on some early efficiency gains and recent further inroads of natural gas, it is estimated that the national CO₂ growth limitation target is within reach. Preliminary estimates indicate that CO₂ emissions may be increasing more slowly than originally expected, even though GDP grew faster than expected at the beginning of the decade.

10. Although vulnerability and adaptation of the country to climate change are not addressed in the national communication, relevant additional documentation was presented during the review. An assessment of the possible impacts of climate change in Ireland and the country's vulnerability were provided during the country visit. It showed that a rise in mean temperatures could have slight positive effects on Irish vegetation, with possible economic benefits. Coastal areas of the island were assumed to be the most vulnerable parts of the country.

11. The team noted with appreciation Ireland's long-term commitment to increase the ratio of official development assistance (ODA) to GNP to 0.7 per cent. In 1995, this ratio was 0.29 per cent. The team was informed of a commitment by the Irish Parliament to increase this ratio by 0.05 per cent annually. Ireland agreed to participate in the restructured Global Environment Facility (GEF) in 1994. It announced that a contribution of £Ir 1.64 million will be made over four years and subsequently made its first contribution of £Ir 425,000 in 1996.

12. During the review, additional information was provided on ongoing research activities in Ireland, including those of the Economic and Social Research Institute (ESRI) on the CO₂ abatement strategy, the main findings of which are listed in this report. The review team was also informed that efforts to raise public awareness had been mainly directed towards energy conservation and the improvement of end-use energy efficiency. The main tool used to reach the public has been the electronic media and annual Energy Awareness Weeks.

I. INTRODUCTION AND NATIONAL CIRCUMSTANCES

13. Ireland ratified the Convention on 20 April 1994. The secretariat received Ireland's first national communication on 15 November 1994. The in-depth review of the national communication was carried out during the period January to August 1996, including a country visit from 29 January to 2 February 1996 to Dublin. The review team consisted of Mr. Joseph Njihia (Kenya), Mr. Christo K. Christov (Bulgaria), Mr. Håvard Toresen (Norway) and Mr. Lucas Assunção (UNFCCC secretariat, Coordinator). The team met with representatives of several ministries as well as with members of the scientific and academic community and representatives of business and non-governmental organizations.

14. The Irish economy is undergoing a major restructuring process with rapid and impressive economic growth accompanied by low inflation and significant gains in employment, as compared with most European economies. Its population is projected to increase slightly above 3.5 million inhabitants, with 1.5 million living in Dublin. As a small open economy with overall foreign trade (imports plus exports of goods and services) representing 148 per cent of gross national product (GNP) in 1994, Ireland experienced very high GNP growth rates (above 8 per cent) in 1994 and 1995. Preliminary forecasts for 1996 indicate a 6 per cent GNP growth^{3/}. Although such high growth rates are not likely to continue through 2000, an average annual growth of just over 4 per cent a year is expected in the second half of this decade, bringing economic growth to a historical high. This growth trend is enabling Ireland to approach steadily the average per capita income levels of its European Union (EU) partners. Before joining the EU in 1972, Ireland's gross domestic product (GDP) per capita was around 58 per cent of the EU average whereas by 1995 it had reached almost 85 per cent. These remarkable achievements have been made possible by Ireland's trade competitiveness and the substantial gains achieved in the education and skill levels of its labour force, as well as by the catalytic impact of structural funds provided by the European Community.

15. Ireland's convergence process towards EU economic standards has been accompanied by changes in the structure of the economy. The share of agriculture in total output decreased from 12 per cent in 1971 to less than 8 per cent in 1994, with industry increasing from 31 to 43 per cent in the same period. This structural change, coupled with a sharp increase in private consumption, inevitably impacts on total energy requirements. Given its island location and limited endowment of energy resources, Ireland's main energy policy goals are to ensure security of supply, reduce dependence on imported fuel, improve energy efficiency in all economic sectors and develop its indigenous energy sources, mainly offshore natural gas and peat. Central responsibility for national energy policy lies with the Department of Transport, Energy and Communications, albeit the Departments of the Environment and of

^{3/} In Ireland, GNP rather than gross domestic product (GDP) is a better indicator of the standard of living. This is due to the fact that GDP includes profits of foreign-owned companies and interest payments on their debts incurred abroad. These items are very large in Ireland and their share in GDP has changed markedly over the years.

Enterprise and Employment are also involved. The Government intervenes in the energy market through nationalized companies (such as the Electricity Supply Board - ESB) which dominate the gas, electricity and peat industries and run Ireland's only oil refinery.

16. The completion of a gas interconnector pipeline from the United Kingdom -- in operation since October 1995 -- has greatly improved the availability of imported gas and is allowing natural gas to make further inroads in meeting new energy demand. Although dependence on imported oil and coal for total energy requirements is not expected to be reduced, natural gas is anticipated to have an increasing role in electricity production and in the residential heating market. In fact, in 1990 Ireland relied on coal and oil imports for roughly 70 per cent of its energy needs and it is projected that in 2000 its dependence on imports of coal, oil and natural gas could increase to almost 90 per cent due to the substantial increase in natural gas imports. Preliminary consideration is already being given to building a second gas pipeline through the Northern Ireland system to the United Kingdom.

17. Ireland's level of energy-related carbon dioxide (CO₂) emissions per capita is 9.5 tonnes, compared to averages of 12 and 9 tonnes in countries of the Organization for Economic Co-operation and Development (OECD) and of the European Union (EU), respectively. Its energy-related CO₂ emissions per unit of GDP (1.4 in 1990), however, are considerably higher than both the OECD average (0.97 in 1990) and the EU average (1.01 in 1990). This is mainly due to the predominance of coal, peat and oil in the primary fuel mix, and limited non-fossil fuel generating capacity. Most of the growth in emissions over the past few years has come from increased electricity production and the transport sector. There is no nuclear generating capacity in Ireland and only a very limited hydroelectric capacity (roughly 4 per cent of electricity generation). Peat represents approximately 14 per cent of total primary energy supply (TPES) in Ireland. Although the share of peat in TPES is expected to decline to 9 per cent in 2000, it will remain the highest for this energy carrier in a country's energy balance among Annex I Parties^{4/}. The share of coal in TPES is expected to be roughly stable at 20 per cent, while oil's share might increase slightly, from 47 per cent in 1990 to 52 per cent in 2000.

18. Ireland is meeting its reporting commitments under the Convention and will play its part in fulfilling the EU commitment to stabilize CO₂ emissions in the Community as a whole at 1990 levels by the year 2000. Within the framework of the overall EU policy on climate change, Ireland launched a national CO₂ abatement strategy in June 1993. Ireland's own CO₂ abatement strategy aims at limiting the growth in CO₂ emissions to 20 per cent over 1990 levels by the year 2000. The formulation and implementation of climate change mitigation policies in Ireland is regarded as an ongoing process subject to regular monitoring and review. In this regard, during the review the team was provided with access to a draft update of the national CO₂ abatement strategy. Although this update was still subject to approval by the

^{4/} Others users of peat as a major energy source are Finland and Sweden, and possibly Estonia and the Russian Federation.

Government at the time of the review, it greatly improved the level of information about the implementation of climate change policies and measures in the country.

19. Ireland's development needs and its focus on energy security have so far led to the implementation of measures which are mostly "no-regrets" and voluntary in nature. Although these measures are expected to generate important results, additional measures leading to further limitation in greenhouse gas emissions are either at an early stage of implementation or still under examination. Ireland's recent structural development has apparently involved some important gains in energy efficiency and indicated a possible decoupling of CO₂ emission trends and economic activity. This may lead to further limitations to the growth of CO₂ emissions at the national level and contribute positively to the achievement of the EU-wide CO₂ stabilization target.

20. During the review, a substantial amount of new and more detailed information was provided to the team. The timing of the review visit was very appropriate since much had happened in the country since the submission of the first national communication. Having access to supplementary documentation not submitted with the communication in 1994 was equally valuable.

21. A national sustainable development strategy is due to be launched in the near future. The team was informed that this initiative responds to two phenomena that have developed in the recent economic growth cycle, namely, a genuine public concern with global and local environmental problems and a general interest in promoting the use of clean technologies. This national cross-sectoral strategy will undoubtedly contribute to the further enhancement of policy coordination, with important benefits for the implementation of ongoing and future climate change policies.

II. INVENTORIES OF ANTHROPOGENIC EMISSIONS AND REMOVALS

22. National inventories were prepared using the standard CORINAIR methodology and converted to the Intergovernmental Panel on Climate Change (IPCC) format. Emission levels are most reliable for CO₂ since they are derived from fuel combustion processes that are well understood and have been independently documented for years. For methane (CH₄) and nitrous oxide (N₂O), however, emission estimates are far less reliable, both because of their inherent uncertainty and the fact that collectively they have never been documented to the level of detail requested by the IPCC inventory methodology. The team felt that greenhouse gas (GHG) inventories were not always presented in a transparent way, owing to resource constraints. The team strongly suggested that for the second communication the estimation approaches used and IPCC minimum tables be provided with relevant background documentation. For several emission categories other than energy-related CO₂, it was not clear how data were converted from the CORINAIR inventory tables into the IPCC reporting format, and for some industrial processes (e.g. cement and lime production) activity data were scarce.

23. Using IPCC-1994 global warming potentials (GWP) figures, the team noted that CO₂ emissions represented only 48 per cent of all greenhouse gas emissions, while CH₄ and N₂O accounted for 30 and 21 per cent, respectively. Total CO₂ emissions in 1990 amounted to 30,719 Gg, with 30 per cent originating in the energy production sector, 17 per cent in the residential sector, 16 per cent in industry and 15 in transport. CH₄ emissions totalled 19,498 Gg in CO₂ equivalent, 80 per cent originating from the agriculture sector and 17 per cent from waste and landfills. N₂O emissions amounted to 13,529 Gg in CO₂ equivalent, 90 per cent of which from the use of fertilizers in agricultural soils.

24. Emission factors for CO₂ from combustion are based on the typical carbon content of the full range of indigenous and imported fuels used in Ireland. Emission factors for CH₄ and N₂O from agriculture, the principal source of these gases, are taken from national research and appropriate literature reviews and are generally consistent with IPCC default values. For other less important sources of all three GHG, the emission factors used are generally the IPCC default values. Exceptions included CO₂ emission factors for peat and N₂O emission factors for agricultural soils. As in other Annex I Parties, emission levels of CH₄ and N₂O from all sectors are not very reliable for a number of technical reasons, including availability of activity data. It would, however, be useful if the uncertainty associated with emission levels of each of these greenhouse gases could be indicated more explicitly in the future, with an explanation of how emission estimates are made.

25. During the review, considerable additional information was provided on Ireland's forests and its ongoing afforestation programme. Although Ireland is one of the least forested countries in the EU and does not seek to offset emissions exclusively through CO₂ uptake in its forests, it would be important to report on 1990 emissions and removals from this sector, as requested by the FCCC reporting guidelines. Furthermore, it is recommended that future projections be provided for the forestry sector. More work is required to establish more clearly the magnitude of the net carbon sink resulting from drainage of certain land types, peat extraction and forest development. The additional information obtained on Ireland's afforestation programme and further reporting on its progress will greatly improve knowledge on the sink capacity of Ireland's (current and future) forests.

26. Figures for methane emissions from all types of sources are admittedly highly uncertain, even though a small number of such sources account for a very large proportion of the total national estimate. In Ireland, these sources are enteric fermentation by ruminants, landfilling of wastes and leakage from gas distribution networks, which together represent 95 per cent of current estimated totals. Considerable additional information on emissions from these sources was provided during the review and will no doubt be reflected in the second national communication. Regarding N₂O, it has been assumed that in Ireland there are no industrial sources of this GHG and that most N₂O emissions arise from agricultural soils. Existing estimates are regarded as tentative due to the enormous uncertainty in the methods of estimation employed.

27. Ireland is encouraged to report on emissions of other gases whenever these occur in the country, examples being sulphur hexafluoride (SF₆) and hydrofluorocarbons (HFCs), and

possibly perfluorocarbons (PFCs) from aluminium smelting. Emissions from international marine transport and from civil aviation were not disaggregated although, as required in the guidelines, they were reported separately from other sources of combustion-related emissions.

28. The use of global warming potentials to convert emission figures into CO₂ equivalents may also throw light on the relative importance of different greenhouse gases emitted in the various sectors of the Irish economy. Pursuant to decision 3/CP.1, Ireland is requested to submit GHG inventories for years other than 1990 with its second national communication due in 1997.

29. Finally, the team strongly recommended that in the next communication projections and greenhouse gas inventories be presented and discussed separately to facilitate the understanding of assumptions made and methodologies used.

III. POLICIES AND MEASURES

30. The CO₂ abatement strategy introduced in June 1993 describes a series of measures in the energy, transport, waste management and forestry sectors. So far, Ireland has focused mainly on no-regrets measures of a non-fiscal nature. The review team noted with appreciation the establishment in 1996 of an interdepartmental group to examine possible distortions in the existing tax structure and consider the use of fiscal measures to promote environmental objectives, including those relating to climate change. Revenues generated from these fiscal measures could play a prominent role in improving environmental management while achieving energy efficiency objectives.

A. Carbon dioxide

31. The Electricity Supply Board (ESB) is a state-owned company and the major electricity utility in Ireland. It is responsible for over 99 per cent of the electricity generated and has a monopoly of electricity distribution. Over the past several years ESB has been successful in improving and maintaining a stable and secure electricity supply at the expense of high reserve margins (37-40 per cent). The forthcoming restructuring of ESB is expected to enhance productivity and efficiency and improve competitiveness in the generation of electricity. At present it is anticipated that the ESB will remain a state-owned utility company with the vertical separation of generation, transmission and distribution. At the same time, it is envisaged that competitions will be held when new generation plant is required, which will be built, owned and operated by the competition winners. Although the possible mitigation effects arising from this restructuring have not been quantified, such a major undertaking could result in reductions in emissions when compared to a reference scenario.

32. Ireland's dispersed population and energy production patterns pose considerable problems in ensuring a reliable electricity supply and in keeping transmission and distribution losses to a minimum. Moreover, a stable electricity demand growth was observed in the period 1990-1994. The level of electricity distribution losses in the medium voltage 10 kV

network is significant (5.9 per cent), but work has commenced to upgrade a quarter of this network to 20 kV by 1999. This gradual conversion to 20 kV may reduce losses considerably and result in a reduction of roughly 400 Gg of CO₂ emissions by 2000, which represents 1.3 per cent of total 1990 emissions in Ireland.

33. In addition to efficiency gains, some fuel switching has also taken place in electricity generation. The combined share of the more carbon-intensive fuels such as coal and peat in electricity generation fell from 60 per cent in 1990 to 54 per cent in 1993 and the absolute quantity of peat consumed has declined sharply, even though peat will remain significant in the overall energy mix. The review team took note of Ireland's plans to construct a modern 126 MW peat-fired power station with fluidized bed combustion technology, which is 50 per cent more efficient than existing ones. It is expected that this new development will lead to the gradual phasing out of inefficient units and reduce the amount of CO₂ produced per unit of electricity generated from peat, while taking into account the social and employment concerns associated with peat extraction in Ireland.

34. Natural gas is a relatively new energy source in the Irish market. It is however a commercially competitive energy carrier, with oil being its main competitor. Further growth in the use of natural gas, partly at the expense of more carbon-intensive alternatives, is expected to contribute significantly to a limitation in the growth in CO₂ emissions.

35. The Irish offshore gas fields of Kinsale Head and Ballycotton have produced gas for the Irish market since 1978. To date, Ireland is self-supplied with indigenous gas deliveries from these fields. Marathon is the sole operator of Kinsale Head and Ballycotton. All gas is sold to the Irish Gas Board (BGE), which has a de facto monopoly on gas transmission and distribution. It is likely that Ireland will become more dependent on external gas deliveries as known gas reserves from domestic fields are depleted. Already from the winter of 1996/97 Ireland is expected to be dependent on peak deliveries through the new BGE pipeline connecting the Irish gas market to Scotland. The new pipeline, which was completed in October 1995, will have capacity to equal or double the present level of deliveries from Irish indigenous sources. The continuing search for petroleum in Irish waters may provide a future domestic supply of gas for the Irish energy market. In the event of further indigenous gas supplies being discovered, the Ireland/United Kingdom interconnector may also be used to export any gas surplus.

36. The contribution of natural gas to Ireland's energy fuel mix has increased since 1990 and now commands a higher share of total final consumption than either coal or peat. Further expansion of the gas supply network is planned. By 1995, at least a third of the one million households in Ireland already had access to the gas network. Sales of natural gas to the domestic sector increased by 10 per cent between 1993 and 1994. No mitigation effects on the overall level of CO₂ emissions have been estimated as a result of the increasing share of natural gas in energy supply.

37. Renewable sources of energy currently provide roughly 2 per cent of Ireland's energy requirement. The biggest contributors are hydroelectricity and biomass. Hydroelectric power contributes 220 MW, representing about 5.5 per cent of the national generating capacity. Ireland's first wind farm was completed in 1992 with an installed capacity of 6.45 MW. As a consequence of Ireland's policy for security of energy supply and the alternative energy requirement scheme (AER), an increase in Ireland's use of renewable energy sources can be expected.

38. The EU Altener Programme has set certain targets in the area of the contribution of renewables to total primary energy requirement, the proportion of installed electricity capacity dedicated to renewables and the proportion of the transport fuel market to be secured by biofuels. In a significant step towards contributing to the EU-wide Altener targets, a decision was taken to introduce 75 MW of newly installed electricity generating capacity from alternative sources (including combined heat and power) in Ireland by 1997. The scheme comprises a combination of price support and grant aid. The additional costs, estimated at £Ir 70 million over 15 years, will be passed through directly to electricity consumers in a transparent manner. In March 1995, the Minister for Transport, Energy and Communications decided that power purchase agreements should be offered by the ESB to projects where no grant aid was required. The programme was intensified with an increased target of 111 MW of new generating capacity by 1997 (73 MW from wind farms, 22 MW from CHP, 12 MW from biomass and waste and 4 MW from small-scale hydro). A number of biomass projects were submitted under the AER I scheme, but were not competitive enough to secure power purchase agreements. However continued encouragement and support for this energy source was found desirable. An outline of a competitive tendering scheme for one biomass-fuelled electricity generating plant of 30 MW was announced in July 1995. Implementation of the present programme for renewable energy sources, including the 30 MW biomass project, could increase the share of renewable energy in electric power capacity to 10 per cent by the end of the century. A review of the strategy for future development of indigenous renewable energy sources has been completed. This review has set further targets for the development of renewable energy sources in Ireland up to 2010.

39. Ireland is to be commended for establishing the Irish Energy Centre as a mechanism to promote energy conservation and energy efficiency improvements in the industrial, commercial and residential sectors. The Centre has a great potential to influence industry behaviour and consumers' choices and reduce CO₂ emissions in the future. It is charged with the task of coordinating and implementing the national energy conservation programme, including its grant scheme, and of raising energy awareness. The team also noted the continued support by departments concerned for existing energy conservation programmes, as well as ESB's commitment to demand-side management (DSM) programmes.

40. Despite the growth in the demand for electricity, the DSM programmes put in place by the ESB have nevertheless helped limit the increase in the consumption of electricity and contributed to more efficient energy use. It is estimated that, thanks to ongoing DSM programmes, the increase in electricity demand has been roughly 1 per cent lower than it would have been without them. Some £Ir 7 million per year has been spent on these

programmes, generating savings of 481 Gg of CO₂ in 1995. More than 3000 projects with small businesses and 700 projects with major customers have been implemented to date.

41. It has been estimated that the energy use associated with the operation of buildings accounts for 45 per cent of national energy use, and that 80 per cent of this is for space heating purposes. The potential for energy savings in the operation of buildings has been recognized by the approval of higher standards of thermal insulation for all new buildings requiring heating. These improved standards were adopted in 1991 for buildings constructed since June 1991. Another revised version of the standards is due by end of 1996. Currently 60 per cent of buildings have central heating. Oil is still the main fuel although natural gas has increased its share where it is available. Building standards do not apply to the existing building stock and improvement of insulation in these buildings is left to the initiative of the owners. There is, however, tax relief (for income tax purposes) on money borrowed to improve a person's residence, including work to improve the energy efficiency of the dwelling. The potential energy savings for new buildings is 15-20 per cent as a result of improved standards. Since standards started to be implemented, energy use has levelled off in the residential sector. The GHG emissions reduction potential was not quantified.

42. CO₂ emissions from the transport sector amounted to 5,500 Gg in 1993, an increase of 11 per cent compared to 1990. These emissions are expected to increase by 24 per cent compared to 1990 levels by 2000. Ireland's transport system is heavily dependent on roads, because of the country's dispersed and low-density population. Measures to limit growth in CO₂ emissions from this sector include the improvement of the rail and road systems, the promotion of public transport and other alternatives to private cars in Dublin, and the reduction of the age profile and improvement in efficiency of private cars.

43. Thanks to significant infrastructure investments and upgrading of the rail system, intercity rail travel increased by 15 per cent from 1990 to 1994. This trend is expected to continue, reducing significantly the use of private cars for daily passenger journeys. However, the vast bulk of passenger and freight journeys in Ireland are still made in private rather than public transport. Efforts to limit emissions from road traffic will therefore concentrate on improving the road network, improving the efficiency of the national car fleet and reducing its age profile. The existing scrapping scheme has drastically reduced the number of cars more than 10 years old to 15 per cent. Additionally, all new petrol-fuelled cars purchased since January 1993 are required to have a catalytic converter.

44. Over a third of the Irish population live in the Dublin area, where there is also greater scope for the introduction of alternatives to the private car than in any other part of the country. The Dublin Transportation Initiative (DTI) was launched in 1991 to investigate the city's transport system and bring forward appropriate proposals. The measures being pursued include the development of a three-line light rail network, the introduction of a series of bus corridors, the upgrading of the DART (Dublin Area Rapid Transport) and other suburban rail services, an integrated ticketing system for all public transport, and improvement of interchange and park-and-ride facilities in the city centre. Given the projected economic growth rates and the low per capita car ownership levels in Ireland, car ownership and usage

are expected to rise over the rest of the decade. However, the major rail and road investments, the rise in the proportion of newer and more efficient cars in the national fleet and the substantial improvements to the transport system in the greater Dublin area, are expected to limit the growth of CO₂ emissions in the sector significantly.

B. Forestry

45. For historical reasons Ireland at the turn of this century had only 1 per cent of its land area under forest. As a result of a broad afforestation programme launched as part of national environmental programmes, public forests now represent about 6 per cent of the land area (roughly 400,000 hectares) and 70 per cent of total forest area. Until recently the State played a dominant role in afforestation but the private sector, and in particular farmers, has become increasingly involved. Though only 30 per cent of the forest area is privately owned, most afforestation is now undertaken by the private sector. About 60 per cent of commercial forests are less than 25 years of age.

46. Even though afforestation has not been motivated exclusively by climate change concerns, Ireland considers that afforestation can make a significant and cost-effective contribution to the national climate change strategy. The annual target of the Irish afforestation programme is 26,000 hectares of newly planted forest. Three quarters of the afforestation programme is funded by the EU. Grants are also available for woodland improvement and a variety of purposes such as reconstructing forest roads, forest harvesting machinery, forest nurseries, forestry training and back-up measures such as studies, pilot projects, awareness campaigns and farm forestry services. The afforestation programme will continue until 2030, by which time the forest area is expected to have increased to 1.17 million hectares. It is estimated that the Irish forests absorbed 5,500 Gg of CO₂ in 1993 and 6,500 Gg in 1995 and will absorb 7,800 Gg of CO₂ in the year 2000. No estimates are available for CO₂ absorption in 1990.

C. Waste

47. In July 1994, a strategy for recycling domestic and commercial waste was launched by the Department of the Environment, which included a general objective of diverting 20 per cent of combined household and commercial waste away from landfills and into recycling facilities. In addition, a higher target of 30 per cent was adopted for recycling packaging waste in 1999. New waste management legislation was enacted in mid-1996 giving wide powers to the Minister for the Environment to introduce regulations aimed at preventing or minimizing waste generation, maximizing waste recovery and ensuring environmentally sound waste disposal. Regarding the upgrading of landfill facilities, significantly improved gas emission standards will be applied. Some limited pilot projects have also explored the possibility of CH₄ removal from landfills for energy purposes. Even though the level of uncertainty in CH₄ emission estimates remains very high, the stabilization of CH₄ emissions from the waste sector at 1990 levels by 2000 is expected as a result of ongoing and planned measures.

IV. PROJECTIONS AND EFFECTS OF POLICIES AND MEASURES

48. Emission projections were based on standard regression models, without the use of macroeconomic and energy models. The team felt that additional resources could usefully be allocated to improve emission monitoring and modelling capacity. It also acknowledged that some exploratory work had been initiated on the use of energy models, which, with the inclusion of other sectors, could greatly facilitate the monitoring of measures and contribute to a better understanding of GHG emission trends.

49. The review team recommended that estimation methods used and assumptions made in emission projections be clearly stated in the second communication in 1997. Additionally, the team encouraged the Government to consider reporting on a baseline ("without measures") scenario for 1990-2000. The availability of such a reference scenario and the estimation of emission reductions expected from the most relevant measures could provide a useful basis for policy decision-making.

50. During the review, additional information was provided on the methodology used in the projections of CO₂ emissions based on national energy figures. The primary assumptions and methods used to estimate energy requirements in 2000 seem plausible and transparent, although such information was not reported in the first communication. Revisions were made during the review regarding the allocation of energy requirements among the various sectors of the economy. Primary energy demand is expected to increase significantly in the electricity generation and transport sectors. It is expected to fall in the industrial, commercial and agricultural sectors and remain roughly stable in the residential sector.

51. The review team remarked that emission levels and projections for nitrogen oxides (NO_x), carbon monoxide (CO) and non-methane volatile organic compounds (NMVOCs) had been included in the first national communication. On the other hand, emission levels for HFC and SF₆ have been estimated and provided during the review but not reported in the communication. The review team expressed the view that even when emission levels of greenhouse gases are considered low, it is desirable that, whenever possible, preliminary or tentative emission projections be included in national communications.

V. PROJECTED PROGRESS IN GREENHOUSE GAS MITIGATION

52. Based on information received during the visit on some early efficiency gains and recent further inroads of natural gas, it is estimated that the national CO₂ growth limitation target is within reach. Preliminary estimates indicate that CO₂ emissions may be increasing more slowly than originally expected, even though GDP grew faster than expected at the beginning of the decade.

53. CO₂ emissions increased from 30,719 Gg in 1990 to 31,825 Gg in 1993 and 33,324 Gg in 1994 and, provisionally, to 33,931 Gg in 1995. The overall increase in emissions is somewhat lower than might have been suggested by the robust economic growth in the same

period. Undoubtedly, measures to improve energy efficiency and conservation, together with a change towards less energy-intensive economic activity and a small shift away from carbon-intensive fuels, have had, and will continue to have, a beneficial impact on total CO₂ emissions. It is clear, however, that these measures alone, which in themselves represent a major challenge for energy policy, will not be sufficient to balance or overcome forces in other sectors tending to raise energy-related CO₂ emissions.

54. The review team recognizes that strong emission growth in several sectors is expected for the coming years, particularly in the transport sector. Special attention should be paid to the enhancement of estimation methods on effects of measures in all relevant sectors.

VI. EXPECTED IMPACTS OF CLIMATE CHANGE

55. Although vulnerability and adaptation of the country to climate change are not addressed in the national communication, relevant additional documentation was presented during the review. An assessment of the possible impacts of climate change in Ireland and the country's vulnerability were provided during the country visit. It showed that a rise in mean temperatures could have slight positive effects on Irish vegetation, with possible economic benefits. Coastal areas of the island were assumed to be the most vulnerable parts of the country.

56. The review team was provided with background information on recent studies on the vulnerability of Ireland's agriculture, forestry, green mantle and its native fauna, hydrology and freshwater resources, fisheries and shell fisheries and on the impact of mean sea level changes. The individual studies were all founded on the same basic assumptions, namely that by the year 2030 the average annual temperature would increase by 2°C; there would be a 5 to 10 per cent increase in precipitation levels and an increase of 18 cm in mean sea level. The study shows that Irish agriculture would have more production options available under such changing conditions. More new crops would be cultivated requiring less effort in terms of soil preparation, with a potential positive impact on overall agricultural costs. Grass yields are likely to increase by 20 per cent. Little or no increase in cereal yields is foreseen. Yields of other tillage crops such as sugar beet and potatoes might, however, increase by up to 20 per cent, although pests and weeds might pose a greater problem than at present. The feed and fertilizer industries would probably be the most affected.

57. The forests are likely to react to climate change in one of two ways - increased productivity where the availability of soil water is not a limiting factor or decreased productivity where it is a limiting factor. Seed production is seen as likely to be enhanced by temperature rise. The choice of trees to plant might need to be reassessed. The green mantle, hydrology and freshwater resources, fisheries and shell fisheries are not expected to be significantly affected.

58. Some 176,000 hectares or 2.5 per cent of Ireland's land area is at risk from sea level rise. These are areas likely to be eroded, flooded, engulfed or environmentally changed.

Most of them are in the most vulnerable areas on the west coast of Ireland. The first risk is that the low-lying lands affected by the combination of groundwater rise and occasional marine incursions would need de-watering if they were to remain agriculturally viable. The second is that, according to preliminary estimations, erosion might increase by 15-20 per cent a year with consequential economic loss. The cost of protecting all vulnerable segments of the Irish coastline by building sea defences was estimated to be £Ir 27 billion.

59. The studies concluded that climate change could have marginal positive effects on Ireland's nature and economy. Coastal areas and peatlands are considered to be the most vulnerable parts of the country. No adaptation measures as such were described, nor are there plans to consider these at this point.

VII. FINANCIAL ASSISTANCE AND TECHNOLOGY TRANSFER

60. The team noted with appreciation Ireland's long-term commitment to increase the ratio of official development assistance (ODA) to GNP to 0.7 per cent. In 1995, this ratio was 0.29 per cent. The team was informed of a commitment by the Irish Parliament to increase this ratio by 0.05 per cent annually. This commitment has apparently received wide public endorsement. Ireland's bilateral programmes started in 1974 and focus mainly on a few African countries to optimize the impact of individual projects. While climate change is not identified as a specific priority in Ireland's aid and assistance, improved environmental management is seen as an objective cutting across all programmes and aid contributions.

61. Ireland agreed to participate in the restructured GEF in 1994. It announced that a contribution of £Ir 1.64 million will be made over four years and subsequently made its first contribution of £Ir 425,000 in 1996.

62. Ireland has not yet engaged in technology transfer with other Parties on activities specifically related to climate change.

VIII. RESEARCH AND SYSTEMATIC OBSERVATION

63. Although the Environment Protection Agency (EPA) does not have a national research programme specifically focusing on climate change, Ireland is a member of the IPCC and Irish scientists and institutes are actively engaged in the EU Environment and Climate programme. On the other hand the national R&D programme on environment management includes activities which could improve national climate policies, such as the measurement of trace GHGs, aerosols and the JOULE, THERMIE and STRIDE research programmes with the EU. During the review, additional information was provided on ongoing research activities in Ireland, including those of the Economic and Social Research Institute (ESRI) on the CO₂ abatement strategy. The main findings of the Institute's studies include: (a) the introduction of the proposed EU carbon tax, with the revenues being used to reduce labour taxes, would yield modest benefits including gains to the Irish economy. Reductions in carbon emissions

would also be modest in the short term, but could be larger in time; (b) the preferred measures in descending order of effectiveness per amount of funds spent in the national CO₂ strategy are the carbon tax, fuel switching, municipal waste conversion to biomass, windmills replacing peat, biomass replacing peat at power stations; (c) required government action includes the introduction of a carbon tax, direct investment and help to losers (e.g. to low-income families for insulation of homes), and information to energy users (e.g. on net present values of energy-saving measures).

64. Ireland has a long tradition of systematic weather observation and a vast system of climatological and synoptic stations scattered over its territory. The EPA laboratory also monitors smoke and sulphur dioxide levels, as well as ozone levels through its ozone data telemetry system.

IX. EDUCATION, TRAINING AND PUBLIC AWARENESS

65. The review team was informed that efforts to raise public awareness had been mainly directed towards energy conservation and the improvement of end-use energy efficiency. The main tool used to reach the public has been the electronic media. The results were particularly remarkable during the Energy Awareness Week in 1995. An annual National Energy Awareness Week, now coordinated by the Irish Energy Centre, is designed to raise public awareness of the environmental and financial benefits of energy efficiency and disseminate technical/technological information so as to foster energy-saving initiatives by firms and individuals.

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