**Advance Version**

**COMPLIANCE COMMITTEE** **CC/ERT/ARR/2012/29**
**6 August 2012**

# Report of the individual review of the annual submission of Ireland submitted in 2011

**Note by the secretariat**

The report of the individual review of the annual submission of Ireland submitted in 2011 was published on 3 August 2012. For purposes of rule 10, paragraph 2, of the rules of procedure of the Compliance Committee (annex to decision 4/CMP.2, as amended by decision 4/CMP.4), the report is considered received by the secretariat on the same date. This report, FCCC/ARR/2011/IRL, contained in the annex to this note, is being forwarded to the Compliance Committee in accordance with section VI, paragraph 3, of the annex to decision 27/CMP.1.

**ADVANCE VERSION**

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# Report of the individual review of the annual submission of Ireland submitted in 2011*

* In the symbol for this document, 2011 refers to the year in which the inventory was submitted, and not to the year of publication.

# Contents

# I. Introduction and summary

## A. Overview

1. This report covers the centralized review of the 2011 annual submission of Ireland, coordinated by the UNFCCC secretariat, in accordance with decision 22/CMP.1. The review took place from 5 to 10 September 2011 in Bonn, Germany, and was conducted by the following team of nominated experts from the UNFCCC roster of experts: generalist – Mr. Domenico Gaudioso (Italy); energy – Mr. Ricardo Fernandez (European Union), Mr. Sergiy Skybyk (Ukraine) and Mr. Michael Strogies (Germany); industrial processes – Ms. Natalya Parasyuk (Ukraine) and Ms. Ingrid Person (Brazil); agriculture – Ms. Olga Gavrilova (Russian Federation) and Mr. Yuriy Pyrozhenko (Ukraine); land use, land-use change and forestry (LULUCF) – Mr. Sandro Federici (San Marino) and Ms. Marina Shvangiradze (Georgia); and waste – Ms. Tatiana Tugui (Moldova). Ms. Parasyuk and Mr. Federici were the lead reviewers. The review was coordinated by Mr. Stylianos Pesmajoglou and Ms. Ruta Bubniene (UNFCCC secretariat).

2. In accordance with the "Guidelines for review under Article 8 of the Kyoto Protocol" (decision 22/CMP.1) (hereinafter referred to as the Article 8 review guidelines), a draft version of this report was communicated to the Government of Ireland, which provided comments that were considered and incorporated, as appropriate, into this final version of the report.

## B. Emission profiles and trends

3. In 2009, the main greenhouse gas (GHG) in Ireland was carbon dioxide ($CO_2$), accounting for 68.0 per cent of total GHG emissions[1] expressed in carbon dioxide equivalent ($CO_2$ eq), followed by methane ($CH_4$) (19.5 per cent) and nitrous oxide ($N_2O$) (11.5 per cent). Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride ($SF_6$) collectively accounted for 1.0 per cent of the overall GHG emissions in the country. The energy sector accounted for 66.5 per cent of total GHG emissions, followed by the agriculture sector (28.0 per cent), the industrial processes sector (3.4 per cent), the waste sector (2.0 per cent) and the solvent and other product use sector (0.1 per cent). Total GHG emissions amounted to 62,394.85 Gg $CO_2$ eq and increased by 13.8 per cent between the base year[2] and 2009. The overall trend in GHG emissions is in line with Ireland's recent economic growth, followed by a decline in recent years, in particular between 2008 and 2009.

4. Tables 1 and 2 show GHG emissions from Annex A sources, emissions and removals from the LULUCF sector under the Convention and emissions and removals from activities under Article 3, paragraph 3, and, if any, Article 3, paragraph 4, of the Kyoto Protocol (KP-LULUCF), by gas and by sector and activity, respectively. In table 1, $CO_2$, $CH_4$ and $N_2O$ emissions included in the rows under Annex A sources do not include emissions and removals from the LULUCF sector, and also do not include the emissions from deforestation that were included in Ireland's initial report under the Kyoto Protocol for the base year and subsequently used for the calculation of the assigned amount.

[1] In this report, the term "total GHG emissions" refers to the aggregated national GHG emissions expressed in terms of $CO_2$ eq excluding LULUCF, unless otherwise specified.

[2] "Base year" refers to the base year under the Kyoto Protocol, which is 1990 for $CO_2$, $CH_4$ and $N_2O$, and 1995 for HFCs, PFCs and $SF_6$. The base year emissions include emissions from Annex A sources only.

Table 1
**Greenhouse gas emissions from Annex A sources and emissions/removals from activities under Article 3, paragraphs 3 and 4, by gas, of the Kyoto Protocol, base year to 2009**[a]

| | | | *Gg $CO_2$ eq* | | | | | | | | *Change* |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *Greenhouse gas* | *Base year*[a] | *1990* | *1995* | *2000* | *2005* | *2007* | *2008* | *2009* | *Base year–2009 (%)* |
| Annex A sources | | $CO_2$ | 32 380.95 | 32 380.95 | 35 224.12 | 44 654.15 | 47 709.13 | 47 480.93 | 47 536.83 | 42 413.76 | 31.0 |
| | | $CH_4$ | 13 589.17 | 13 589.17 | 13 884.11 | 13 441.67 | 12 976.81 | 12 498.85 | 12 379.59 | 12 178.05 | –10.4 |
| | | $N_2O$ | 8 813.80 | 8 813.80 | 9 179.21 | 9 176.88 | 7 835.04 | 7 354.94 | 7 212.77 | 7 171.24 | –18.6 |
| | | HFCs | 0.69 | 0.69 | 44.85 | 231.23 | 436.66 | 500.76 | 520.88 | 500.93 | 72 185.3 |
| | | PFCs | 0.09 | 0.09 | 75.38 | 305.41 | 168.34 | 130.58 | 106.20 | 65.57 | 70 329.7 |
| | | $SF_6$ | 35.41 | 35.41 | 82.83 | 55.81 | 95.46 | 68.75 | 60.83 | 65.30 | 84.4 |
| KP-LULUCF | Article 3.3[b] | $CO_2$ | | | | | | | –2 428.86 | –2 800.33 | |
| | | $CH_4$ | | | | | | | 0.02 | 0.01 | |
| | | $N_2O$ | | | | | | | 0.00 | 0.00 | |
| | Article 3.4[c] | $CO_2$ | NA | | | | | | NA | NA | NA |
| | | $CH_4$ | NA | | | | | | NA | NA | NA |
| | | $N_2O$ | NA | | | | | | NA | NA | NA |

*Abbreviations*: KP-LULUCF = land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, NA = not applicable.

[a] "Base year" for Annex A sources refers to the base year under the Kyoto Protocol, which is 1990 for all gases. The "base year" for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol is 1990.

[b] Activities under Article 3, paragraph 3, of the Kyoto Protocol, namely afforestation and reforestation, and deforestation. Only the inventory years of the commitment period must be reported.

[c] Elected activities under Article 3, paragraph 4, of the Kyoto Protocol, including forest management, cropland management, grazing land management and revegetation. For cropland management, grazing land management and revegetation the base year and the inventory years of the commitment period must be reported.

Table 2
**Greenhouse gas emissions by sector and activity, base year to 2009**[a]

| | | | *Gg $CO_2$ eq* | | | | | | | | *Change* |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *Sector* | *Base year*[a] | *1990* | *1995* | *2000* | *2005* | *2007* | *2008* | *2009* | *Base year–2009 (%)* |
| Annex A | | Energy | 31 006.21 | 31 006.21 | 33 800.38 | 42 477.12 | 45 765.25 | 45 493.05 | 45 809.62 | 41 472.03 | 33.8 |
| | | Industrial processes | 3 178.55 | 3 178.55 | 3 073.12 | 4 195.97 | 3 253.26 | 3 280.52 | 2 989.49 | 2 117.12 | –33.4 |
| | | Solvent and other product use | 80.03 | 80.03 | 85.39 | 79.04 | 74.05 | 75.68 | 74.36 | 71.80 | –10.3 |
| | | Agriculture | 19 253.54 | 19 253.54 | 19 956.01 | 19 697.27 | 18 744.48 | 17 823.45 | 17 657.35 | 17 491.31 | –9.2 |
| | | Waste | 1 301.78 | 1 301.78 | 1 575.59 | 1 415.74 | 1 384.39 | 1 362.10 | 1 286.29 | 1 242.59 | –4.6 |
| | | LULUCF | NA | –565.01 | –784.60 | –788.15 | –1 364.23 | –1 870.12 | –2 357.43 | –2 173.06 | NA |
| | | **Total (with LULUCF)** | NA | 54 255.09 | 57 705.89 | 67 076.99 | 67 857.21 | 66 164.68 | 65 459.67 | 60 221.79 | **NA** |
| | | **Total (without LULUCF)** | 54 820.10 | 54 820.10 | 58 490.49 | 67 865.14 | 69 221.44 | 68 034.80 | 67 817.10 | 62 394.85 | **13.8** |
| KP-LULUCF | Article 3.3[c] | Other[b] | NA | NA | NA | NA | NA | NA | NA | NA | **NA** |
| | | Afforestation and reforestation | | | | | | | –2 704.30 | –2 859.89 | |
| | | Deforestation | | | | | | | 25.66 | 3.69 | |
| | | **Total (3.3)** | | | | | | | –2 678.64 | –2 826.30 | |
| | Article 3.4[d] | Forest management | | | | | | | NA | NA | |
| | | Cropland management | NA | | | | | | NA | NA | NA |
| | | Grazing land management | NA | | | | | | NA | NA | NA |
| | | Revegetation | NA | | | | | | NA | NA | NA |
| | | **Total (3.4)** | NA | | | | | | **NA** | **NA** | **NA** |

*Abbreviations*: LULUCF = land use, land-use change and forestry; KP-LULUCF = LULUCF emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, NA = not applicable.

[a] "Base year" for Annex A sources refers to the base year under the Kyoto Protocol, which is 1990 for all gases. The "base year" for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol is 1990.

[b] Emissions/removals reported in the sector other (sector 7) are not included in Annex A to the Kyoto Protocol and are therefore not included in national totals.

[c] Activities under Article 3, paragraph 3, of the Kyoto Protocol, namely afforestation and reforestation, and deforestation. Only the inventory years of the commitment period must be reported.

[d] Elected activities under Article 3, paragraph 4, of the Kyoto Protocol, including forest management, cropland management, grazing land management and revegetation. For cropland management, grazing land management and revegetation the base year and the inventory years of the commitment period must be reported.

5. Table 3 provides information on the most important emissions and removals and accounting parameters that will be included in the compilation and accounting database.

Table 3
**Information to be included in the compilation and accounting database in t $CO_2$ eq**

| | *As reported* | *Adjustment*[a] | *Final*[b] | *Accounting quantity*[c] |
|---|---|---|---|---|
| **Commitment period reserve** | 282 765 845 | | 282 765 845 | |
| **Annex A emissions for current inventory year** | | | | |
| $CO_2$ | 42 413 762 | | 42 413 762 | |
| $CH_4$ | 12 178 051 | | 12 178 051 | |
| $N_2O$ | 7 171 238 | | 7 171 238 | |
| HFCs | 500 925 | | 500 925 | |
| PFCs | 65 570 | | 65 570 | |
| $SF_6$ | 65 300 | | 65 300 | |
| **Total Annex A sources** | **62 394 847** | | **62 394 847** | |
| **Activities under Article 3, paragraph 3, for current inventory year** | | | | |
| 3.3 Afforestation and reforestation on non-harvested land for current year of commitment period as reported | –2 859 891 | | –2 859 891 | |
| 3.3 Afforestation and reforestation on harvested land for current year of commitment period as reported | 26 128 | | 26 128 | |
| 3.3 Deforestation for current year of commitment period as reported | 33 689 | | 33 689 | |
| **Activities under Article 3, paragraph 4, for current inventory year**[d] | | | | |
| 3.4 Forest management for current year of commitment period | | | | |
| 3.4 Cropland management for current year of commitment period | | | | |
| 3.4 Cropland management for base year | | | | |
| 3.4 Grazing land management for current year of commitment period | | | | |
| 3.4 Grazing land management for base year | | | | |
| 3.4 Revegetation for current year of commitment period | | | | |
| 3.4 Revegetation in base year | | | | |

*Abbreviation*: NA = not applicable.

[a] "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).

[b] "Final" includes revised estimates, if any, and/or adjustments, if any.

[c] "Accounting quantity" is included in this table only for Parties that chose annual accounting for activities under Article 3, paragraph 3, and elected activities under Article 3, paragraph 4, if any.

[d] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

# II. Technical assessment of the annual submission

## A. Overview

### 1. Annual submission and other sources of information

6. The 2011 annual inventory submission was submitted on 13 April 2011; it contains a complete set of common reporting format (CRF) tables for the period 1990–2009 and a national inventory report (NIR). Ireland also submitted information required under Article 7, paragraph 1, of the Kyoto Protocol, including information on: activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, accounting of Kyoto Protocol units, changes in the national system and in the national registry, and minimization of adverse impacts under Article 3, paragraph 14, of the Kyoto Protocol. The standard electronic format (SEF) tables were submitted on 13 April 2011. The annual submission was submitted in accordance with decision 15/CMP.1.

7. Where necessary, the expert review team (ERT) also used previous years' submissions during the review. In addition, the ERT used the standard independent assessment report (SIAR), parts I and II, to review information on the accounting of Kyoto Protocol units (including the SEF tables and their comparison report) and on the national registry.[3]

8. During the review, Ireland provided the ERT with additional information and documents, which are not part of the annual submission. The full list of information and documents used during the review is provided in annex I to this report.

Completeness of inventory

9. The inventory covers most of the source and sink categories for the period 1990–2009 and is complete in terms of years and geographical coverage.

10. The ERT noted that Ireland had reported the emissions for some categories as not estimated ("NE"), in particular for some categories in the LULUCF sector (land converted to wetlands, land converted to settlements). Generally, the ERT recommends that the Party provide these missing estimates in its future annual submissions or, alternatively, considers replace "NE" with the notation key for not occurring ("NO") if the relevant emissions/removals are not occurring.

11. The ERT encourages the Party to continue its efforts to include in its inventory emission estimates for other categories for which there are no methodologies or emission factors for estimating emissions available in the Intergovernmental Panel on Climate Change (IPCC) Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories (hereinafter referred to as the IPCC good practice guidance) or in the Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories (hereinafter referred to as the Revised 1996 IPCC Guidelines), such as estimates of $CO_2$ emissions from asphalt roofing, road paving with asphalt, and food and drink, potential emissions of $SF_6$ from consumption in sporting goods, $N_2O$ emissions from the use of $N_2O$ for anaesthesia.

[3] The SIAR, parts I and II, is prepared by an independent assessor in line with decision 16/CP.10 (paras. 5(a), 6(c) and 6(k)), under the auspices of the international transaction log administrator using procedures agreed in the Registry System Administrators Forum. Part I is a completeness check of the submitted information relating to the accounting of Kyoto Protocol units (including the SEF tables and their comparison report) and to national registries. Part II contains a substantive assessment of the submitted information and identifies any potential problem regarding information on the accounting of Kyoto Protocol units and the national registry.

## 2. A description of the institutional arrangements for inventory preparation, including the legal and procedural arrangements for inventory planning, preparation and management

Overview

12. The ERT concluded that the national system continued to perform its required functions.

Inventory planning

13. The NIR described the national system for the preparation of the inventory. The Environmental Protection Agency (EPA) has overall responsibility for the national inventory. The Office of Climate, Licensing and Resource Use (OCLR) of EPA is the inventory agency with overall responsibility for the compilation of emission estimates for all sectors except forest-related categories. The OCLR also includes the Emissions Trading Unit, which provides the inventory team with the information submitted by participants in the European Union emissions trading scheme (EU ETS). The National Council for Forest Research and Development (COFORD) prepares estimates of emissions and removal from forest-related activities, in particular those under Article 3, paragraph 3, of the Kyoto Protocol.

14. Other agencies and organizations, namely the Sustainable Energy Authority of Ireland (SEAI), the Department of Agriculture, Fisheries and Food, the Central Statistics Office; Bord Gáis, the Marine Institute, the Road Safety Authority, and the Department of Communications, Energy and Natural Resources, are also involved in the provision of activity data for the inventory. The OCLR puts in place formal procedures for the planning, preparation and management of the national atmospheric inventory (including the inventory reported to the Convention on Long-Range Transboundary Air Pollution), identifies the roles and responsibilities of all the organizations involved in its compilation and stipulates memoranda of understanding (MoU) with key data providers. A specific MoU has been established with COFORD, which is responsible for the planning, preparation and management of estimates for the LULUCF sector.

15. The EPA is responsible for the choice of methods for estimating GHG emissions and removals, data collection and processing and archiving of the information; it also implements quality assurance/quality control (QA/QC) procedures formally established in 2005 through the adoption of a QA/QC plan and a manual. Information available in the NIR shows weaknesses with respect to QA/QC activities for specific sectors, in particular for industrial processes and waste; strengthening of these activities could help the Party to ensure better consistency between the different parts of its submission.

Inventory preparation

*Key categories*

16. Ireland has reported a key category tier 1 analysis, both level and trend assessment, as part of its 2011 submission. The key category analysis performed by the Party and that

performed by the secretariat[4] produced similar results, but some differences were identified due to the higher level of category disaggregation used by the Party, which is the same at which the emissions are calculated. Ireland has included the LULUCF sector in its key category analysis, which was performed in accordance with the IPCC good practice guidance and the IPCC good practice guidance for LULUCF.

17. Although the inventory agency has not performed a tier 2 key category analysis, owing to resource constraints, some elements of the qualitative approaches mentioned in the IPCC good practice guidance section 7.2.2 (namely mitigation techniques and technologies, high expected emission growth, high uncertainty, unexpectedly low or high emissions) are already being carried out. The results of the key category analysis are discussed in the NIR and are used as a driving factor for the prioritization of improvements to the national inventory. Ireland is considering implementing a tier 2 key category analysis on an annual basis, if resources allow. The ERT encourages Ireland to implement a tier 2 key category analysis in future submissions where resources allow.

18. Ireland has identified $CO_2$ emissions from forest land remaining forest land under Article 3, paragraph 3, of the Kyoto Protocol as a key category. The result of the analysis is presented both in the KP-LULUCF CRF table NIR-3 and in the NIR.

*Uncertainties*

19. Ireland performed and reported a tier 1 uncertainty analysis for 2009 and for the trend of the period 1990–2009, in accordance with the IPCC good practice guidance. The results of this analysis are presented and discussed, both at a summary level and at the individual category level. The Party states that there is insufficient information available on uncertainties to allow for analysis using the tier 2 method.

20. With regard to uncertainty assessment for LULUCF activities, the ERT noted inconsistencies between different elements of the Party's submission. In particular, according to chapter 1.7 of the NIR, on uncertainty assessment, uncertainty has been estimated for LULUCF under both the Convention inventory and Article 3, paragraph 3, activities, whereas according to chapter 7.9 of the NIR, on uncertainties for LULUCF, full evaluation of uncertainties in quantitative terms has not been possible for LULUCF for the current submission (but an estimate for Article 3, paragraph 3, activities under the Kyoto Protocol is provided in chapter 11). In table 1.9 of the NIR, the only available disaggregation for LULUCF is between "liming" and "non-liming". The ERT recommends that the Party provide consistent information on uncertainty assessment for LULUCF in the different parts of its submission, and, for LULUCF uncertainty assessment, to use the same categories used to estimate emissions and removals.

*Recalculations and time-series consistency*

21. Recalculations have been performed and reported in accordance with the IPCC good practice guidance. According to the information available in the NIR, recalculations affect the entire time series 1990–2008 and in all cases are due to methodological refinement rather than major methodological change.

22. Recalculations have been undertaken in the energy sector to take into account minor revisions to the national energy balance for manufacturing industries and construction, and,

[4] The secretariat identified, for each Party, the categories that are key categories in terms of their absolute level of emissions, applying the tier 1 level assessment as described in the Intergovernmental Panel on Climate Change *Good Practice Guidance for Land Use, Land-Use Change and Forestry*. Key categories according to the tier 1 trend assessment were also identified for Parties that provided a full set of CRF tables for the base year or period. Where the Party performed a key category analysis, the key categories presented in this report follow the Party's analysis. However, they are presented at the level of aggregation corresponding to a tier 1 key category assessment conducted by the secretariat.

for transport and other sectors, revised emission factors (EFs) for transport and other sectors and new estimates for fugitive emissions from fuels. In the industrial processes sector, recalculations have resulted from a minor revision to the country-specific natural gas $CO_2$ EF and from revised data in some subcategories for substitutes of ozone depleting substances (ODS). Revision to estimates in the solvent and other product use sector primarily arise from revisions to the solvent content of products across the time series, or the way in which measured data for specific years have been used to generate a time series of emissions.

23. In the agriculture sector, recalculations are due to revision of swine weights for enteric fermentation, derivation of tier 2 EFs for swine for manure management and a revised tier 2 ammonia model that now includes goats, horses, mules and asses. Recalculations for the LULUCF sector include a number of methodological refinements resulting mainly from a wider use of the national forest inventory data in the CARBWARE model for forest land and its development to ensure consistency between submission under the Convention and its Kyoto Protocol. In the waste sector, recalculations are due to revisions of the quantities of waste allocated to managed and unmanaged SWDS for some years and the revision of landfill gas from flaring.

24. The ERT noted that for 2008 the major impact on the estimate of total GHG emissions was due to the recalculation of the estimates of $CO_2$ emissions from fuel combustion activities and from manufacturing industries and construction, and to the recalculation of estimates of $CH_4$ emissions from solid waste disposal on land. The effect of the recalculations for the base year (as reported in the CRF tables) was an increase by 0.06 per cent in $CO_2$ eq emissions excluding LULUCF. The effect of the recalculations for 2008 (as reported in the CRF tables) was an increase by 0.52 per cent in $CO_2$ eq excluding LULUCF. The rationale for these recalculations is provided in the NIR and in CRF table 8(b).

25. The ERT noted that the Party provides different figures for the overall impact of recalculations in different parts of its submission. The ERT recommends that the Party provide the correct values in all the elements of its submission.

*Verification and quality assurance/quality control approaches*

26. Since 2005, Ireland has had an elaborated QA/QC plan in place, in accordance with decision 19/CMP.1 and the IPCC good practice guidance. Summary information on the QA/QC system and procedures is provided in section 1.6 of the NIR; additional information on QA/QC for individual sectors is provided for the energy, industrial processes, agriculture and waste sectors. The ERT commends the Party for providing more detailed descriptions of QA/QC procedures for power generation by energy industries and for industrial processes; this information explains how the information from the EU ETS is verified and used in the preparation of the inventory for the different categories.

27. With regard to industrial processes, the Party only provides information on QA/QC checks regarding information made available through the EU ETS. Given the diversity of categories within this sector, the Party is recommended to provide specific information for each category; in particular, the Party is encouraged to specify which tier of the monitoring and reporting guidelines under the EU ETS applies to that category and to explain how this is in line with the IPCC good practice guidance. The Party is also recommended to provide information on QA/QC for LULUCF.

*Transparency*

28. The degree of transparency of the information included in the NIR and in the CRF is, in general, quite good. The ERT did not identify any restrictions relating to the provision of information in the CRF tables and the NIR for confidentiality reasons. In particular, the ERT commends the Party for improving the use of notation keys since previous

submissions. However, incorrect notation keys are still used in the CRF tables. For example, emissions from national navigation are reported as not occurring ("NO"), but should actually be included elsewhere ("IE").

Inventory management

29. Ireland has a centralized archiving system, which includes the archiving of disaggregated EFs and activity data (AD) and documentation on how these factors and data have been generated and aggregated for the preparation of the inventory. The archived information also includes internal documentation on QA/QC procedures, external and internal reviews, and documentation on annual key categories and key category identification and planned inventory improvements. All data used in the preparation of the inventory are stored on a server located in the Monaghan regional inspectorate of the EPA; all data stored on the server are backed up daily, with a copy kept in the EPA's headquarters in Wexford.

## 3. Follow-up to previous reviews

30. On the basis of the findings of previous reviews, Ireland improved its 2011 submission compared with previous submissions. The ERT commends the Party for providing, in section 10.4 of its NIR, a detailed description of action taken in response to previous review reports. The ERT also commends Ireland for the actions taken, in particular for correcting notation keys for $CO_2$, $N_2O$ and $CH_4$ emissions from the use of solid fuels in navigation and for $CO_2$ emissions from refining/storage and distribution of oil products, for improving the explanation of uncertainty and the relevant trend, for providing sector-specific QA/QC information for industrial processes and for improving methodological descriptions for several categories compared with the 2010 NIR. The ERT recommends that Ireland continue the efforts already in place to improve its submission, particularly in relation to providing sector-specific QA/QC information also for the other sectors. The ERT also notes that recommendations by previous review reports concerning the use of notation keys were only partially implemented by the Party, and inconsistencies still exist between the different parts of the submission. The ERT, therefore, recommends the Party to further improve the use of notation keys in the CRF.

## 4. Areas for further improvement

Identified by the Party

31. The 2011 NIR identifies several areas for improvement. In particular, Ireland is working to improve the completeness of the GHG inventory by including emission estimates for other categories for which there are no methodologies in the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Revised 1996 IPCC Guidelines) and in the IPCC good practice guidance and by revising its uncertainty analysis for the LULUCF sector by further disaggregating the relevant categories.

32. The Party is also working to:

(a) Incorporate in the inventory new estimates for civil aviation, based on new and more detailed data;

(b) Report separately emissions from domestic navigation or improve the use of notation keys in the CRF with clear explanations in the NIR about the reasons why they are not estimated separately and where in the inventory they are included in the next and future annual submissions;

(c) Re-examine and extend the inventory time series for emissions of fluorinated gases (F-gases) and include data on hydrofluorocarbon-23 (HFC-23) in CRF table 2(II).F;

(d) Provide additional information on the calcium oxide/magnesium oxide (CaO/MgO) content of clinker;

(e) Introduce a much more in-depth model to estimate $N_2O$ emissions from soils;

(f) Improve estimates for the LULUCF sector by applying more extensively the results of the national forest inventory;

(g) Refine the approach to the estimation of $CH_4$ emissions from solid waste disposal through the use of the model provided by the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* (2006 IPCC Guidelines) and seeking, on an annual basis, detailed analyses of landfill gas flaring and utilization statistics from landfill operators by surveying landfill sites.

Identified by the expert review team

33. During the review, the ERT identified cross-cutting issues for improvement. These are listed in paragraph 134 below.

34. Recommended improvements relating to specific categories are presented in the relevant sector chapters of this report.

## B. Energy

### 1. Sector overview

35. The energy sector is the main sector in the GHG inventory of Ireland. In 2009, emissions from the energy sector amounted to 41,472 Gg $CO_2$ eq, or 66.5 per cent of total GHG emissions. Since 1990, emissions have increased by 33.8 per cent. The key drivers for the rise in emissions are energy industries and road transportation. Within the sector, 31.6 per cent of the emissions in 2009 were from transport, followed by 31.5 per cent from energy industries, 25.8 per cent from other sectors (commercial/institutional, residential and agriculture/forestry/fishing)and 11.0 per cent from manufacturing industries and construction. The remaining 0.1 per cent of emissions are fugitive emissions from oil refining and natural gas production and distribution.

36. Ireland's 2011 GHG inventory for the energy sector is transparent, accurate, consistent, comparable and complete and has been prepared in accordance with the Revised 1996 IPCC Guidelines and the IPCC good practice guidance.

37. There are significant improvements related to the transparency of the information provided by the Party in its 2011 NIR. Many of the recommendations from the 2010 review have been implemented in the 2011 submission. These include improved descriptions relating to the use of EU ETS data, which are used extensively in the energy sector. Overall, the transparency of the information reported in Ireland's 2011 GHG inventory submission as well as the transparency of the answers provided by Ireland during the review is good. Ireland foresees additional improvements being made in relation to the remaining recommendations from the 2010 review, which were not possible to incorporate in the 2011 submission. Ireland's responses to these recommendations are clearly documented in annex I of the 2011 NIR.

38. Ireland reported substantial recalculations of $N_2O$ and $CH_4$ emissions from road transportation. In 2008, these recalculations represented a downward revision of 23.0 per cent in $N_2O$ emissions (38.15 Gg $CO_2$ eq) and of 15.1 per cent in $CH_4$ emissions (4.07 Gg $CO_2$ eq). During the review, Ireland provided very transparent and detailed comparisons of emissions from the "Computer programme to calculate emissions from road transport" (COPERT) version 4.6.1, used in Ireland's previous submission, and COPERT version 4.8.0, used in Ireland's latest submission. This latest version of the COPERT model includes all vehicle technologies up to Euro VI for passenger cars, Euro VI for heavy duty

vehicles and Euro III for motorcycles. In addition, the ERT found that significant recalculations in $CH_4$ and $N_2O$ emissions were caused by a software bug in COPERT version 4.6.1, which misallocated the hot and cold emissions of these GHGs (and ammonia), as well as a correction in the $N_2O$ hot EF of urban buses standard Euro III. The ERT recommends that Ireland ensure its future NIR submissions include a clear description of the main reasons (i.e. improvements) behind the recalculations when changing from one version of COPERT to another.

## 2. Reference and sectoral approaches

Comparison of the reference approach with the sectoral approach and international statistics

39. The difference between the reference approach and the sectoral approach was 0.60 per cent in 2009. However, the ERT noted the overall difference for fossil fuels is small because of the netting of positive (solid fuels) and negative (liquid and gaseous fuels) differences. There is a significant discrepancy between $CO_2$ emissions from the sectoral and the reference approach for solid fuels (4.2 per cent). The categories residential and public heat and electricity production are the largest consumers of solid fuels in the energy sector in Ireland. During the review the ERT asked the Party to clarify whether the difference could be explained by lower $CO_2$ emissions from EU ETS combustion installations using coal compared with $CO_2$ emissions calculated from the AD in the energy balance. The Party provided the ERT with a comparison of emissions from solid fuels from EU ETS and the energy balances at a more disaggregated level for all years between 1990 and 2009. The comparison suggests that the difference could be explained by the application of a constant net calorific value (NCV) for all years using the energy balance data, whereas the $CO_2$ estimates reported in the CRF tables correspond to verified EU ETS emissions. Ireland informed the ERT that the issue would be solved with the harmonization of the energy balance and EU ETS AD. The ERT recommends that the Party ensure as much consistency as possible between the AD reported in the CRF tables and in its energy balance.

40. During the review, the Party stated that its inventory agency will request the compiler of Ireland's energy statistics to investigate the differences between apparent consumption reported to UNFCCC and that reported to the International Energy Agency. The ERT welcomes Ireland's proactive approach. The ERT also recommends that the Party investigate the differences between the AD submitted in its CRF tables with the energy balances reported to Eurostat under the EU regulation on energy statistics, which has legal provisions aimed at ensuring the consistency of energy data in the energy balances with AD in the CRF tables.

*International bunker fuels*

41. The ERT noted that $CH_4$ and $N_2O$ emissions from marine bunkers have not been estimated because of the lack of national EFs. The Revised 1996 IPCC Guidelines provide EFs for the EU as well as factors developed by Lloyd's Register (see IPCC good practice guidance page section 2.4.1.2). It is good practice to use the factors developed by Lloyd's Register to estimate $CH_4$ and $N_2O$ emissions from large marine diesel engines consuming distillate or residual fuel oils. The ERT recommends that the Party assess the use and applicability of these EFs for $CH_4$ and $N_2O$ for reporting emissions from international shipping in its future annual submissions.

*Feedstocks and non-energy use of fuels*

42. Ireland's reporting of feedstocks and non-energy use is generally transparent and consistent with the Revised 1996 IPCC Guidelines. During the review, a minor issue was the reporting of white spirit in CRF table 1.A(d) on feedstocks and non-energy use. There is no fraction reported for carbon stored and thus 100 per cent is assumed to be emitted as $CO_2$. However, the same table shows that only 15.33 Gg of carbon from lubricants was

emitted in 2009, implying that 100 per cent of white spirit consumption had been stored. Ireland informed the ERT that all white spirit is reported as part of the total non-energy consumption (feedstocks) and that the inventory agency would include this minor liquid fuel use as being stored in CRF table 1.A(b) in its future submissions. The ERT recommends that the Party ensure full consistency between tables 1.A(b) and 1.A(d) in future annual submissions.

### 3. Key categories

Stationary combustion: all fuels – $CO_2$

43. Verified emissions from EU ETS participants under EU directive 2003/87/EC are the only source of $CO_2$ emissions from energy industries in Ireland. The NIR states that energy industries' $CO_2$ emissions correspond to 22 individual installations – 19 electricity generating stations under sub-category public electricity and heat production, one oil refinery under sub-category petroleum refining and two peat briquetting plants under sub-category manufacture of solid fuels and other energy industries. The ERT found some discrepancies when comparing $CO_2$ emissions reported in the CRF tables in 2009 and $CO_2$ verified emissions at the installation level reported to the EPA. These differences amounted to 4,572 Gg for all key categories in the above mentioned sub-categories combined.

44. During the review, the Party informed the ERT that some process emissions occur at the two milled peat-fired power plants, which use limestone for abatement of sulphur dioxide. These emissions are reported in the industrial processes sector under limestone and dolomite use, and not under public electricity and heat production. The small difference in emissions from the sub-category petroleum refining was due to the reporting of about 0.19 Gg of carbon catalyst resulting in emissions of 69.76 t $CO_2$. The difference for manufacture of solid fuels and other energy industries is due to a smaller amount of combustion of gasoil and kerosene at the two milled peat plants, which are not specifically allocated in the energy balance.

45. The inventory agency only reports $CO_2$ emissions from milled peat combustion under manufacture of solid fuels and other energy industries. The inventory agency leaves these emissions out in order to avoid double counting and the small quantities of gasoil and kerosene used are reported under the manufacturing industries and construction category instead. The ERT encourages Ireland to improve the disaggregation in the energy balance and report these small amounts of emissions under manufacture of solid fuels and other energy industries. The Party also informed the ERT that small differences for energy industries overall may be the result of 'rounding' up to the next tonne in the ETS data reported to the European Commission, whereas the inventory agency uses the exact estimated $CO_2$ amount from combustion of fuels for reporting in the CRF tables. Finally, the Party clarified that not all combustion emissions under the EU ETS (sector 1) occur in the category energy industries. Some ETS operators' combustion emissions also occur in category manufacturing industries and construction and other sectors. The inventory agency provides the ETS data for these operators to SEAI for information purposes to improve the energy balance. The ERT commends Ireland for these transparent explanations during the review and, should differences remain or new ones occur, the ERT recommends that the Party include explanatory information in its future annual submissions.

46. The previous review report concluded that the implied EFs to derive $CO_2$ emissions from energy industries are not comparable with those of other Parties. $CO_2$ emissions reported by Ireland are from the EU ETS, whereas the underpinning AD in the CRF tables are from the energy balances. The current ERT believes that $CO_2$ emissions from energy industries are accurate and complete, and that the time series is consistent because of the use of identical AD from the EU Directive from large combustion plants. However, the implied emission factors (IEFs) in the CRF tables are calculated on the basis of AD not used in the estimation of $CO_2$ emissions. During the review, the Party informed the ERT

that the issue regarding the energy data in the national energy balance and the corresponding energy data reported through the EU ETS are being harmonized to ensure that both are fully consistent. This would mean that the energy data reported in the next energy balance will be the same as the EU ETS data. The ERT looks forward to this improvement and recommends that Ireland use consistent AD, EFs and emissions in its 2012 annual submission.

### 4. Non-key categories

Stationary combustion: all fuels – $N_2O$, $CH_4$

47. Ireland uses the energy balances to estimate $CH_4$ and $N_2O$ emissions in energy industries. The previous review report "strongly recommended" that the Party use consistent data for estimating emissions of GHGs in its future annual submissions. The current ERT believes that the Party is making significant efforts to improve the consistency of the AD reported in the energy balance and in the EU ETS regarding $CO_2$ emissions. The ERT also argues that the accuracy of the reporting of Ireland's second most important category energy industries and gas ($CO_2$) should not be at the expense of ensuring full consistency in the estimation of non-$CO_2$ gases. The harmonization of the energy balances and EU ETS AD may lead to improvements in the estimation of $CH_4$ and $N_2O$ emissions. The ERT recommends that the Party include transparent information, including on how to ensure time-series consistency, about the potential recalculations of emissions of non-$CO_2$ gases in its future annual submissions.

Domestic navigation: liquid fuels – $CO_2$, $CH_4$, $N_2O$

48. The NIR states that domestic navigation is estimated based on energy balance data. However, "NO" is reported in the CRF tables, even though Ireland reported these data to Eurostat in 2009 in accordance with the EU Energy Statistics Regulation. The 2011 CRF submission (CRF table 1.C) also shows that emissions from navigation are fully accounted for by marine bunkers. During the review, the Party clarified that emissions from domestic navigation have been reported as "NO", but should have actually been reported as "IE". Ireland explained that the recent oil balances provided to SEAI to compile the national energy balance did not specify gasoil/diesel use in domestic navigation. Emissions are, however, included in other transport under diesel fuel. Ireland also clarified that its national inventory agency sourced additional information from Ireland's Revenue Commissioners on marine diesel.

## C. Industrial processes and solvent and other product use

### 1. Sector overview

49. In 2009, emissions from the industrial processes sector amounted to 2,117.12 Gg $CO_2$ eq, or 3.5 per cent of total GHG emissions, and emissions from the solvent and other product use sector amounted to 71.80 Gg $CO_2$ eq, or 0.1 per cent of total GHG emissions. Since the base year, emissions have decreased by 33.4 per cent in the industrial processes sector, and decreased by 10.3 per cent in the solvent and other product use sector. The key drivers for the fall in emissions in the industrial processes sector are: the closing of the single nitric acid production plant in 2002; the ceasing of ammonia production in 2003; and the recent economic downturn in 2008. Within the industrial processes sector, 70.2 per cent of the emissions were from mineral products. The remaining 29.8 per cent were from consumption of halocarbons and $SF_6$.

50. In terms of major categories within the sector, 62.7 per cent of the emissions were from cement production, followed by 16.7 per cent from consumption of halocarbons and $SF_6$ in refrigeration and air-conditioning equipment, 7.4 per cent from lime production and

5.2 per cent from consumption of halocarbons and $SF_6$ in semiconductor manufacturing. Aerosols/metered dose inhalers accounted for 4.4 per cent, foam blowing accounted for 1.3 per cent and fire extinguishers 1.1 per cent of total sectoral emissions. Ireland has reported $CH_4$ emissions from this sector as "NO" for the whole time series 1990–2009 as well as $N_2O$ emissions as they did not occur after 2002, when the nitric acid plant ceased operations. In terms of gases, $CO_2$ represented 70.2 per cent of total sectoral emissions, followed by 23.7 per cent for HFCs, 3.1 per cent for PFCs, and the remaining 3.0 per cent for $SF_6$.

51. Ireland has made recalculations for the industrial processes sector between the 2010 and 2011 submissions following changes in AD from HFCs and in order to rectify identified errors. The impact of these recalculations on the industrial processes sector is an increase in emissions of 0.002 per cent for 2008. The main recalculations took place for foam blowing and metered dose inhalers.

52. The Party made recalculations for the solvent and other product use sector between the 2010 and 2011 submissions following changes in methodology and in order to rectify identified errors. The impact of these recalculations on the solvent and other product use sector is a decrease in emissions of 13.5 per cent for 2008. Recalculations took place in all categories.

53. Emissions from the industrial processes sector decreased by 29.2 per cent from 2008 to 2009, mainly as a consequence of the decrease in $CO_2$ emissions from cement and HFCs in refrigeration and air-conditioning equipment. $CO_2$ emissions from lime production also declined contributing to the sector's overall emissions reductions, despite the increase in F-gases consumption such as: HFC consumption for subcategories foam blowing, fire extinguishers, aerosols/metered dose inhalers, and $SF_6$ consumed for electrical equipment and in semiconductor manufacturing. The ERT encourages Ireland to provide a more detailed description in its future annual submissions of F-gases consumption trends at each specific subcategory, as the ERT observed that different drivers explain the trends of emissions for different sub-categories.

54. Ireland has reported the following categories as "NE": $CO_2$ emissions from asphalt roofing, road paving with asphalt, and food and drink; potential emissions of $SF_6$ from consumption in sporting goods and $N_2O$ emissions from the use of $N_2O$ for anaesthesia. The ERT commends the Party for having tried to estimate and clarify the potential $SF_6$ emissions from sporting goods (consumption of halocarbons and $SF_6$), following the recommendation in the previous review report. However, potential emissions from sporting goods were not estimated due to the lack of methodologies in the Revised 1996 IPCC Guidelines or in the IPCC good practice guidance. The ERT encourages the Party to investigate ways to estimate emissions for these categories wherever possible. In addition, the Party is also recommended to correct some uses of notation keys, such as the substitution of "NO" to "IE" for aerosols disposal emissions and the insertion of "IE" in industrial refrigeration for the identified HFCs, in order to bring consistency to the NIR and CRF tables.

55. The ERT considers that data availability and the relevant documentation have, in general, been reported in a transparent manner for the industrial processes sector. However, regarding the estimation approaches, the ERT recommends that the Party make reference to which tier from the Revised 1996 IPCC Guidelines was applied at each category level. The ERT commends Ireland for having addressed a recommendation of the previous review report regarding the provision of AD analysis in annex E for cement production, limestone and dolomite use, glass production, bricks and tiles, and for having provided more information on technologies and processes in the NIR. An analysis of the observed changes in the emission level and/or trend for cement production and semiconductor manufacture was also made. However, the ERT still considers that Ireland could considerably enhance the transparency and completeness of its inventory by providing an analysis of the observed

changes in emissions from the consumption of halocarbons and $SF_6$, limestone and dolomite use, and soda ash use.

56. As raised in previous review reports, the ERT noted that Ireland is still not presenting transparent information on the time series of AD and EFs for each category separately, as appropriate, and for the variations of emissions from year to year. The ERT considers that the approach adopted by Ireland impairs transparency, and reiterates the recommendation in the previous review report of increasing the level of disaggregation of the above-mentioned issues in its future annual submissions by providing additional information for the following categories: lime production, soda ash use, aerosols and metered dose inhalers.

57. The NIR still includes only a very short section on the uncertainty analysis and QA/QC procedures for the industrial processes sector in general. The ERT reiterates once more the recommendation made in the past two reviews reports for the Party to provide more detailed information for all categories under mineral production, except for cement production, at each category level or under the sectoral uncertainty section in its future annual submissions. The ERT also recommends that the Party fill the CRF tables with the percentage of manufacture, in life and disposal factors regarding F-gases consumption categories, instead of the proportions currently reported.

## 2. Key categories

Cement production – $CO_2$

58. $CO_2$ emissions from cement production is the largest source of GHG emissions in the Party's industrial processes sector, accounting for 62.7 per cent of total sectoral emissions. Ireland uses plant-specific data and EFs reported under the EU ETS to estimate emissions from cement production. Estimates include the consideration of the cement kiln dust factor. However, the Party still does not report information on the CaO and MgO content of the clinker, which is used to derive the country-specific estimates. The ERT, therefore, reiterates the recommendation in the previous review report, in accordance with the IPCC good practice guidance, that Ireland include information on the CaO and MgO content of the clinker in its future annual submissions.

Consumption of halocarbons and $SF_6$ – HFCs, PFCs and $SF_6$[5]

59. The ERT noted once more that in CRF table 2(II).F Ireland still used the notation keys "IE" and "NA" to report AD and the corresponding estimates of emissions of HFCs from refrigeration and air-conditioning equipment. Estimated emissions from manufacturing and from disposal for commercial refrigeration are reported as "IE" and included under stock, and AD are reported as "NA", thus not allowing the application of the bottom-up approach. The ERT notes that Ireland still has not implemented the recommendation from previous years' review reports to investigate this matter further in order to improve the transparency of its reporting by reviewing its use of the notation keys for this category.

60. The ERT also noted that the recommendation in the previous review report for the provision of more information on the share of new vehicles was not addressed in the 2011 annual submission. The ERT reiterates this recommendation for the future annual submissions. In addition, the ERT reiterates the recommendation in the previous review report for the correction of mobile air-conditioning IEFs for product manufacturing, lifetime and disposal losses in the future annual submission.

[5] Not all emissions related to all gases under this category are key categories, particularly PFCs and $SF_6$ emissions. However, since the calculation procedures for and issues related to this category are discussed as a whole, the individual gases are not assessed in separate sections.

61. Ireland reports emissions of HFC-23 and HFC-227ea from fire extinguishers in the 2011 submission. However, the ERT notes that only sectoral background data is provided for HFC 227ea in CRF table 2(II).F. The ERT reiterates the recommendation from the previous review that Ireland provides background data on HFC-23 from fire extinguishers in the future annual submissions

62. With regard to aerosols, the ERT notes that the notation key "NA" is used to report HFC-134a and HFC-152a emissions for the major sub-categories (personal-care products, household products, industrial products and other general products) and encourages Ireland to undertake national surveys in order to obtain actual AD, instead of using UK market based estimates, and report these data in its future annual submissions. The ERT also notes that the NIR includes only the product life factor for dose inhalers and encourages Ireland to provide more details regarding the manufacturing product leak factor and EFs for HFC emissions.

63. With regard to semiconductor manufacture, the ERT notes that the NIR includes the same explanation on F-gases use in semiconductor manufacturing as in the previous annual submission. The ERT encourages Ireland to provide more explanation on the use of HFCs, PFCs and $SF_6$, which would enhance transparency and better present the efforts made by the plants to reduce emissions of these GHGs.

64. The ERT notes with appreciation the improvement of the description of F-gases emissions in the NIR, where the analysis of the key contributors of F-gases (categories consumption of halocarbons and $SF_6$ and refrigeration and air-conditioning equipment) was provided.

### 3. Non-key categories

Limestone and dolomite use – $CO_2$

65. During the review, Ireland did not provide an explanation regarding the sharp fall of $CO_2$ emissions from 2008 to 2009, but referred to the AD contained in annex E of the NIR. The ERT recommends that the Party include an explanation of the emissions variation from year to year either in the introduction part of the industrial processes sector or under the category-level section in order to improve the transparency of the NIR. The ERT also recommends a more detailed explanation regarding the IEF used (it currently represents the average of the two consumers) in order to improve transparency.

66. The ERT welcomes the Party's answer during the review over the correction in the notation key for brick manufacture and recommends the inclusion of this information in the future annual submissions.

## D. Agriculture

### 1. Sector overview

67. In 2009, emissions from the agriculture sector amounted to 17,491.31 Gg $CO_2$ eq, or 28.0 per cent of total GHG emissions. Since the base year, emissions have decreased by 9.2 per cent. The key drivers for the fall in emissions are the reduction of the dairy cow and sheep populations, reduction of the amount of nitrogen applied to soils with synthetic fertilizers and lower production of main agricultural crops. Within the sector, 49.7 per cent of emissions were from enteric fermentation, followed by 36.0 per cent from agricultural soils and 14.3 per cent from manure management. $CH_4$ was the dominant GHG, accounting for 62.0 per cent of total sectoral emissions, while $N_2O$ accounted for the remaining 38.0 per cent.

68. Most recommendations from the previous review report have been implemented (Ireland's responses to the recommendations in the review report of Ireland's 2010

inventory submission are provided in annex I of the NIR) and emissions were recalculated. The impact of these recalculations on the agriculture sector is an increase in $CH_4$ and $N_2O$ emissions of 0.2 per cent and 0.4 per cent, respectively, for 2008. Total emissions from the agriculture sector in 2008 increased from 17,605.08 to 17,657.35 Gg $CO_2$ eq or 0.3 per cent.

69. The GHG inventory of the agriculture sector is complete with regard to the years, categories, gases and geographical coverage.

70. The NIR is generally transparent in relation to the methodologies, AD and EFs used. However, there is lack of information regarding background data and references to well-recognized literature used to calculate uncertainties. During the review, Ireland provided the ERT with the data and references requested. The ERT recommends that the Party include all the information provided regarding uncertainties in the future annual submissions.

71. Emission from enteric fermentation and manure management for most significant livestock species were estimated using IPCC tier 2 and country-specific methodologies and EFs. The country-specific method used to calculate $CH_4$ emissions from cattle enteric fermentation is more complex than the tier 2 approach from the IPCC good practice guidance and accounts for detailed diet composition, seasonal variation in animal population and production characteristics, calving dates, amount and quality of feed consumed, and breed structure (in total 12, 18, 13 and 14 subsystems were modelled for dairy cows, suckler (beef) cows, non-breeding beef females and non-breeding beef males, respectively).

72. The number of cattle in each category was provided by the Central Statistics Office (CSO) and was allocated to the three regions of the country using the highly accurate estimates (uncertainty is within 1 per cent) of the Cattle Movement Monitoring System and the Animal Identification and Movement System. Moreover, the Party is working with researchers to adopt a model that systematically accounts for the influences of soil type, fertilizer type and application rates, temperature and rainfall in the agricultural soils category. The ERT acknowledges and encourages the substantial efforts made by Ireland to improve emissions estimates in the sector.

## 2. Key categories

Enteric fermentation – $CH_4$

73. Milk yields for beef cows reported in CRF table 4.A (7.808 kg/day) do not change from year to year and are rather high compared with the estimates of yields for non-dairy cows given in the Revised 1996 IPCC Guidelines (table A-2). CRF table 4.A contains data on the working hours per day (three hours) for dairy cattle. However, common practice in the world shows that bulls are used as drafting animals. During the review, Ireland clarified that average milk yields are reported as the average daily production along with the days of lactation per year, which is in line with the IPCC good practice guidance. The Party further responded that livestock is not used for draft purposes in the country. The ERT recommends that Ireland remove data about working hours per day for draft animals in CRF table 4.A of its future annual submissions.

74. The ERT noted that the data on the fraction of gross energy that is converted to $CH_4$ for cattle reported in the NIR (0.065) and the CRF tables (0.06) are inconsistent. During the review, the Party explained that the correct value is the value presented in the NIR. The ERT recommends that Ireland revise the data about the $CH_4$ conversion rate in the CRF tables of its future annual submissions.

75. The ERT noted that Ireland, following the recommendations from the previous review report, revised the corrected EFs for swine based on more accurate data about the live weight of animals. Previously the default EF was corrected based on the assumption

that the value of 1.5 kg/head/year equates to an adult animal; younger animals were adjusted accordingly by weight. In the current submission, Ireland assumed a default EF for swine (1.5 kg/head/year), derived for animals with an average weight of 82 kg (Revised 1996 IPCC Guidelines, table B-6), and applied country-specific data on swine weight per subcategory to correct the default EF. The ERT considers that the current approach used by the Party to correct EFs from swine enteric fermentation is more reliable than the previous approach and is in line with the IPCC good practice guidance.

76. The Party applied a tier 1 approach to estimate $CH_4$ emissions from sheep. For lowland ewes, upland ewes and rams, the default EF for enteric fermentation of 8 kg $CH_4$/head/year is used as per table 4-3 of the Revised 1996 IPCC Guidelines for developed countries. The EF for lambs is estimated with correction to the number of months that young animals are alive and the values of the gross energy fraction that is converted to $CH_4$. To improve the comparability of estimates, the ERT recommends that the Party apply the same method as for swine to calculate the corrected EFs per sheep subcategories, which is in line with the IPCC good practice guidance. The ERT further reiterates the recommendation from the previous review report for Ireland to investigate the possibility of the development and implementation of a tier 2 approach for the calculation of $CH_4$ emissions from sheep.

Manure management – $CH_4$

77. According to CRF table 4.B(a), the $CH_4$ producing potential for non-dairy cattle amounts to 0.24 $m^3$ $CH_4$/kg organic matter excretion as volatile solids (VS), while according to table B-1 of the Revised 1996 IPCC Guidelines, the maximum $CH_4$ producing capacity of manure (Bo) for non-dairy cattle for all regions (except for Latin America) is 0.17 $m^3$ $CH_4$/kg VS. Ireland explained that the Bo value for non-dairy cattle is based on a publication from O'Mara (2006).[6] The ERT recommends that Ireland further investigate whether the value of 0.24 $m^3$/kg VS was obtained using standardized methods, including a sampling methodology as prescribed in the IPCC good practice guidance.

78. The VS values for dairy (2.81 kg/head/day) and non-dairy cattle (1.33 kg/head/day) from CRF table 4.B(a) are almost two times lower than the default VS values from the 1996 Revised IPCC Guidelines (5.08 kg/head/day and 2.65 kg/head/day, respectively, as per table B-1, data for Western Europe). During the review, Ireland responded, to a question raised by the ERT, that the VS values for dairy cows and non-dairy cattle are estimated using the information provided in the model developed by O'Mara (2006). The main reason for the discrepancy is that the default digestibility value of 60 per cent is very low in comparison to the digestibility of feeds in Ireland (60 per cent would be equivalent to poor quality hay). In Ireland, the digestibility of silage is approximately 70 per cent, while that of grass and concentrates is approximately 80 per cent. The explanation provided is considered to be reasonable and the ERT recommends that Ireland include it in future NIRs to increase transparency.

79. The VS value reported in CRF table 4.B(a) for mules and asses is 1.72 kg/head/day and differs from the default value presented in the Revised 1996 IPCC Guidelines table B-7 (0.94 kg/head/day). The Party explained that the VS value for horses was erroneously used for mules and asses. The ERT recommends that Ireland recalculates $CH_4$ emissions from manure management of mules and asses in the future annual submissions.

Direct soil emissions – $N_2O$

80. The tier 1b method from the IPCC good practice guidance was used to estimate the nitrogen contribution from nitrogen-fixing crops and crop residues returned to the soil. However, the data used (such as the annual crop production of nitrogen-fixing crops and

[6] O'Mara, F., 2006. Development of Emission Factors for the Irish Cattle Herd. Environmental Protection Agency, Johnstown Castle, Wexford, Ireland.

other crops and the fraction of crop residues used for fodder) to estimate the $N_2O$ emissions from the above-mentioned categories are not transparently described in the NIR. The ERT recommends that Ireland improve the transparency of reporting by including summary tables with data used to estimate $N_2O$ emissions from N-fixing crops and crop residues returned to soils in future NIRs.

81. In CRF table 4.D, for $Frac_{NCRBF}$ and $Frac_{NCRO}$, the notation key "NO" is used without corresponding explanations, while according to the NIR data (page 96) for these fractions the default values from the IPCC good practice guidance were used. The ERT recommends that the Party remove this inconsistency by including the same information on these fractions in both the NIR and CRF table 4.D in its future annual submissions.

82. The ERT reiterates the recommendations of the previous review reports that Ireland report the amount of nitrogen in sewage sludge applied to soils separately from nitrogen input with manure and that it estimate the volatilization of ammonia and nitrogen oxide after sludge spreading.

### 3. Non-key categories

Field burning of agricultural residues – $CH_4$ and $N_2O$

83. According to CRF table 4.F, field burning of agricultural residues does not occur in Ireland and no further explanations are provided. During the review, the Party explained that the burning of agricultural residues is prohibited in Ireland as a result of the requirements imposed on farmers/agricultural enterprises that are in receipt of payment/subsidies (e.g. under Area Aid, the Rural Environmental Protection Scheme and subsequently Cross Compliance Measures under the Single Farm Payment). The ERT recommends that Ireland provide this information in the NIR and CRF documentation boxes with reference to official documents in its future annual submissions.

## E. Land use, land-use change and forestry

### 1. Sector overview

84. In 2009, net removals from the LULUCF sector amounted to 2,173.06 Gg $CO_2$ eq. Since the base year, net removals have increased by 284.6 per cent. The key driver for the rise in removals is the increase in the area of forest land remaining forest land and in net increment of biomass in this area. Within the sector, removals of 2,684.8 Gg were from forest land, followed by emissions of 226.3 Gg from grassland, 209.3 Gg from cropland and 38.6 Gg from wetlands. Settlements accounted for 28.3 Gg and other land accounted for 16.3 Gg. The sector constitutes an offset of 3.5 per cent of total emissions.

85. Ireland made recalculations for the LULUCF sector between the 2010 and 2011 submissions in response to the 2010 annual review report following changes in methods, AD and EFs and in order to rectify identified errors. The impact of these recalculations on the LULUCF sector is an increase in removals of 60.4 per cent for 2008. The main recalculations took place in the following categories:

(a) Wetlands, increase in emissions of 34.7 per cent;

(b) Forest land, increase in removals of 29.5 per cent;

(c) Other land, increase in removals of 26.4 per cent.

86. The Party uses different methods for reporting emissions and removals from LULUCF sinks and sources under the Convention and its Kyoto Protocol. Considering that a number of errors have been found in reported data in the CRF tables and inconsistencies between data reported in the CRF tables and the NIR tables, the ERT recommends that Ireland harmonize the methods used for estimating emissions and removals reported under

the Convention and its Kyoto Protocol. The ERT also notes that the Party did not provide the uncertainty analysis for the LULUCF sector and, therefore, recommends that the Party provide it in its future annual submissions.

87. Although Ireland reported in its NIR (table 7.4) a consistent time series of land use and land-use change matrices, the data time series reported in the CRF tables does not represent a consistent representation of land and is not consistent with that provided in the NIR. For forest land the area reported in NIR table 7.4 is 745,324 ha, while in CRF table 5.A it is 718,674 ha; for grassland it is 3,787,800 ha versus 3,893,840 ha; for cropland there is correspondence between the two sources of data (399,500 ha for both); for wetlands it is 53,415 ha versus 53,432 ha; for settlements it is 114,600 ha versus 114,319 ha; for other land it is 879,572 ha versus 890,803 ha. Moreover, a number of inconsistencies have been detected for AD of subcategories. Furthermore, the total area reported in the CRF tables changes annually, for example 5,224,860 ha in 1990 and 6,070,568 ha in 2009. The ERT recommends that the Party provide a consistent and accurate time series of land use and land-use change matrices and that it ensure full correspondence among data reported in the NIR and in the CRF tables. The ERT also recommends that the Party revise and strengthen the sector-specific QA/QC procedures.

88. The ERT notes that Ireland applied a country-specific stock change method to calculate the carbon stock gains in biomass, which consists of comparing the total carbon stocks at two points in time but not in the same area (i.e., the area used to calculate the stock at time 1 may be different from the area used to calculate the stock at time 2). This method is not consistent with the IPCC good practice guidance for LULUCF (see, for example, equation 3.2.3 of the IPCC good practice guidance for LULUCF method 2 relating to "a given forest area at two points in time"). Thus, the method applied by the Party can result in the reporting of emissions and removals that never occur in reality, since the accounted fluxes may simply be the result of the transfer of carbon stocks from one stratum to another. The ERT recommends that, when the Party applies the stock change method, it calculate the carbon stock values at two consecutive points in time in the same area. The ERT also recommends that the Party revise all its estimates of biomass carbon stock changes and associated emissions and removals and that it report in its future annual submissions the revised estimates.

89. The ERT notes that some pools have not been estimated, such as dead organic matter for categories of conversion from forest land to any other land use and soil organic matter of each reported conversion category to settlement and other land and for conversion from forest land to wetlands. To ensure completeness in the report the ERT recommends that the Party provide these missing estimates in its future annual submissions.

90. The ERT noted several instances of incorrect use of the notation keys in the sectoral background data tables: when an activity is assumed not to have any impact on the carbon stored in a pool, Ireland tends to use the notation key "NO" instead of "NA". The ERT recommends that Ireland revise its use of the notation keys in its future annual submissions, in order to increase the transparency of its reporting.

### 2. Key categories

Land converted to forest land – $CO_2$

91. Ireland divides its forest land into three subcategories: young (7 to 25 years) mature (older than 25 years) and unclassified clearfelled areas (containing afforested and reforested areas younger than 7 years and areas without tree cover). The ERT notes that although the annual recruitment of area of the young subdivision (i.e. the transfer of area from the afforested/reforested class (0 to 7 years old) to the young class) is done on the basis of annual records of the afforested and reforested (replanted) areas, the annual recruitment of area of the mature subdivision (i.e. the transfer of area from the young class to the mature class) is done on a constant basis (i.e. 5.6 per cent each year). Considering the availability

of annual data on afforested and reforested areas, the ERT recommends the Party to use as the annual accretion of the mature forest category the area that was afforested and reforested 26 years before the year in which the accretion area is added.

Grassland – $N_2O$

92. The ERT notes that Ireland in its CRF table 5.C for the category grassland remaining grassland does not report stock changes from mineral soils (the notation key NO is used) while it reports stock changes (i.e. emissions) from organic soils. The ERT also notes that Ireland in its CRF table 5.C for the category land converted to grassland does report stock changes (i.e. emissions) from organic soils. This means that some management activity occurs in organic soils under grassland that causes the oxidation of organic matter. However, the Party is not reporting in table 4.D under the category cultivation of histosols the corresponding $N_2O$ emissions caused by the oxidation of organic matter in managed grassland. The ERT sees that intensive and extensive management practices in pastureland are part of the agricultural practices of a country. The ERT, therefore, recommends the Party to report information to demonstrate that $N_2O$ emissions due to oxidation of organic matter in organic soils in managed grassland have been reported in table 4.D under the category cultivation of histosols.

### 3. Non-key categories

Wetlands

93. The ERT notes that, inconsistent with the IPCC good practice guidance for LULUCF, areas of natural wetlands are not reported in CRF table 5.D, wetlands. The ERT encourages the Party to report in its future submissions the total area of natural wetlands as a subdivision of the category wetlands remaining wetlands.

Other land

94. The ERT notes that, inconsistent with the IPCC good practice guidance for LULUCF, areas of natural grassland that are an available reserve for rough grazing but that are not grazed in the inventory year are reported under the land use category other land. The ERT recommends that Ireland report in its future annual submissions such areas as a subdivision of the land use category grassland.

Biomass burning – $CO_2$

95. As reported on page 118 of the NIR, the Party, in calculating emissions from biomass burning on forest land and in incorporating the effect of forest fires into the model CARBWARE, assumes that 40 per cent of biomass (IPCC default EF taken from the IPCC good practice guidance for LULUCF table 3A 1.12) is consumed by forest fires and, consequently, 60 per cent stands on the forest land, mainly as dead organic matter. However, the model CARBWARE does not incorporate in its equations, which estimate carbon stock changes in dead mass and litter, the transfer of carbon stock from the biomass pool due to forest fires. The ERT recommends that the Party amend the CARBWARE equations in order to remove the bias and submit recalculated estimates in its future annual submissions.

## F. Waste

### 1. Sector overview

96. In 2009, emissions from the waste sector amounted to 1,242.59 Gg $CO_2$ eq, or 2.0 per cent of total GHG emissions. Since the base year, emissions have decreased by 4.5 per cent. The key driver for the fall in emissions is the increased recovery of $CH_4$ from

landfills. Within the sector, 87.1 per cent of the emissions were from solid waste disposal on land, with the remaining 12.9 per cent coming from wastewater handling.

97. Ireland made recalculations for the waste sector between the 2010 and 2011 submissions in response to the 2010 annual review report. The impact of these recalculations on the waste sector is an increase of emissions of 20.4 per cent for 2008. The main recalculations took place for the solid waste disposal on land category and were due to the methodology improving and the availability of improved data on $CH_4$ recovery.

98. The methodologies, assumptions used and comprehensive background data for estimating emissions from the waste sector are described in the NIR. The Party followed the ERT recommendation from the previous review report and provided information on the improved data on $CH_4$ recovery.

99. The QA/QC in the waste sector is undertaken by the inventory team in close collaboration with specialists and licence inspectors through yearly reviews of data collection methods, including checks of the calculations and time-series consistency. The ERT noted that Ireland applied QA/QC procedures in a proper manner and encourages Ireland to continue its efforts in the future annual submissions.

### 2. Key categories

Solid waste disposal on land – $CH_4$

100. $CH_4$ emissions from solid waste disposal on land amounted to 1,081.98 Gg $CO_2$ eq in 2009. Since the 2009 annual submission, Ireland has been using the 2006 IPCC Guidelines to estimate $CH_4$ emissions from solid waste disposal on land. The AD on municipal solid waste disposal were taken from the National Waste Database. The ERT considers that the use of this methodology has improved the accuracy of the Party's estimates and it is in line with the IPCC good practice guidance.

101. In its 2011 submission, Ireland provides detailed information on the calculations and parameters to estimate $CH_4$ emissions from municipal solid waste, commercial waste and street cleaning waste (tables H.2 from the NIR). Following the ERT recommendation in the previous review report Ireland included in the NIR information demonstrating that the efficiencies for flaring are based on international good practice standards. The ERT welcomes this effort.

### 3. Non-key categories

Wastewater handling – $CH_4$ and $N_2O$

102. Ireland reported that two third of the population is served by urban wastewater treatment plants, which are based on the aerobic system, and one third of the population uses septic tanks. Owing to climatic condition, $CH_4$ emissions from septic tanks do not occur. In its 2011 submission, Ireland improved the transparency of the inventory by including information and documentation to support that assumption. The ERT welcomes this effort.

103. Emissions of $N_2O$ from human sewage were estimated following the methodology from the Revised 1996 IPCC Guidelines and country-specific parameters.

Waste incineration – $CO_2$ and $N_2O$

104. In its 2011 submission, Ireland reported emissions from waste incineration for the period 1990–2009 as "NO". It was noted in the previous review report that there was indeed a small amount of clinical waste incinerated up to 1997. In its response to the recommendation in the previous review report Ireland will consider providing estimates for

clinical waste incineration in its submission for the 2012 annual submission. The ERT welcomes this effort.

## G. Supplementary information required under Article 7, paragraph 1, of the Kyoto Protocol

### 1. Information on activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol

Overview

105. Ireland has reported estimates of Article 3, paragraph,3 activities only, since no Article 3, paragraph 4, activities have been elected. For afforestation, reforestation and deforestation Ireland reported estimates for all five carbon pools and for other emissions due to liming and biomass burning. All supplementary information requested by paragraphs 5–9 of the annex to decision 15/CMP.1 has been reported. Ireland has chosen to account for Article, paragraph 3, activities at the end of the commitment period.

106. The ERT found inconsistencies in AD reported in CRF table NIR-2 for the years 2008 and 2009. The total area reported for 2009 (7,111,786 ha) does not match the area reported for 2008 (7,111,777 ha); the area reported in cell J8 of the 2009 table (previous year total afforestation), 264,930 ha, does not match the total area reported as afforested in the 2008 table, 264,880 ha. The area deforested in 2009 is reported as previously subject to afforestation/reforestation. The ERT recommends that Ireland improve the accuracy in the time series of AD for afforestation/reforestation and deforestation activities and that it report consistent land representation of areas subject to afforestation/reforestation and deforestation in its future annual submissions.

107. Ireland made recalculations for the KP-LULUCF activities between the 2010 and 2011 submissions in response to the 2010 annual review report following changes in methods, AD and EFs and in order to rectify identified errors. The impact of these recalculations on each KP-LULUCF activity for 2008 is as follows:

(a) Deforestation, increase in emissions of 57.2 per cent;

(b) Afforestation/reforestation, increase in removals of 2.4 per cent.

Activities under Article 3, paragraph 3, of the Kyoto Protocol

*Afforestation and reforestation – $CO_2$*

108. Ireland, in calculating emissions from biomass burning on land subject to afforestation/reforestation and in incorporating the effect of forest fires into the model CARBWARE assumes that 40 per cent of biomass (IPCC's EF taken from the IPCC good practice guidance for LULUCF table 3A 1.12) is consumed by forest fires and, consequently, 60 per cent stands on the forest land, mainly as dead organic matter. However, the model CARBWARE does not incorporate in its equations that estimate carbon stock changes in dead mass and litter the transfer of carbon stock from the biomass pool due to forest fires. The ERT recommends that the Party amend the CARBWARE equations in order to remove the bias and submit revised unbiased estimates in its future submissions.

*Deforestation – $CO_2$*

109. The ERT notes that Ireland does not report carbon stock changes from SOM for deforestation to settlement and other land and does not provide information that demonstrates that SOM is not a source of emissions. The ERT recommends that the Party provide in its future annual submissions estimates of SOM carbon stock changes for both

mineral soils and organic soils of forest land converted either to settlement or to other land or demonstrate that this pool is not a source. Furthermore, due to the high uncertainty of data the ERT encourages the Party to improve its analysis on stock changes in the SOM pool for conversion from forest land to grassland as new information becomes available.

110. The ERT notes that equations 11.10 and 11.11, reported on page 176 of the NIR, calculate the aboveground and below ground biomass multiplying the total biomass by *(1–R)* and *R*, respectively, where *R* is the root/shoot ratio, and the total biomass is calculated by applying to the standing mass a BEF that includes the root/shoot ratio. Further the ERT notes that the total biomass equals the aboveground biomass multiplied by *(1+R)* or the belowground biomass multiplied by (*1/R + 1*). Therefore, the ERT recommends the Party to correct the equation 11.10 by substituting the term (*1-R*) with *1/(1+R)* and equation 11.11 by substituting the term *R* with *1/(1/R + 1)*; furthermore the ERT recommend the Party to provide transparent information on how the biomass expansion factor has been calculated and to report all elements (e.g. the root/shoot ratio) applied in the calculation of the BEF.

## 2. Information on Kyoto Protocol units

Standard electronic format and reports from the national registry

111. Ireland has reported information on its accounting of Kyoto Protocol units in the required SEF tables, as required by decisions 15/CMP.1 and 14/CMP.1. The ERT took note of the findings included in the SIAR on the SEF tables and the SEF comparison report.[7] The SIAR was forwarded to the ERT prior to the review, pursuant to decision 16/CP.10. The ERT reiterated the main findings contained in the SIAR.

112. Information on the accounting of Kyoto Protocol units has been prepared and reported in accordance with chapter I.E of the annex to decision 15/CMP.1, and reported in accordance with decision 14/CMP.1 using the SEF tables. This information is consistent with that contained in the national registry and with the records of the international transaction log (ITL) and the clean development mechanism registry and meets the requirements set out in paragraph 88(a–j) of the annex to decision 22/CMP.1. The transactions of Kyoto Protocol units initiated by the national registry are in accordance with the requirements of the annex to decision 5/CMP.1 and the annex to decision 13/CMP.1. No discrepancy has been identified by the ITL and no non-replacement has occurred. The national registry has adequate procedures in place to minimize discrepancies.

National registry

113. The ERT took note of the SIAR and its finding that the reported information on the national registry is complete and has been submitted in accordance with the annex to decision 15/CMP.1. The ERT further noted from the SIAR and its finding that the national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1, and continues to adhere to the technical standards for data exchange between registry systems in accordance with decisions 16/CP.10 and 12/CMP.1. The national registry also has adequate security, data safeguards and disaster recovery measures in place and its operational performance is adequate.

114. The Party provided access to information from its national registry that substantiated or clarified the information reported in its annual submission.

[7] The SEF comparison report is prepared by the international transaction log (ITL) administrator and provides information on the outcome of the comparison of data contained in the Party's SEF tables with corresponding records contained in the ITL.

115. In response to the recommendation of the previous review report, Ireland has clearly stated the confidentiality of the public information pursuant to paragraphs 44–48 of the annex to decision 13/CMP.1, and provided this information on the website of the registry.

Calculation of the commitment period reserve

116. Ireland has reported its commitment period reserve in its 2011 annual submission. The Party reported that its commitment period reserve has not changed since the initial report review (282,765,845 t $CO_2$ eq) as it is based on the assigned amount and not the most recently reviewed inventory. The ERT agrees with this figure.

### 3. Changes to the national system

117. Ireland reported that there are no changes in its national system since the previous annual submission. The ERT concluded that the Party's national system continues to be in accordance with the requirements of national systems outlined in decision 19/CMP.1.

### 4. Changes to the national registry

118. Ireland reported that there are small changes in its national registry since the previous submission, consisting of changes to contacts, software upgrades to improve functionality and application and some improvements to security. The ERT concluded that, taking into account the confirmed changes, the Party's national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1, and continues to adhere to the technical standards for data exchange between registry systems in accordance with relevant decisions of the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol (CMP).

### 5. Minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol

119. Ireland reported that there are no changes in its reporting of the minimization of adverse impacts in accordance with Article 3, paragraph 14, since the previous annual submission. The ERT concluded that the information provided continues to be complete and transparent.

120. As Ireland is a member State of the EU, the impact assessment of new policy initiatives has been established within the EU, which allows their potential adverse social, environmental and economic impacts on various stakeholders, including developing country Parties, to be identified and limited at an early stage within the legislative process.

121. In addition, Ireland informed the ERT that its electricity market has been deregulated and that the levy supporting the use of peat for electricity generation under a public service agreement is being discontinued. Further, Ireland has withdrawn subsidies associated with the use of environmentally unsound and unsafe technologies.

122. Ireland supports the Renewable Energy and Energy Efficiency Partnership (REEEP), a partnership that works to reduce barriers in policy, regulatory and financial structures that bar and limit the uptake of renewable energy and energy-efficiency technologies and projects. Ireland currently holds the Programme Chair of REEEP. This partnership focuses on the deployment of projects in sub-Saharan Africa, Asia and Latin America. Ireland is actively involved in the partnership, alongside energy-related organizations from Australia, Austria, Canada, Germany, Italy, Spain, the Netherlands, New Zealand, Norway, the United Kingdom of Great Britain and Northern Ireland, the United States of America and the European Commission.

# III. Conclusions and recommendations

123. Ireland made its annual submission on 13 April 2011. The annual submission contains the GHG inventory (comprising CRF tables and an NIR) and supplementary information under Article 7, paragraph 1, of the Kyoto Protocol (information on activities under Article 3, paragraph 3, of the Kyoto Protocol; Kyoto Protocol units; changes to the national system and the national registry; and minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol). This is in line with decision 15/CMP.1.

124. The ERT concludes that the inventory submission of Ireland has been prepared and reported in accordance with the UNFCCC reporting guidelines. The inventory submission is complete and the Party has submitted a complete set of CRF tables for the years 1990–2009 and an NIR; these are complete in terms of geographical coverage, years and sectors, as well as generally complete in terms of categories and gases.

125. The submission of information required under Article 7, paragraph 1, of the Kyoto Protocol has been prepared and reported in accordance with decision 15/CMP.1.

126. The Party's inventory is generally in line with the Revised 1996 IPCC Guidelines, the IPCC good practice guidance and the IPCC good practice guidance for LULUCF. The ERT commends Ireland for improving the transparency of its submission, and in particular for providing clear information on the use of information provided by the EU ETS.

127. The Party has made recalculations for the inventory between the 2010 and 2011 submissions, mainly due to methodological refinement rather than major methodological change. The impact of these recalculations on the national totals is an increase in emissions of 0.52 per cent for 2008. The main recalculations took place in the following categories:

(a) $CO_2$ emissions from fuel combustion activities;

(b) $CO_2$ emissions from manufacturing industries and construction;

(c) $CH_4$ emissions from solid waste disposal on land.

128. Ireland has reported estimates of Article 3.3 activities only, since no Article 3.4 activities have been elected. For afforestation, reforestation and deforestation Ireland reported estimates for all five carbon pools and for other emissions due to liming and biomass burning. All supplementary information requested by paragraphs 5–9 of the annex to decision 15/CMP.1 has been reported. Ireland chose to account at the end of the commitment period.

129. Ireland made recalculations for the KP-LULUCF activities between the 2010 and 2011 submissions in response to the 2010 annual review report following changes in methods, AD and EFs and in order to rectify identified errors. The impact of these recalculations on each KP-LULUCF activity for 2008 is as follows:

(a) Deforestation, increase in emissions of 57.2 per cent;

(b) Afforestation/reforestation, increase in removals of 2.4 per cent.

130. Ireland has reported information on its accounting of Kyoto Protocol units in accordance with chapter I.E of the annex to decision 15/CMP.1, and used the required reporting format tables as required by decision 14/CMP.1.

131. The national system continues to perform its required functions as set out in the annex to decision 19/CMP.1.

132. The national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1, and continues to adhere to the technical standards for data exchange between registry systems in accordance with relevant CMP decisions.

133. Ireland has reported information under chapter I.H of the annex to decision 15/CMP.1, "Minimization of adverse impacts in accordance with Article 3, paragraph 14", as part of its 2011 annual submission. The information was provided on 13 April 2011. The information contained in the submission is complete and transparent.

134. The ERT identifies the following cross-cutting issues for improvement:

(a) The strengthening of QA/QC procedures for specific sectors, in particular for LULUCF, and the provision of more detailed information on QA/QC arrangement for industrial processes and for LULUCF;

(b) The implementation of a tier 2 key category analysis;

(c) The improvement of the uncertainty assessment for LULUCF, and the provision of consistent information on this subject in the different parts of its submission;

(d) The further improvement of the use of notation keys in the CRF;

(e) The provision of estimates for categories and gases for which no methodologies and emission factors exist in the Revised 1996 IPCC Guidelines and in the IPCC good practice guidance.

135. During the review, the ERT formulated a number of recommendations relating to the information presented in Ireland's annual submission. The key recommendations are that Ireland:

(a) Provide more detailed information on QA/QC procedures for categories in the energy and industrial processes sectors that include installations under the EU ETS, in particular by specifying which tier of the monitoring and reporting guidelines under the EU ETS applies to that category and provide information on how these estimates are in line with the IPCC good practice guidance;

(b) Provide a clear indication about the methodological tiers used in the estimation of emissions in the industrial processes sector;

(c) Improve the use of notation keys in the CRF for categories in the industrial processes sector, in particular for subcategories under the consumption of halocarbons and $SF_6$;

(d) Improves transparency in the agriculture chapter of the NIR by providing references to background data and to the well-recognized literature used to calculate uncertainties;

(e) Further harmonize the methods used for estimating emissions and removals for the LULUCF sector reported under the Convention and its Kyoto Protocol.

# IV. Questions of implementation

136. No questions of implementation were identified by the ERT during the review.

# Annex I

## Documents and information used during the review

### A. Reference documents

Intergovernmental Panel on Climate Change. *2006 IPCC Guidelines for National Greenhouse Gas Inventories*. Available at <http://www.ipcc-nggip.iges.or.jp/public/2006gl/index. html>.

Intergovernmental Panel on Climate Change. *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*. Available at <http://www.ipcc-nggip.iges.or.jp/public/gl/invs1.htm>.

Intergovernmental Panel on Climate Change. *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*. Available at <http://www.ipcc-nggip.iges.or.jp/public/gp/english/>.

Intergovernmental Panel on Climate Change. *Good Practice Guidance for Land Use, Land-Use Change and Forestry*. Available at <http://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf.htm>.

"Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories". FCCC/SBSTA/2006/9. Available at <http://unfccc.int/resource/docs/2006/sbsta/eng/09.pdf>.

"Guidelines for the technical review of greenhouse gas inventories from Parties included in Annex I to the Convention". FCCC/CP/2002/8. Available at <http://unfccc.int/resource/docs/cop8/08.pdf>.

"Guidelines for national systems under Article 5, paragraph 1, of the Kyoto Protocol". Decision 19/CMP.1. Available at <http://unfccc.int/resource/docs/2005/cmp1/eng/08a03.pdf# page=14>.

"Guidelines for the preparation of the information required under Article 7 of the Kyoto Protocol". Decision 15/CMP.1. Available at <http://unfccc.int/resource/docs/2005/cmp1/eng/08a02.pdf#page=54>.

"Guidelines for review under Article 8 of the Kyoto Protocol". Decision 22/CMP.1. Available at <http://unfccc.int/resource/docs/2005/cmp1/eng/08a03.pdf#page=51>.

Status report for Ireland 2011. Available at <http://unfccc.int/resource/docs/2011/asr/irl.pdf>.

Synthesis and assessment report on the greenhouse gas inventories submitted in 2011. Available at <http://unfccc.int/resource/webdocs/sai/2011.pdf>.

FCCC/ARR/2010/IRL. Report of the individual review of the greenhouse gas inventory of Ireland submitted in 2010. Available at <http://unfccc.int/resource/docs/2011/arr/irl.pdf>.

UNFCCC. *Standard Independent Assessment Report*, parts I and II. Available at <http://unfccc.int/kyoto_protocol/registry_systems/independent_assessment_reports/items/4061.php>.

## B. Additional information provided by the Party

Responses to questions during the review were received from Mr. Paul Duffy, Ms. Eimear Cotter and Mr. Bernard Hyde (Environmental Protection Agency of Ireland), including additional material on the methodology and assumptions used. The following document[1] was also provided by Ireland:

Michael L. Wellock, Christina M. LaPerle, Gerard Kiely. 2011. *What is the impact of afforestation on the carbon stocks of Irish mineral soils?* Forest Ecology and Management 262 (2011) 1589–1596

[1] Reproduced as received from the Party.

# Annex II

## Acronyms and abbreviations

| | |
|---|---|
| AD | activity data |
| $CH_4$ | methane |
| $CO_2$ | carbon dioxide |
| $CO_2$ eq | carbon dioxide equivalent |
| CMP | Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol |
| CRF | common reporting format |
| EF | emission factor |
| ERT | expert review team |
| EU | European Union |
| EU ETS | European Union emissions trading scheme |
| F-gas | fluorinated gas |
| GHG | greenhouse gas; unless indicated otherwise, GHG emissions are the sum of $CO_2$, $CH_4$, $N_2O$, HFCs, PFCs and $SF_6$ without GHG emissions and removals from LULUCF |
| HFCs | hydrofluorocarbons |
| IE | included elsewhere |
| IEF | implied emission factor |
| IPCC | Intergovernmental Panel on Climate Change |
| ITL | international transaction log |
| KP-LULUCF | Land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol |
| kg | kilogram (1 kg = 1,000 grams) |
| kgoe | kilograms of oil equivalent |
| LULUCF | land use, land-use change and forestry |
| $m^3$ | cubic metre |
| Mg | megagram (1 Mg = 1 tonne) |
| MoU | Memorandum of Understanding |
| Mt | million tonnes |
| Mtoe | million tonnes of oil equivalent |
| NA | not applicable |
| $N_2O$ | nitrous oxide |
| NIR | national inventory report |
| NO | not occurring |
| PFCs | perfluorocarbons |
| QA/QC | quality assurance/quality control |
| SEF | standard electronic format |
| $SF_6$ | sulphur hexafluoride |
| SIAR | standard independent assessment report |
| $SO_2$ | sulphur dioxide |
| UNFCCC | United Nations Framework Convention on Climate Change |