Advance Version

COMPLIANCE COMMITTEE

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16 May 2011

Report of the individual review of the annual submission of Ireland submitted in 2010

Note by the secretariat

The report of the individual review of the annual submission of Ireland submitted in 2010 was published on 16 May 2011. 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/2010/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.

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Report of the individual review of the annual submission of Ireland submitted in 2010*

* In the symbol for this document, 2010 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 2010 annual submission of Ireland, coordinated by the UNFCCC secretariat, in accordance with decision 22/CMP.1. The review took place from 20 to 25 September 2010 in Bonn, Germany, and was conducted by the following team of nominated experts from the UNFCCC roster of experts: generalists – Ms. Katarina Mareckova (European Union (EU)) and Ms. Daniela Romano (Italy); energy – Mr. Matej Gasperic (Slovenia), Mr. Norbert Nziramasanga (Zimbabwe) and Mr. Ole-Kenneth Nielsen (Denmark); industrial processes – Ms. Ingrid Person (Brazil) and Mr. Koen Smekens (Belgium); agriculture – Mr. Etienne Mathias (France), Mr. Yuriy Pyrozhenko (Ukraine) and Mr. Amnat Chidthaisong (Thailand); land use, land-use change and forestry (LULUCF) – Ms. Dominique Blain (Canada) and Mr. Walter Oyhantçabal (Uruguay); and waste – Ms. Cherie Sweeney (New Zealand) and Mr. José Villarin (Philippines). Ms. Blain and Mr. Oyhantçabal were the lead reviewers. The review was coordinated by Mr. Vitor Gois Ferreira (UNFCCC secretariat).

2. In accordance with the "Guidelines for review under Article 8 of the Kyoto Protocol" (decision 22/CMP.1), 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 2008, the main greenhouse gas (GHG) in Ireland was carbon dioxide (CO_2), accounting for 70.2 per cent of total GHG emissions[1] expressed in CO_2 eq, followed by methane (CH_4) (18.0 per cent) and nitrous oxide (N_2O) (10.7 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 67.7 per cent of total GHG emissions, followed by the agriculture sector (26.1 per cent), the industrial processes sector (4.4 per cent), the waste sector (1.6 per cent) and the solvent and other product use sector (0.1 per cent). Total GHG emissions amounted to 67,468.89 Gg CO_2 eq and increased by 22.8 per cent between the base year[2] and 2008. The overall trend in the total GHG emissions is in accordance with the rapid economic growth experienced by Ireland in recent years.

4. Tables 1 and 2 show GHG emissions from Annex A sources. 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, respectively. In addition, table 2 shows emissions and removals from the LULUCF sector under the Convention. 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.

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 1
Greenhouse gas emissions from Annex A sources and emissions/removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, by gas, base year to 2008

			Gg CO_2 eq								*Change*
		Greenhouse gas	*Base year*[a]	*1990*	*1995*	*2000*	*2005*	*2006*	*2007*	*2008*	*Base year–2008 (%)*
Annex A sources		CO_2	32 377.19	32 377.19	35 220.20	44 650.87	47 519.62	47 110.21	47 305.20	47 391.52	46.4
		CH_4	13 581.41	13 581.41	13 871.38	13 336.93	12 786.42	12 822.34	12 303.51	12 165.85	–10.4
		N_2O	8 789.91	8 789.91	9 167.47	9 180.30	7 840.33	7 675.55	7 364.91	7 223.67	–17.8
		HFCs	44.85	0.69	44.85	231.23	436.72	509.17	500.49	520.83	1 061.3
		PFCs	75.38	0.09	75.38	305.41	168.34	148.32	130.58	106.20	40.9
		SF_6	82.83	35.40	82.83	55.81	95.46	67.46	68.75	60.83	–26.6
KP-LULUCF	Article 3.3[b]	CO_2								–2 642.14	
		CH_4								0.02	
		N_2O								0.00	
	Article 3.4[c]	CO_2	NA							NA	NA
		CH_4	NA							NA	NA
		N_2O	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 CO_2, CH_4 and N_2O, and 1995 for HFCs, PFCs and SF_6. 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 2008

			Gg CO_2 eq								*Change*
		Sector	*Base year*[a]	*1990*	*1995*	*2000*	*2005*	*2006*	*2007*	*2008*	*Base year–2008 (%)*
Annex A		Energy	31 028.31	31 028.31	33 831.92	42 523.67	45 609.32	45 193.07	45 350.17	45 693.47	47.3
		Industrial processes	3 345.41	3 178.55	3 073.12	4 195.80	3 253.32	3 263.69	3 280.25	2 989.44	–10.6
		Solvent and other product use	79.43	79.43	84.58	78.96	78.70	81.57	83.97	85.97	8.2
		Agriculture	19 196.64	19 196.64	19 896.89	19 633.03	18 687.60	18 458.14	17 769.55	17 605.08	–8.3
		Waste	1 301.78	1 301.78	1 575.59	1 329.08	1 217.95	1 336.56	1 189.50	1 094.93	–15.9
		Other	NA	NA	NA	NA	NA	NA	NA	NA	NA
		LULUCF	NA	247.56	287.67	141.58	–475.34	–498.07	–979.69	–1 470.10	NA
		Total (with LULUCF)	**NA**	**55 032.26**	**58 749.77**	**67 902.12**	**68 371.55**	**67 834.96**	**66 693.74**	**65 998.79**	**NA**
		Total (without LULUCF)	**54 951.57**	**54 784.70**	**58 462.10**	**67 760.54**	**68 846.89**	**68 333.04**	**67 673.43**	**67 468.89**	**22.8**
KP-LULUCF	Article 3.3[b]	Afforestation & reforestation								–2 652.81	
		Deforestation								11.11	
		Total (3.3)								**–2 641.71**	
	Article 3.4[c]	Forest management								NA	
		Cropland management	NA							NA	NA
		Grazing land management	NA							NA	NA
		Revegetation	NA							NA	NA
		Total (3.4)	**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, LULUCF = land use, land-use change and forestry, NA = not applicable.

[a] "Base year" for Annex A sources 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" 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 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	282 756 845		282 756 845	
Annex A emissions for current inventory year				
CO_2	47 391 524		47 391 524	
CH_4	12 165 043		12 165 846	
N_2O	7 194 856		7 223 670	
HFCs	520 828		520 828	
PFCs	106 197		106 197	
SF_6	60 829		60 829	
Total Annex A sources	**67 439 277**		**67 468 893**	
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	-2 758 157		-2 758 157	
3.3 Afforestation and reforestation on harvested land for current year of commitment period as reported	105 345		105 345	
3.3 Deforestation for current year of commitment period as reported	10 979		11 107	
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 for base year				

[a] "Adjustment" is relevant only for Parties for which the expert review team has calculated one or several 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 of these activities.

II. Technical assessment of the annual submission

A. Overview

1. Annual submission and other sources of information

6. The 2010 annual inventory submission was submitted on 14 April 2010; it contains a complete set of common reporting format (CRF) tables for the period 1990–2008 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 14 April 2010. The annual submission was submitted in accordance with decision 15/CMP.1.

7. Ireland officially submitted revised emission estimates on 1 November 2010, in response to the list of potential problems and further questions raised by the expert review team (ERT) in the course of the review (see paras. 80–82 and 113–114 below). The Party provided revised estimates of CH_4 and N_2O emissions from manure management for dairy cattle and non-dairy cattle, N_2O emissions from pasture, range and paddock, direct and indirect N_2O emissions from agricultural soils and of carbon stock changes in mineral and organic soils under forest land converted to grassland. Ireland also submitted revised information and data on KP-LULUCF (carbon stock changes in mineral and organic soils under areas subject to deforestation activities under Article 3, paragraph 3, of the Kyoto Protocol) on 1 November 2010, in response to the list of potential problems and further questions raised by the ERT during the review. Where necessary, the ERT also used the previous year's annual submission during the review. The values in this report are based on those reported in the submission of 1 November 2010.

8. 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]

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

Completeness of inventory

10. The inventory covers most of the source and sink categories for the period 1990–2008 and is complete in terms of gases, years and geographical coverage. The NIR follows the outline set out in the "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories" (hereinafter referred to as the UNFCCC reporting guidelines) and all

[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 (ITL) 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.

CRF tables have been reported for all years of the time series, except CRF table 7 (key category analysis), which has been reported for 1990 and 2008 only.

11. The ERT noted that Ireland had reported the emissions for some categories as not estimated ("NE"), including CO_2, N_2O and CH_4 emissions from the use of solid fuels in navigation and CO_2 emissions from refining/storage and distribution of oil products (the Party informed the ERT that emissions for these two categories are negligible). In accordance with the information provided by Ireland in response to a question raised by the previous ERT,[4] the present ERT recommends that the Party revise the notation key used for these categories, and consider replacing "NE" with the notation key for not occurring ("NO") if appropriate justifications are provided in the NIR of its next annual submission. The Party also reported CO_2, CH_4 and N_2O emissions from petrol distribution as "NE" (reported under other non-specified fugitive emissions from oil and natural gas). The Party did, however, explain to the ERT during the review that these emissions are included in the estimates under production/processing of natural gas. Finally, Ireland did not estimate N_2O emissions from industrial and commercial wastewater, and the ERT encourages Ireland to provide estimates of N_2O emissions from the industrial and commercial fractions in its next annual submission (see para. 100 below). Generally, the ERT recommends that the Party revise the notation keys used and the relevant explanations provided in the CRF tables for its next annual submission.

12. The ERT encourages the Party to continue its efforts[5] to include in its inventory emission estimates for other categories for which there are no methodologies 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, N_2O emissions from the use of N_2O for anaesthesia, and N_2O emissions from industrial and commercial wastewater.

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

Overview

13. The ERT concluded that the national system continues to perform its required functions.

14. The Party described the changes to the national system since the previous annual submission and these changes are discussed in paragraphs 123 and 124 below.

Inventory planning

15. The NIR provides sufficient and detailed information on the institutional and procedural arrangements of the national system for the preparation of the GHG inventory. The establishment of Ireland's national system was completed by a government decision in early 2007. The Environmental Protection Agency (EPA) is the single national entity responsible for establishing and maintaining the national system and for the submission of the annual inventory to the secretariat. The Office of Climate, Licensing and Resource Use (OCLR) of EPA is the inventory agency with overall responsibility for the compilation of

[4] FCCC/ARR/2009/IRL, paragraph 10.
[5] FCCC/ARR/2009/IRL, paragraph 10.

emission estimates for all sectors except forest-related categories. The National Council for Forest Research and Development (COFORD) prepares estimates of emissions and removals from forest-related activities, including activities under Article 3, paragraph 3, of the Kyoto Protocol. Other agencies and organizations are also involved in the preparation of the inventory, namely: Sustainable Energy Ireland; the Department of Agriculture, Fisheries and Food; the Central Statistics Office; the Bord Gáis; the Marine Institute; the Emissions Trading Unit (ETU) of EPA; the Road Safety Authority; and the Department of Communications, Energy and Natural Resources. Additionally, ETU, which is part of OCLR, is a key component of the national system, providing the inventory team with the information submitted by Irish participants in the European Union emissions trading scheme (EU ETS) under EU directive 2003/87/EC.

16. Table 1.1 of the NIR provides an overview of the main data sources for the inventory that are covered by memorandums of understanding (MOUs). The same table also includes the deadlines for the delivery of data, while figure 1.1 of the NIR outlines the institutional arrangements and data flow.

17. Provisions for reporting on reforestation, afforestation and deforestation activities related to Article 3, paragraph 3, of the Kyoto Protocol were strengthened to some degree by the establishment of additional MOUs to formalize data collection by COFORD. The MOUs were put into effect between COFORD and the Forest Service and between COFORD and the forestry company Coillte. Signed copies of the MOUs are held on file along with other MOUs underpinning the national system at the EPA offices in Dublin and Monaghan.

Inventory preparation

Key categories

18. Ireland has reported a tier 1 key category analysis, both level and trend assessment, as part of its 2010 annual submission. The key category analysis performed by Ireland and that performed by the secretariat[6] produced similar results, but some differences were identified, which were due to the higher level of category disaggregation used in Ireland's analysis. Ireland explained that the level of disaggregation used corresponds to the level of disaggregation at which the estimates of emissions are calculated, which the ERT finds appropriate.

19. 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 Land Use, Land-Use Change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF). In addition, Ireland identified CO_2 emissions from afforestation/reforestation and deforestation as the key categories for activities under Article 3, paragraph 3, of the Kyoto Protocol.

20. 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. The ERT

[6] 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 IPCC *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.

encourages Ireland to consider undertaking a tier 2 key category analysis and to discuss the use of elements of a qualitative approach.

Uncertainties

21. Ireland performed and reported a tier 1 uncertainty analysis for 2008 and for the uncertainty of the emission trend in the period 1990–2008, in accordance with the IPCC good practice guidance. The ERT welcomes the information on the uncertainty of emission factors (EFs) and activity data (AD) provided in table 1.9 of the NIR. The level of category disaggregation used in the uncertainty analysis corresponds to the level used in the key category analysis, which the ERT finds appropriate except for the LULUCF sector. In fact, the ERT noted that, although the LULUCF sector is considered in the uncertainty analysis in line with the recommendation made in the previous review report,[7] overall emissions/removals from the LULUCF sector are disaggregated into only two categories: "liming" and "LULUCF excluding liming". The ERT encourages Ireland to further disaggregate the LULUCF categories for the purposes of the uncertainty analysis for its next annual submission. The ERT also noted that detailed uncertainty estimates for LULUCF activities under Article 3, paragraph 3, of the Kyoto Protocol were provided in chapter 11 of the NIR, also calculated using a tier 1 approach.

22. The overall uncertainty of the inventory for 2008 was estimated at 6.4 per cent, which corresponds closely to the uncertainty estimates reported in Ireland's previous annual submissions (5.9 per cent in the 2009 annual submission and 6.1 per cent in the 2008 annual submission). The uncertainty of the emission trend reported in the 2010 annual submission is slightly higher (4.7 per cent) than the corresponding estimates reported in the 2008 and 2009 annual submissions, which were 3.8 and 3.6 per cent, respectively. The ERT encourages the Party to analyse the reasons behind this increase in uncertainty.

23. The ERT noted that some emission estimates for 2008 reported in table 1.9 of the NIR and used in the uncertainty analysis do not correspond to the figures provided in the CRF tables for the same categories: for example, estimated emissions from liming are reported as 262.21 Gg CO_2 eq in CRF table 5(IV) but as 376.77 Gg CO_2 eq in the NIR. The ERT recommends that Ireland check and improve the consistency of data between the NIR and the CRF tables for its next annual submission.

Recalculations and time-series consistency

24. Recalculations have been performed and reported in accordance with the IPCC good practice guidance and the UNFCCC reporting guidelines. According to the information in the NIR, all recalculations are due to methodological refinement rather than major methodological change, and are a consequence of the standard revision work carried out to improve the accuracy of the inventory. Chapter 10 and, in particular, table 10.1 of the NIR summarize the major recalculations and provide useful links to detailed information in other chapters of the NIR. Information on recalculations is also provided in CRF table 8(b).

25. Recalculations have been undertaken in the energy sector to take into account revisions of the CH_4 and N_2O EFs for energy industries, manufacturing industries and construction, transport and other sectors. In the industrial processes sector, recalculations have resulted from the revision of AD for limestone and dolomite use and the CO_2 EF for brick and tile production (reported under mineral products), as well as from the inclusion of estimates of CO_2 emissions from glass production, which have been reported for the first time in the 2010 annual submission (also reported under mineral products). A minor revision of AD for solvent and other product use has also been reported by the Party as a

[7] FCCC/ARR/2009/IRL, paragraph 25.

reason for recalculations. In the agriculture sector, recalculations are due to the improvement of the accuracy of animal statistics (for sheep and swine) and the definition of weight classes. In the LULUCF sector, the Party has revised land areas and has corrected the double counting of biomass restoration in acid peatland. The application of the first order decay method, in accordance with the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the 2006 IPCC Guidelines), and the use of the results of the new survey on CH_4 recovery are the main reasons for the recalculations in the waste sector.

26. The ERT noted that for 2007 the major impact on the estimate of total GHG emissions was due to the recalculation of the estimates of CH_4 emissions from solid waste management (41.6 per cent decrease in the estimate of total emissions for the category) and of N_2O emissions from energy industries (60.8 per cent decrease in the estimate of total emissions for the category). The overall impact of the recalculations for these categories on the estimate of total GHG emissions for 2007 was a 1.1 per cent decrease. Overall, the recalculations performed for the 2010 annual submission resulted in a decrease in the estimate of total GHG emissions for both 1990 and 2007, of 1.0 and 2.3 per cent, respectively.

Verification and quality assurance/quality control approaches

27. In 2005, Ireland established formal quality assurance/quality control (QA/QC) procedures relating to the national GHG inventory by developing a QA/QC plan and a manual, which are in line with decision 19/CMP.1 and the IPCC good practice guidance. The manual provides guidance and templates for annual checking, documentation and the selection of source data and calculation methodologies, and outlines the annual requirements for the continuous improvement of the inventory.

28. Summary information on the QA/QC system and procedures is provided in section 1.6 of the NIR. Additional information on QA/QC activities in individual sectors is provided for the energy, agriculture and waste sectors. Reiterating the recommendation made in the previous review report,[8] the ERT recommends that the Party include sector-specific information on QA/QC also for the industrial processes and LULUCF sectors in its next annual submission. The ERT noted an improvement in the level of detail of the information on QA/QC procedures relating to data from the EU ETS, but considers that the information provided in the NIR is still insufficient in terms of addressing the recommendation made in the previous review report[9] (i.e. the NIR did not include information on which tier approach from the EU ETS guidelines was used) and encourages the Party to continue its efforts in that regard.

Transparency

29. Ireland's 2010 annual inventory submission is, in general, transparent. Ireland submitted a comprehensive NIR, including detailed descriptions of the methods and EFs used, which enables the ERT to easily assess the assumptions used and the rationale for the choices of data, methods and inventory parameters. However, the ERT still identified a lack of information on the methods and EFs used for some categories, such as: road transportation (see para. 56 below); navigation (see paras. 57–58 below); consumption of halocarbons and SF_6 (see paras. 68 and 69 below); solid waste disposal on land (see para. 103 below); and for the LULUCF sector. The ERT commends Ireland for the timely provision of additional explanatory information during the review in response to questions

[8] FCCC/ARR/2009/IRL, paragraph 28.
[9] FCCC/ARR/2009/IRL, paragraph 29.

raised by the ERT, which enhanced the transparency of the emission estimates, and recommends that the Party, in order to increase the transparency of its inventory, include the appropriate information in its next annual submission. The ERT also commends Ireland for having improved its use of the notation keys since the 2009 annual submission, in particular for its reporting on CH_4 and N_2O emissions from glass production and cement production.

30. The ERT did not identify any restrictions relating to the provision of information in the CRF tables and the NIR for confidentiality reasons.

31. The ERT noted some inconsistencies between the information in the NIR and that in the CRF tables, such as information on some categories reported as "NE" and the use of the notation keys (see para. 11 above). From the information included in CRF table summary 3, the ERT noted that data are largely consistent, although inconsistencies were identified in relation to the methods used to estimate the data: for example, CH_4 and N_2O emissions from energy industries were reported as estimated using tier 2 and tier 3 methods in the NIR but as estimated using tier 1 and tier 2 methods in the CRF tables; fugitive CO_2 emissions from oil and natural gas were reported as estimated using a country-specific method in the NIR but as not applicable ("NA") in the CRF tables; and the CO_2 EFs used for manufacturing industries and construction were reported as CORINAIR data in the NIR but as country-specific in the CRF tables.

32. The ERT recommends that Ireland make efforts to harmonize the reported information between the NIR and the CRF tables in its next annual submission.

Inventory management

33. The ERT found that the information provided in the NIR on the Party's archiving system is not sufficiently detailed and transparent. During the review, Ireland explained to the ERT that all the data used for the compilation of the national GHG inventory submission are stored on an EPA data server located at the Monaghan Regional Inspectorate of EPA, which is the single national entity and has overall responsibility for the Party's inventory submissions and for data archiving. All background data for recent years are available in electronic format. All data (emission estimates, AD, inventory submissions, references and information on QA/QC) on the data server are backed up daily. The ERT recommends that Ireland include this information in the NIR of its next annual submission.

3. Follow-up to previous reviews

34. Ireland provided a detailed analysis of the follow-up actions taken in response to the previous review report in annex H to the NIR. The ERT commends the Party for the actions taken, in particular the improvement of completeness through the inclusion of estimates of CO_2 emissions from glass production, the improvement of the transparency and consistency of the reporting, the revision of the use of the notation keys, and the provision of additional information on QA/QC activities for some sectors (e.g. the energy and waste sectors). The ERT commends the Party for these improvements, but recommends that Ireland continue such efforts, particularly in relation to providing sector-specific QA/QC information also for the other sectors.

35. The NIR indicates that extensive further work has been conducted in relation to the LULUCF sector in order to improve completeness, the methodologies used and the treatment of data for the 2010 annual submission and to achieve consistency with the estimates of emissions and removals from activities under Article 3, paragraph 3, of the Kyoto Protocol.

36. Following the outcome of the 2009 annual review, Ireland has restated its position regarding the non-relevance of a number of minor sources of emissions under wastewater handling and has made a revision to account for the utilization of the CH_4 derived from the treatment of sewage sludge. In addition, the NIR reiterates that waste incineration does not occur in Ireland. The Party has included information on AD and EF uncertainty for the agriculture sector in the NIR. Ireland considers that refining the approach used for the estimation of CH_4 emissions from solid waste disposal on land and providing recalculated emission estimates for the waste sector are important improvements to be implemented for future annual submissions, and the ERT encourages the Party to make these improvements.

37. The ERT welcomes the improved explanations of the use of EU ETS data in the inventory preparation process, including the clarification that EU ETS data are used only when calculating estimates using higher-tier methods.

4. Areas for further improvement

Identified by the Party

38. The 2010 NIR identifies areas for improvement in all sectors apart from the energy sector. The NIR states that CO_2 emissions from the energy sector, which account for 98.5 per cent of total emissions from the sector, are accurately quantified and that there is therefore very little scope for further improvement in the inventory for the energy sector as delivered in the 2010 annual submission. However, Ireland indicated that it is considering options to further improve its estimation methods, particularly for the industrial processes, agriculture and LULUCF sectors:

(a) Ireland will continue to improve its emission estimates for the industrial processes sector by using EU ETS data as the most reliable data for calculating estimates of emissions from mineral products. Also, Ireland plans to continue the practice of outsourcing contracts on a periodic basis to re-examine and extend the inventory time series for emissions of halocarbons and SF_6;

(b) For the agriculture sector, Ireland is considering options for using a more in-depth, model-based approach to take account of all the factors that determine the level of emissions from livestock and to capture the inter-annual variation in the country-specific EFs. Recently published research using both field and lysimeter measurements conducted in Ireland suggests that the N_2O EFs for agricultural soils may be substantially higher than the IPCC default. However, high inter-annual and spatial variability in emission estimates found in these studies requires further investigation before the EFs are used in the emission inventory;

(c) Ireland plans to continue its collaboration with the agencies providing land-use and forestry data sets and has established formal arrangements for the provision of the data within the national system, in the same way as for other sectors. Also, Ireland intends to apply a more detailed treatment of carbon stock changes for future annual submissions.

Identified by the expert review team

39. The ERT identified a number of cross-cutting issues for improvement, and recommends that Ireland:

(a) Provide more precise and transparent descriptions of methodologies for some categories in the energy, industrial processes and waste sectors (see paras. 51, 56, 64, 68–69 and 103 below);

(b) Improve the transparency of the reporting on the national system by including more detailed information on its archiving system;

(c) Improve the transparency of the reporting by including more information on implemented QA/QC activities for all sectors, particularly for the industrial processes and LULUCF sectors;

(d) Improve the uncertainty analysis by the use of a higher level of category disaggregation for the LULUCF sector, in accordance with the IPCC good practice guidance for LULUCF;

(e) Improve the completeness of the inventory, in particular by reporting estimates for the remaining emissions reported as "NE" in the LULUCF sector (see para. 89 below);

(f) Reconcile the AD from the national energy balance used to estimate emissions from the energy sector with the EU ETS data (see para. 53 below);

(g) Improve the methodological tier level used to estimate emissions for categories in the LULUCF sector other than forest land, in particular for grassland, in accordance with the recommendations in the IPCC good practice guidance for LULUCF;

(h) Improve the consistency of the information reported for the LULUCF sector under the Convention and on KP-LULUCF activities, and provide more detailed information on forest-related land-use changes that occurred prior to 2006 (see paras. 92 and 115 below).

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

B. Energy

1. Sector overview

41. The energy sector is the main sector in the GHG inventory of Ireland. In 2008, emissions from the energy sector amounted to 45,693.47 Gg CO_2 eq, or 67.7 per cent of total GHG emissions. Since 1990, emissions have increased by 47.3 per cent. The key driver for the rise in emissions is the significant increase in the emissions from the transport sector (by 172.2 per cent), although significant increases were also observed in the emissions from energy industries (by 30.3 per cent) and manufacturing industries and construction (by 40.2 per cent). Within the sector, 32.0 per cent of the emissions were from energy industries, followed by 31.2 per cent from transport, 24.5 per cent from other sectors and 12.1 per cent from manufacturing industries and construction. The remaining 0.1 per cent were fugitive emissions from fuels.

42. Ireland's inventory for the energy sector is complete and generally transparent and has been prepared in accordance with the Revised 1996 IPCC Guidelines, the IPCC good practice guidance and the UNFCCC reporting guidelines. However, the ERT identified areas for improvement and recommends that the Party improve transparency in relation to the energy sector by providing more information on the estimation methods used, which would enhance the understanding of the inventory and the estimates (see paras. 51 and 56–58 below).

43. Recalculations for the energy sector have been undertaken and reported in line with the IPCC good practice guidance. The main recalculations for 2007 relate to the estimates of N_2O emissions from energy industries, and CO_2 and N_2O emissions from manufacturing industries and construction. Overall, the recalculations for 1990 and 2007 resulted in a decrease in the estimates of total emissions from the sector of 1.3 per cent (420.28 Gg CO_2 eq) and 1.7 per cent (806.01 Gg CO_2 eq), respectively.

44. Ireland reports having used EU ETS data to prepare estimates of the total CO_2 emissions from energy industries. Further, in the NIR, Ireland states that all plants included in the EU ETS use high-tier estimation methods (defined as high tier in accordance with EU ETS rules). During the review, the ERT enquired as to whether high-tier estimation methods were used for all fuels. Ireland responded that for minor fuels lower-tier methods were in fact used. The ERT recommends that the Party clarify this issue in its next annual submission.

45. The ERT identified another problem: for peat briquette production, only peat consumption is included under the category manufacture of solid fuels and other energy industries, while all other fuels are reported under other (manufacturing industries and construction). The ERT found this approach inconsistent and recommends that Ireland report all fuel consumption for and emissions from peat briquette production under the category manufacture of solid fuels and other energy industries. Additionally, the ERT identified discrepancies between the energy consumption reported under the EU ETS and that in the national energy balance (see para. 53 below).

2. Reference and sectoral approaches

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

46. The methodology used to prepare estimates under the reference approach and the results are discussed in the NIR.

47. For 2008, estimated CO_2 emissions calculated using the reference approach were 0.2 per cent lower than the emissions estimated using the sectoral approach. The difference between the estimates of energy consumption was 0.4 per cent. For all years of the period 1990–2008, the differences between the estimates of fuel consumption and CO_2 emissions calculated using the two approaches are below 2 per cent.

48. However, as identified in the previous review report,[10] there are some discrepancies between the data reported to the International Energy Agency (IEA) and the data reported in the CRF tables related to energy consumption. Since the differences between the estimates calculated using the sectoral and reference approaches are very small, and for its 2010 annual submission Ireland has used data taken directly from the IEA/Eurostat questionnaire, the differences between the IEA data and the data in the CRF tables could be due to differences in the net calorific values used. The ERT recommends that Ireland verify the reasons for the differences and report on the outcome of its analysis in its next annual submission.

International bunker fuels

49. Ireland has used a bottom-up approach to estimate emissions from civil aviation and international aviation, using data on landing and take-off cycles (LTOs) and aircraft-specific EFs from the IPCC good practice guidance. The estimates have been prepared in line with the IPCC good practice guidance.

50. The national energy balance reports fuel sold for marine bunkers and international aviation as specific line items and the emission estimates were calculated using these data. However, during the review, the ERT noted that the energy consumption for international aviation and navigation in the energy balance did not match the data reported in the CRF tables. Ireland clarified, during the review, that the fuel consumption for international aviation and navigation is calculated by EPA and transferred to the compiler of the energy

[10] FCCC/ARR/2009/IRL, paragraph 44.

balance, and that the small difference observed was due to the different timing of the reporting.

51. The ERT considers that the Party has not yet improved the explanation of the method used to distinguish between emissions from domestic and international navigation bunkers, as was recommended in the previous review report.[11] The ERT reiterates the recommendation that the Party explain in detail how emissions from domestic and international segments are disaggregated between the two categories in its next annual submission (see para. 55 below).

Feedstocks and non-energy use of fuels

52. Ireland indicated that work was ongoing to analyse whether emissions from the non-energy use of fuels, such as lubricants and bitumen, could be estimated. During the review, the ERT found that a small amount of white spirit included in the energy balance was not included in the inventory estimates. In response to questions raised by the ERT, Ireland explained that it would include the consumption of white spirit in the CRF tables in its future annual submissions. Further, Ireland stated that estimates of emissions from the non-energy use of fuels would be reassessed and revised if necessary. The ERT recommends that Ireland report on the results of this work in its next annual submission.

3. Key categories

Stationary combustion: all fuels – CO_2

53. Ireland uses estimates of CO_2 emissions reported under the EU ETS for its reporting of the energy industries category. However, the ERT noted that the fuel consumption data provided in the CRF tables are taken from the national energy balance. Because the fuel consumption data used to derive estimates of CO_2 emissions do not correspond to the data from the energy balance, the resulting implied emission factors (IEFs) are not comparable to those of other reporting Parties. During the review, Ireland confirmed that this was the case and also explained that the estimation of CH_4 and N_2O emissions was based on the data from the energy balance presented in the CRF tables. This means that the data basis for the estimation and reporting of CO_2 and non-CO_2 emissions is not consistent. However, the ERT noted that fuel consumption is not consistently lower or higher in the EU ETS data compared with the data in the energy balance for individual categories. However, the ERT believes that emissions of CH_4 and N_2O have not been clearly underestimated, while CO_2 emissions have been accurately estimated. The ERT strongly recommends that Ireland use consistent data for estimating emissions of all GHGs for its next annual submission.

4. Non-key categories

Stationary combustion: all fuels – CH_4 and N_2O

54. In the previous review report it was noted that Ireland was using EFs to estimate N_2O emissions from the use of liquid and solid fuels that were too high for several categories in comparison with those of other reporting Parties (e.g. 14.00 t/TJ for the use of liquid fuels and 13.45 t/TJ for the use of solid fuels in public electricity and heat production).[12] Also, in its previous annual submission, Ireland reported CH_4 emissions from public electricity and heat production as "NO", and the ERT recommended that the Party review this reporting.[13] Responding to the previous review report, Ireland stated that it

[11] FCCC/ARR/2009/IRL, paragraph 45.
[12] FCCC/ARR/2009/IRL, paragraph 47.
[13] FCCC/ARR/2009/IRL, paragraph 48.

intended to undertake a project to revise the EFs. The Party has provided a detailed report on the results of that project in its 2010 annual submission. It refers extensively to the use of EFs from the 2006 IPCC Guidelines. The Party has revised the N_2O IEF for all categories (in relation to the examples provided above, Ireland reports an IEF of 0.30 t/TJ for the use of liquid fuels and 2.76 t/TJ for the use of solids fuels in public electricity and heat production). In addition, Ireland provides estimates of CH_4 emissions from public electricity and heat production in its 2010 annual submission. The ERT commends Ireland for the improvements made and for the transparent reporting in the NIR.

Civil aviation: liquid fuels – CO_2, CH_4 and N_2O

55. Ireland has reported all fuel consumption for and associated emissions from civil aviation under jet fuel. The ERT noted that the energy balance contains information on the use of both aviation gasoline and jet fuel. During the review, Ireland informed the ERT that the fuel consumption used for civil aviation is calculated by EPA, and that that is the source of the split between fuel uses in the energy balance. The ERT recommends that Ireland, in its next annual submission, report the consumption of aviation gasoline and the associated emissions separately from the information for jet fuel, in order to increase transparency.

Road transportation: all fuels – CH_4 and N_2O

56. The ERT noted that Ireland has improved the transparency of its reporting for this category by discussing the time-series trends for the transport sector. However, the ERT considers that some of the important parameters used in the tier 3 estimation of emissions from road transportation have not yet been provided in the NIR. In response to a question raised by the ERT during the review, Ireland provided information on vehicle distribution, annual distance travelled by vehicle type, trip speed and distribution between road types. To enhance the transparency of the estimates of emissions from road transportation and to allow for a proper review of the model, the ERT recommends that Ireland include this information in an annex to the NIR in its next annual submission.

Navigation: liquid fuels – CO_2, CH_4 and N_2O

57. The ERT noted that the energy balance contains data on marine bunkers but no information on the use of fuels in national navigation. However, Ireland has reported a consumption of 57.95 TJ gas/diesel oil in 2008 under navigation, although no explanations are provided in the NIR as to how this figure was derived from the energy balance. The ERT recommends that the Party provide clear explanations as to how AD for navigation are established, in the NIR of its next annual submission.

58. In addition, the ERT found that the trend in total liquid fuel consumption for navigation displays a drop of 52.1 per cent between 2001 (1,662.08 TJ) and 2002 (795.33 TJ) and of 93.4 per cent between 2005 (792.24 TJ) and 2006 (52.65 TJ). The consumption of residual oil in 2005 is estimated at 742.24 TJ and is reported as "NO" for the following years (2006–2008). During the review, Ireland explained to the ERT that the consumption of residual oil had been incorrectly allocated for the period 1990–2005. The ERT recommends that Ireland improve the reporting of data for national navigation and provide explanations in the NIR for the fluctuations in the time series in its next annual submission.

C. Industrial processes and solvent and other product use

1. Sector overview

59. In 2008, emissions from the industrial processes sector amounted to 2,989.44 Gg CO_2 eq, or 4.4 per cent of total GHG emissions, and emissions from the solvent and other product use sector amounted to 85.97 Gg CO_2 eq, or 0.1 per cent of total GHG emissions. Since the base year, emissions have decreased by 10.6 per cent in the industrial processes

sector and increased by 8.2 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 in 2002 of the single nitric acid production plant and the ceasing of ammonia production in 2003. Within the industrial processes sector, 77.0 per cent of the emissions resulted from mineral products and 23.0 per cent were from consumption of halocarbons and SF_6. In terms of major categories within the sector, 70.5 per cent of the emissions were from cement production, followed by 12.7 per cent from consumption of halocarbons and SF_6 in refrigeration and air-conditioning equipment, 6.3 per cent from lime production and 5.0 per cent from semiconductor manufacturing. Aerosols/metered dose inhalers accounted for 3.1 per cent and foam blowing accounted for 0.8 per cent of total sectoral emissions. Ireland has reported CH_4 emissions from this sector as "NO" for the whole time series 1990–2008, as well as that N_2O emissions did not occur after 2002. In terms of gases, CO_2 represented 77.0 per cent of total sectoral emissions, followed by 17.4 per cent for HFCs, 3.6 per cent for PFCs, and the remaining 2.0 per cent for SF_6.

60. Emissions from the industrial processes sector decreased by 8.9 per cent from 2007 to 2008, mainly as a consequence of the decrease in CO_2 emissions from cement production and the decrease in HFC and SF_6 emissions from semiconductor manufacturing and electrical equipment.

61. The Party has reported a number of categories as "NE", such as: CO_2 emissions from asphalt roofing, road paving with asphalt, and food and drink; and N_2O emissions from the use of N_2O for anaesthesia. Although there are no methodologies for estimating these emissions available 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.

62. The ERT noted that potential SF_6 emissions from sporting goods (consumption of halocarbons and SF_6) are reported as "NE", while the Party stated in the NIR that the use of SF_6 in sporting goods was discontinued in 2007. The ERT encourages the Party to clarify its use of these notation keys in its next annual submission and to verify the reporting of potential emissions.

63. The ERT considers that estimation approaches, data availability and the relevant documentation have, in general, been reported in a transparent manner for the industrial processes sector. However, the ERT considers that Ireland could considerably enhance the transparency and completeness of its inventory by providing an analysis of the observed changes in the emission level and/or trend in AD and IEFs for the following categories: cement production; lime production; limestone and dolomite use; soda ash use; other mineral products; and consumption of halocarbons and SF_6.

64. The ERT noted that Ireland is not presenting transparent information on the time series of AD and EFs for each category separately as appropriate. The ERT considers that the aggregated approach adopted by Ireland impairs transparency, and recommends that the Party increase the level of disaggregation of the information in its next annual submission by providing additional information for the following categories: cement production; lime production; limestone and dolomite use; soda ash use; other mineral products; and consumption of halocarbons and SF_6.

65. The NIR includes only a very short section on the uncertainty analysis (and mostly with qualitative information) and QA/QC procedures for the industrial processes sector as a whole. The ERT reiterates the recommendation made in the previous review report[14] that

[14] FCCC/ARR/2009/IRL, paragraph 52.

the Party provide more detailed information on the sectoral uncertainty analysis separately in its next annual submission, at least for the key categories.

66. Recalculations were performed for the 2010 inventory submission of the estimates of: CO_2 emissions from limestone and dolomite use; CO_2 emissions from soda ash use and glass production; CO_2 emissions from brick and tile production; and CO_2 emissions from solvents. The recalculations are well described in both the NIR and the CRF tables. For 2007, the recalculations resulted in an increase of 0.01 per cent in the estimate of emissions from the industrial processes sector and an increase of 0.9 per cent in the estimate of emissions from the solvent and other product use sector.

2. Key categories

Cement production – CO_2

67. CO_2 emissions from cement production is the largest source of GHG emissions in the Party's industrial processes sector, accounting for 70.5 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 (CKD) factor. However, the Party does not report information on the calcium oxide (CaO) and magnesium oxide (MgO) contents of the clinker that are used to derive the country-specific estimates. The ERT therefore recommends, in accordance with the IPCC good practice guidance, that Ireland include information on the CaO and MgO content of the clinker in its next annual submission.

Consumption of halocarbons and SF_6 – HFCs

68. The ERT noted that in CRF table 2(II).F the Party appears to have inconsistently used the notation key for included elsewhere ("IE") and the notation key "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". The Party explained to the ERT during the review that the use of a bottom-up approach is not appropriate for estimating actual emissions from stationary refrigeration and air conditioning in Ireland, owing to the lack of data available on equipment types and sales of HFCs for each equipment subcategory. Emissions are therefore estimated using a top-down approach based on reported sales data and information on market shares. These are used to allocate the estimates of total HFC sales between stationary refrigeration and air conditioning. Therefore, Ireland is not in a position to provide AD but only estimates of actual emissions from stocks. The ERT recommends that Ireland investigate this matter further for its next annual submission and improve the transparency of its reporting by reviewing its use of the notation keys for this category. The ERT also recommends that the Party provide more information on the share of new vehicles equipped with air conditioning (the NIR states that 75 per cent of new or imported vehicles are equipped with air conditioning) and the average filling amount (0.8 kg for private cars and 1.2 kg for commercial vehicles) of new vehicles that were used to estimate emissions for this category.

69. The ERT noted that the amount of HFC emissions from semiconductor manufacture has been increasing over time. However, at the same time, the amount of PFC emissions has been decreasing since 2000, while SF_6 emissions show an oscillating trend. In response to a question raised by the ERT during the review, the Party replied that the installations involved in this activity have been subjected to several optimization programmes and corporate targets to reduce their overall impact on the environment. Also, the Party provided information to explain why the emissions of HFCs, PFCs and SF_6 are somehow

unrelated: HFCs are primarily used as refrigerants in enclosed systems which occasionally need some replenishment following maintenance work; PFCs are used as "chamber clean" gases; while SF_6 is used in chemical vapour deposition tools and "dry etching". The ERT suggests that Ireland include these explanations in the NIR of its next annual submission.

70. Although the NIR states that data on the use of HFCs in fire extinguishers have been provided by the industry and it is assumed that 97.5 per cent of the total product is HFC-227ea and the remainder is HFC-23, this information was not reflected in CRF background table 2(II).F, which contains data on HFC-227ea only. The ERT recommends that Ireland include data on HFC-23 in CRF table 2(II).F in its next annual submission.

3. Non-key categories

Soda ash use – CO_2

71. The NIR states that, for reporting years prior to 2005, CO_2 emissions from soda ash use were estimated using an EF based on EU ETS data for the period 2005–2008. However, from detailed data provided by the Party during the review, the ERT concluded that plant-specific data were used and not EU ETS data. The ERT recommends that Ireland revise the relevant description in the NIR of its next annual submission in order to correctly reflect the applied methodology for the complete time series.

D. Agriculture

1. Sector overview

72. In 2008, emissions from the agriculture sector amounted to 17,605.08 Gg CO_2 eq, or 26.1 per cent of total GHG emissions. Since 1990, emissions have decreased by 8.3 per cent. The key drivers for the fall in emissions are the reduction in livestock numbers and in the use of synthetic nitrogen (N) fertilizer, in the follow-up to the EU Common Agricultural Policy. Within the sector, 50.0 per cent of the emissions were from enteric fermentation, followed by 35.7 per cent from agricultural soils and 14.3 per cent from manure management. CH_4 was the dominant GHG, accounting for 62.2 per cent of total sectoral emissions, while N_2O accounted for the remaining 37.8 per cent.

73. Ireland prepared revised estimates of emissions from the agriculture sector in response to the list of potential problems and further questions raised by the ERT during the review. The main problems identified by the ERT which led to the revised estimates are presented in paragraphs 80–82 below. As a result of the revisions, the estimate of total emissions from the agriculture sector in 2008 increased by 0.2 per cent, from 17,575.46 Gg CO_2 eq to 17,605.08 Gg CO_2 eq. The revisions undertaken by the Party also resulted in the following changes: estimated CH_4 emissions from manure management increased by 0.04 per cent (from 2,152.42 to 2153.22 Gg CO_2 eq); estimated N_2O emissions from manure management decreased by 2.5 per cent (from 373.55 to 364.39 Gg CO_2 eq); and estimated N_2O emissions from agricultural soils increased by 0.6 per cent (from 6,245.40 to 6,283.37 Gg CO_2 eq).

74. With regard to the agriculture sector, the NIR is complete in terms of gases, categories, geographical coverage and years, as well as transparent in relation to the methodologies, AD and EFs used. References to the most relevant studies supporting the use of country-specific methodologies, EFs and parameters are well presented.

75. Very few recalculations were conducted for the 2010 annual submission, and those that were undertaken mostly concerned some minor updates of AD. According to the Party, no improvements to the inventory for the agriculture sector for the forthcoming years have been planned, mainly because many relevant improvements were only recently

implemented with regard to the most important categories (e.g. enteric fermentation and manure management). The only exception relates to the Party's plans to use a methodology to estimate N_2O emissions from agricultural soils taking into consideration the influences of soil type, fertilizer type, application rates, temperature and rainfall.

76. The ERT considers that the Party has generally prepared accurate and relevant estimates on the basis of a very good model for enteric fermentation and manure management. However, during the review, the ERT recommended that Ireland increase the consistency of the calculations within the sector by incorporating the results of the model on N excretion in manure in the calculation of estimated N_2O emissions from manure management and agricultural soils.

2. Key categories

Enteric fermentation – CH_4

77. Emissions from enteric fermentation accounted for 13.3 per cent of total GHG emissions in 2008 and have decreased by 7.3 per cent since 1990. Since the 2006 annual submission, a tier 2 method has been used to estimate emissions from cattle. This country-specific methodology results in values that are close to the ones resulting from the use of the default tier 2 methodology proposed in the IPCC good practice guidance, although it is based on animal feeding requirements, while the IPCC default methodology is based on the digestibility of rations. The ERT finds that this country-specific method is appropriate, considering that the Irish system of rearing livestock is rather different from other systems observed in Western Europe. Also, the ERT noted that estimates calculated using this approach are based on very accurate data collected from three different geographical regions and taking into account several animal subcategories. The ERT recommends that the Party report this method as country-specific.

78. As mentioned in the previous review report,[15] the ERT recommends that Ireland re-examine the assumption that a constant average weight for dairy cattle is satisfactory, and/or provide a clear explanation for this assumption in its next annual submission.

79. Ireland has used a tier 1 approach to estimate emissions for other livestock categories (e.g. swine and sheep), departing from the IPCC default EFs for these species and adjusting them for subcategory age classes on the basis of the animals' weight. As a result, the aggregated IEFs for sheep (5.90 kg/head/year) and swine (0.45 kg/head/year) are lower than the IPCC default EFs (8.00 kg/head/year and 1.50 kg/head/year for sheep and swine, respectively). During the review, the Party provided supplementary information on the animal weights for each subcategory. It is unclear to the ERT how Ireland's modification of the default EFs by subcategory constitutes an improvement on the use of the IPCC default EFs. The ERT strongly recommends that Ireland provide information to support the use of these adjusted default EFs, and strongly encourages the development and implementation of a tier 2 approach to estimate emission for sheep, which is a key category, for the next annual submission.

Manure management – CH_4 and N_2O

80. During the review, the ERT identified potential problems with the CH_4 IEF for dairy cattle: (a) the value reported in CRF table 4.B(a) is 20.7 kg CH_4/head/year, but the ERT estimated it to be equal to 27 kg CH_4/head/year using the values provided by Ireland for the following parameters: CH_4 production potential (Bo), daily excretion of volatile solids (VS), methane conversion factor (MCF), and animal waste management system (AWMS);

[15] FCCC/ARR/2009/IRL, paragraph 63.

and (b) the allocation to AWMS used by Ireland to estimate CH_4 emissions from manure management (liquid (29.2 per cent), solid storage (1.9 per cent) and pasture, range and paddock (68.9 per cent)) is different from the allocation scheme used to estimate N_2O emissions from manure management (liquid (40.6 per cent), solid storage (2.7 per cent) and pasture, range and paddock (56.7 per cent)).

81. Responding to the list of potential problems and further questions raised by the ERT, Ireland recognized the existence of problems in relation to these emission estimates and clarified that the correct allocation to AWMS should be the following for both CH_4 and N_2O emissions from dairy cattle: liquid (29.2 per cent), solid storage (1.9 per cent) and pasture, range and paddock (68.9 per cent). This AWMS allocation is based on expert assumptions on the housing period and on a farm facilities survey conducted in 2003 (Hyde et al., 2008) to distinguish between liquid and solid systems. In its efforts to respond to the questions raised by the ERT, the Party made the following additional changes to the inventory: (a) using information from the farm facilities survey, the AWMS allocation for non-dairy cattle was revised from liquid (23.2 per cent), solid storage (11.5 per cent) and pasture, range and paddock (65.2 per cent) to liquid (30.0 per cent), solid storage (10.7 per cent) and pasture, range and paddock (59.3 per cent); and (b) $Frac_{GASM}$ was revised from 0.189 to 0.175. The ERT agrees with the revised estimates submitted by the Party.

82. Following the recognition of transcription errors in the tier 2 model used for the estimations, the Party revised the emission estimates for all categories directly and indirectly affected: CH_4 and N_2O emissions from manure management; N_2O emissions from pasture, range and paddock; and direct and indirect N_2O emissions from agricultural soils. The ERT considers that the revised estimates provided by Ireland have corrected the identified problem. The ERT recommends that the Party improve the QA/QC for this category for the next annual submission.

Direct soil emissions – N_2O

83. Direct N_2O soil emissions accounted for 3.6 per cent of total GHG emissions in 2008 and have decreased by 17.0 per cent since 1990. Following recommendations made in the previous review report,[16] Ireland provided explanations in the NIR of the emission trend and of the inter-annual changes in N_2O emissions from N-fixing crops: the Party explains on page 93 of the NIR that the contribution of crops in Ireland to N_2O emissions is small relative to other N sources and that it fluctuates significantly in line with the yearly fluctuation in the area grown of the relevant crops. The ERT commends the Party for addressing this action.

84. AD for and estimated emissions from sewage sludge applied to soils are currently aggregated together with the AD for and estimated emission from the N input from animal manure applied to soils. This reporting procedure impairs comparability with the reports of other reporting Parties and creates difficulties for the ERT when comparing this information with the information concerning the other categories related to animal activity. The ERT encourages the Party to report this category separately to improve the transparency of its reporting.

Indirect soil emissions – N_2O

85. Indirect N_2O soil emissions from leaching and run-off accounted for 1.2 per cent of total GHG emissions in 2008 and have decreased by 11.6 per cent since 1990. Ireland estimates emissions from leaching and run-off using a value for $Frac_{LEACH}$ of 0.1, instead of the IPCC default fraction (0.3). The use of this country-specific parameter has led to a

[16] FCCC/ARR/2009/IRL, paragraph 66.

lower overall estimate of emissions than if the IPCC default value had been used. During the review, the Party clarified that references to the country-specific value are provided in the NIR. The ERT considers the documentation valid, but recommends that the Party provide more detailed information to justify the choice of value for this parameter in the NIR of its next annual submission.

86. Indirect soil emissions from the deposition of N added accounted for 0.6 per cent of total GHG emissions in 2008 and have decreased by 7.4 per cent since the base year. Ireland does not estimate the volatilization of ammonia (NH_3) and nitrogen oxide (NO_X) after sludge spreading, but the ERT encourages the Party to estimate the volatilization for this activity and to estimate the associated emissions from atmospheric deposition.

E. Land use, land-use change and forestry

1. Sector overview

87. In 2008, net removals from the LULUCF sector amounted to 1,470.10 Gg CO_2 eq. The general trend displays a large increase in removals from the level of net emissions reported in 1990 (247.56 Gg CO_2 eq). The increase in removals was observed in particular after 2002. The key driver for the rise in removals is the increasing trend in the removals from forest land remaining forest land (removals increased by 555.4 per cent between 1990 (328.12 Gg CO_2 eq) and 2008 (2,150.54 Gg CO_2 eq). In 2008, removals from forest land were only partially offset by net emissions from cropland (361.95 Gg CO_2 eq), grassland (290.28 Gg CO_2 eq), settlements (41.24 Gg CO_2 eq) and wetlands (30.08 Gg CO_2 eq), while other land contributed additional net removals of 43.12 Gg CO_2 eq.

88. The ERT commends Ireland for the detailed information provided in the NIR on the LULUCF sector, including the transparent descriptions of methodological issues and assumptions used. However, the ERT found that the information on methodologies is split between chapters 7 (LULUCF) and 11 (Emissions and Removals from LULUCF Activities under Article 3.3 of the Kyoto Protocol) of the NIR. The reason for this is that some methods are used for estimating emissions and removals from LULUCF under both the Convention and the Kyoto Protocol activities, while others seem to be applied to estimating emissions from activities under the Kyoto Protocol activities only. The ERT recommends that Ireland streamline, where appropriate, the common methodological information on this sector in a single location in the NIR, and that it clearly explain in chapter 11 the instances where methods differ between the reporting on activities under the Convention and the Kyoto Protocol.

89. The inventory for the LULUCF sector is mostly complete, but Ireland still reports as "NE" some categories and pools for which there are estimation methodologies available in the IPCC good practice guidance for LULUCF, including net carbon stock changes in soils for forest land remaining forest land, net carbon stock changes in dead organic matter (DOM) for wetlands converted to grassland, all carbon stock changes for forest land converted to wetlands, and CO_2, CH_4 and N_2O emissions from wildfires on land converted to forest land, cropland and wetlands. The ERT recommends that the Party improve the completeness of the inventory by providing estimates for the currently not-estimated categories and pools. The ERT noted several instances of inappropriate use of the notation keys in the sectoral background 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 next annual submission, in order to increase the transparency of its reporting

90. For the forest land category, Ireland uses higher-tier methods for estimating net removals from biomass and emissions from the litter component of the DOM pool. Tier 1

estimation methods are applied for all remaining categories and pools. Ireland has provided detailed information on land-use changes (land-use matrices) in its NIR. The dominant land-use category is grassland, which accounts for 58.0 per cent of the total national territory. Although accounting for only 8.7 per cent of the total national area, the forest land area has increased by 67.0 per cent since 1990 and is the key driver for the rise in removals from the sector. The ERT believes that the use of tier 1 estimation methods for all but the forest land category may contribute to obscuring the real contribution of land management and land-use change to the emissions and removals from the LULUCF sector. The ERT, in line with the recommendations made in the previous review report,[17] recommends that Ireland develop an improvement plan for the other key categories in the LULUCF sector (e.g. grassland remaining grassland was identified as a key category for the 2010 annual submission) and report thereon in its next annual submission.

91. The ERT commends Ireland for having devoted significant resources to the development of improved forest-related information, notably decay rates for DOM in land converted to forest land. During the review, the ERT learned that this improvement was motivated by the need to quantify the effect of thinning disturbance and other losses during first forest rotations. However, the improvements have not been applied in the estimation of emissions from the conversion of forest land to other land uses, where it is assumed that all emissions from above-ground living biomass are emitted at once. Hence, the Party appears to be using different assumptions and methodological tiers to estimate emissions from decay on forest land and forest land converted to other land. The ERT recommends that Ireland, for its next annual submission, simultaneously implement methodological improvements in its estimations for all applicable land uses under the Convention and for activities under the Kyoto Protocol, or provide transparent justification for not doing so.

92. The ERT noted inconsistencies between estimates reported under the Convention and those reported for corresponding activities under the Kyoto Protocol, and also between the information in the NIR and in the CRF tables. For example, CRF table 5.D shows that forest land converted to wetlands is reported as "NE" for 2006, 2007 and 2008, owing to a lack of AD. However, CRF table 5(KP-I)A.2, reporting information on LULUCF activities under the Kyoto Protocol, indicates that 366 ha forest land were converted to wetlands in the period 2006–2007 and 4 ha forest land were converted to wetlands in 2008; further, table 7.7 of the NIR indicates that 217.82 ha and 153.40 haforest land were converted to wetlands in 2006 and 2007, respectively. Likewise, Ireland has reported non-CO_2 emissions from wildfires on afforested land in CRF table 5(KP-II)5, but it has used the notation key "NE" to report emissions from wildfires in areas of land converted to forest land in CRF table 5(V) under the Convention. The ERT recommends that Ireland correct these inconsistencies in its next annual submission by enhancing its QC procedures. In response to the draft annual review report, Ireland informed the ERT that improvements related to these issues will be included in the 2011 annual submission.

2. Key categories

Forest land remaining forest land – CO_2

93. As indicated in paragraph 87 above, this category accounts for a significant net carbon sink. The ERT noted that Ireland relies on higher-tier methods for estimating carbon stock changes in the living biomass and DOM pools, but that carbon stock changes in soils are not estimated and are assumed to be zero as Ireland uses the tier 1 estimation method. In the light of the importance of the forest land remaining forest land category in the Irish

[17] FCCC/ARR/2009/IRL, paragraphs 69 and 70.

GHG inventory, the ERT encourages Ireland to further pursue its methodological improvements in this pool.

Land converted to forest land – CO_2

94. In accordance with the explanations regarding inter-annual variability provided by Ireland during the review, the ERT understands that Ireland estimates carbon stock changes under the category land converted to forest land for a given year by subtracting the total carbon stocks in the previous year from the total carbon stocks in the current year, regardless of whether these stock changes occur on the same land units. The ERT considers that this practice confuses two processes: the movement of land between the forest land remaining forest land and land converted to forest land categories (showing as a carbon loss on forest land converted to other land and as a carbon gain on forest land remaining forest land), and the carbon gains and losses on land units that have remained in the land converted to forest land category for the entire year. The ERT recommends that Ireland re-examine the method used to calculate carbon stock changes for each year, and also recommends that the Party base its estimates on consistently defined land areas (e.g. land converted to forest land on 1 January each year). The ERT considers that this will reduce spurious variations that do not reflect actual carbon gains or losses in managed forests.

95. The ERT found that a shorter transition period (four years) is applied to land converted to forest land for organic soils, compared with the 20-year default period used for land converted to forest land for mineral soils. The ERT believes that this is the underlying reason why land converted to forest land for organic soils accounts for only 3 per cent of the area under this category. However, the implied rate of soil carbon stock change is one order of magnitude higher for organic soils (infertile, acidic peat) than for mineral soils, and, as a result, carbon losses in afforested organic soils on land converted to forest land account for 45 per cent of the total soil carbon losses. A single scientific paper provided by Ireland during the review (Hargreaves et al., 2003) is the basis for the approach used by the Party. The ERT recommends that Ireland examine options for validating the use of this approach and the estimates submitted in its next annual submission. In response to the draft annual review report, Ireland informed the ERT that it has revised the EFs and transition times in its 2011 annual submission.

Land converted to cropland – CO_2

96. Generally, net emissions from land converted to cropland increased significantly over the period 1990–2008, from being reported as "NO" for the period 1990–1991 to accounting for 7.91 Gg CO_2 eq in 1992 and 359.47 Gg CO_2 eq in 2008. The Party has not provided explanations in the NIR for this trend. The ERT recommends that Ireland provide such explanations in its next annual submission.

3. Non-key categories

Grassland remaining grassland – CO_2

97. Grassland is the dominant land use in Ireland. Information in the NIR suggests that this category plays an important role in the national land-use dynamics, with seemingly ongoing conversions to forest land and other land, and conversions from cropland. The cause of the ongoing emissions under this category (ranging from 480.36 to 718.45 Gg CO_2 eq depending on the year) is unclear to the ERT. The ERT recommends that Ireland re-examine its calculations of carbon stock changes for this category in the light of the suggestions made in paragraph 94 above in relation to land converted to forest land. The ERT reiterates the recommendation made in the previous review report that the Party prioritize methodological improvements for this category.

F. Waste

1. Sector overview

98. In 2008, emissions from the waste sector amounted to 1,094.93 Gg CO_2 eq, or 1.6 per cent of total GHG emissions. Since 1990, emissions have decreased by 15.9 per cent. The key driver for the fall in emissions is the increased recovery of CH_4 from landfills. Within the sector, 85.5 per cent of the emissions were from solid waste disposal on land. The remaining 14.5 per cent were from wastewater handling.

99. Recalculations for the waste sector resulted in an 11.8 per cent decrease in the estimated sectoral emissions for 1990 and a 41.6 per cent decrease for 2007. These recalculations were due principally to the improvement of the methodology for estimating emissions from solid waste disposal on land and the availability of improved data on the recovery of CH_4.

100. Ireland's inventory for the waste sector is generally complete for 2008. Ireland reported waste incineration as "NO" as this activity did not occur during the period 1998–2008. However, during the review, the Party clarified that in the period 1990–1997 emissions from incineration of clinical waste did indeed occur but that they have not been estimated, since they were considered negligible. The ERT noted that N_2O emissions from industrial and commercial wastewater have not yet been estimated, and the ERT encourages the Party to provide estimates for these categories in its next annual submission.

2. Key categories

Solid waste disposal on land – CH_4

101. CH_4 emissions from the disposal of solid waste on land decreased from 55.86 Gg CH_4 in the base year to 44.56 Gg CH_4 in 2008. This represents a 20.2 per cent decrease, or a decrease of 237.22 Gg CO_2 eq. The recovery of CH_4 emissions from landfills has occurred in Ireland only since 1996, but it has increased by 1,451.16 Gg CO_2 eq since then, from 7.40 Gg CH_4 in 1996 to 76.50 Gg CH_4 in 2008.

102. Recalculations performed for the 2010 annual submission resulted in a decrease in the estimate of net emissions for the category solid waste disposal on land by 737.25 Gg CO_2 eq for 2007. These recalculations were due to improvements made to the methodology for estimating emissions from solid waste disposal on land and the availability of improved information on the recovery of CH_4. Since the 2009 annual submission, Ireland has applied the tier 2 methodology from the 2006 IPCC Guidelines to estimate CH_4 emissions from solid waste disposal on land. Ireland applied this model to 14 different scenarios, reflecting landfill-specific compositions of waste and the appropriate default parameters. The ERT considers that the use of this methodology has improved the accuracy of the Party's estimates and that it is in line with the IPCC good practice guidance.

103. In the NIR, Ireland provides detailed information on the calculations and parameters applied to estimate CH_4 emissions from food, paper, wood and straw textiles, and disposable nappies. The ERT recommends that Ireland expand the information in its next annual submission to illustrate how all other waste streams are accounted for in the estimates.

104. Ireland has recalculated the estimates of CH_4 recovery from solid waste disposal on land on the basis of a detailed study of landfill sites undertaken by external consultants. This study quantified the CH_4 recovered through landfill gas flaring for all years since the practice was introduced and validated the CH_4 utilization value in the annual energy balance. During the review, Ireland provided the ERT with information demonstrating that the efficiencies for flaring are based on international good practice standards. The ERT

recommends that Ireland include the information provided during the review in its next annual submission to improve the transparency of the inventory.

3. Non-key categories

Wastewater handling – CH_4

105. Ireland has applied country-specific parameters for estimating the organic content of industrial and domestic sludge. Since its 2009 annual submission, Ireland has improved the transparency of the inventory by including information on how these country-specific parameters have been derived. The ERT welcomes these efforts.

106. Ireland has reported CH_4 emissions from domestic septic tanks as "NO". In response to a question raised by the ERT during the review, the Party explained that this reporting was based on expert judgement: in Ireland, the temperature of the surrounding soil is constantly below 15 °C throughout the year, except for short periods and in certain areas of country. These climatic conditions therefore prevent the process of methanogenesis. During the review, the Party provided the ERT with sufficient information and documentation to support this claim. The ERT encourages Ireland to include the information provided to the ERT during the review in its next annual submission.

Waste incineration – CO_2 and N_2O

107. Ireland has reported emissions from waste incineration for the period 1998–2008 as "NO". However, during the review, Ireland clarified that there was indeed a small amount of clinical waste incineration up to 1997. The ERT noted that, in accordance with the information in Ireland's inventory submitted to the United Nations Economic Commission for Europe (UNECE) Convention on Long-range Transboundary Air Pollution, hazardous waste was incinerated in Ireland in the period 1990–2007. The ERT encourages Ireland to reflect this information in its next annual submission, in order to improve the completeness of its reporting. Further, the ERT encourages Ireland to provide an explanation of how the clinical waste not incinerated is treated, in its next inventory submission.

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

108. Ireland submitted estimates for afforestation, reforestation and deforestation activities under Article 3, paragraph 3, of the Kyoto Protocol. It has not elected any activities under Article 3, paragraph 4, of the Kyoto Protocol. The Party chose to account for activities under Article 3, paragraph 3, of the Kyoto Protocol at the end of the commitment period.

109. The ERT considers that chapter 11 of the NIR and the CRF tables that refer to KP-LULUCF activities contain all the necessary information as required by decision 15/CMP.1. The ERT also considers that sufficient information has been provided on definitions, institutional arrangements and land areas. However, the ERT considers that the time series of data on afforestation/reforestation and deforestation may be inconsistent before and after 2006 (see paras. 110 and 112 below), and that there is lack of consistency between the methodologies and parameters used for the reporting under the Convention and under the Kyoto Protocol. The Party presented the corresponding AD under the

Convention, and the underlying causes of the differences between the reporting under the Kyoto Protocol and the Convention are explained in the NIR.

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

Afforestation and reforestation – CO_2

110. Ireland has provided estimates of emissions and removals from afforested areas of land for 2008. Ireland states, in chapter 11 of the NIR, that reforestation does not occur in Ireland. High-quality AD for after 2006 have been assembled from a variety of sources, notably maps of indicative forest soils and global information system map layers from the database of the Forest Service Grant and Premiums Scheme, but no information has been provided for the years before 2006. The ERT recommends that Ireland clarify in the NIR of its next annual submission how it monitored afforested land prior to 2006.

111. Harvesting on afforested land began in 2007 and is being monitored on permanent sample plots on the basis of felling licences for private forest land, and by the forest industry for public forest land. A tier 2 method is used by Ireland to estimate emissions from harvesting on afforested land.

Deforestation – CO_2

112. During the review, the ERT learned that detailed data on deforestation are available only for 2006 onwards, and that for the previous reporting years AD were derived from large-scale data sets. According to the literature cited in the NIR, this would provide biased estimates of land-use change in Ireland (Black et al., 2008). The ERT recommends that Ireland continue its efforts to improve historical data on deforestation and correct the problem of bias in its next annual submission.

113. In CRF table 5(KP-1)A.2, Ireland reports carbon stock changes in the litter, deadwood and soil pools on 1,354.08 ha deforested land over the period 1990–2007 as "NO". However, table 7.7 of the NIR presents data indicating that the conversion of forest land to grassland did occur in 2006 and 2007. Further, Ireland made the assumption that all land deforested prior to 2006 was converted to settlements, although transparent and verifiable information has not been provided demonstrating that there was no deforestation to grassland prior to 2006. Noting that methodologies are provided in the IPCC good practice guidance for LULUCF to estimate soil residual emissions on forest land converted to grassland over the 20 years following the conversion, the ERT believes that emissions from this pool are in fact "NE". The Party recognized during the review that it has no data to estimate forest areas converted to grassland before 2006, but stated that it will estimate such areas assuming the same rate of conversion as for forest land converted to settlements.

114. Responding to the list of potential problems and further questions raised by the ERT, the Party provided further information clarifying the issue described in paragraph 113 above and submitted a revised set of KP-LULUCF CRF tables, with revised values in CRF table 5(KP-1)A.2. Ireland explained that emissions from the dead fractions are assumed to be immediately oxidized in the year in which deforestation occurs. For mineral soils, the Party provided documentation showing that there is no significant change in soil carbon stocks for up to 30 years following transitions between grassland and forest land. However, Ireland resubmitted new estimates for emissions from organic soils (0.029 Gg carbon), calculated using the tier 1 methodology and an EF of 0.25 t carbon/year. The ERT recommends that Ireland provide these justifications in the NIR of its next annual submission.

115. The ERT noted inconsistencies between the values selected for the biomass expansion factor (BEF) used to report emissions/removals from the LULUCF sector under the Convention and emissions/removals from LULUCF activities under the Kyoto Protocol:

for example, Ireland uses a BEF of 1.64 to estimate emissions from living biomass on forest land converted to other land, but it uses a BEF of 1.4 to estimate emissions from deforestation under the Kyoto Protocol. The ERT also noted that the estimates reported under the Convention and for KP-LULUCF activities are not always consistent. For example, it is not clear whether below-ground biomass is included in the estimation of emissions from deforestation both under the Convention and the Kyoto Protocol. The ERT noted that BEF values strongly influence the estimates of carbon stock changes in the biomass and DOM pools in all forest-related categories. The ERT recommends that Ireland examine the appropriateness of the BEF values used and the equations used for all its forest-related estimates and indicate in its next annual submission whether any corrections were implemented as a result.

2. Information on Kyoto Protocol units

Standard electronic format and reports from the national registry

116. 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.[18] The SIAR was forwarded to the ERT prior to the review, pursuant to decision 16/CP.10. The ERT reiterated the main findings and recommendations contained in the SIAR.

117. 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.

118. Information reported by the Party on records of any discrepancies and on any records of non-replacement was found to be consistent with information provided to the secretariat by the ITL. No non-replacements have occurred.

National registry

119. The Party provided access to information from its national registry that substantiated or clarified the information reported in its annual submission. 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 also took note of 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 safeguard and disaster recovery measures in place and its operational performance is adequate.

120. However, the SIAR identified the following problem: the national registry did not fulfil the requirements regarding the public availability of information in accordance with section II.E of the annex to decision 13/CMP.1. In particular, the SIAR recommends that the Party include the information required by paragraph 47(a), (d), (f) and (l) of the annex

[18] The SEF comparison report is prepared by the 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.

to decision 13/CMP.1. The ERT reiterates this recommendation, which should be implemented in Ireland's next annual submission.

Calculation of the commitment period reserve

121. Ireland has reported its commitment period reserve in its 2010 annual submission. Ireland reported that its commitment period reserve (282,756,845 t CO_2 eq) has not changed since the initial report review, as it is based on the assigned amount (315,184,272 t CO_2 eq) and not on the most recently reviewed inventory. The ERT agrees with this figure.

3. Changes to the national system

122. Ireland reported that there are changes to its national system since the previous annual submission.

123. Ireland reported in the NIR that there have been no changes to the institutions or resources involved in the national system since the previous review, but that the provisions for reporting on areas of afforestation and deforestation related to LULUCF under the Convention and Article 3, paragraph 3, of the Kyoto Protocol were strengthened to some degree and consequently the related functions of the national system, by the establishment of secondary MOUs to formalize data collection by COFORD, which is responsible for these parts of the inventory submission. The MOUs were put into effect between COFORD and the Forest Service and between COFORD and the forestry company Coillte. Signed copies of the MOUs are held on file along with the other MOUs underpinning the national system at the EPA offices in Dublin and Monaghan.

124. 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

125. Ireland reported changes to its national registry since the previous annual submission, including changes to contacts, software and the hosting provider, as well as upgrades to improve functionality and application. The most relevant changes include: a new release of the registry software (GRETA); migration to a new hosting provider; and the update of the readiness documentation related to the database and application backup plan, the test plan and the test report.

126. After evaluating the information reported in the SIAR and the NIR, the ERT concluded that 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

127. Ireland has reported information on the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol, as requested in chapter I.H of the annex to decision 15/CMP.1, in its 2010 annual submission (in chapter 15 of the NIR).

128. The ERT considers that the reported information is complete, transparent and consistent, including the information on how the Party gives priority to the implementation of its commitments under Article 3, paragraph 14, of the Kyoto Protocol for individual actions.

129. As a member State of the EU, Ireland has reported the national measures and programmes to minimize adverse impacts which are being implemented under EU decisions 2005/166/EC and 280/2004/EC: for example, Ireland supports a range of EU activities aimed at reducing dependence on the consumption of fossil fuels, in particular the EU support programmes for the promotion of renewable energies and energy efficiency in developing countries.

130. Furthermore, Ireland is a founding member of the United Nations Environment Programme (UNEP) Sustainable Energy Finance Initiative (SEFI) Public Finance Alliance, or SEF Alliance. This is a member-driven coalition of public and publicly backed organizations that finances sustainable-energy markets in various countries, including emerging and developing economies, and assists developing countries that are highly dependent on the export and consumption of fossil fuels in diversifying their economies.

131. 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.

III. Conclusions and recommendations

132. Ireland made its annual submission on 14 April 2010. The annual submission contains the GHG inventory (comprising the CRF tables and an NIR) and supplementary information under Article 7, paragraph 1, of the Kyoto Protocol (information on: activities under Article 3, paragraphs 3 and 4, 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. Ireland submitted revised emission estimates on 1 November 2010, in response to the list of potential problems and further questions raised by the ERT in the course of the review, and also submitted revised information and data on KP-LULUCF.

133. The ERT concludes that the inventory submission of Ireland has been prepared and the information reported in accordance with the UNFCCC reporting guidelines. Ireland has submitted a complete set of CRF tables for the years 1990–2008 and an NIR. The inventory is complete in terms of gases, geographical coverage, years and sectors, and complete in terms of categories. Only some categories were reported as "NE" in the energy and waste sectors, but all of those are categories for which there are no methodologies to estimate emissions available in the Revised 1996 IPCC Guidelines or in the IPCC good practice guidance. The ERT encourages the Party to make efforts to estimate emissions for these categories in its next annual submission, in order to improve completeness.

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

135. The Party's inventory is generally in line with the UNFCCC reporting guidelines, the Revised 1996 IPCC Guidelines, the IPCC good practice guidance and the IPCC good practice guidance for LULUCF, but the ERT concluded that the transparency of the reporting could be enhanced further (see paras. 51, 56, 64, 68–69 58, 68, 69 and 103 above).

136. Ireland submitted all the necessary information required by decision 15/CMP.1 in relation to the LULUCF activities under Article 3, paragraph 3, of the Kyoto Protocol. However, the ERT concluded that the consistency of the AD time series and the

consistency of that information with the information provided in the reporting on the LULUCF sector under the Convention need to be further enhanced.

137. 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.

138. The national system continues to perform its required functions as set out in the annex to decision 19/CMP.1. The ERT commends the improvements made by the Party to the national system since the previous annual submission, in particular with regard to the procedural arrangements for meeting the reporting obligations in relation to activities under Article 3, paragraph 3, of the Kyoto Protocol.

139. 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 decisions of the CMP.

140. Ireland has reported the information requested in 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 2010 annual submission, in chapter 15 of the NIR. The ERT finds that the information is complete and transparent.

141. In the course of the review, the ERT formulated a number of recommendations relating to the transparency and the consistency of the information presented in Ireland's annual submission. The key recommendations are that Ireland:

(a) Provide more precise and transparent descriptions of the methodologies used for estimating emissions for some categories in the energy, industrial processes and waste sectors (see paras. 51 , 56, 64, 68–69 and 103 above);

(b) Improve the transparency of the reporting on the national system by including more detailed information on the archiving system;

(c) Improve the transparency of the inventory by including more information on implemented QA/QC activities for all sectors, particularly the industrial processes and LULUCF sectors;

(d) Improve the uncertainty analysis by the use of a higher level of category disaggregation for the LULUCF sector;

(e) Improve the completeness of the inventory, in particular by reporting estimates of the remaining emissions reported as "NE" in the LULUCF sector (see para. 89 above);

(f) Reconcile the AD from the energy balance used to estimate emissions from the energy sector with the EU ETS data;

(g) Improve the methodological tier level used to estimate emissions for categories in the LULUCF sector other than forest land, in particular for grassland, in accordance with the recommendations in the IPCC good practice guidance for LULUCF;

(h) Improve the consistency of the information reported for the LULUCF sector under the Convention and for KP-LULUCF activities (see paras. 92 and 115 above), and provide more detailed information on forest-related land-use changes that occurred prior to 2006 (see paras. 110 and 112 above).

IV. Questions of implementation

142. 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>.

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FCCC/ARR/2009/IRL. Report of the individual review of the annual submission of Ireland submitted in 2009. Available at <http://unfccc.int/resource/docs/2009/arr/irl_b.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 Ms. Eimear Cotter (Irish Environmental Protection Agency), including additional material on the methodologies and assumptions used. The following documents[1] were also provided by Ireland:

Black, K., O'Brien, P., Redmondd, J., Barrettd, F. & M. Twomeyd. 2008. *The extent of recent peatland afforestation in Ireland*. Irish Forestry vol 65: 71–81.

DAFF. *AIM Bovine Statistics Report 2008*. Department of Agriculture, Fisheries and Food.

Garcia-Suarez, A. M. & C. J. Butler. 2006. *Soil Temperatures at Armagh Observatory, Northern Ireland, From 1904 to 2002.* Int. J. Climatol. 26: 1075–1089 DOI: 10.1002/joc.1294.

Hargreaves, K.J., Milne, R. & M.G.R. Cannell. 2003. *Carbon balance of afforested peatland in Scotland* Forestry vol. 76(3): 299–317.

O'Mara, F. 2006. Climate Change. *Development of Emission Factors for the Irish Cattle Herd*. Special Report 2000-LS-5.1.1-M1 UCD School of Agriculture, Food Science and Veterinary Medicine. Environmental Protection Agency 2006.

[1] Reproduced as received from the Party.

Annex II

Acronyms and abbreviations

AD	activity data
AWMS	animal waste management system
BEF	biomass expansion factor
CaO	calcium oxide
CH_4	methane
CKD	cement kiln dust
CO_2	carbon dioxide
CO_2 eq	carbon dioxide equivalent
CRF	common reporting format
DOM	dead organic matter
EF	emission factor
ERT	expert review team
EU	European Union
EU ETS	European Union emissions trading scheme
FOD	first order decay
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
IEA	International Energy Agency
IEF	implied emission factor
ITL	international transaction log
IPCC	Intergovernmental Panel on Climate Change
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)
LTO	landing and take-off
LULUCF	land use, land-use change and forestry
MCF	methane conversion factor
MgO	magnesium oxide
MOU	memorandum of understanding
NA	not applicable
NE	not estimated
N_2O	nitrous oxide
NH_3	ammonia
NIR	national inventory report
NO	not occurring
NO_X	nitrogen oxide
PFCs	perfluorocarbons
QA/QC	quality assurance/quality control
SEF	standard electronic format
SEFI	Sustainable Energy Finance Initiative
SF_6	sulphur hexafluoride
SIAR	standard independent assessment report
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
VS	volatile solids