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**Report of the individual review of the annual submission of  
Ireland submitted in 2012\***

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\* In the symbol for this document, 2012 refers to the year in which the inventory was submitted, and not to the year of publication.

## Contents

	<i>Paragraphs</i>	<i>Page</i>
I. Introduction and summary .....	1–5	3
II. Technical assessment of the annual submission.....	6–102	8
A. Overview .....	6–28	8
B. Energy.....	29–44	13
C. Industrial processes and solvent and other product use .....	45–56	17
D. Agriculture.....	57–68	19
E. Land use, land-use change and forestry.....	69–79	22
F. Waste .....	80–86	24
G. Supplementary information required under Article 7, paragraph 1, of the Kyoto Protocol.....	87–102	25
III. Conclusions and recommendations .....	103–114	28
A. Conclusions .....	103–113	28
B. Recommendations.....	114	30
IV. Questions of implementation .....	115	32
 Annexes		
I. Documents and information used during the review.....		33
II. Acronyms and abbreviations.....		35

## I. Introduction and summary

1. This report covers the centralized review of the 2012 annual submission of Ireland, coordinated by the UNFCCC secretariat, in accordance with decision 22/CMP.1. The review took place from 3 to 8 September 2012 in Bonn, Germany, and was conducted by the following team of nominated experts from the UNFCCC roster of experts: generalist – Mr. Mario Contaldi (Italy); energy – Mr. Graham Anderson (Australia), Mr. Kaleem Anwar Mir (Pakistan) and Mr. Jongikhaya Witi (South Africa); industrial processes – Ms. Siriluk Chiarakorn (Thailand), Mr. Eilev Gjerald (Norway) and Mr. Samir Tantawi Al-Sayed (Egypt); agriculture – Mr. Amnat Chidthaisong (Thailand) and Ms. Olga Gavrilova (Estonia); land use, land-use change and forestry (LULUCF) – Mr. Lucio Santos (Colombia) and Mr. Nalin Srivastava (India); and waste – Ms. Hlobsile Patricia Sikhosana (Swaziland) and Ms. Masako White (Japan). Mr. Contaldi and Mr. Witi were the lead reviewers. The review was coordinated by Mr. Stylianos Pesmajoglou (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.

3. In 2010, the main greenhouse gas (GHG) in Ireland was carbon dioxide (CO<sub>2</sub>), accounting for 67.3 per cent of total GHG emissions<sup>1</sup> expressed in carbon dioxide equivalent (CO<sub>2</sub> eq), followed by methane (CH<sub>4</sub>) (18.9 per cent) and nitrous oxide (N<sub>2</sub>O) (12.7 per cent). Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF<sub>6</sub>) collectively accounted for 1.0 per cent of the overall GHG emissions in the country. The energy sector accounted for 66.1 per cent of total GHG emissions, followed by the agriculture sector (29.2 per cent), the industrial processes sector (3.2 per cent), the waste sector (1.4 per cent) and the solvent and other product use sector (0.1 per cent). Total GHG emissions amounted to 61,314.07 Gg CO<sub>2</sub> eq and increased by 11.2 per cent between the base year<sup>2</sup> and 2010.

4. Tables 1 and 2 show GHG emissions from Annex A sources, emissions and removals from the LULUCF sector under the Convention and emissions and removals from activities under Article 3, paragraph 3, and, if any, Article 3, paragraph 4, of the Kyoto Protocol (KP-LULUCF), by gas and by sector and activity, respectively. In table 1, CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O emissions included in the rows under Annex A sources do not include emissions and removals from the LULUCF sector.

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

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<sup>1</sup> In this report, the term “total GHG emissions” refers to the aggregated national GHG emissions expressed in terms of CO<sub>2</sub> eq excluding LULUCF, unless otherwise specified.

<sup>2</sup> “Base year” refers to the base year under the Kyoto Protocol, which is 1990 for CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O, and 1995 for HFCs, PFCs and SF<sub>6</sub>. The base year emissions include emissions from Annex A sources only.

Table 1  
**Greenhouse gas emissions from Annex A sources and emissions/removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, by gas, base year to 2010<sup>a</sup>**

	Greenhouse gas	Gg CO <sub>2</sub> eq								Change %
		Base year <sup>a</sup>	1990	1995	2000	2005	2008	2009	2010	Base year–2010
Annex A sources	CO <sub>2</sub>	32 341.25	32 341.25	35 148.60	44 627.07	47 673.10	46 960.78	41 649.26	41 267.97	27.6
	CH <sub>4</sub>	13 673.14	13 673.14	13 918.55	13 410.53	12 808.03	12 241.68	11 923.83	11 605.08	-15.1
	N <sub>2</sub> O	9 111.30	9 111.30	9 491.34	9 446.94	8 089.93	7 637.17	7 543.63	7 806.45	-14.3
	HFCs	54.35	1.31	54.35	259.18	474.45	564.67	521.07	563.04	935.9
	PFCs	75.38	0.09	75.38	305.41	168.34	106.20	65.57	37.02	-50.9
	SF <sub>6</sub>	82.93	35.51	82.93	54.35	101.63	56.68	38.24	34.51	-58.4
KP-LULUCF	Article 3.3 <sup>b</sup>	CO <sub>2</sub>					-2 425.57	-2 798.10	-2 967.97	
		CH <sub>4</sub>					0.65	0.37	2.40	
		N <sub>2</sub> O					0.06	0.03	0.21	
	Article 3.4 <sup>c</sup>	CO <sub>2</sub>	NA				NA	NA	NA	NA
		CH <sub>4</sub>	NA				NA	NA	NA	NA
		N <sub>2</sub> O	NA				NA	NA	NA	NA

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

<sup>a</sup> “Base year” for Annex A sources refers to the base year under the Kyoto Protocol, which is 1990 for CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O, and 1995 for HFCs, PFCs and SF<sub>6</sub>. The “base year” for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol is 1990.

<sup>b</sup> 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.

<sup>c</sup> 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<sup>a</sup> to 2010

	Sector	Gg CO <sub>2</sub> eq								Change %	
		Base year <sup>a</sup>	1990	1995	2000	2005	2008	2009	2010	Base year–2010	
Annex A	Energy	30 966.45	30 966.45	33 711.74	42 415.32	45 702.64	45 251.14	40 717.94	40 510.42	30.8	
	Industrial processes	3 082.73	3 179.27	3 082.73	4 222.47	3 297.22	3 029.12	2 110.20	1 933.62	-37.3	
	Solvent and other product use	80.03	80.03	85.39	79.04	74.07	74.31	71.80	71.59	-10.5	
	Agriculture	19 635.07	19 635.07	20 315.70	19 970.91	18 857.16	18 162.31	17 926.09	17 909.69	-8.8	
	Waste	1 301.78	1 301.78	1 575.59	1 415.74	1 384.39	1 050.28	915.56	888.74	-31.7	
	LULUCF	NA	201.37	472.80	392.02	-216.98	-1 108.17	-1 035.66	-1 030.41	NA	
	<b>Total (with LULUCF)</b>	<b>NA</b>	<b>55 363.97</b>	<b>59 243.95</b>	<b>68 495.50</b>	<b>69 098.50</b>	<b>66 459.00</b>	<b>60 705.92</b>	<b>60 283.66</b>	<b>NA</b>	
<b>Total (without LULUCF)</b>	<b>55 066.06</b>	<b>55 162.60</b>	<b>58 771.15</b>	<b>68 103.48</b>	<b>69 315.49</b>	<b>67 567.17</b>	<b>61 741.59</b>	<b>61 314.07</b>	<b>11.2</b>		
	Other <sup>b</sup>	NA	NA	NA	NA	NA	NA	NA	NA	NA	
KP-LULUCF	Article 3.3 <sup>c</sup>	Afforestation and reforestation						-2 451.31	-2 832.25	-2 984.89	
		Deforestation						26.44	34.55	19.54	
		<b>Total (3.3)</b>						<b>-2 424.87</b>	<b>-2 797.71</b>	<b>-2 965.36</b>	
	Article 3.4 <sup>d</sup>	Forest management						NA	NA	NA	
		Cropland management	NA					NA	NA	NA	NA
		Grazing land management	NA					NA	NA	NA	NA
		Revegetation	NA					NA	NA	NA	NA
		<b>Total (3.4)</b>	<b>NA</b>					<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>

Abbreviations: KP-LULUCF = LULUCF 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.

<sup>a</sup> “Base year” for Annex A sources refers to the base year under the Kyoto Protocol, which is 1990 for CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O, and 1995 for HFCs, PFCs and SF<sub>6</sub>. The “base year” for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol is 1990.

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

<sup>c</sup> 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.

<sup>d</sup> 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<sub>2</sub> eq for the year 2010, including the commitment period reserve**

	<i>As reported</i>	<i>Revised estimates</i>	<i>Adjustment<sup>a</sup></i>	<i>Final<sup>b</sup></i>
<b>Commitment period reserve</b>	282 765 845	–		282 765 845
<b>Annex A emissions for current inventory year</b>				
CO <sub>2</sub>	41 267 968			41 267 968
CH <sub>4</sub>	11 604 941	11 605 082		11 605 082
N <sub>2</sub> O	7 806 437	7 806 447		7 806 447
HFCs	563 037			563 037
PFCs	37 022			37 022
SF <sub>6</sub>	34 511			34 511
<b>Total Annex A sources</b>	<b>61 313 916</b>	<b>61 314 068</b>		<b>61 314 068</b>
<b>Activities under Article 3, paragraph 3, for current inventory year</b>				
3.3 Afforestation and reforestation on non-harvested land for current year of commitment period as reported	–3 029 713			–3 029 713
3.3 Afforestation and reforestation on harvested land for current year of commitment period as reported	44 819			44 819
3.3 Deforestation for current year of commitment period as reported	19 537			19 537
<b>Activities under Article 3, paragraph 4, for current inventory year<sup>c</sup></b>				
3.4 Forest management for current year of commitment period				
3.4 Cropland management for current year of commitment period				
3.4 Cropland management for base year				
3.4 Grazing land management for current year of commitment period				
3.4 Grazing land management for base year				
3.4 Revegetation for current year of commitment period				
3.4 Revegetation in base year				

<sup>a</sup> “Adjustment” is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).

<sup>b</sup> "Final" includes revised estimates, if any, and/or adjustments, if any.

<sup>c</sup> Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

Table 4  
Information to be included in the compilation and accounting database in t CO<sub>2</sub> eq for the year 2009

	<i>As reported</i>	<i>Revised estimates</i>	<i>Adjustment<sup>a</sup></i>	<i>Final<sup>b</sup></i>
<b>Annex A emissions for 2009</b>				
CO <sub>2</sub>	41 649 260			41 649 260
CH <sub>4</sub>	11 923 741	11 923 826		11 923 826
N <sub>2</sub> O	7 543 626	7 543 632		7 543 632
HFCs	521 067			521 067
PFCs	65 570			65 570
SF <sub>6</sub>	38 236			38 236
<b>Total Annex A sources</b>	<b>61 741 499</b>	<b>61 741 589</b>		<b>61 741 589</b>
<b>Activities under Article 3, paragraph 3, for 2009</b>				
3.3 Afforestation and reforestation on non-harvested land for 2009 as reported	-2 858 382			-2 858 382
3.3 Afforestation and reforestation on harvested land for 2009 as reported	26 128			26 128
3.3 Deforestation for 2009 as reported	34 548			34 548
<b>Activities under Article 3, paragraph 4, for 2009<sup>c</sup></b>				
3.4 Forest management for 2009				
3.4 Cropland management for 2009				
3.4 Cropland management for base year				
3.4 Grazing land management for 2009				
3.4 Grazing land management for base year				
3.4 Revegetation for 2009				
3.4 Revegetation in base year				

<sup>a</sup> "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).

<sup>b</sup> "Final" includes revised estimates, if any, and/or adjustments, if any.

<sup>c</sup> Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

Table 5  
Information to be included in the compilation and accounting database in t CO<sub>2</sub> eq for the year 2008

	<i>As reported</i>	<i>Revised estimates</i>	<i>Adjustment<sup>a</sup></i>	<i>Final<sup>b</sup></i>
<b>Annex A emissions for 2008</b>				
CO <sub>2</sub>	46 960 776			46 960 776
CH <sub>4</sub>	12 241 561	12 241 683		12 241 683
N <sub>2</sub> O	7 637 162	7 637 171		7 637 171
HFCs	564 668			564 668
PFCs	106 197			106 197
SF <sub>6</sub>	56 676			56 676
<b>Total Annex A sources</b>	<b>67 567 040</b>	<b>67 567 171</b>		<b>67 567 171</b>
<b>Activities under Article 3, paragraph 3, for 2008</b>				
3.3 Afforestation and reforestation on non-harvested land for 2008 as reported	-2 701 547			-2 701 547
3.3 Afforestation and reforestation on harvested land for 2008 as reported	250 237			250 237
3.3 Deforestation for 2008 as reported	26 444			26 444
<b>Activities under Article 3, paragraph 4, for 2008<sup>c</sup></b>				
3.4 Forest management for 2008				
3.4 Cropland management for 2008				
3.4 Cropland management for base year				
3.4 Grazing land management for 2008				
3.4 Grazing land management for base year				
3.4 Revegetation for 2008				
3.4 Revegetation in base year				

<sup>a</sup> "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).

<sup>b</sup> "Final" includes revised estimates, if any, and/or adjustments, if any.

<sup>c</sup> Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

## II. Technical assessment of the annual submission

### A. Overview

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

6. The 2012 annual inventory submission was submitted on 13 April 2012; it contains a complete set of common reporting format (CRF) tables for the period 1990–2010 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 the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol. The standard electronic format (SEF) tables were submitted on 11 April 2012. The annual submission was submitted in accordance with decision 15/CMP.1.

7. Ireland officially submitted revised emission estimates on 19 October 2012 in response to questions raised by the expert review team (ERT) during the review. The figures contained in this report are those submitted by the Party on 19 October 2012.

8. The ERT also used the 2010 and 2011 annual submissions during the review. In addition, the ERT used the standard independent assessment report (SIAR), parts I and II, to review information on the accounting of Kyoto Protocol units (including the SEF tables and their comparison report) and on the national registry.<sup>3</sup>

9. During the review, Ireland provided the ERT with additional information that is not part of the annual submission. The documentation concerned is not part of the annual submission. The full list of materials used during the review is provided in annex I to this report.

#### Completeness of inventory

10. The inventory covers all mandatory<sup>4</sup> source and sink categories for the period 1990–2010 and is complete in terms of years and geographical coverage. However, the ERT noted that some emission sources have been reported as not estimated (“NE”), including: CH<sub>4</sub> emissions from land converted to wetlands; CH<sub>4</sub> emissions from land converted to settlements; N<sub>2</sub>O emissions from solvents; CO<sub>2</sub> emissions from asphalt roofing, road paving with asphalt, and food and drink production; and CH<sub>4</sub> emissions from poultry. The ERT encourages Ireland to provide estimates for these categories in its next annual submission and to continue its efforts to include, in its inventory, emission estimates for categories for which there are no methodologies or emission factors (EFs) available to estimate emissions 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).

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

<sup>4</sup> Mandatory source and sink categories under the Kyoto Protocol are all source and sink categories for which the Intergovernmental Panel on Climate Change (IPCC) *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*, the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* and the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry* provide methodologies and/or emission factors to estimate GHG emissions.

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

Overview

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

Inventory planning

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

13. OCLR puts in place formal procedures for the planning, preparation and management of the national atmospheric inventory (including the inventory reported to the Convention on Long-range Transboundary Air Pollution), identifies the roles and responsibilities of all organizations involved in the compilation of the inventory and stipulates memorandums of understanding with key data providers.

14. EPA is responsible for the choice of methods for estimating GHG emissions and removals, data collection, and processing and archiving of the inventory information; it also implements the quality assurance/quality control (QA/QC) procedures which were formally established in 2005 through the adoption of a QA/QC plan and manual.

Inventory preparation

*Key categories*

15. Ireland has reported a key category tier 1 analysis, both level and trend assessment, as part of its 2012 annual submission. The key category analysis performed by the Party and that performed by the secretariat<sup>5</sup> produced similar results, but some differences were identified due to the higher level of category disaggregation used by the Party, which is the same level at which the emissions are calculated. Ireland has included the LULUCF sector in its key category analysis, which was performed in accordance with the IPCC good practice guidance and the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF).

16. In response to a question raised by the ERT during the review, Ireland explained that a tier 2 key category analysis was not performed due to resource constraints. However,

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<sup>5</sup> 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 LULUCF. 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.

some elements of the qualitative approaches mentioned in section 7.2.2 of the IPCC good practice guidance (namely, mitigation techniques and technologies, high expected emissions growth, high uncertainty, unexpectedly low or high emissions) are already being carried out by the Party, and, therefore, Ireland does not expect the performance of a tier 2 key category analysis to result in significant improvements to the inventory. The results of the key category analysis are discussed in the NIR and are used as a driving factor for the prioritization of inventory improvements. The ERT encourages Ireland to implement a tier 2 key category analysis in future annual submissions.

17. Ireland has identified CO<sub>2</sub> emissions from afforestation and reforestation under Article 3, paragraph 3, of the Kyoto Protocol as a key category for 2010. The results of the key category analysis for the KP-LULUCF activities are presented in KP-LULUCF CRF table NIR-3. The ERT encourages Ireland to include, in the NIR, a paragraph explaining the data sources and the analysis performed.

#### *Uncertainties*

18. Ireland has performed and reported a tier 1 uncertainty analysis for 2010 and for the trend for the period 1990–2010, in accordance with the IPCC good practice guidance. The results of this analysis are presented and discussed, both at the summary level and at the individual category level. Higher-tier calculation methods are used and reported for combustion sources covered by the EU ETS.

19. Following the recommendation in the previous review report, Ireland has improved the uncertainty analysis for the LULUCF categories, including the additional disaggregation of the categories under the Convention and the activities under Article 3, paragraph 3, of the Kyoto Protocol.

#### *Recalculations and time-series consistency*

20. Recalculations have been performed and reported in accordance with the IPCC good practice guidance. The ERT noted that the recalculations reported by Ireland of the time series 1990–2009 have been undertaken for a variety of different reasons in various sectors. The major changes, and the magnitude of the impact, include the following: an increase in estimated total GHG emissions in 1990 (0.6 per cent) and a decrease in 2009 (1.0 per cent). The rationale for these recalculations is provided in the NIR and in CRF table 8(b).

21. The main recalculations took place in the following sectors/categories:

(a) In the energy sector: the recalculation of CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O emissions for the years 1990–2009, owing to the availability of revised energy data for all subcategories (see para. 30 below);

(b) In the industrial processes sector: the recalculation of HFC and SF<sub>6</sub> emissions, owing to the improved availability of activity data (AD) (see paras. 47 and 48 below);

(c) In the agriculture sector: the review of nitrogen (N) excretion values for all categories of livestock, owing to revisions of the livestock statistics and in response to the recommendations made in the previous review report (see paras. 58 and 59 below);

(d) In the LULUCF sector: the implementation of a number of methodological refinements, mainly as the result of the more extensive use of the national forest inventory (NFI) data in the CARBWARE model for forest land, and the recalculation of emissions from biomass burning (see paras. 71 and 90 below);

(e) In the waste sector: the performance of a landfill gas survey, which resulted in new information on the quantity of CH<sub>4</sub> recovered that had been underestimated for the years 2007, 2008 and 2009 (see para. 81 below).

*Verification and quality assurance/quality control approaches*

22. Since 2005, Ireland has had an elaborated QA/QC plan in place, in accordance with decision 19/CMP.1 and the IPCC good practice guidance. Summary information on the QA/QC system and procedures is provided in section 1.6 of the NIR; additional information on sector-specific QA/QC procedures is provided for the energy, industrial processes, agriculture and waste sectors.

*Transparency*

23. The degree of transparency of the information included in the NIR and in the CRF tables is, in general, relatively good. The ERT did not identify any restrictions relating to the provision of information in the CRF tables or in the NIR for confidentiality reasons. In particular, the ERT commends the Party for improving the use of the notation keys in the energy sector (transport and fugitive emissions). However, some incorrect notation keys are still used in the CRF tables. For example, emissions from domestic navigation (residual oil) are reported as not occurring (“NO”), but should actually be reported as included elsewhere (“IE”), based on the information provided in response to questions raised by the ERT during the review (see para. 43 below).

Inventory management

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

**3. Follow-up to previous reviews**

25. Significant improvements have been made in the 2012 annual submission in relation to the agriculture sector, in particular the revision of the animal population characterization and the N excretion rates for livestock. Ireland has reported in a dedicated annex to the NIR (annex I) a summary of the issues raised in the 2010 annual review report and the Party’s response to those issues in the 2011 and 2012 annual submissions. The draft annual review report for the 2011 annual submission<sup>6</sup> was received by the national inventory agency on 11 April 2012. Due to the late publication of the report, the national inventory agency was unable to implement all of the recommendations contained in that report in the 2012 annual submission.

26. The ERT commends Ireland for the detailed follow-up of the recommendations made to date and recommends that the Party continue to report on the changes made in response to the recommendations contained in the 2011 and 2012 annual review reports in its next annual submission.

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<sup>6</sup> FCCC/ARR/2011/IRL.

#### 4. Areas for further improvement identified by the expert review team

27. During the review, the ERT identified several issues for improvement. These are listed in table 6 below.

28. Recommended improvements relating to specific categories are presented in the relevant sector chapters of this report and in table 6 below.

## B. Energy

### 1. Sector overview

29. The energy sector is the main sector in the GHG inventory of Ireland. In 2010, emissions from the energy sector amounted to 40,510.42 Gg CO<sub>2</sub> eq, or 66.1 per cent of total GHG emissions. Since 1990, emissions have increased by 30.8 per cent. The key drivers for the rise in emissions are energy industries, transport and other sectors (commercial/institutional, residential and agriculture/forestry/fisheries). Within the sector, 32.9 per cent of the emissions were from energy industries, followed by 28.6 per cent from transport, 27.1 per cent from other sectors and 11.2 per cent from manufacturing industries and construction. The remaining 0.1 per cent were from fugitive emissions from oil and natural gas.

30. Ireland has made recalculations for the energy sector between the 2011 and 2012 annual submissions following changes in AD. The impact of these recalculations on the energy sector is a decrease in emissions of 0.02 per cent for 2009. The main recalculations took place in the following categories:

(a) CH<sub>4</sub> and N<sub>2</sub>O emissions from energy industries: an increase of 0.05 per cent, or 6.09 Gg CO<sub>2</sub> eq;

(b) CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O emissions from manufacturing industries and construction: a decrease of 2.6 per cent, or 117.63 Gg CO<sub>2</sub> eq;

(c) CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O emissions from transport: a decrease of 4.5 per cent, or 595.45 Gg CO<sub>2</sub> eq.

31. The reporting in the energy sector is complete in terms of gases and generally complete in terms of categories. The ERT noted that Ireland does not report CH<sub>4</sub> and N<sub>2</sub>O emissions associated with charcoal use, as described in paragraph 40 below.

32. The ERT noted that Ireland has addressed some of the recommendations from the 2010 annual review report, including the provision of detailed explanations of the use of EU ETS data to prepare the estimates of CO<sub>2</sub> emissions from some subcategories in energy industries and the parameters used in the tier 3 emission estimates for road transportation. The ERT further noted that the transparency of the methodologies, EFs and explanations of the emission trends has improved. The ERT commends Ireland for improving the transparency of the methods used to estimate emissions from the energy sector.

33. The ERT noted that Ireland has improved the description of its QA/QC procedures for the energy sector in relation to the use of EU ETS data in the estimation of emissions from public electricity and heat production under energy industries. However, the ERT further noted that the Party does not provide information on the category-specific QA/QC measures in the NIR. The ERT considers that this reduces the transparency of the Party's reporting. The ERT therefore recommends that Ireland provide information on the category-specific QA/QC measures in its next annual submission.

## 2. Reference and sectoral approaches

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

34. Ireland has reported the reference and sectoral approaches. The difference between the reference approach and the sectoral approach was  $-0.41$  per cent in 2010. The ERT noted that the Sustainable Energy Authority of Ireland (SEAI) is continuing to develop its own procedures to ensure that the national energy balances are fully harmonized with the requirements of the Statistical Office of the European Union and the International Energy Agency (IEA) and are made available in a timely manner to facilitate the annual reporting of the GHG emission estimates. Ireland further explained that arrangements have been established whereby the bottom-up energy data reported to EPA for individual enterprises for all relevant energy-use categories covered by the EU ETS will be reconciled at an early stage with the corresponding top-down information collected by SEAI. This procedure aims to progressively minimize the differences between the energy data reported by SEAI and those supplied by individual enterprises for particular subcategories and fuels. The ERT commends Ireland for developing these data harmonization procedures and encourages the Party to report on the progress made with respect to the implementation of these procedures in its next annual submission.

### *International bunker fuels*

35. The ERT noted a discrepancy in the comparison of jet kerosene consumption in civil aviation between the CRF tables (527.75 TJ) and the IEA data (1,075.00 TJ). Similarly, residual fuel oil used in navigation was reported as “NO” in the CRF tables, whereas IEA reports residual fuel consumption of 800 TJ. In response to a question raised by the ERT during the review, the Party explained that the fuel consumption data reflected in the IEA data for Ireland are reported by the Department of Communications, Energy and Natural Resources (DCENR), while the data reflected in the CRF tables are taken from the energy balances prepared by SEAI. Ireland further confirmed that the correct AD are those from the national energy balances and that SEAI is currently in discussion with DCENR to provide all statistical information to IEA in the future on all types of fuels consumed in the country, including any revisions to historical data, in an effort to improve the consistency of all energy data sets. The ERT welcomes this initiative by Ireland and recommends that the Party report on the progress made in the implementation of this initiative in its next annual submission.

36. The ERT noted that  $\text{CH}_4$  and  $\text{N}_2\text{O}$  emissions from marine bunkers were reported as “NE”. In CRF table 9(a), the Party states that there are no IPCC default  $\text{CH}_4$  and  $\text{N}_2\text{O}$  EFs. However, consistent with the recommendations in the previous review report, the ERT notes that  $\text{CH}_4$  and  $\text{N}_2\text{O}$  EFs are available in Volume 3 of the Revised 1996 IPCC Guidelines. In response to a question raised by the ERT during the review, Ireland explained that, by applying the IPCC default EFs, it has prepared a provisional GHG inventory for the years 1990–2011, which includes  $\text{CH}_4$  and  $\text{N}_2\text{O}$  emissions from marine bunker fuel use. These new emission estimates will be reported in the 2013 annual submission. The ERT welcomes this effort by Ireland to estimate  $\text{CH}_4$  and  $\text{N}_2\text{O}$  emissions from marine bunker fuel use and recommends that the Party report these emissions in its next annual submission.

### *Feedstocks and non-energy use of fuels*

37. The ERT noted that the reporting of feedstocks and non-energy use of fuels is in accordance with the Revised 1996 IPCC Guidelines and the IPCC good practice guidance. The ERT also noted that Ireland uses IPCC default carbon storage factors. The methodology used is documented in the NIR.

### 3. Key categories

#### Stationary combustion: solid and liquid fuels – CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O

38. Following a recommendation in the previous review report that Ireland report transparently on the use of EU ETS data and improve the use of plant-specific data, the Party has reported verified CO<sub>2</sub> emission estimates from the EU ETS for public electricity and heat production, petroleum refining and manufacture of solid fuels. These emission estimates are more accurate and reliable than the plant-specific data reported prior to the availability of the EU ETS emission estimates for the same categories. Ireland reported that the EU ETS emission estimates are available from 2005 onwards only and that the detailed information that underlies these data cannot reasonably be acquired by the national inventory agency for historical years of the relevant time series. As such, the application of the improved methodology introduces a degree of inconsistency in the time series that is unavoidable in this instance. However, given that the EU ETS emission estimates fully cover the subcategory public electricity and heat production and that these estimates match those reported separately under parallel arrangements that have been in place for many years for the same plants, it is assumed that the time-series consistency is not seriously affected and that the use of the EU ETS data does not affect the emissions trend. The ERT agrees with this assessment and commends Ireland for introducing these improvements.

39. In response to a recommendation in the previous review report that Ireland use more disaggregated AD for the category manufacturing industries and construction, the Party has revised and expanded the annual energy balance in line with the six subcategories under manufacturing industries and construction (i.e. iron and steel; non-ferrous metals; chemicals; pulp, paper and print; food processing, beverages and tobacco; and other). The ERT noted that this facilitates a transparent assessment of the Party's emissions and allows for improved comparability of the emission estimates with those of other reporting Parties. Ireland further explained that combustion-related CO<sub>2</sub> emissions from a variety of installations under the six subcategories are covered by the European Union (EU) directive on establishing a scheme for greenhouse gas emission allowance trading within the Community (directive 2003/87/EC), but that the total CO<sub>2</sub> emissions in each subcategory cannot be reported using EU ETS data alone, as is the case for the subcategories under energy industries. Therefore, CO<sub>2</sub> emissions are estimated using top-down AD from the national energy balances and country-specific EFs developed using the EU ETS data, while CH<sub>4</sub> and N<sub>2</sub>O emissions are estimated using IPCC default EFs. The ERT welcomes the improvement made by Ireland to disaggregate fuel consumption according to the subcategories under manufacturing industries and construction.

### 4. Non-key categories

#### Stationary combustion: biomass – CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O

40. The ERT noted that Ireland does not report the emissions associated with charcoal use. In response to a question raised by the ERT during the review, the Party indicated that the national energy balances do not indicate any production or use of charcoal in Ireland. The ERT further noted that the statistical database of the Food and Agriculture Organization of the United Nations (FAOSTAT) provides information on charcoal import quantities for Ireland. For example, according to the FAOSTAT data, Ireland had charcoal imports amounting to 1,157 t in 2010.

41. In response to the list of potential problems and further questions raised by the ERT during the review week, Ireland informed the ERT that charcoal use does occur in the country. The Party also confirmed that the FAOSTAT data, which are provided by the Irish Central Statistics Office (CSO), are correct. Following discussions with CSO, the national

inventory agency informed the ERT that not all imported charcoal is used for cooking. Other main uses include: the food and drink industry; the pharmaceutical and chemical industries as a carbon catalyst ('activated charcoal'); the health-care industry; and animal feed products.

42. Ireland also informed the ERT that it was not able to estimate the emissions from charcoal used only for cooking within the six-week time period required to resolve this potential problem. The Party suggested estimating the emissions from all charcoal use in Ireland as if it were used for cooking in the residential sector and providing revised emission estimates for charcoal use after further analysis of the statistical data in its 2013 annual submission. In addition, Ireland provided preliminary estimates of CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O emissions from charcoal use in the residential sector under solid biomass for all years of the time series (1990–2010). The charcoal consumption figures are based on the sum of production and imports less the exports from FAOSTAT and by applying the default EFs provided in the Revised 1996 IPCC Guidelines (table 1-7 in Volume 3 for CH<sub>4</sub> emissions, Table 1-8 in Volume 3 for N<sub>2</sub>O emissions). Given that no data were available for 1990 or 1991 from FAOSTAT, Ireland used the same value for 1990 and 1991 as for 1992, the first year of available data. The resulting emission estimates amounted to 14.15 Gg CO<sub>2</sub> eq for 1990 (0.01 per cent of total sectoral emissions), 8.98 Gg CO<sub>2</sub> eq for 2009 (0.01 per cent of total sectoral emissions) and 10.41 Gg CO<sub>2</sub> eq for 2010 (0.01 per cent of total sectoral emissions). The ERT agrees with the revised emission estimates.

#### Other transportation: liquid fuels – CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O

43. In response to a question raised by the ERT during the review on the allocation of emissions from ground activities at airports and harbours, Ireland reported that the national energy balance does not provide a breakdown of the fuel used by mobile or stationary plants at airports or harbours. The ERT considered that this implies that the fuel consumption for these activities is included elsewhere. However, the ERT noted that Ireland used the notation key "NO" to report liquid fuels in the subcategory other transportation. The ERT therefore recommends that the Party review the notation key used to report liquid fuels and, as appropriate, change the notation key from "NO" to "IE", in its next annual submission.

#### Other sectors: biomass – CH<sub>4</sub> and N<sub>2</sub>O

44. The ERT noted that the Party has reported biomass use in the subcategory agriculture/forestry/fisheries as "NO". The ERT further noted that other reporting countries with national circumstances similar to those of Ireland report biomass consumption in this subcategory. In response to a question raised by the ERT during the review, Ireland explained that, according to the energy statistics published in 2009 for the years 1990–2008, a small amount of woody biomass was used in agricultural activities in the years 2007 and 2008. SEAI investigated this issue and found that the woodchips were used in animal bedding and standoff pads (woodchip corrals) and not for combustion purposes. Based on this analysis, the woodchip use was removed from the national energy balance for 2007 onwards. The ERT welcomes this explanation and recommends that Ireland include this information in the NIR of its next annual submission. The ERT further encourages the Party to conduct periodic surveys or similar studies as the one conducted in 2009 to assess the use of biomass for combustion purposes in the subcategory agriculture/forestry/fisheries.



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

### 1. Sector overview

45. In 2010, emissions from the industrial processes sector amounted to 1,933.62 Gg CO<sub>2</sub> eq, or 3.2 per cent of total GHG emissions, and emissions from the solvent and other product use sector amounted to 71.59 Gg CO<sub>2</sub> eq, or 0.1 per cent of total GHG emissions. Since the base year, emissions have decreased by 37.3 per cent in the industrial processes sector, and decreased by 10.5 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 closure of the single nitric acid production plant in 2002, the cessation of ammonia production in 2003 and the recent economic downturn beginning in 2008.

46. Within the industrial processes sector, 67.2 per cent of the emissions were from mineral products. The remaining 32.8 per cent were from consumption of halocarbons and SF<sub>6</sub>. In terms of specific categories, 57.2 per cent of the emissions were from cement production, followed by 19.4 per cent from consumption of halocarbons and SF<sub>6</sub> in refrigeration and air-conditioning equipment, 10.0 per cent from lime production and 4.9 per cent from aerosol/metered dose inhalers. Consumption of halocarbons and SF<sub>6</sub> in semiconductor manufacture accounted for 3.9 per cent, while fire extinguishers accounted for 3.3 per cent, followed by foam blowing with 1.4 per cent. Ireland reported CH<sub>4</sub> emissions from the industrial processes sector as “NO” for the whole time series and N<sub>2</sub>O emissions from nitric acid production as “NO” for 2003 onwards, due to the cessation of nitric acid production.

47. Ireland has made recalculations for the industrial processes sector between the 2011 and 2012 annual submissions following changes in AD. The impact of these recalculations on the industrial processes sector is an increase in HFC emissions of 4.0 per cent and a decrease in SF<sub>6</sub> emissions of 41.4 per cent for 2009. As a result of the recalculations, total sectoral emissions decreased by 0.3 per cent.

48. The main recalculations took place in the following categories:

(a) HFC emissions from mobile air conditioning, refrigeration and air-conditioning equipment, foam blowing, fire extinguishers, and aerosols/metered dose inhalers: an increase in emissions of 20.14 Gg CO<sub>2</sub> eq, or 4.0 per cent;

(b) SF<sub>6</sub> emissions from semiconductor manufacture, windows/sound-proofing, double-glazed windows, and sporting goods: a decrease in emissions of 27.06 Gg CO<sub>2</sub> eq, or 41.4 per cent.

49. The Party has made minor recalculations for the solvent and other product use sector resulting in an increase in emissions of 0.01 Gg CO<sub>2</sub> eq, or 0.01 per cent, for 2009.

50. In response to recommendations in the previous review report, Ireland has improved the transparency of its NIR by providing relevant information on the AD and EFs for cement production, limestone and dolomite use, glass production and the production of bricks and tiles (see annex E to the 2012 NIR). The ERT welcomes this improvement.

51. The ERT noted that the NIR does not follow the recommended structure of the national inventory report with regard to the sector chapters<sup>7</sup> (e.g. the structure outlined for chapters 3–9). With respect to clinker production, the description of the methods, AD and EFs would be more transparent if the Party followed the recommended reporting structure. The ERT therefore reiterates the encouragement in the previous review report that Ireland

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<sup>7</sup> FCCC/SBSTA/2006/9, annex I.

use the recommended reporting structure in its next annual submission in order to increase transparency.

## 2. Key categories

### Cement production – CO<sub>2</sub>

52. CO<sub>2</sub> emissions from cement production are the largest source of GHG emissions in the industrial processes sector (amounting to 1,299.05 Gg CO<sub>2</sub> eq in 2010). The emission estimates for the period 1990–2010 are based on emissions reported by the plants. For the years 1990–2003, the plants reported their own emission estimates, which were calculated using a method based on the same assumptions used for the development of Ireland’s first national allocation plan. This method is in line with the IPCC tier 2 methodology. Emissions for the years 2004–2010 are from each plant’s reporting under the EU ETS. The estimates include the consideration of the cement kiln dust factor. However, the Party does not yet report information on the calcium oxide (CaO) and magnesium oxide (MgO) content of the clinker. The ERT therefore reiterates the recommendation in the previous review report that Ireland include information on the CaO and MgO content of the clinker in its next annual submission, in accordance with the IPCC good practice guidance.

### Consumption of halocarbons and SF<sub>6</sub> – HFCs

53. Consumption of halocarbons and SF<sub>6</sub> is a key category, both for the level and for the trend, according to CRF table 7. However, this is not consistent with the information provided in tables 1.2 and 1.3 of the NIR. The ERT recommends that Ireland cross-check the information in the CRF tables and in the NIR and make appropriate corrections in its next annual submission.

54. Ireland has followed up on several of the recommendations made in previous review reports. The recalculations made as a result of the recommendations and their impact on the emission estimates are explained in section 4.6 of the NIR. The ERT commends the Party for this improvement and encourages Ireland to include additional information from section 4.6 of the NIR (e.g. the updated disposal factor for vehicles at ‘end of life’, the revised product lifetime factor from 0.01 per cent to 0.049 per cent for fire extinguishers) in the relevant sections of the NIR where the methodological issues are described.

55. The ERT noted that Ireland still uses the notation keys “IE” and “NA” in CRF table 2(II).F to report the AD and corresponding estimates of HFC emissions from refrigeration and air-conditioning equipment, except mobile air conditioning. The emission estimates for manufacturing and for the disposal of commercial refrigeration equipment are reported as “IE” and included under “stock”, and the AD are reported as “NA”, thereby preventing the ERT from replicating the bottom-up approach. The ERT strongly reiterates the recommendation in previous review reports that Ireland investigate this matter further by reviewing the use of the notation keys for this category, in order to improve the transparency of its reporting in its next annual submission.

## 3. Non-key categories

### Limestone and dolomite use – CO<sub>2</sub>

56. In the previous review report, the ERT noted that Ireland had not provided an explanation regarding the sharp fall in CO<sub>2</sub> emissions from 2008 (2.71 Gg CO<sub>2</sub> eq) to 2009 (1.54 Gg CO<sub>2</sub> eq) (a 43.1 per cent decrease) in the NIR. The Party has not included an explanation in the 2012 NIR either. The ERT therefore reiterates the recommendation in the previous review report that Ireland include an explanation for the inter-annual fluctuation in CO<sub>2</sub> emissions, either in the introductory part of the chapter on the industrial processes

sector or at the category level, in order to improve the transparency of the NIR in its next annual submission.

## D. Agriculture

### 1. Sector overview

57. In 2010, emissions from the agriculture sector amounted to 17,909.69 Gg CO<sub>2</sub> eq, or 29.2 per cent of total GHG emissions. Since 1990, emissions have decreased by 8.8 per cent. The key drivers for the fall in emissions are the reduction in the dairy cattle population by 21.0 per cent and the sheep population by 46.2 per cent since 1990, as well as the reduction in the amount of N applied to soils from synthetic fertilizers and crop residues. Within the sector, 47.4 per cent of the emissions were from enteric fermentation, followed by 38.2 per cent from agricultural soils and 14.4 per cent from manure management. Prescribed burning of savannas, field burning of agricultural residues and rice cultivation do not occur in Ireland and were reported as “NO”.

58. Ireland has made recalculations for the agriculture sector between the 2011 and 2012 annual submissions in response to the 2010 annual review report. This has improved the consistency between the country-specific and the IPCC tier 2 methods, especially in relation to the estimates of emissions from enteric fermentation and manure management. The impact of these recalculations on the agriculture sector is an increase in CH<sub>4</sub> and N<sub>2</sub>O emissions of 72.68 Gg CO<sub>2</sub> eq, or 0.7 per cent, and 362.10 Gg CO<sub>2</sub> eq, or 5.4 per cent, respectively, for 2009. As a result of the recalculations, total sectoral emissions increased from 17,491.31 Gg CO<sub>2</sub> eq to 17,926.09 Gg CO<sub>2</sub> eq, or by 2.5 per cent, for 2009.

59. Ireland has made recalculations for the N excretion values for all livestock categories in response to the recommendations in the previous review report regarding the enhancement of consistency between the tier 2 model used to estimate CH<sub>4</sub> emissions from enteric fermentation and manure management and the N excretion values used to estimate N<sub>2</sub>O emissions from agricultural soils. In the previous annual submission, the Party used a fixed value of 85.00 kg N/head/year for dairy cattle. However, between 1990 and 2010, the milk yield per cow has increased from 4,192 kg milk/head/year to 5,322 kg milk/head/year. Ireland used the tier 2 methods provided in the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the 2006 IPCC Guidelines) to re-estimate its annual N excretion rates. The N excretion values were also updated for poultry and for some subcategories of sheep and goats. The revision of the N excretion values for livestock also led to a revised approach for the estimation of ammonia emissions. As a result, the N excretion rate for dairy cattle has increased by 6.7 per cent between 1990 (95.5 kg/head/year) and 2010 (101.9 kg/head/year). The main impact of the revision of the N excretion rates is clearly observed in the rise in N<sub>2</sub>O emissions from manure management for 2009, which increased by 26.7 per cent (from 364.68 Gg CO<sub>2</sub> eq to 462.07 Gg CO<sub>2</sub> eq).

60. Ireland has implemented most of the recommendations in the previous review reports, including the provision of N fixing and non-N fixing crop data used as the basis for the calculation of N<sub>2</sub>O emissions from agricultural soils, and the correction of the methane conversion rate value.

61. Ireland has applied one annual average population characterization for the estimation of emissions from cattle and other livestock for the first time in the 2012 annual submission. In previous annual submissions, two annual population characterizations were used (one using data collected in June and the other using data collected in December). This improvement was adopted following the EU consistency checks in 2011 through which it was discovered that the product of the animal populations and the N excretion values for dairy cattle and other cattle did not equal the sum of the animal waste management

practices provided in CRF table 4.B(b). The new annual average population is used for enteric fermentation for dairy cattle and suckler cows. However, Ireland continues to use the June census figures for all other animal categories because these account for the movement of animals from a lower age group to a higher age group during the year. The ERT agrees with the use of the June figures because they better represent the size of the population in the country.

62. The ERT noted that, in the 2012 NIR, Ireland only briefly described the methodologies used to estimate CH<sub>4</sub> emissions from enteric fermentation and manure management and did not provide the emission calculation results, although these results were reported in the CRF tables. To improve transparency, the ERT encourages Ireland to provide all necessary input parameters, together with the calculation results, in the NIR of its next annual submission.

## 2. Key categories

### Enteric fermentation – CH<sub>4</sub>

63. The ERT noted that Ireland has applied a country-specific method to calculate CH<sub>4</sub> emissions from cattle. The model used to estimate CH<sub>4</sub> emissions from dairy cattle covers 12 production systems. Separate model calculations are undertaken for each production system and a weighted average EF is then calculated using population data for each region. Each production system is defined in terms of calving date, dates of winter housing and spring turnout to grass, and milk yield and composition. With respect to milk yield and composition, monthly time steps, or parts thereof, are developed for each production system; different fat and protein contents are therefore used for each time step in each region based on the known lactation structure. The ERT found that not all of the necessary input data are provided in the 2012 annual submission and that the calculations are not replicable. In response to questions raised by the ERT during the review with regard to this issue, Ireland provided the necessary data and supporting documentation. The information provided sufficiently clarifies the method used to estimate the emissions. The ERT commends Ireland for providing this information and recommends that the Party incorporate this information in the NIR of its next annual submission, in order to improve transparency.

64. Ireland has applied a tier 1 approach to estimate CH<sub>4</sub> emissions from sheep. For lowland ewes, upland ewes, rams and sheep older than one year, the Party has used the IPCC default EF for enteric fermentation of 8 kg CH<sub>4</sub>/head/year for developed countries as per table 4-3 of the Revised 1996 IPCC Guidelines. The EF for sheep is estimated using a correction for the number of months that young animals are alive and the value of the gross energy fraction converted to CH<sub>4</sub>, as per table 4.9 of the IPCC good practice guidance. The ERT notes that it is good practice to use tier 2 methods for the key categories, and therefore reiterates the recommendation in the previous review report that Ireland investigate the possibility of developing and implementing a tier 2 approach for the calculation of CH<sub>4</sub> emissions from sheep in its next annual submission.

### Manure management – CH<sub>4</sub> and N<sub>2</sub>O<sup>8</sup>

65. The ERT appreciates the efforts made by Ireland in its 2012 annual submission to improve and provide the revised N excretion rates by applying the tier 2 methods provided

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<sup>8</sup> Not all emissions related to all gases under this category are key categories, particularly N<sub>2</sub>O emissions. However, since the calculation procedures for issues related to this category are discussed as a whole, the individual gases are not assessed in separate sections.

in the 2006 IPCC Guidelines (see para. 59 above). This has improved the consistency and comparability of the Party's emission estimates.

66. The ERT noted that, for animal categories other than dairy cattle, the Party uses fixed N excretion rates throughout the time series (1990–2010). In response to a question raised by the ERT during the review, Ireland explained that, owing to the lack of information available to estimate dynamic, year-specific N excretion rates for all other animal categories, it uses available national statistics on these animal categories. The ERT considers that for animal categories other than dairy cattle there is no convincing evidence to substantiate the use of fixed N excretion rates throughout the whole time series. The ERT strongly recommends that Ireland either substantiate the use of fixed N excretion rates in the NIR of its next annual submission, or increase its efforts to obtain the relevant AD, including the necessary input data on N excretion rates, for all animal categories other than dairy cattle, and recalculate the CH<sub>4</sub> and N<sub>2</sub>O emission estimates accordingly in its next annual submission, in order to ensure the accuracy of the emissions estimates. The ERT reiterates the recommendation in the previous review report regarding the issue of the CH<sub>4</sub> production potential of non-dairy cattle (0.24 m<sup>3</sup> CH<sub>4</sub>/kg organic matter excretion as volatile solids (VS)), namely that Ireland investigate whether the value of 0.24 m<sup>3</sup>/kg VS was obtained using standardized methods, including a sampling methodology, as prescribed in the IPCC good practice guidance.

#### Direct soil emissions – N<sub>2</sub>O

67. The ERT found an inconsistency in the values for the amount of N fixed in N-fixing crops (F<sub>BN</sub>) provided in CRF table 4.D and in table F.6 of the NIR. In response to a question raised by the ERT during the review, Ireland provided the correct values for F<sub>BN</sub>, which should have been provided in the NIR for the full time series. Ireland also explained that the value provided in table F.6 of the NIR for F<sub>BN</sub> is in fact the emission value and not the F<sub>BN</sub> value. The ERT recommends that Ireland correct this error in its next annual submission.

### **3. Non-key categories**

#### Field burning of agricultural residues – CH<sub>4</sub> and N<sub>2</sub>O

68. The burning of agricultural residues does not occur in Ireland as a result of the requirements imposed on farmers/agricultural enterprises, which receive subsidies. These requirements include, for example, Area Aid, the Rural Environment Protection Scheme and the Cross Compliance Measures under the Single Farm Payment.<sup>9</sup> During the review, the ERT accessed the web resources provided by the Party and found that under the Rural Environment Protection Scheme the ban on the burning of straw, stubble and vegetation was indeed explicitly mentioned. However, these measures are applied on a voluntary basis and data on farmer participation indicated a rate of approximately 50 per cent (information available for 2005 only). Spot and planned burnings for management purposes are still allowed. Based on this information, the ERT concludes that, to some extent, field burning of agricultural residues is still being practised in Ireland, and strongly recommends that the Party further clarify, in its next annual submission, whether all farmers have participated in the implementation of these measures. If it is found that field burning of agricultural residues takes place in the country, the ERT strongly recommends that Ireland estimate the associated emissions and report them in its next annual submission.

<sup>9</sup> Details of the Rural Environment Protection Scheme and the Cross Compliance Measures under the Single Farm Payment can be found at <http://www.agriculture.gov.ie/farmerschemespayments/ruralenvironmentprotectionschemereps/overviewofreps/> and at <http://www.agriculture.gov.ie/farmerschemespayments/crosscompliance/>.

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

### 1. Sector overview

69. In 2010, net removals from the LULUCF sector amounted to 1,030.41 Gg CO<sub>2</sub> eq, offsetting 1.7 per cent of Ireland's total GHG emissions. Between 1990 and 1997, the LULUCF sector was a net source of emissions, while it was a net sink of carbon in most years thereafter, with removals increasing substantially towards the end of the reported time series. Since 1990, net removals have increased by 611.7 per cent. The key drivers for the rise in removals are: the increase in removals from forest land (by 1,000.24 Gg CO<sub>2</sub> eq between 1990 and 2010); and the decrease in emissions from grassland (by 285.08 Gg CO<sub>2</sub> eq between 1990 and 2010). The categories representing the most significant emission sources are carbon emissions from soils in land converted to forest land; and agricultural lime application on grassland and cropland. Within the sector, net removals of 1,371.23 Gg were from forest land, followed by 183.26 Gg from other land; and net emissions of 252.44 Gg were from cropland, followed by 208.50 Gg from grassland. Wetlands accounted for net emissions of 39.81 Gg and settlements accounted for net emissions of 23.33 Gg.

70. Ireland has made recalculations for the LULUCF sector between the 2011 and 2012 annual submissions due to methodological improvements and in response to recommendations made in the 2011 annual review report. The impact of these recalculations on the LULUCF sector is a decrease in net removals of 1137.39 Gg CO<sub>2</sub> eq, or 52.3 per cent, for 2009.

71. The main recalculations took place in the following categories:

(a) Forest land: a decrease in estimated net removals of 1,209.49 Gg CO<sub>2</sub> eq, or 45.0 per cent, for 2009;

(b) Cropland: a decrease in estimated net emissions of 228.44 Gg CO<sub>2</sub> eq, or 23.0 per cent, for 2009;

(c) Other land: an increase in estimated net removals of 132.94 Gg CO<sub>2</sub> eq, or 818.1 per cent, for 2009.

72. Ireland conducted a major review of the CARBWARE model<sup>10</sup> in 2011 for the reporting under the Convention. A number of coding errors were discovered and corrected and, as a result, it is now possible to demonstrate consistency between the total areas reported for all land uses in the CRF tables and the annual land-use change matrix. The ERT welcomes these improvements made by the Party.

73. The ERT notes that the Party uses different versions of the CARBWARE model to estimate emissions and removals from LULUCF sinks and sources under the Convention and its Kyoto Protocol. In response to questions raised by the ERT during the review, Ireland indicated that the Kyoto Protocol version provides more accurate estimates of the carbon stock changes for all pools based on NFI data, completed for the first time in 2006. This version could not be applied to reporting areas under the Convention because there is no historic NFI information prior to 2006. Therefore, a volume-based assessment of biomass is conducted for the reporting under the Convention. The carbon stock changes in forest biomass estimated for the reporting under the Convention are lower than those reported for forests under the Kyoto Protocol because of the underestimation of the volume in young crops less than seven years old. The Party conservatively assumes that there are zero carbon stock changes in these crops because there is no detectable volume increment.

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<sup>10</sup> The CARBWARE model uses species information from the FIPS95 data set and applies species-specific forestry commission yield tables to derive the stand volume, which is converted to biomass. The model also estimates the DOM (litter and dead wood) using country-specific methods.

The same assumption is applied to the carbon stock changes in dead organic matter (DOM) for the reporting under the Convention to ensure consistency with the methodologies used for the estimation of biomass. The method used to report the soil carbon stock changes is the same both under the Convention and under the Kyoto Protocol. It is envisaged that the model versions used for the reporting under the Convention and its Kyoto Protocol will be harmonized once the second NFI is completed in 2013. The ERT recommends that, in the next annual submission and until the next NFI is completed, the Party use the Kyoto Protocol version of the CARBWARE model for the reporting under the Convention, using backcasting techniques, as necessary, for the years prior to 2006. The ERT further recommends that Ireland continue its work to harmonize the methods used for estimating the emissions and removals reported under the Convention and its Kyoto Protocol.

74. In response to recommendations in the previous review report, the Party has made some significant modifications regarding the treatment of areas and other parameters in order to be as consistent as possible in the reporting of emissions and removals under the Convention and under the Kyoto Protocol, specifically for the category forest land. The ERT commends the improvements made by the Party, such as the more extensive use of NFI data and the enhanced QA/QC procedures.

## 2. Key categories

### Land converted to forest land – CO<sub>2</sub>

75. Ireland divides its forest land into three subcategories: young (seven to 25 years), mature (older than 25 years) and unclassified clear felled areas (containing afforested and forested areas younger than seven years and areas without tree cover). The ERT noted that the previous review report recommended that Ireland use the area that was afforested and reforested 26 years before the year in which the accretion area is added as the annual accretion to the mature forest category. In response to a question raised by the ERT during the review regarding the timing of the addition of the accretion area, Ireland clarified that the assumption used to assign forest areas for the 2012 annual submission is that 5 per cent of the young crop category moves into the mature category each year. This means that there is a full turnover of these forest plantations every 20 years. In this way, the time series of forest strata by area and age for the years 1990–2010 was constructed using information from the Forest Information Planning System base year of 1995. For the years 1996–2010, data were obtained by accounting for annual changes in area per species, while for the years 1990–1994, the process was reversed using a backward extrapolation to obtain consistent time-series data. The ERT welcomes this clarification and recommends that the Party clearly explain this issue in its next annual submission.

### Grassland remaining grassland – N<sub>2</sub>O

76. The ERT noted that the areas reported in NIR table 7.4 for 2010 for grassland remaining grassland (3,787.80 kha) are inconsistent with those reported in CRF table 5.C (3,733.45 kha). The ERT recommends that Ireland ensure the consistency of this information in the CRF tables and in the NIR for all years in its next annual submission.

77. The ERT noted that N<sub>2</sub>O emissions from grassland have been reported in NIR table 7.1, while in CRF tables 5 and 5.C they have been reported as “NO”. However, no additional explanation has been provided regarding the subcategory under which these emissions are reported or justification for the use of the notation key “NO”. The ERT recommends that Ireland provide clear explanations of where these emissions have been reported in its next annual submission.

### 3. Non-key categories

#### Other land – CO<sub>2</sub>

78. The impact of the recalculations made by Ireland for this category is a continuous increase in net removals across the time series since 2002 (e.g. an increase of 132.94 Gg CO<sub>2</sub> eq, or 818.1 per cent, for 2009). Although this increase could be largely explained by the conversion of 313.15 kha of grassland to other land in 2010, the ERT noted that the area of grassland converted to other land reported in NIR table 7.4 (74.58 kha) and in the CRF tables is inconsistent. The ERT recommends that Ireland cross-check the information in the NIR and in the CRF tables and, as appropriate, revise the calculations for the time series in its next annual submission.

79. In the previous review report, the ERT noted that, inconsistent with the IPCC good practice guidance for LULUCF, the areas of natural grassland that are an available reserve for rough grazing but that are not grazed in the inventory year were reported under the land-use category other land. The ERT reiterates the recommendation in the previous review report that Ireland introduce natural grassland areas as a subdivision of the land-use category grassland, in its next annual submission.

## F. Waste

### 1. Sector overview

80. In 2010, emissions from the waste sector amounted to 888.74 Gg CO<sub>2</sub> eq, or 1.4 per cent of total GHG emissions. Since 1990, emissions have decreased by 31.7 per cent. The key driver for the decrease in emissions is the 38.0 per cent decline in CH<sub>4</sub> emissions from managed waste disposal sites owing to increased CH<sub>4</sub> recovery (from 9 per cent in 1996, when the practice was introduced, to 72 per cent in 2010). Within the sector, 81.9 per cent of the emissions were from solid waste disposal on land, followed by 18.1 per cent from wastewater handling. Emissions from waste incineration were reported as not occurring.

81. The Party has made recalculations for the waste sector between the 2011 and 2012 annual submissions following changes in AD. The impact of these recalculations on the waste sector is a decrease in emissions of 26.3 per cent for 2009. The main recalculation took place in the category solid waste disposal on land following a validation exercise that led to refined values for CH<sub>4</sub> recovery (a reduction of 327.03 Gg CO<sub>2</sub> eq, or 35.6 per cent for 2009).

### 2. Key categories

#### Solid waste disposal on land – CH<sub>4</sub>

82. Ireland used a tier 2 method to estimate CH<sub>4</sub> emissions from solid waste disposal on land, which is in line with the IPCC good practice guidance. A combination of IPCC default and country-specific EFs were used in this category and default degradable organic carbon (DOC) values from the 2006 IPCC Guidelines were used for the different waste types (wood and straw, and textiles). However, the ERT noted that the Party did not provide documentation justifying the appropriateness of the default values from the 2006 IPCC Guidelines for the national circumstances of Ireland. The ERT recommends that the Party provide such documentation in its next annual submission, in order to improve transparency.

83. Ireland used a combination of decay constants (k) for different waste types, which required historical data for three to five half-lives for each waste type. In the NIR, the Party did not provide information on the historical time series for each of the model runs, as



raised in the recommendations in previous review reports. However, in response to questions raised by the ERT during the review, the Party provided additional information on the generation of the time series for each model run. The ERT recommends that the Party incorporate this additional information in its next annual submission.

84. Ireland uses waste composition data from national statistics to quantify the fractional distribution of waste between food waste, paper, wood and straw, textiles and disposable nappies in order to assign different DOC and methane conversion factor values for each waste type. The Party did not provide any information in the NIR on the source of the AD for garden waste. In response to a question raised by the ERT during the review, the Party provided additional information showing that the organic waste reported in national statistics is biodegradable food, garden and landscaping waste, and, where the context permits, also includes industrial organic sludges. For the purposes of emission estimates, organic waste is classified as food, as that is the largest proportion of organic material, and no further information on the composition of organic waste is available. The ERT recommends that Ireland provide information on the composition of organic waste (in terms of food, straw, wood, etc.), for the purpose of assigning input parameters for the first-order decay method, in its next annual submission, in order to improve the accuracy of its inventory.

### 3. Non-key categories

#### Wastewater handling – CH<sub>4</sub> and N<sub>2</sub>O

85. As also noted in the previous review report, Ireland has reported CH<sub>4</sub> emissions from septic tanks as “NO” and, as per the recommendation in the previous review report, the Party has provided detailed documentation on the prevailing soil temperatures in Ireland (below 15 °C), which inhibit the process of methanogenesis that produces CH<sub>4</sub> emissions. The ERT welcomes the additional information and appreciates this improvement in the completeness of the Party’s reporting.

#### Waste incineration – CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O

86. Ireland reported waste incineration as “NO” in the 2012 annual submission. In response to a question raised by the ERT during the review, the Party provided additional information regarding an estimated quantity of about 4,000 t/year of clinical waste that was incinerated between the years 1990 and 1997. The Party also explained that there was no information on the proportion of biogenic and non-biogenic waste in the incinerated clinical waste. The ERT strongly recommends that the Party provide estimates for the emissions from waste incineration in its next annual submission, in order to ensure the completeness and accuracy of its inventory.

## 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

87. Ireland has accounted for all mandatory activities under Article 3, paragraph 3, of the Kyoto Protocol (afforestation and reforestation, and deforestation). The Party has elected not to account for activities under Article 3, paragraph 4, of the Kyoto Protocol. For afforestation and reforestation, and deforestation, Ireland has reported estimates for all five carbon pools and for other emissions due to liming and biomass burning. All supplementary

information requested in paragraphs 5–9 of the annex to decision 15/CMP.1 has been reported. Ireland has chosen to account for the KP-LULUCF activities at the end of the commitment period.

88. The ERT noted that Ireland has improved the accuracy of the total area of land in the time series, thereby addressing the recommendation made in the previous review report. However, the ERT found the following inconsistencies in the AD reported in CRF table NIR-2:

(a) The total area reported for afforestation and reforestation at the beginning of 2009 (264,932 ha) does not match the total area reported at the end of 2008 (264,880 ha);

(b) The total area reported for afforestation and reforestation at the beginning of 2010 (271,414 ha) does not match the total area reported at the end of 2009 (271,382 ha).

89. The ERT recommends that Ireland improve the accuracy of the time series of AD for afforestation and reforestation activities and that the Party report a consistent land representation of areas subject to afforestation and reforestation, and deforestation in its next annual submission.

90. Ireland has made recalculations for the KP-LULUCF activities between the 2011 and 2012 annual submissions in response to the 2011 annual review report, following changes in AD and EFs, and in order to rectify identified errors. The impact of these recalculations on each KP-LULUCF activity for 2009 is as follows:

(a) Afforestation and reforestation: a decrease in net removals of 1.51 Gg CO<sub>2</sub> eq, or 0.1 per cent;

(b) Deforestation: an increase in net emissions of 0.86 Gg CO<sub>2</sub> eq, or 2.5 per cent.

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

##### *Afforestation and reforestation – CO<sub>2</sub>*

91. To address the recommendation in the previous review report, Ireland has incorporated the effect of forest fires into the CARBWARE model by including the direct effect of wildfires on DOM in the oxidation of biomass, based on the mean DOM carbon (C) stock (per ha) for Sitka spruce forest (yield class 16), which is the most representative forest type in Ireland. The mean C stock for DOM over one rotation up to 50 years is 10.2 t C/ha, equivalent to 20,400 kg biomass/ha. Emissions from soils are assumed to be negligible and were reported as “NO”. Consequently, emissions from forest fires were recalculated for the 2012 annual submission to account for emissions from the DOM pool structure.

92. The ERT notes that the AD used to derive the estimates for afforestation activities under the Kyoto Protocol vary considerably to those used for lands converted to forest land. The major difference is that, in the reporting under the Kyoto Protocol, the Party uses the latest NFI data to derive the carbon stock change using biomass algorithms. In addition, dead wood carbon is also estimated in the reporting under the Kyoto Protocol because the NFI data contain dead wood measurements, while a tier 1 approach is adopted for the reporting under the Convention. According to the NIR, the methods could not be harmonized because no AD exist to enable the estimation of the historic time series 1990–2010. However, as explained in chapter 7 of the NIR, the methods will be harmonized once the next NFI cycle is completed in 2013. The ERT encourages the Party to include information on this harmonization in its next annual submission.

*Deforestation – CO<sub>2</sub>*

93. The ERT reiterates the recommendation in the previous review report that Ireland provide, in its next annual submission, estimates of the carbon stock changes in soil organic matter for mineral soils in forest land converted either to settlements or to other land, or demonstrate that this pool is not a net source.

## 2. Information on Kyoto Protocol units

### Standard electronic format and reports from the national registry

94. 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.<sup>11</sup> The SIAR was forwarded to the ERT prior to the review, pursuant to decision 16/CP.10. The ERT reiterated the main findings contained in the SIAR.

95. Information on the accounting of Kyoto Protocol units has been prepared and reported in accordance with decision 15/CMP.1, annex, chapter I.E, 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 referred to in decision 22/CMP.1, annex, paragraph 88(a–j). The transactions of Kyoto Protocol units initiated by the national registry are in accordance with the requirements of the annex to decision 5/CMP.1 and the annex to decision 13/CMP.1. No discrepancy has been identified by the ITL and no non-replacement has occurred. The national registry has adequate procedures in place to minimize discrepancies.

### National registry

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

### Calculation of the commitment period reserve

97. Ireland has reported its commitment period reserve in its 2012 annual submission. The Party reported that its commitment period reserve has not changed since the initial review report (282,765,845 t CO<sub>2</sub> eq) as it is based on the assigned amount and not the most recently reviewed inventory. The ERT agrees with this figure.

## 3. Changes to the national system

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

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<sup>11</sup> 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.

#### **4. Changes to the national registry**

99. Ireland reported that there have been changes to its national registry since the previous annual submission, mainly in relation to changes to the contacts, and software upgrades to improve functionality and security. In particular, in order to improve performance and reliability, the processing of message flows for external transfers has been modified; the new message flow introduces an additional step that marks the transaction and unit blocks as “proposed” in the acquiring registry until that registry has confirmed acceptance of the unit blocks and the ITL has completed the transaction. The ERT concluded that, taking into account the confirmed changes to the national registry, Ireland’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**

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

101. Ireland underlines that, as a member State of the EU, the minimization of adverse impacts on developing countries is largely dictated by the European Commission’s policy on climate change and by its policies and programmes affecting developing countries. Further, regulation at the EU level also controls or influences market conditions, fiscal incentives, tax and duty exemptions and subsidies in all economic sectors in member States. An impact assessment of new policy initiatives has been established in the EU, which allows their potential adverse social, environmental and economic impacts on various stakeholders, including developing country Parties, to be identified and limited at an early stage within the legislative process.

102. In addition, in the NIR, Ireland lists a series of country-specific national measures that limit subsidies, and the Party has deregulated many segments of the national economy, (e.g. electricity production, subsidies in the agriculture sector). Further, several cooperative initiatives with Parties not included in Annex I to the Convention (non-Annex I Parties) are reported in the NIR, such as the diffusion of new technologies and efficiency improvements related to fossil fuel use.

### **III. Conclusions and recommendations**

#### **A. Conclusions**

103. Ireland made its annual submission on 13 April 2012. The annual submission contains the GHG inventory (comprising CRF tables and an NIR) and supplementary information under Article 7, paragraph 1, of the Kyoto Protocol (information on: activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, Kyoto Protocol units and changes to the national system and the national registry, and the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol. This is in line with decision 15/CMP.1.

104. The ERT concludes that the inventory submission of Ireland has been prepared and reported in accordance with 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”. The inventory submission is complete and the Party has submitted a complete set of CRF tables for the years 1990–2010 and an NIR; these are complete in terms of geographical coverage, years and sectors, as well as complete in terms of categories and gases.

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

106. Ireland’s inventory is in line with the Revised 1996 IPCC Guidelines, the IPCC good practice guidance and the IPCC good practice guidance for LULUCF. The ERT commends Ireland for having improved the uncertainty analysis for LULUCF, including the additional disaggregation of categories.

107. Ireland has made recalculations for the inventory between the 2011 and 2012 annual submissions following changes in AD and EFs. The impact of these recalculations on the national totals is a decrease in emissions of 1.1 per cent for 2009. The main recalculations took place in the following categories:

(a) CH<sub>4</sub> and N<sub>2</sub>O emissions from energy industries: an increase in emissions of 0.05 per cent, or 6.09 Gg CO<sub>2</sub> eq;

(b) CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O emissions from manufacturing industries and construction: a decrease in emissions of 2.6 per cent, or 117.63 Gg CO<sub>2</sub> eq;

(c) CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O emissions from transport: a decrease in emissions of 4.5 per cent, or 595.45 Gg CO<sub>2</sub> eq;

(d) HFC emissions from mobile air conditioning, refrigeration and air-conditioning equipment, foam blowing, fire extinguishers, and aerosols/metered dose inhalers: an increase in emissions of 4.0 per cent, or 20.14 Gg CO<sub>2</sub> eq;

(e) SF<sub>6</sub> emissions from semiconductor manufacture, windows/sound-proofing, double-glazed windows, and sporting goods: a decrease in emissions of 0.04 per cent, or 27.06 Gg CO<sub>2</sub> eq;

(f) N<sub>2</sub>O emissions from manure management: an increase in emissions of 26.7 per cent, or 97.39 Gg CO<sub>2</sub> eq;

(g) Forest land: a decrease in estimated net removals of 45.0 per cent, or 1,209.49 Gg CO<sub>2</sub> eq;

(h) Cropland: a decrease in estimated net emissions of 23.0 per cent, or 228.44 Gg CO<sub>2</sub> eq;

(i) Other land: an increase in estimated net removals of 818.1 per cent, or 132.94 Gg CO<sub>2</sub> eq;

(j) Solid waste disposal on land: a decrease in emissions of 30.2 per cent, or 327.03 Gg CO<sub>2</sub> eq.

108. Ireland has opted to account for activities under Article 3, paragraph 3, of the Kyoto Protocol at the end of the commitment period and has elected not to account for activities under Article 3, paragraph 4, of the Kyoto Protocol. For afforestation and deforestation Ireland reported removal/emission estimates for all five carbon pools and for other emissions due to liming and biomass burning. All supplementary information requested by paragraphs 5–9 of the annex to decision 15/CMP.1 has been reported.

109. The Party has made recalculations for the KP-LULUCF activities between the 2011 and 2012 annual submissions in response to the 2011 annual review report, following changes in AD and EFs, and in order to rectify identified errors. The impact of these recalculations on each KP-LULUCF activity for 2009 is as follows:

- (a) Afforestation and reforestation: a decrease in net removals of 0.1 per cent, or 1.51 Gg CO<sub>2</sub> eq;
- (b) Deforestation: an increase in net emissions of 2.5 per cent, or 0.86 Gg CO<sub>2</sub> eq.

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

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

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

113. Ireland has reported information under decision 15/CMP.1, annex, chapter I.H, “Minimization of adverse impacts in accordance with Article 3, paragraph 14” as part of its 2012 annual submission. This information was provided on 13 April 2012 and is considered complete and transparent.

## B. Recommendations

114. The ERT identifies issues for improvement as listed in table 6 below. The recommendations are to be implemented in the next annual submission, unless otherwise specified.

Table 6  
**Recommendations identified by the expert review team**

<i>Sector</i>	<i>Category</i>	<i>Recommendation</i>	<i>Paragraph reference</i>
General	Follow-up to previous reviews	Report on the changes made following the recommendations contained in the 2011 and 2012 annual review reports	26
Energy	Sector overview	Provide information on the category-specific QA/QC measures	33
	Reference and sectoral approaches	Improve the time-series consistency of data on civil aviation consumption produced by different national entities	35
	International bunker fuels – CH <sub>4</sub> and N <sub>2</sub> O	Estimate and report CH <sub>4</sub> and N <sub>2</sub> O emissions from marine bunker fuel use	36
	Other transportation: liquid fuels – CO <sub>2</sub> ,	Use the appropriate notation key to report emissions from ground activities at airports and harbours	43

<i>Sector</i>	<i>Category</i>	<i>Recommendation</i>	<i>Paragraph reference</i>
	CH <sub>4</sub> and N <sub>2</sub> O		
	Other sectors: biomass – CH <sub>4</sub> and N <sub>2</sub> O	Include information on the use of woody biomass for agricultural activities in the NIR	44
Industrial processes	Cement production – CO <sub>2</sub>	Include information on the calcium oxide and magnesium oxide content of the clinker	52
	Consumption of halocarbons and SF <sub>6</sub> – HFCs	Cross-check the information in the CRF tables and in the NIR and make appropriate corrections	53
		Improve the transparency of the reporting by reviewing the use of the notation keys	55
	Limestone and dolomite use – CO <sub>2</sub>	Include an explanation for the inter-annual fluctuation in emissions, either in the introductory part of the chapter on the industrial process sector or at the category level, in order to improve transparency	56
Agriculture	Enteric fermentation – CH <sub>4</sub>	Provide all necessary data and supporting documentation in the NIR of the next annual submission to sufficiently clarify the method used to estimate the emissions	63
		Investigate the possibility of developing and implementing a tier 2 approach for the calculation of CH <sub>4</sub> emissions from sheep	64
	Manure management – CH <sub>4</sub> and N <sub>2</sub> O	Either substantiate the use of fixed nitrogen excretion rates or increase efforts to obtain the relevant AD and necessary input data on estimated nitrogen excretion rates for all animal categories other than dairy cattle	66
		Investigate whether the value of 0.24 m <sup>3</sup> /kg volatile solids was obtained using standardized methods, including a sampling methodology, as prescribed in the <i>IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories</i>	66
	Direct soil emissions – N <sub>2</sub> O	Correct the error in the value of the fraction of crop residue burned	67
	Field burning of agricultural residues – CH <sub>4</sub> and N <sub>2</sub> O	Estimate emissions from field burning of agricultural residues	68
LULUCF	Sector overview	Until the next national forest inventory is completed, use the Kyoto Protocol version of the CARBWARE model for the reporting under the Convention, using backcasting techniques, as necessary, for the years prior to 2006	73
		Continue work to harmonize the methods used for estimating the emissions and removals reported under	73

<i>Sector</i>	<i>Category</i>	<i>Recommendation</i>	<i>Paragraph reference</i>
		the Convention and its Kyoto Protocol	
	Land converted to forest land – CO <sub>2</sub>	Clarify the assumptions used for the addition of the accretion area	75
	Grassland – N <sub>2</sub> O	Ensure the consistency of the information on areas of grassland between the CRF tables and the NIR	76
		Provide clear explanations of where grassland emissions have been reported	77
	Other land – CO <sub>2</sub>	Cross-check the information in the NIR and in the CRF tables and, as appropriate, revise the calculations for the time series	78
		Introduce natural grassland areas as a subdivision of the land-use category grassland	79
Waste	Solid waste disposal on land – CH <sub>4</sub>	Provide documentation justifying the use of the IPCC default degradable organic carbon values from the <i>2006 IPCC Guidelines for National Greenhouse Gas Inventories</i> for wood and straw, and textiles	82
		Provide additional information on the generation of the time series for each model run	83
		Provide information on the composition of organic waste (in terms of food, straw, wood, etc.) for the purpose of assigning input parameters for the first order decay method	84
	Waste incineration – CO <sub>2</sub> , CH <sub>4</sub> and N <sub>2</sub> O	Provide estimates for the emissions from waste incineration	86
KP-LULUCF	Overview	Improve the accuracy of the time series of AD for afforestation and reforestation activities and report a consistent land representation of areas subject to afforestation and reforestation, and deforestation	89
	Deforestation – CO <sub>2</sub>	Provide estimates of the carbon stock changes in soil organic matter for mineral soils in forest land converted either to settlements or to other land, or demonstrate that this pool is not a net source.	93

*Abbreviations:* AD = activity data, CRF = common reporting format, 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, LULUCF = land use, land-use change and forestry, NIR = national inventory report, QA/QC = quality assurance/quality control.

#### IV. Questions of implementation

115. 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>>.

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**B. Additional information provided by the Party**

Responses to questions during the review were received from Mr. Paul Duffy, Ms. Eimear Cotter and Mr. Bernard Hyde (Environmental Protection Agency of Ireland), including additional material on the methodologies and assumptions used.

## Annex II

### Acronyms and abbreviations

AD	activity data
C	carbon
CaO	calcium oxide
CH <sub>4</sub>	methane
CMP	Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol
CO <sub>2</sub>	carbon dioxide
CO <sub>2</sub> eq	carbon dioxide equivalent
CRF	common reporting format
CSO	Central Statistical Office
DCENR	Department of Communications, Energy and Natural Resources
DOC	degradable organic carbon
DOM	dead organic matter
EF	emission factor
EPA	Environmental Protection Agency
ERT	expert review team
EU	European Union
EU ETS	European Union Emissions Trading System
F <sub>BN</sub>	amount of nitrogen fixed in nitrogen-fixing crops
FAOSTAT	statistical database of the Food and Agriculture Organization of the United Nations
GHG	greenhouse gas; unless indicated otherwise, GHG emissions are the sum of CO <sub>2</sub> , CH <sub>4</sub> , N <sub>2</sub> O, HFCs, PFCs and SF <sub>6</sub> without GHG emissions and removals from LULUCF
HFCs	hydrofluorocarbons
IE	included elsewhere
IEA	International Energy Agency
IPCC	Intergovernmental Panel on Climate Change
ITL	international transaction log
kg	kilogram (1 kg = 1,000 grams)
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
m <sup>3</sup>	cubic metre
MgO	magnesium oxide
N	nitrogen
N <sub>2</sub> O	nitrous oxide
NA	not applicable
NE	not estimated
NFI	national forest inventory
NIR	national inventory report
NO	not occurring
OCLR	Office of Climate, Licensing and Resource Use of EPA
PFCs	perfluorocarbons
QA/QC	quality assurance/quality control
SEAI	Sustainable Energy Authority of Ireland
SEF	standard electronic format
SF <sub>6</sub>	sulphur hexafluoride

SIAR	standard independent assessment report
TJ	terajoule (1 TJ = 10 <sup>12</sup> joule)
UNFCCC	United Nations Framework Convention on Climate Change
VS	volatile solids

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