



**Report of the individual review of the annual submission of Austria  
submitted in 2012**

**Note by the secretariat**

The report of the individual review of the annual submission of Austria submitted in 2012 was published on 15 January 2013. For purposes of rule 10, paragraph 2, of the rules of procedure of the Compliance Committee (annex to decision 4/CMP.2, as amended by decision 4/CMP.4), the report is considered received by the secretariat on the same date. This report, FCCC/ARR/2012/AUT, contained in the annex to this note, is being forwarded to the Compliance Committee in accordance with section VI, paragraph 3, of the annex to decision 27/CMP.1.





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

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## I. Introduction and summary

1. This report covers the centralized review of the 2012 annual submission of Austria, coordinated by the UNFCCC secretariat, in accordance with decision 22/CMP.1. The review took place from 10 to 15 September 2012 in Bonn, Germany, and was conducted by the following team of nominated experts from the UNFCCC roster of experts: generalists – Ms. Suvi Monni (Finland) and Mr. Justin Goodwin (United Kingdom of Great Britain and Northern Ireland); energy – Mr. Peter Seizov (Bulgaria), Ms. Rianne Dröge (Netherlands) and Mr. Ali Can (Turkey); industrial processes – Mr. Mauro Meirelles de Oliveira Santos (Brazil) and Mr. Cheon-Hee Bang (Republic of Korea); agriculture – Mr. Sorin Deaconu (Romania) and Mr. Mahmoud Medany (Egypt); land use, land-use change and forestry (LULUCF) – Mr. Kevin Black (Ireland), Mr. Atsushi Sato (Japan) and Mr. Erik Karlton (Sweden); and waste – Ms. Juliana Boateng (Ghana) and Mr. Qingxian Gao (China). Mr. Goodwin and Mr. Meirelles de Oliveira Santos were the lead reviewers. The review was coordinated by Mr. Matthew Dudley (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 Austria, 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 Austria was carbon dioxide (CO<sub>2</sub>), accounting for 85.5 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>) (6.6 per cent) and nitrous oxide (N<sub>2</sub>O) (6.1 per cent). Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF<sub>6</sub>) collectively accounted for 1.9 per cent of the overall GHG emissions in the country. The energy sector accounted for 76.0 per cent of total GHG emissions, followed by the industrial processes sector (12.6 per cent), the agriculture sector (8.8 per cent), the waste sector (2.1 per cent) and the solvent and other product use sector (0.4 per cent). Total GHG emissions amounted to 84,593.94 Gg CO<sub>2</sub> eq and increased by 13.4 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 all gases. 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>	62 059.59	62 059.59	63 943.97	65 972.21	79 723.89	73 921.54	67 225.70	72 290.47	16.5
	CH <sub>4</sub>	8 304.66	8 304.66	7 618.18	6 625.71	6 094.53	5 731.45	5 663.35	5 574.51	–32.9
	N <sub>2</sub> O	6 198.25	6 198.25	6 606.82	6 289.48	5 433.59	5 688.19	5 409.51	5 153.46	–16.9
	HFCs	26.32	26.32	411.88	901.85	986.36	1 057.99	1 056.61	1 160.63	4 309.5
	PFCs	1 079.24	1 079.24	71.27	84.79	133.82	173.53	35.05	69.85	–93.5
	SF <sub>6</sub>	494.28	494.28	1 154.06	595.54	507.33	382.84	349.14	345.01	–30.2
KP-LULUCF	Article 3.3 <sup>b</sup>	CO <sub>2</sub>					–1 126.84	–1 230.64	–1 258.85	
		CH <sub>4</sub>					NO	NO	NO	
		N <sub>2</sub> O					0.003	0.00	0.00	
	Article 3.4 <sup>c</sup>	CO <sub>2</sub>	NA	NA			NA	NA	NA	NA
		CH <sub>4</sub>	NA	NA			NA	NA	NA	NA
		N <sub>2</sub> O	NA	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, NO = not occurring.

<sup>a</sup> “Base year” for Annex A sources refers to the base year under the Kyoto Protocol, which is 1990 for all gases. The “base year” for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol is 1990.

<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

		<i>Gg CO<sub>2</sub> eq</i>								<i>Change</i>	
<i>Sector</i>		<i>Base year<sup>d</sup></i>	<i>1990</i>	<i>1995</i>	<i>2000</i>	<i>2005</i>	<i>2008</i>	<i>2009</i>	<i>2010</i>	<i>Base year–2010 (%)</i>	
Annex A	Energy	55 396.89	55 396.89	57 669.86	59 250.78	72 112.85	65 000.43	60 219.86	64 327.66	16.1	
	Industrial processes	10 108.40	10 108.40	9 896.75	10 324.58	10 623.26	11 910.82	9 675.39	10 680.47	5.7	
	Solvent and other product use	511.80	511.80	422.45	425.12	386.59	367.24	299.16	327.12	–36.1	
	Agriculture	8 557.96	8 557.96	8 720.66	7 910.93	7 412.12	7 647.15	7 631.63	7 452.64	–12.9	
	Waste	3 587.28	3 587.28	3 096.47	2 558.17	2 344.70	2 029.90	1 913.30	1 806.05	–49.7	
	LULUCF	NA	–10 022.56	–11 597.40	–15 035.87	–7 395.44	385.02	–3 644.48	–3 610.72	NA	
<b>Total (with LULUCF)</b>		<b>NA</b>	<b>68 139.78</b>	<b>68 208.78</b>	<b>65 433.72</b>	<b>85 484.08</b>	<b>87 340.55</b>	<b>76 094.87</b>	<b>80 983.22</b>	<b>NA</b>	
<b>Total (without LULUCF)</b>		<b>78 162.33</b>	<b>78 162.33</b>	<b>79 806.18</b>	<b>80 469.58</b>	<b>92 879.51</b>	<b>86 955.53</b>	<b>79 739.35</b>	<b>84 593.94</b>	<b>8.2</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					–2 488.47	–2 608.25	–2 620.86		
		Deforestation					1 361.63	1 377.60	1 362.00		
		<b>Total (3.3)</b>					<b>–1 126.84</b>	<b>–1 230.64</b>	<b>–1 258.85</b>		
	Article 3.4 <sup>d</sup>	Forest management						NA	NA	NA	
		Cropland management	NA	NA				NA	NA	NA	NA
		Grazing land management	NA	NA				NA	NA	NA	NA
		Revegetation	NA	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>	<b>NA</b>	

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

<sup>a</sup> “Base year” for Annex A sources refers to the base year under the Kyoto Protocol, which is 1990 for all gases. The “base year” for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol is 1990.

<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, and 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>	309 479 408			309 479 408
<b>Annex A emissions for current inventory year</b>				
CO <sub>2</sub>	72 290 471			72 290 471
CH <sub>4</sub>	5 574 512			5 574 512
N <sub>2</sub> O	5 153 464			5 153 464
HFCs	1 160 634			1 160 634
PFCs	69 846			69 846
SF <sub>6</sub>	345 012			345 012
<b>Total Annex A sources</b>	<b>84 593 939</b>			<b>84 593 939</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	-2 620 855			-2 620 855
33.3 Afforestation and reforestation on harvested land for current year of commitment period as reported		NO		NO
3.3 Deforestation for current year of commitment period as reported	1 362 005			1 362 005
<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				

*Abbreviation:* NO = not occurring.

<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>	67 225 695			67 225 695
CH <sub>4</sub>	5 663 347			5 663 347
N <sub>2</sub> O	5 409 505			5 409 505
HFCs	1 056 614			1 056 614
PFCs	35 046			35 046
SF <sub>6</sub>	349 142			349 142
<b>Total Annex A sources</b>	<b>79 739 349</b>			<b>79 739 349</b>
<b>Activities under Article 3, paragraph 3, for 2009</b>				
3.3 Afforestation and reforestation on non-harvested land for 2009 as reported	-2 608 246			-2 608 246
3.3 Afforestation and reforestation on harvested land for 2009 as reported		NO		NO
3.3 Deforestation for 2009 as reported	1 377 605			1 377 605
<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				

*Abbreviation:* NO = not occurring.

<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>	73 921 535			73 921 535
CH <sub>4</sub>	5 731 451			5 731 451
N <sub>2</sub> O	5 688 194			5 688 194
HFCs	1 057 986			1 057 986
PFCs	173 530			173 530
SF <sub>6</sub>	382 837			382 837
<b>Total Annex A sources</b>	<b>86 955 534</b>			<b>86 955 534</b>
<b>Activities under Article 3, paragraph 3, for 2008</b>				
3.3 Afforestation and reforestation on non-harvested land for 2008 as reported	-2 488 471			-2 488 471
3.3 Afforestation and reforestation on harvested land for 2008 as reported		NO		NO
3.3 Deforestation for 2008 as reported	1 361 634			1 361 634
<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				

*Abbreviation:* NO = not occurring.

<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 12 April 2012; it contains a complete set of common reporting format (CRF) tables for the period 1990–2010 and a national inventory report (NIR). Austria 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 12 April 2012. The annual submission was submitted in accordance with decision 15/CMP.1.

7. Where necessary, the ERT also used previous years' submissions during the review. In addition, the expert review team (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>

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

#### Completeness of inventory

9. Austria submitted a complete set of CRF tables for the period 1990–2010 and an NIR. The inventory is complete in terms of years and geographical coverage and covers all source and sink categories for the period 1990–2010. The ERT commends Austria for reporting emissions of GHGs for all categories for which the Intergovernmental Panel on Climate Change (IPCC) *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Revised 1996 IPCC Guidelines) and the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC good practice guidance) provide methodologies for estimation. However, the ERT reiterates the recommendation from the previous review report that Austria estimate emissions associated with the destruction of HFCs, PFCs and SF<sub>6</sub> and report thereon in its next annual submission. With regard to the recommendation from the previous review report concerning the completeness of the information provided on the LULUCF sector, Austria has reported information on grassland converted to other land-use categories for the first time in the 2012 annual submission; however, the Party continues to report the carbon stock changes in the optional LULUCF categories as not estimated ("NE").

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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.

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

Overview

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

11. Austria reported that there have been no changes to its national system since the previous annual submission.

Inventory planning

12. The NIR and additional information submitted by the Party described the national system and the institutional arrangements for the preparation of the inventory. The Austrian Federal Environment Agency (Umweltbundesamt) has been designated as the single national entity with overall responsibility for inventory preparation. Austria's reporting obligations to the UNFCCC, the United Nations Economic Commission for Europe and the European Commission are administered by the Federal Ministry of Agriculture, Forestry, Environment and Water Management (BMLFUW) under the framework of the Environmental Control Act (Umweltkontrollgesetz; Federal Law Gazette 152/1998). This Act regulates the responsibilities for environmental control in Austria and lists the tasks of the Umweltbundesamt. Other legal and institutional arrangements are in place and form the basis of the national system. These include: contracts with the Austrian statistical office (Statistik Austria), BMLFUW, and the Federal Ministry of Economics and Labour for the annual preparation of the energy balance; agreements with Statistik Austria to use annual statistics on industrial and agricultural activities and allowing Statistik Austria to provide the Umweltbundesamt with confidential data necessary to comply with its reporting obligations; an ordinance regarding the monitoring and reporting of GHG emissions in the context of the European Union emissions trading scheme (EU ETS), aimed at ensuring consistency of emissions trading data with data in the national inventory on the energy and industrial processes sectors; legal arrangements in place in support of the national system; a federal Act indicating the mandatory reporting of emissions for each licensee of an operating boiler with a thermal capacity larger than 2 MW; an ordinance stipulating the reporting of the type and amount of waste deposited in landfills annually; and an ordinance establishing the reporting obligations of users of fluorinated gases (F-gases). The Umweltbundesamt can request these data for the purpose of inventory preparation.

13. The Department of Emissions and Climate Change of the Umweltbundesamt is responsible for the preparation of the emissions inventory and all related work.

14. BMLFUW is also the national UNFCCC focal point and is in charge of the reporting obligations. This ministry is responsible for the official approval of the inventory, received from the Umweltbundesamt, and its submission to the secretariat.

15. As part of Austria's quality management system, the management of the inventory includes a control system for all documents and data and for records and their archives, as well as documentation on quality assurance/quality control (QA/QC) activities.

16. Supplementary information required under Article 7, paragraph 1, of the Kyoto Protocol as part of the national system as defined in the annex to decision 19/CMP.1 is prepared within the institutions of the national system.

Inventory preparation

*Key categories*

17. Austria has reported a key category tier 1 and 2 analysis, both level and trend assessment, as part of its 2012 annual submission. The ERT commends the Party for

reporting a tier 2 key category analysis in line with the recommendations from the previous review report. Austria has included the LULUCF sector in its key category analysis. The Party has also compiled a key category analysis for the activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol. The key category analysis 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).

18. The tier 1 key category analysis performed by the Party and that performed by the secretariat<sup>4</sup> produced different results. The differences are attributed to the different levels of aggregation used by Austria for categories in the energy and agriculture sectors. The Party has aggregated some subcategories in a number of categories that are explicitly included in the secretariat's key category analysis, including: CO<sub>2</sub> emissions from manufacturing industries and construction; CO<sub>2</sub> emissions from other sectors; HFC/PFC emissions from consumption of halocarbons and SF<sub>6</sub>; CH<sub>4</sub> emissions from cattle; N<sub>2</sub>O direct and indirect soil emissions; CH<sub>4</sub> emissions from solid waste disposal on land; and N<sub>2</sub>O emissions from wastewater handling. In addition, Austria's tier 1 key category analysis does not include some of the categories included by the secretariat, such as: N<sub>2</sub>O emissions from solid storage and dry lot (manure management) and N<sub>2</sub>O emissions from other animal waste management systems (AWMS) in the level analysis; and CO<sub>2</sub> emissions from cropland remaining cropland; CO<sub>2</sub> emissions from aluminium production, N<sub>2</sub>O emissions from other (solvents and other product use) and N<sub>2</sub>O emissions from pasture, range and paddock manure in the trend analysis. Further, the presentation of information in CRF table 7 does not show the significance of the LULUCF categories (locating the two categories at the bottom of the table because they are removals); the information is ordered according to total emissions rather than the key category analysis criteria of absolute values. The ERT recommends that Austria investigate the differences between the key category analysis performed by the Party and that performed by the secretariat, including the possible missing categories, in order to ensure that it is applying the appropriate methodologies and to report thereon in its next annual submission.

19. Austria considered four qualitative criteria in its key category analysis. These criteria did not lead to the identification of additional key categories.

20. In its NIR, Austria explained that it uses the results of the key category analysis to prioritize the development and improvement of the inventory.

#### *Uncertainties*

21. Austria has reported in its NIR tier 1 and tier 2 uncertainty analyses for all sectors of the inventory including LULUCF. In response to the previous review report, the Party has implemented a detailed structure for its key category and uncertainty analyses, which has resulted in small decreases in observed uncertainties for totals excluding LULUCF. However, the ERT noted that uncertainties were not calculated for the KP-LULUCF activities (see para. 86 below). The ERT recommends that the Party include uncertainty estimates for the whole LULUCF sector in its next annual submission.

22. The total tier 1 uncertainty (excluding LULUCF) of Austria's inventory in 2010 is 4.2 per cent for the level and 2.3 per cent for the trend. The total tier 1 uncertainty (including LULUCF) of Austria's inventory in 2010 is 22.1 per cent (compared to 4.6 per

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<sup>4</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.

cent in the previous annual submission) as a result of high uncertainties for forest land remaining forest land (–20.8 per cent). The trend uncertainty for the period 1990–2010 is 2.9 per cent (compared to 1.9 per cent for the previous annual submission) as a result of the inclusion of LULUCF<sup>5</sup> in the uncertainty analysis.

*Recalculations and time-series consistency*

23. Recalculations have been performed and reported in accordance with the IPCC good practice guidance. The ERT noted that recalculations reported by the Party of the time series 1990–2009 have been undertaken to take into account revisions to the energy balance (NIR tables A 48 and A 116), including updates of activity data (AD) and net calorific values (NCVs) (see para. 38 below), the incorporation of new data from the updated national forest inventory (NFI) (2007/2009) (see para. 72 below), and revised AD and methods for the industrial processes and agriculture sectors. Recalculations have been reported by the Party for the following categories and subcategories:

- (a) CO<sub>2</sub> emissions from the energy sector: manufacturing industries and construction, transport and other sectors;
- (b) CO<sub>2</sub> emissions from the industrial processes sector: ammonia production, soda ash use and pig iron;
- (c) HFC emissions from consumption of halocarbons and SF<sub>6</sub>;
- (d) CO<sub>2</sub> emissions from the solvent and other product use sector: paint application, degreasing and dry cleaning, chemical products, manufacture and processing and other;
- (e) CH<sub>4</sub> and N<sub>2</sub>O emissions from manure management;
- (f) N<sub>2</sub>O emissions from agricultural soils: direct and indirect soil emissions;
- (g) CO<sub>2</sub> emissions/removals from the LULUCF sector: forest land remaining forest land, land converted to forest land, cropland, grassland, wetlands, settlements and other land;
- (h) N<sub>2</sub>O emissions from disturbance due to land conversion to cropland.

24. The recalculations for Annex A categories (excluding LULUCF) between the 2011 and 2012 submissions resulted in a decrease of 0.01 per cent for 1990 and 2008 and an increase of 0.4 per cent for 2009. The major changes and the magnitude of impact including LULUCF result in an increase in GHG emissions in 1990, 2008 and 2009 of 5.7, 25.9 and 21.7 per cent, respectively, primarily as a result of the large recalculations for the LULUCF sector.

25. The rationale for these recalculations is provided in the NIR and in CRF table 8(b) (for 2009 only). In response to a question raised by the ERT during the review, the Party confirmed that all the explanations provided in CRF table 8(b) for 2009 also apply for 1990–2008. The ERT recommends that Austria provide the required information in CRF table 8(b) for all the years for which recalculations have been performed.

*Verification and quality assurance/quality control approaches*

26. Austria has developed a QA/QC plan in accordance with decision 19/CMP.1 and the IPCC good practice guidance. This plan forms part of Austria's quality management system. The NIR indicates that QC procedures include general (tier 1) and category-specific

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<sup>5</sup> This is mainly due to the inclusion of the litter and soil carbon pools from category forest land remaining forest land in the uncertainty analysis, which have a high uncertainty (contributing to around 7 per cent of the overall LULUCF uncertainty).

(tier 2) QC checks. QA activities include second-party audits for country-specific methods; the documentation of one category per sector; and checks on the work performed by subcontractors. The ERT concluded that the Party's QA/QC activities have been implemented in accordance with the IPCC good practice guidance.

27. Since 2005, the Department of Air Pollution Control and Climate Change Mitigation of the Umweltbundesamt has been accredited as an inspection body for emission inventories according to the International Organization for Standardization (ISO) standard 17020. In 2011, Austria obtained re-accreditation (scheduled every five years) under the above ISO standard.

28. CO<sub>2</sub> emissions reported under the EU ETS are required to be submitted for independent verification with BMLFUW, which is responsible for the granting of licenses to independent verifiers. In addition, the ministry has to fulfil a QC function in relation to the EU ETS data and information, which is implemented by the Umweltbundesamt on behalf of the ministry.

29. The ERT identified an error in the presentation of the AD in annex 4 (national energy balance) to the NIR, including some small discrepancies between the AD reported in the national energy balance (table A 88 for crude oil, table A 104 for natural gas and table 92 for crude oil refined and gas produced) and the AD reported by the Austrian Petroleum Industry Association (see para. 53 below). In response to a question raised by the ERT during the review week, Austria provided the ERT with a revised annex 4 to the NIR containing corrected data, thereby ensuring consistency with the CRF tables. The ERT recommends that Austria implement specific QA/QC procedures in order to ensure the accuracy and consistency of the data presented in the NIR and in the CRF tables and to ensure that the data correspond to the actual data used to estimate emissions.

#### *Transparency*

30. In general, the NIR is transparent and the information that it contains, combined with the additional information provided to the ERT during the review, is sufficient to enable the ERT to understand how the emissions and removals have been estimated and reported. In addition, Austria indicated that it has completed a table on the expert judgement used in the preparation of the inventory in response to issues raised by the ERT in the previous review report, but this table was not included in the 2012 NIR due to the fact that the 2011 annual review report (ARR)<sup>6</sup> was received on 29 June 2012, after the 2012 submission due date. Austria indicated that it would include the missing information on sources and the logical basis for the expert judgement used in the 2013 NIR. The ERT has identified areas in which the transparency of reporting could be enhanced, and recommends that Austria provide, in its next annual submission, more transparent and complete information on the AD, emission factors (EFs), assumptions and methodologies used in the following categories:

- (a) Road transportation (liquid fuels) (see para. 48 below);
- (b) Navigation (liquid fuels) (see para. 49 below);
- (c) Fugitive fuel emissions from oil production (see para. 50 below);
- (d) Iron and steel production (solid fuels) (see para. 57 below);
- (e) Cement, limestone and dolomite use as regards the use of EU ETS data (see paras. 57 and 58 below);
- (f) Manure management (see para. 65 below);
- (g) Cultivation of histosols (see para. 66 below);

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

- (h) The LULUCF sector in relation to the uncertainty data used and the tier 3 descriptions provided (see para. 71 below);
- (i) Waste (all categories) (see paras. 78, 81 and 82 below).

Inventory management

31. Austria 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. The system also includes documentation on the responsibilities of and the actions performed by the sectoral experts. Inventory information, both on paper and in electronic format, is stored at the Umweltbundesamt.

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

32. The ERT noted the following improvements made by Austria since the previous review report:

- (a) The incorporation of the LULUCF sector in the uncertainty analysis;
- (b) The performance of a tier 2 key category analysis;
- (c) Addressing the unusual pattern identified by the ERT for fuel consumption for international marine bunkers;
- (d) The incorporation of new NFI data in the methodologies used to calculate the emissions and removals from the LULUCF sector; the introduction of a tier 3 model for the litter and soil carbon pools; and the correction of a calculation error in the litter carbon pool (see para. 69 below);
- (e) The improvement of transparency with regard to the QC activities applied to the category nitric acid (information on the AD and EFs provided by the nitric acid plants);
- (f) The improvement of consistency in the reporting of CH<sub>4</sub> and N<sub>2</sub>O emissions from manure management systems;
- (g) The improvement of the reporting of information on CH<sub>4</sub> emissions from anaerobic digesters;
- (h) The collection of appropriate data on residual waste composition to derive actual degradable organic carbon (DOC) values;
- (i) The improvement of the data and methodologies used in order to calculate time-series consistent emissions and removals from the KP-LULUCF activities.

33. The ERT noted that the 2011 ARR was published on 31 August 2012, which is after the due date for the 2012 annual submission (15 April 2012). Hence, the ERT exercises a degree of latitude in its reiteration of the recommendations from the 2011 ARR, including:

- (a) Reporting the required information in CRF table 8(b) for all years for which recalculations have been performed;
- (b) Providing a brief summary of the procedures used for eliciting and archiving the expert judgement, and providing references in the NIR for all expert judgement used;
- (c) Improving the transparency and time-series consistency of: the allocation of fuel consumption between navigation and international marine bunkers; the use of EU ETS data to estimate CO<sub>2</sub> emissions from cement and from iron and steel production; and the use of country-specific parameters in the LULUCF sector;



(d) Improving the transparency of its reporting with regard to the impact of fuel exports on implied EFs (IEFs) and CO<sub>2</sub> emissions from road transportation;

(e) Implementing editorial changes in the NIR to clarify and improve the ERT's understanding of issues concerning the difference between the reference approach and the sectoral approach, with a particular reference to the disaggregation of the biogenic and fossil fuel fractions;

(f) Improving the transparency of its reporting with regard to the use of the methane conversion factor (MCF) for emissions from deep litter systems, including information on storage duration and mixing practices;

(g) Undertaking further methodological work with regard to the reporting requirement under paragraph 8(a) of the annex to decision 15/CMP.1 (information that demonstrates that activities under Article 3, paragraph 3, of the Kyoto Protocol began on or after 1 January 1990 and before 31 December of the last year of the commitment period, and are directly human-induced).

34. In addition, Austria has implemented a number of additional improvements since the 2011 annual submission:

(a) A change in the methodology used to estimate emissions from navigation and to improve time-series consistency;

(b) The correction of the CO<sub>2</sub> EFs for passenger cars in line with the national CO<sub>2</sub> monitoring data for the Austrian fleet;

(c) A change of the interpolation method used to calculate biomass in forest land (LULUCF);

(d) A revision of the forest biomass function (LULUCF);

(e) A reclassification of the soil category (LULUCF).

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

35. During the review, the ERT identified a number of areas for improvement. These are listed in table 6 below.

36. 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**

37. The energy sector is the main sector in the GHG inventory of Austria. In 2010, emissions from the energy sector amounted to 64,327.66 Gg CO<sub>2</sub> eq, or 76.0 per cent of total GHG emissions. Since 1990, emissions have increased by 16.1 per cent. The key drivers for the rise in emissions are the increases in emissions from transport and from manufacturing industries and construction. Within the sector, 34.9 per cent of the emissions were from transport, followed by 24.3 per cent from manufacturing industries and construction, 22.2 per cent from energy industries and 17.7 per cent from other sectors. Fugitive emissions from fuels accounted for 0.8 per cent, while the remaining 0.1 per cent were from other emissions.

38. Austria has performed recalculations for the energy sector between the 2011 and 2012 submissions in response to changes in AD and NCVs and as a result of the use of revised methodologies following the updates of the International Energy Agency (IEA)-compliant energy balance compiled by Statistik Austria. The impact of these recalculations

on the energy sector is a decrease in emissions of 0.8 per cent for 2009, a decrease in emissions of 0.02 per cent for 2008 and a decrease in emissions of 0.01 per cent for 1990. The main recalculations took place in the following categories:

- (a) CO<sub>2</sub> emissions from other sectors;
- (b) CO<sub>2</sub> emissions from manufacturing industries and construction;
- (c) CO<sub>2</sub> emissions from transport.

39. The energy sector inventory is complete, covers all categories and gases, and is generally transparent (see paras. 48–50 below). The AD, EFs and methodologies used are presented in detail in the NIR. Notable improvements since the previous annual submission include a change in the methodology used to estimate emissions from navigation and to improve time-series consistency, and the correction of the CO<sub>2</sub> EFs for passenger cars in line with the national CO<sub>2</sub> monitoring data for the Austrian fleet. The ERT commends the Party for these improvements.

## 2. Reference and sectoral approaches

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

40. The ERT identified significant differences in the estimates of CO<sub>2</sub> emissions between the reference and the sectoral approaches across the entire time series, with a difference of 7.5 per cent for 2010. Explanations for the fluctuations in the differences between the two approaches over the time series are provided in the NIR together with detailed quantifications of the differences. The remaining difference, which could not be justified by the Party, is 0.2 per cent for 2010. The ERT found that the explanations of the differences were transparent, detailed and well justified. Further analysis did not reveal any systematic errors.

41. According to the NIR, the main reason for the significant difference between the reference and the sectoral approaches is attributed to emissions from solid fuels. The difference in terms of emissions is equal to 4,188.93 Gg CO<sub>2</sub> for 2010, or 46.2 per cent. The Party has estimated the quantities of fuel reported as emissions under iron and steel production (in the industrial processes sector) at 3,979.00 Gg CO<sub>2</sub> in NIR table 21; this leaves a difference of approximately 210.00 Gg CO<sub>2</sub> that the Party has not explained in the NIR. In response to a question raised by the ERT during the review, Austria provided additional information on an analysis of the detailed mass balance data reported under the EU ETS for 2010 which indicated that approximately 66.00 Gg CO<sub>2</sub> was stored in products (iron and steel) as well as in slag and dust. This would reduce the difference between the two approaches to approximately 145.00 Gg CO<sub>2</sub>, equating to 1.1 per cent of the reference approach. Liquid and gaseous fuels have differences of 3.9 and 4.6 per cent, respectively, and both have increased since 2009. The ERT commends the Party for this analysis and encourages it to continue to investigate the reasons for the difference between the reference and the sectoral approaches for solid fuels and to report thereon in its next annual submission.

42. The ERT reiterates the recommendation contained in paragraph 39 of the previous review report that Austria implement editorial changes in the NIR in order to improve the understanding of any differences in the accounting of the biogenic and fossil fuel fractions between the reference and the sectoral approaches.

### *International bunker fuels*

43. Austria uses data from the Austrian Federal Ministry of Economy, Family and Youth to calculate emissions from international marine bunker fuels. These data are collected from Austrian companies who export or import oil products; the domestic

navigation consumption is subtracted from the total amount of reported fuel. In response to a recommendation made by the ERT in the previous review report, Austria has addressed the unusual pattern in the fuel consumption data for international marine bunkers in NIR chapter 3.2.2.1 by undertaking additional research in order to clarify the situation. The Party has also improved the transparency of its reporting on this issue. The research carried out by the Party showed that fuel prices were reduced in 2005, which increased the market share of fuel stations operating in Austria along the Danube River. The ERT found this to be a plausible explanation for the fluctuations in the amount of fuel sold and commends the Party for this research.

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

44. In NIR chapter 3.2.3, Austria has reported non-energy use of bituminous coal and anthracite used for the manufacture of electrodes. In response to a question raised by the ERT during the review, the Party explained that there was a technical error in the NIR and that the reported non-energy use value mentioned above was actually referring to petroleum coke, which is used in the production of electrodes. The Party further explained that the electrode production process is considered to generate zero GHG emissions. The Party was not able to provide the ERT with any electrode production statistics, which could confirm the use of the reported quantities of non-energy use of petroleum coke. Since there is no methodology available for the calculation of emissions from electrode production, the ERT was not able to determine whether any GHG emissions are generated from this process. However, preliminary research showed that electrodes are made from petroleum coke after it is mixed with coal tar pitch, which is extruded and shaped, then baked to carbonize the binder (pitch), and then graphitized by heating it to temperatures approaching 3,000 °C, which converts the carbon to graphite. The ERT recommends that Austria gather additional information regarding the electrode production process and annual production data in order to verify that there is no non-energy use of petroleum coke (which is actually used in the combustion process).

45. Austria reports significant amounts of residual fuel oil as non-energy use in annex 4, table A 91 of the NIR; however, no explanation is provided in the NIR regarding its use. In response to a question raised by the ERT during the review, Austria explained that the residual fuel oil is used in blast furnaces and the same amount is also reported under the section blast furnaces (energy) in the national energy balance. The resulting emissions are reported by the Party as liquid fuels under the category iron and steel (manufacturing industries and construction). As the emissions have been reported, the ERT concluded that there is no underestimation of emissions due to the reporting of non-energy use of residual fuel oil by Austria; however, the ERT also concluded that the same quantity of residual fuel oil consumed should not be reported under both blast furnaces (energy) and non-energy use of fuels. The ERT recommends that, in its next national energy balance, the Party exclude the quantity of residual fuel oil used in blast furnaces from non-energy use of fuel. Alternatively, Austria should provide an explanation clarifying the issue in its next annual submission.

### **3. Key categories**

#### Stationary combustion: gaseous fuels – CO<sub>2</sub>

46. In its NIR, Austria stated that the country-specific natural gas CO<sub>2</sub> EF was calculated using the results of a 2001 study on natural gas composition. The Party currently uses a value of 55.40 t CO<sub>2</sub>/TJ. In response to a question raised by the ERT during the review, Austria explained that it had verified this value with EU ETS data which showed no significant difference overall (the highest EU ETS value being 55.46 t/TJ). The ERT noted that the Party is able to collect data on annual changes in natural gas based on the quantity and quality of the domestic production and imports. The ERT therefore recommends that

Austria continue its practice of comparing the national data with corresponding data obtained under the EU ETS. Further, the ERT recommends that Austria, in cases where the EFs obtained from the EU ETS data are consistently higher than the current country-specific EFs, collect additional data regarding the natural gas composition of the domestic production and imports in order to calculate an accurate country-specific EF for natural gas on an annual basis.

#### Stationary combustion: solid fuels – CO<sub>2</sub>

47. Considerable amounts of distribution losses for blast furnace gas and coke oven gas are reported in the national energy balance in annex 4 to the NIR. For 2004, the distribution losses are 11.0 per cent of the total production of coke oven gas (7.2 per cent for 2010) and 5.1 per cent of the total blast furnace gas production for 2006 (no distribution losses are reported for 2010). According to the IEA *Energy Statistics Manual*<sup>7</sup> and the IEA/Statistical Office of the European Union (EUROSTAT) coal questionnaire documentation,<sup>8</sup> manufactured gases are lost during distribution within the facilities that produce and use them due to leaks and sometimes due to accidental or deliberate venting that occurs during the normal course of operations. In response to a question raised by the ERT during the review, Austria confirmed that all CO<sub>2</sub> emissions from the two integrated iron and steel plants operating blast furnaces in the country (i.e. all emissions from coke oven gas and blast furnace gas) are considered based on a mass balance approach from the reporting under the EU ETS and are therefore included in the national GHG inventory under the subcategory iron and steel (manufacturing industries and construction) or the subcategory iron and steel production (metal production). The ERT recommends that Austria clarify the methodology used in the reporting under the EU ETS for the iron and steel plants and transparently explain, in its next annual submission, how any distribution losses and fugitive emissions are accounted for in the national GHG inventory.

#### Road transportation: liquid fuels – CO<sub>2</sub>

48. Austria calculates the energy consumption and associated emissions from road transportation using a bottom-up methodology based on the annual mileage per vehicle category and the specific fuel efficiency. The annual mileage per year in Austria is derived from the national traffic model. The NIR states that the difference between the fuel consumption calculated using the bottom-up methodology and the total fuel sales figures obtained from the national statistics is allocated to fuel exports (i.e. fuel sold in Austria but consumed abroad). The difference is estimated at 30 per cent of the total fuel sales, which was also confirmed by two separate studies conducted by the Party in 2004 and 2009. In response to a question raised by the ERT during the review, Austria confirmed that the emissions resulting from fuel purchased in Austria but exported in vehicle tanks are accounted for under the category road transportation. The ERT concluded that there is no underestimation of emissions, but reiterates the recommendation from the previous review report that, in order to improve the transparency of its reporting in this category, Austria provide additional information in the NIR of its next annual submission regarding the methodology used and the impact of tank fuel exports on the emission estimates.

### 4. Non-key categories

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

49. Austria used a bottom-up model to calculate the national fuel consumption in navigation. The Party did not provide detailed information in the NIR on the methodology, AD and EFs used for the bottom-up assessment; the ERT therefore identified a problem in

<sup>7</sup> <[http://www.iea.org/stats/docs/statistics\\_manual.pdf](http://www.iea.org/stats/docs/statistics_manual.pdf)>.

<sup>8</sup> <<http://www.iea.org/stats/questionnaire/Coalques.pdf>>.

relation to the transparency of the reporting within this category. The ERT was able to clarify the methodology used and data for the tonne-kilometre, operating hours, other relevant parameters and assumptions used for the calculation of emissions based on additional information provided by Austria during the review. The ERT concluded that there is no underestimation of emissions for this category. The ERT recommends that Austria improve the transparency of its reporting on the methodology and data used for the calculation of emissions from this category, including the provision, in its next annual submission, of the additional information provided to the ERT during the review week.

#### Oil and natural gas: liquid and gaseous fuels – CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O

50. According to the NIR, the AD on and emissions from the production of oil and natural gas were reported by the Austrian Petroleum Industry Association and these emissions were calculated according to information from an oil company paper on “Environment/Storage”. In addition, NIR table 90 states that emissions from oil exploration, transport, natural gas exploration and natural gas production/processing are also reported under oil production. In response to a question raised by the ERT during the review, Austria provided a description of the methodology used for this category and a reference to the cited paper; however, the Party was not able to provide the industry-specific AD or EFs used in the calculation of the emissions due to the absence of the relevant experts from the two relevant companies. The ERT concluded that there is a lack of transparency in the Party’s reporting but that the emissions were not underestimated when compared to an IPCC tier 1 approach using default EFs. Therefore, the ERT recommends that Austria improve the transparency of its reporting on the approach used to calculate the emissions for oil and gas exploration and production in its next annual submission by including: a discussion on the outcomes of a detailed verification of the emission estimates provided by the industry; and information on the methodologies, AD and EFs used.

#### Oil refining/storage: liquid fuels – CH<sub>4</sub>

51. Austria uses a default EF of 745.00 kg CH<sub>4</sub>/PJ crude oil input (which is the average of the range 90–1,400 kg CH<sub>4</sub>/PJ in table 1-58 of the Revised 1996 IPCC Guidelines for refining only) to estimate the emissions from oil refining and storage, but it does not consider the default range 20–250 kg CH<sub>4</sub>/PJ for storage emissions in the Revised 1996 IPCC Guidelines. The ERT confirmed during the review that, according to the original source used to calculate the EF (United States Environmental Protection Agency, 1994, page 5-11, table 5-3), the range 90–1,400 kg CH<sub>4</sub>/PJ from the Revised 1996 IPCC Guidelines for refining, as presented in table 1-58, excludes emissions from storage (20–250 kg CH<sub>4</sub>/PJ). The ERT also noted that Austria does not estimate combustion CH<sub>4</sub> emissions from petroleum refining separately (energy industries) and instead reports those emissions as included elsewhere (“IE”) in CRF table 1.A(a).

52. In response to a question raised by the ERT during the review on this matter, Austria clarified that its fugitive emissions reported under oil refining and storage include emissions from all potential refining and storage sources of the refinery plant (including combustion emissions). The Party indicated that it had selected a conservative EF of 745.00 kg CH<sub>4</sub>/PJ which is a medium value within the range (90–1,400 kg CH<sub>4</sub>/PJ) from the Revised 1996 IPCC Guidelines and used the assumption that it included all emissions, including combustion emissions. The assertion of Austria that this estimate is conservative is based on crude oil being transported by pipeline and, therefore, that it is stored for a short period only, thereby reducing the release potential of fugitive CH<sub>4</sub> emissions compared to the processes represented by the IPCC default EFs. The Party also confirmed that its refinery plant implements high standards for the recovery of fugitive CH<sub>4</sub> emissions in accordance with their Best Available Technology regulations. In addition, Austria indicated that CH<sub>4</sub> emissions from combustion (in the category petroleum refining) would be around

0.06 Gg CH<sub>4</sub> using a country-specific EF (2.00 kg CH<sub>4</sub>/TJ for heavy oil and 0.30 kg CH<sub>4</sub>/TJ for natural gas) and would therefore be more than covered by the conservative EF of 745.00 kg CH<sub>4</sub>/PJ used by the Party. The ERT accepted that Austria was not underestimating emissions by using this approach as the EF used for fugitive emissions is likely to overestimate emissions of CH<sub>4</sub>. The ERT recommends that Austria bring its methodology into line with the IPCC good practice guidance by implementing its plan (confirmed to the ERT during the review week) to report, in the NIR and in the CRF tables, CH<sub>4</sub> emissions from combustion separately in the petroleum refining category (CRF table 1.A.(a)) using the country-specific EFs. The ERT further recommends that the Party develop a country-specific EF for fugitive emissions, taking into account the specific technologies in use for oil refining and storage, or apply expert judgement to estimate the emissions using an IPCC tier 1 method and selecting a more appropriate value within the range 90–1,400 kg CH<sub>4</sub>/PJ for refining and 20–250 kg CH<sub>4</sub>/PJ for storage and report thereon in its next annual submission.

#### Natural gas: gaseous fuels – CH<sub>4</sub>

53. For the calculation of fugitive emissions from natural gas, Austria uses AD on produced natural gas provided by the Austrian Petroleum Industry Association, as presented in NIR table 92. The ERT found small discrepancies between these AD when compared to the national energy balance, with data from the Austrian Petroleum Industry Association being higher for some years (e.g. 5.6 per cent in 2010). The ERT confirmed that this is not an underestimation of emissions, since Austria uses the higher values for its emission estimates, but recommends that the Party further investigate the reasons for the discrepancies in the AD reported under the national energy balance and by the Austrian Petroleum Industry Association, and correct these data and recalculate the emission estimates where applicable. The ERT recommends that Austria implement additional QA/QC procedures to cross-check the information from the national energy balance with the information from the Austrian Petroleum Industry Association.

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

#### **1. Sector overview**

54. In 2010, emissions from the industrial processes sector amounted to 10,680.47 Gg CO<sub>2</sub> eq, or 12.6 per cent of total GHG emissions, and emissions from the solvent and other product use sector amounted to 327.12 Gg CO<sub>2</sub> eq, or 0.4 per cent of total GHG emissions. Since 1990, emissions have increased by 5.7 per cent in the industrial processes sector, and decreased by 36.1 per cent in the solvent and other product use sector. The key driver for the rise in emissions in the industrial processes sector is the large increase in the consumption of halocarbons and SF<sub>6</sub>, where emissions have increased by 431.6 per cent since 1990. Emissions from metal production have also increased by 9.0 per cent, while emissions from mineral products and chemical industry have decreased by 10.3 and 54.3 per cent, respectively. Within the industrial processes sector, 51.3 per cent of the emissions were from metal production, followed by 27.5 per cent from mineral products, 14.7 per cent from consumption of halocarbons and SF<sub>6</sub> and 6.5 per cent from chemical industry. With regard to solvent and other product use, the main drivers for the fall in emissions are the decreases in paint application, and the use, manufacture and processing of chemical products, which decreased by 53.0 per cent and 57.6 per cent, respectively.

55. The Party has performed recalculations for the industrial processes sector between the 2011 and 2012 submissions in response to changes in AD. The impact of these recalculations on the industrial processes sector is a decrease in emissions of 0.03 per cent in 1990 and 0.02 per cent for 2008 and an increase of 1.7 per cent for 2009. The main recalculations took place in the following categories:

- (a) CO<sub>2</sub> emissions from soda ash use;
- (b) CO<sub>2</sub> emissions from ammonia production;
- (c) CO<sub>2</sub> emissions from pig iron;
- (d) HFC emissions from consumption of halocarbons and SF<sub>6</sub>.

56. The Party also performed recalculations for the solvent and other product use sector between the 2011 and 2012 submissions in response to changes in AD from the year 2003 onwards. The impact of these recalculations on the solvent and other product use sector is a 0.02 per cent increase in emissions for 2008 and a 0.14 per cent increase for 2009. The main recalculations took place in the following categories:

- (a) CO<sub>2</sub> emissions from paint application;
- (b) CO<sub>2</sub> emissions from degreasing and dry cleaning;
- (c) CO<sub>2</sub> emissions from chemical products, manufacture and processing;
- (d) CO<sub>2</sub> emissions from other.

57. Austria's inventory for the industrial processes sector is complete and generally transparent. However, the ERT encourages the Party to continue improving the transparency of its reporting by providing background information on the methodology, data sources and EFs used (e.g. background information provided by Austria during the review week in response to questions raised by the ERT in relation to semiconductor manufacture). The ERT concluded that there is a need for improved transparency with regard to the subcategories for which EU ETS data are used from the year 2005 onwards, including a description of how the data are reconciled with the national statistics and how time-series consistency is maintained. In addition, the ERT was not able to confirm how Austria allocates emissions from limestone and dolomite use, and by-product gases (e.g. coke oven gas, blast furnace gas, Linz Donawitz Gas (LDG)) to different categories and for iron and steel production. However, in response to questions raised by the ERT during the review week, the Party explained that there is no double-counting or underestimation of emissions in this category as the by-product gases, such as coke oven gas from iron and steel, are reported under the energy sector. The ERT recommends that Austria further explain the use of the respective EU ETS data, including information such as that included in the energy chapter of the 2012 NIR, and include an explanation of how time-series consistency is ensured with regard to the use of EU ETS data from 2005 onwards.

## 2. Key categories

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

58. Austria estimates CO<sub>2</sub> emission from cement production using a country-specific method similar to the IPCC tier 2 methodology. Prior to 2003, the AD (clinker production, raw meal used) and emissions data were taken from studies undertaken by the Austrian Cement Production Industry. In 2004, these data were obtained from the Austrian Cement Industry Association. From 2005 onwards, the Party has used data on CO<sub>2</sub> emissions reported under the EU ETS. The ERT noted that the IEFs from 1990 to 2005 (0.551–0.567 t CO<sub>2</sub>/t clinker) were on average 5.1 per cent higher than the IEFs from 2006 onwards (0.524–0.535 t CO<sub>2</sub>/t clinker) but was satisfied that this decreasing trend was a result of improvements in efficiency in the industry. Further, Austria explained that the significant decrease in the IEF between 2005 and 2006 (–4.1 per cent) is due to the decrease in the raw meal factor (raw meal/clinker) between 2005 and 2006, and the decrease in the carbonate content of raw meal in most companies, mainly as a result of the increase of secondary raw materials such as substitutes, brick chips and recycled gypsum. The ERT is satisfied with this response. The ERT noted that the previous ERT recommended that Austria include

information on the amount of raw meal used across the time series and information on its composition and its calcium carbonate and magnesium carbonate content, in the next annual submission. In response to a question raised by the ERT during the review, Austria explained that it could not address the recommendation from the previous review report, since the publication date of the 2012 ARR was after the 2012 annual submission due date, with the draft report received on 29 June 2012. However, the Party indicated that it will include, in its next annual submission, an update of the industry chapter that reflects the recommendations of the previous ERT. The ERT reiterates the recommendation that Austria improve the transparency of its reporting on how the emissions are estimated by including information on the composition of raw meal and on its calcium carbonate and magnesium carbonate content for all years of the time series, as well as additional information on the use of EU ETS data and an explanation of how it ensures the time-series consistency of the emission estimates.

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

59. Austria reports CO<sub>2</sub> emissions from the decarbonizing of limestone in the categories iron and steel production, limestone use for desulphurization, glass production and chemical industry. However, the ERT noted that it was not possible to understand how the limestone is used across the different categories as the NIR refers to total limestone use only without allocating it to the separate categories. The ERT recommends that Austria, in its next annual submission, improve the transparency of its reporting by clearly allocating the total usage to each respective category.

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

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

60. According to the NIR, perfluoromethane (CF<sub>4</sub>), HFC-23 (CHF<sub>3</sub>), perfluoroethane (C<sub>2</sub>F<sub>6</sub>), perfluoropropane (C<sub>3</sub>F<sub>8</sub>), perfluorocyclobutane (c-C<sub>4</sub>F<sub>8</sub>), hexafluorocyclobutane (C<sub>4</sub>F<sub>6</sub>), nitrogen trifluoride (NF<sub>3</sub>) and SF<sub>6</sub> are emitted in the semiconductor manufacture category. However, in CRF table 2(II), the Party has reported HFC and PFC emissions from manufacturing and from disposal as not occurring (“NO”). In response to a question raised by the ERT during the review, Austria explained that the emissions are reported as “NO” for confidentiality reasons and that emissions “from manufacturing”, “from stocks” and “from disposal” are aggregated and reported under “from stocks”. The ERT concluded that most F-gases are emitted from semiconductor manufacturing processes such as chemical vapour deposition, and etching; therefore, emissions from semiconductor manufacture must be reported in the column “from manufacturing” in CRF table 2(II).F. The ERT recommends that Austria revise the reporting of F-gases from semiconductor manufacture in its next annual submission and use the notation key “IE” to indicate that emissions from manufacture and disposal are included under the emissions “from stocks”.

## **D. Agriculture**

### **1. Sector overview**

61. In 2010, emissions from the agriculture sector amounted to 7,452.64 Gg CO<sub>2</sub> eq, or 8.8 per cent of total GHG emissions. Since 1990, emissions have decreased by 12.9 per cent. The key driver for the fall in emissions is the decrease in livestock numbers and the amount of nitrogen (N) synthetic fertilizer applied to agricultural soils. Within the sector, 43.7 per cent of the emissions were from enteric fermentation, followed by 39.4 per cent from agricultural soils. Manure management accounted for 16.9 per cent. The remaining 0.01 per cent were from field burning of agricultural residues.



62. The Party has performed recalculations for the agriculture sector between the 2011 and 2012 submissions in response to changes in AD and EFs. The impact of these recalculations on the agriculture sector is an increase in emissions of 0.003 per cent for 1990, 0.2 per cent for 2008 and 0.2 per cent for 2009. The main recalculations took place in the following categories:

- (a) CH<sub>4</sub> emissions from manure management;
- (b) N<sub>2</sub>O emissions from manure management;
- (c) N<sub>2</sub>O emissions from agricultural soils: direct soil emissions;
- (d) N<sub>2</sub>O emissions from agricultural soils: indirect emissions.

63. The inventory is complete with respect to the coverage of activities, gases and years, and is generally transparent and accurate, with emissions estimated in line with the IPCC good practice guidance. Uncertainties, recalculations and QA/QC procedures have been described in the NIR at a category and sectoral level. The estimates are consistent across the time series and explanations have generally been provided for the sources of AD and EFs, the methodological issues and the emissions trend.

64. However, the ERT found that, in some cases, the lack of background data in the annual submission inhibited a thorough review of the inventory for the agriculture sector. During the review week, the ERT noted that the transparency of the reporting on the agriculture sector could be improved with respect to: a clear presentation of the gross energy intake and volatile solid excretion rates associated with suckling cows and the method used to derive them for the period 1991–2003; information on the derivation of the share of manure digested in biogas plants for the period 1991–2009; and the values of the fraction of livestock manure handled using AWMS for the period 1991–2009 and for all animal subcategories considered in the emission estimates. In response to a question raised by the ERT during the review, the Party provided the ERT with this information. The ERT recommends that Austria include this information in its next annual submission.

## 2. Key categories

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

65. As referred to in the previous review report, Austria uses an EF from the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the 2006 IPCC Guidelines) of 0.01 kg N<sub>2</sub>O-N/kg N excreted for cattle and swine deep bedding with no mixing of manure, in order to be consistent with the use of the MCF value for deep litter AWMS when estimating CH<sub>4</sub> emissions. The ERT reiterates the recommendation from the previous review report that Austria provide, in its next annual submission, a more detailed explanation for the use of the above EF, including information on storage duration and mixing practice.

### Agricultural soils – N<sub>2</sub>O

66. Emissions from the cultivation of histosols are reported as “NO”. In response to a question raised by the ERT during the review, Austria clarified that there is no cropland with organic soils and that there are no annually cultivated organic soils in grassland areas. The ERT recommends that Austria include this explanation for the use of the notation key “NO” to report N<sub>2</sub>O emissions from agricultural soils in its next annual submission.

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

### **1. Sector overview**

67. In 2010, net removals from the LULUCF sector amounted to 3,610.72 Gg CO<sub>2</sub> eq. Since 1990, net removals have decreased by 64.0 per cent. The key driver for the fall in removals is the decrease in the carbon stock in forest land remaining forest land. Within the sector, removals of 5,410.92 Gg CO<sub>2</sub> eq were from forest land, followed by emissions of 568.06 Gg CO<sub>2</sub> eq from cropland, emissions of 355.78 Gg CO<sub>2</sub> eq from wetlands and emissions of 347.22 Gg CO<sub>2</sub> eq from other land. Grassland accounted for emissions of 280.75 Gg CO<sub>2</sub> eq and settlements accounted for emissions 248.40 Gg CO<sub>2</sub> eq.

68. The Party has performed recalculations for the LULUCF sector between the 2011 and 2012 submissions in response to changes in land area data, parameters and methodologies. The impact of these recalculations on the LULUCF sector is a decrease in removals of 27.0, 102.2 and 79.2 per cent for 1990, 2008 and 2009, respectively, largely driven by the recalculations undertaken for forest land remaining forest land due to an updated data set on forest land after the year 2002 that had previously been reported based on data extrapolated from 2000 to 2002. The main recalculations took place in the following categories:

- (a) CO<sub>2</sub> emissions from forest land remaining forest land;
- (b) CO<sub>2</sub> emissions from land converted to other land;
- (c) CO<sub>2</sub> emissions from land converted to grassland.

69. Austria has provided information for all mandatory reporting categories and carbon pools. Generally, the information is well documented and all of the recommendations from the previous review report have been reflected in the NIR. The ERT notes that Austria has improved the accuracy of the inventory on the LULUCF sector since the previous annual submission. The main methodological improvement relates to the estimation of litter and soil carbon stock changes, the introduction of a tier 3 model calculation that uses a finer stratification of soil carbon stocks, and the correction of a calculation error for the litter stock change transition period. In response to a question raised by the ERT during the review, Austria indicated that it will improve the transparency of the inventory on the LULUCF sector in its next annual submission by including detailed information on biomass functions and by correcting the description errors regarding an equation used to calculate mineral soils in cropland remaining cropland. The ERT commends Austria for these efforts and recommends that the Party implement the identified improvements in relation to the transparency of its reporting in its next annual submission, and also include information on the calculation method used for soils in cropland and grassland and on the observation periods for the NFIs.

70. The time series of net removals from the LULUCF sector shows significant inter-annual fluctuations. For example, the largest removals of 18,136.35 Gg CO<sub>2</sub> eq were reported for 1999, whereas net emissions of 385.02 Gg CO<sub>2</sub> eq were reported for 2008. According to the information provided in the NIR, these fluctuations are driven by changes in forest land remaining forest land that is explained by forest data which reflect the inter-annual variations in weather conditions and in harvesting driven by timber demands and price. The ERT considers that the information provided in the NIR is sufficient to explain the inter-annual fluctuations in net removals and encourages Austria to provide an explanation for any years that do not follow the emissions trend in future annual submissions.

71. In its 2012 annual submission, Austria has reassessed the uncertainties for the entire LULUCF sector by applying a tier 2 Monte Carlo analysis. Information on the uncertainty analysis, including the assumptions, is generally well described in the NIR. The ERT

encourages Austria to include, in its next annual submission, information on the assumptions used for non-forest land categories that was provided to the ERT during the review week.

## 2. Key categories

### Forest land remaining forest land – CO<sub>2</sub>

72. In its 2012 annual submission, Austria has incorporated new data from the most recent NFI (2007/2009). The ERT found that the use of these new data has improved the accuracy of the estimations of the biomass and dead wood carbon stock changes for land-use transitions to forest and forest land remaining forest land. The ERT welcomes this information.

73. The carbon stock changes have been reported for productive forest (constituting 90 per cent of Austria's forest land), whereas the corresponding calculations for non-productive forest were not provided by the Party. In response to a question raised by the ERT during the review, Austria explained that it assumed that there is no extraction of biomass from non-productive forest, and that the emissions from biomass decomposition relating to disturbance that occur within non-productive forest are balanced by the carbon gains due to the subsequent recovery after a disturbance event. In addition, Austria clarified that planting activities also occurred in non-productive forests. The Party indicated that the biomass carbon stock changes for non-productive forest areas will be calculated once the next NFI data are completed. The ERT considers that the current assumption does not lead to the omission of large amounts of emissions or removals in non-productive forest, but, conversely, the ERT also considers that it does not demonstrate that no carbon stock changes occurred in non-productive forest. The ERT therefore recommends that Austria estimate the carbon stock changes in non-productive forest when the new NFI data become available.

## 3. Non-key categories

### Grassland remaining grassland – CO<sub>2</sub>

74. Austria calculated the carbon stock changes in mineral soils in grassland remaining grassland using a country-specific annual carbon change factor derived from a tier 2 method. In this approach, default management factors were applied to grassland management status in the years 1990 and 2003, with the change between those two years divided by the default transition period of 20 years. Austria explained that the years prior to 1990 are assumed to be in a steady state and that data from 2003 are representative of the current management status due to the fact that the major changes in grassland management occurred during the 1990s. The ERT considers that more recent data than that from 2003 should be used to more accurately reflect recent management status. During the review, the Party indicated that it intends to update the estimates based on more recent data. The ERT recommends that Austria conduct this work to update the estimates and report on the updated results in its next annual submission.

75. According to the information on organic soils in grassland remaining grassland provided in the NIR, in 2010, the area of organic soils in grassland remaining grassland was less than 0.8 per cent of the total area of grassland remaining grassland; the corresponding estimated CO<sub>2</sub> emissions from organic soils in grassland are 11.87 Gg CO<sub>2</sub> eq. However, this is offset by about one seventh of the estimated total carbon stock changes in mineral soils under grassland remaining grassland in 2010. The ERT notes that the emissions from organic soils represent a relatively high contribution to the total net emissions under grassland remaining grassland. The ERT also notes that Austria reported the area of organic soils under grassland remaining grassland as "IE". The ERT recommends that the Party

report the area of organic soils under grassland remaining grassland in the CRF table 5.C instead of using the notation key “IE”, examine the assumption that the emissions from organic soils are included in the calculation of the mineral soil stock changes and report the results in its next annual submission.

## F. Waste

### 1. Sector overview

76. In 2010, emissions from the waste sector amounted to 1,806.05 Gg CO<sub>2</sub> eq, or 2.1 per cent of total GHG emissions. Since 1990, emissions have decreased by 49.7 per cent. The key driver for the fall in emissions is the implementation of waste management policies. The amount of landfilled waste has decreased significantly, the organic fraction within this waste has also decreased, and the recovery of CH<sub>4</sub> has increased. Within the sector, 74.8 per cent of the emissions were from solid waste disposal on land, followed by 16.2 per cent from wastewater handling, 9.0 per cent from other (compost production) and 0.1 per cent from waste incineration.

77. Austria has performed recalculations for the waste sector between the 2011 and 2012 submissions in response to changes in AD (for the period 2006–2010) and EFs. The impact of these recalculations on the waste sector is a decrease in emissions of 0.6 per cent for 2009, and a decrease in emissions of 0.4 per cent for 2008. The main recalculations took place in the following categories:

- (a) CO<sub>2</sub> emissions from waste incineration;
- (b) CH<sub>4</sub> and N<sub>2</sub>O emissions from other (compost production).

78. Austria reported that a country-specific methodology was used to estimate CH<sub>4</sub> and N<sub>2</sub>O emissions from other (compost production); however, the ERT found that there was insufficient information in the NIR to enable an understanding of how this method was used by the Party. The ERT recommends that Austria enhance the transparency of its reporting on the use of this method in its next annual submission.

### 2. Key categories

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

79. Austria has used the IPCC first-order decay tier 2 method to estimate CH<sub>4</sub> emissions from landfills, together with the use of country-specific parameters for DOC, the fraction of DOC (DOC<sub>f</sub>) and the half-life period. The ERT noted that Austria has divided the total waste into residual waste and non-residual waste, but the description of these splits in the NIR may cause confusion. The NIR indicates that for 2009 only 0.4 per cent of the total waste from households was directly deposited in landfills. However, the AD on residual waste for 2009 and 2010 were reported as 0 (table 251 of the NIR). During the review week, Austria confirmed that the amount of residual waste directly deposited in landfills reported in NIR table 252 has a different meaning to the AD for “residual waste” presented in NIR table 251. The ERT recommends that Austria improve the transparency of its reporting by clearly describing the different waste types (in NIR tables 251 and 252) in its next annual submission.

80. According to NIR figure 32, the DOC value for residual waste changes significantly over time. For example, after 1999, the organic carbon in residual waste increases but is then kept constant after 2004. Therefore, it would be expected that the CH<sub>4</sub> generation potential would change in line with the changes in waste composition, but NIR table 254 shows that the CH<sub>4</sub> generation potential for residual waste is constant for the entire time series (0.016). The ERT recommends that Austria update its waste composition data with a

view to improving the calculation of DOC and the CH<sub>4</sub> generation potential for residual waste.

#### Wastewater handling – CH<sub>4</sub>

81. Emissions from domestic and commercial wastewater handling are based on country-specific research; however, the ERT found limited information in the NIR to enhance the ERT's understanding of this research. The ERT recommends that Austria provide further information on this research in its next annual submission, including a clarification of the use of the IPCC default EFs and information on the percentage of the population connected to wastewater infrastructure.

82. The ERT recommends that Austria change the use of the notation key "NA" to "NO" in the reporting of CH<sub>4</sub> emissions from wastewater handling, since Austria explained in the NIR that all CH<sub>4</sub> is used for energy or is flared.

### **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

83. The ERT noted that Austria submitted estimates for afforestation and reforestation, and deforestation (ARD) activities under Article 3, paragraph 3, of the Kyoto Protocol for the years 2008, 2009 and 2010. The Party did not elect to report on any activities under Article 3, paragraph 4, for the first commitment period. Austria chose commitment period accounting for activities under Article 3, paragraph 3. The ERT also noted that Austria reported all of the information required in paragraphs 5–9 of the annex to decision 15/CMP.1.

84. Austria has incorporated the latest NFI (2007/2009) data in its emission estimates for ARD activities for the first time in its 2012 annual submission, which has resulted in changes in the area data and parameters used compared to the previous annual submission. The ERT concluded that this recalculation has improved the accuracy of the emission estimates. The ERT noted that the calculations of ARD activities for the years 2009 and 2010 were undertaken using averages of the most recent NFI (2007/2009). The ERT reiterates the concern expressed by the previous review report that simple extrapolation assumptions without any supplemental index are not accurate enough to demonstrate the accounting requirement set out in paragraphs 18 and 20 of the annex to decision 16/CMP.1. The ERT welcomes the planned improvements such as incorporating the new ARD NFI (2011/2013) information into the calculations, including an update of the ARD land-use change area, annual ARD biomass gains and losses, and the AR dead wood calculation. The ERT encourages Austria to continue to work towards ensuring that the time-series data are properly constructed using the NFI. The ERT also noted that the Party has provided in the NIR an update on the planned improvements as recommended in the previous review report.

85. Austria has performed recalculations of the KP-LULUCF activities between the 2011 and 2012 submissions for the reasons specified in chapter II.E above. The impact of these recalculations on each KP-LULUCF activity for 2009 is as follows:

- (a) Net CO<sub>2</sub> removals from AR activities decreased by 1.5 per cent and 1.7 per cent for 2009 and 2008, respectively;
- (b) Net CO<sub>2</sub> emissions from D activities increased by 8.3 per cent and 10.1 per cent for 2009 and 2008, respectively.

86. No uncertainty assessments were provided for activities under Article 3, paragraph 3, of the Kyoto Protocol. In response to a question raised by the ERT during the review, Austria explained that the current reported values are based on intermediate estimates and that the results of the ongoing assessment of ARD activities will provide improved data in time for the 2014 annual submission. According to the IPCC good practice guidance for LULUCF, an uncertainty assessment should be provided for KP-LULUCF activities. The ERT recommends that Austria assess the uncertainties for ARD activities and report thereon in its next annual submission.

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

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

87. In the previous review report, the ERT concluded that the combined provisions of the NFI and the Austrian Forest Act mean that the reported AR activities are directly human-induced. With regard to the reporting requirement set out in paragraph 8(a) of the annex to decision 15/CMP.1, the ERT reiterates the recommendation from the previous review report that Austria carry out further methodological work relating to this issue, including an analysis of the degree of accounting of AR land affected by the difference in the definitions of forest, such as minimum area, of the NFI and the Austrian Forest Act.

##### *Deforestation – N<sub>2</sub>O*

88. The ERT found that the reported N<sub>2</sub>O emissions from disturbance associated with land-use conversion to cropland under deforestation were 0.001 times smaller than the corresponding value reported under the Convention. The ERT was able to clarify that there was a unit conversion error regarding the calculation of N<sub>2</sub>O emissions from deforestation. The ERT concluded that the N<sub>2</sub>O emissions from deforestation have been underestimated and recommends that Austria correct this calculation error in its next annual submission. The recommendation from the previous review report regarding the litter carbon pool has been addressed by the Party in its 2012 annual submission.

## **2. Information on Kyoto Protocol units**

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

89. Austria 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>9</sup> The SIAR was forwarded to the ERT prior to the review, pursuant to decision 16/CP.10. The SIAR does not contain any recommendations that should be addressed by the Party.

90. Information on the accounting of Kyoto Protocol units has been prepared and reported in accordance with chapter I.E of the annex to decision 15/CMP.1, and reported in accordance with decision 14/CMP.1 using the SEF tables. This information is consistent with that contained in the national registry and with the records of the international transaction log (ITL) and the clean development mechanism registry and meets the requirements referred to in paragraph 88(a–j) of the annex to decision 22/CMP.1. The Party provided information according to the requirements included in paragraphs 12–17 of the annex to decision 15/CMP.1. The transactions of Kyoto Protocol units initiated by the national registry are in accordance with the requirements of the annex to decision 5/CMP.1 and the annex to decision 13/CMP.1. No discrepancy has been identified by the ITL and no

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<sup>9</sup> The SEF comparison report is prepared by the international transaction log (ITL) administrator and provides information on the outcome of the comparison of data contained in the Party's SEF tables with corresponding records contained in the ITL.

non-replacement has occurred. The national registry has adequate procedures in place to minimize discrepancies.

#### National registry

91. 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

92. Austria has reported its commitment period reserve in its 2012 annual submission. The Party reported its commitment period reserve to be 309,479,408 t CO<sub>2</sub> eq based on the assigned amount and not the most recently reviewed inventory. The ERT agrees with this figure.

### **3. Changes to the national system**

93. Austria 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.

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

94. Austria reported that there have been changes to its national registry since the previous annual submission. The Party described the change to the security measures that were enhanced during the reported period in several areas, as well as the updated security plan that sufficiently documents the changes to the security measures implemented during the reported period. The updated security plan (a version containing no confidential information) was submitted to the secretariat (as part of the annual submission) through the UNFCCC submission portal. Austria also reported changes to the test procedures that were enhanced during the reported period in several areas, and submitted the relevant test documentation in NIR section 13.1. The Party provided sufficient documentation on the changes to the test procedures and test results during the reported period. The ERT concluded that, taking into account the confirmed changes to the national registry, Austria'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**

95. Austria did not provide information on changes in its reporting of the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol in its annual submission. Responding to the ERT during the review, Austria stated that no comment was provided because no changes had occurred in the NIR of its 2012 annual submission compared with the NIR of its 2011 annual submission, but that a comment will be included in its 2013 annual submission. The ERT reiterates the recommendation from the previous review report that the Party, in its next annual submission, report any changes

in its information provided under Article 3, paragraph 14, in accordance with chapter I.H of the annex to decision 15/CMP.1.

96. Austria has reported information on the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol, as requested in chapter I.H of the annex to decision 15/CMP.1.

97. The reported information is considered complete and transparent. Austria has reported general information in the NIR regarding the measures undertaken by the Party within the framework of emissions trading to minimize the risk of carbon leakage and the social and environmental criteria established for the eligibility of projects under the Austrian joint implementation/clean development mechanism (CDM) programme. The links for specific information are provided in the NIR.

98. Austria has also reported information on how the Party gives priority, in implementing its commitments under Article 3, paragraph 14. Specific actions include:

(a) Phasing out of market imperfections through: (i) the reform to a large extent of its energy market; (ii) the use of fiscal incentives, which include a mineral oil tax, a consumption tax law (Normverbrauchsabgabegesetz) regarding CO<sub>2</sub> emissions from road transportation vehicles and a flight fee law, which establishes fees (at a specific amount per passenger) that must be paid for all flights starting from Austrian airports; and (iii) the provision of agriculture subsidies that are extensive, appropriate to the environment, and protective of nature;

(b) Implementing more than 50 CDM projects all over the world using an approach that addresses key issues such as capacity, awareness, and technical, methodological and financial restrictions;

(c) Launching the CDM in Africa initiative, aimed at boosting projects in Ethiopia, Ghana and Uganda.

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

#### **A. Conclusions**

99. Austria made its annual submission on 12 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, 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.

100. The ERT concludes that the inventory submission of Austria 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.

101. 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.

102. The Party’s inventory is in line with the Revised 1996 IPCC Guidelines, the IPCC good practice guidance and the IPCC good practice guidance for LULUCF.



103. The Party has performed recalculations for the inventory between the 2011 and 2012 submissions in response to the 2011 ARR and following changes in AD and EFs. The impact of these recalculations on the national totals is a decrease of 0.4 per cent for 2009. The main recalculations took place in the following sectors/categories:

- (a) CO<sub>2</sub> emissions from the energy sector: manufacturing industries and construction, transport and other sectors;
- (b) CO<sub>2</sub> emissions from the industrial processes sector: ammonia production, soda ash use and pig iron;
- (c) HFC emissions from consumption of halocarbons and SF<sub>6</sub>;
- (d) CO<sub>2</sub> emissions from the solvent and other product use sector: paint application, degreasing and dry cleaning, chemical products, manufacture and processing and other;
- (e) CH<sub>4</sub> and N<sub>2</sub>O emissions from manure management;
- (f) N<sub>2</sub>O emissions from agricultural soils: direct and indirect soil emissions;
- (g) CO<sub>2</sub> emissions/removals from the LULUCF sector: forest land remaining forest land, land converted to forest land, cropland, grassland, wetlands, settlements and other land;
- (h) N<sub>2</sub>O emissions from disturbance due to land conversion to cropland.

104. The Party has performed recalculations for the KP-LULUCF activities between the 2011 and 2012 submissions in order to incorporate new NFI data. The impact of these recalculations on each KP-LULUCF activity for 2009 is as follows:

- (a) Net CO<sub>2</sub> removals from AR activities decreased by 1.5 per cent and 1.7 per cent for 2009 and 2008, respectively;
- (b) Net CO<sub>2</sub> emissions from D activities increased by 8.3 per cent and 10.1 per cent for 2009 and 2008, respectively.

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

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

107. 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.

108. Austria has reported information under chapter I.H of the annex to decision 15/CMP.1, "Minimization of adverse impacts in accordance with Article 3, paragraph 14" as part of its 2012 annual submission. The information is considered complete and transparent.

## B. Recommendations

109. The ERT identifies issues for improvement as listed in table 6 below.

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

<i>Sector</i>	<i>Category</i>	<i>Recommendation</i>	<i>Paragraph reference</i>
General	Key category analysis	The expert review team (ERT) recommends that Austria investigate the differences between the key category analysis performed by the Party and that performed by the secretariat, including the possible missing categories, in order to ensure that it is applying the appropriate methodologies and to report thereon in the next annual submission	18
	Uncertainties	Include uncertainty estimates for entire LULUCF sector in its next annual submission	21
	Recalculations	Complete common reporting format (CRF) table 8(b) for all the years for which recalculations have been undertaken	25
	Quality assurance/quality control (QA/QC)	Implement additional QA/QC procedures in order to ensure that the presented data in the NIR correspond to the actual data used for the emission estimates, as presented in the official national energy balance, and check them against other data sources	29
		Include a corrected national energy balance table in annex 4 to the national inventory report (NIR) in the next annual submission and implement adequate QA/QC procedures prior to the submission of the NIR	29
	Transparency	Improve the transparency of the reporting with regard to the energy, industrial processes, agriculture, land use, land-use change and forestry (LULUCF) and waste sectors	30
Previous annual review reports (ARRs)	The ERT reiterates the recommendations from the previous ARR	33	
Energy	Reference approach	The ERT reiterates the recommendation that Austria implement editorial changes in the NIR in order to improve the understanding of the accounting of the biogenic and fossil fuel fractions between the reference and the sectoral approaches, thereby ensuring transparency	42
	Feedstocks and non-energy use of fuels	Gather additional information regarding the electrode production process and annual production data in order to verify that there is no non-energy use of petroleum coke, reported as non-energy use (which is actually used in a combustion process)	44
		Exclude the amounts of residual fuel oil used in blast furnaces from the activity data (AD) reported for non-energy use of fuels	45

<i>Sector</i>	<i>Category</i>	<i>Recommendation</i>	<i>Paragraph reference</i>
	Stationary combustion: gaseous fuels – all gases	In cases where the emission factors (EFs) from the European Union emissions trading scheme (EU ETS) are consistently higher than the current country-specific EFs, the ERT recommends that Austria collect additional data regarding the natural gas composition of the domestic production and imports in order to calculate an accurate country-specific EF for natural gas on an annual basis	46
	Stationary combustion	Clarify the methodology used in the reporting under the EU ETS for the iron and steel plants and highlight how the distribution losses and fugitive emissions are accounted for in the NIR of the next annual submission	47
	Road transportation: liquid fuels – all gases	The ERT reiterates the recommendation from the previous ARR (para. 45) that Austria improve the transparency of its reporting on this category, by providing additional information in the NIR of the next annual submission regarding the methodology used and the impact of tank fuel exports on the emission estimates	48
	Navigation: liquid fuels – all gases	Include the additional information provided to the ERT during the review week in the next annual submission in order to improve the transparency of the reporting on emissions from navigation (liquid fuels)	49
	Oil and natural gas – all gases	Perform more detailed verification of these estimates provided by industry and include, in the NIR of the next annual submission, information on the methodologies, AD and EFs used to calculate the fugitive emission estimates	50
		Develop a country-specific EF, taking into account the specific technologies in use for oil refining and storage or apply expert judgement to estimate the emissions using a tier 1 method by selecting a more appropriate value within the range 90–1,400 kg CH <sub>4</sub> /PJ for refining and 20–250 kg CH <sub>4</sub> /PJ for storage	52
		Implement its plan (confirmed during the review week) to report the CH <sub>4</sub> emissions from combustion separately in CRF table 1.A.1.b (petroleum refining) using the country-specific EFs described above in the CRF tables and in the NIR of the next annual submission	52
		Implement additional QA/QC procedures to cross-check the information from the national energy balance with the information from the Austrian Petroleum Industry Association	53
		Further investigate the reasons for the discrepancies between the AD reported under the national energy balance and by the Austrian Petroleum Industry Association and correct the AD and emission estimates where necessary	53

<i>Sector</i>	<i>Category</i>	<i>Recommendation</i>	<i>Paragraph reference</i>
Industrial processes and solvent and other product use	Transparency	Further explain the use of the respective EU ETS data, including information such as that included in the energy chapter of the 2012 NIR; and provide an explanation as to how time-series consistency is ensured with regard to the use of EU ETS data from 2005 onwards; and avoid omissions or overlaps in the accounting for limestone and dolomite use and iron and steel production	57
	Cement production – CO <sub>2</sub>	Improve transparency by including information on the composition of raw meal and on the calcium carbonate and magnesium carbonate content for all years of the time series, including additional information on the use of EU ETS data and provide an explanation of how time-series consistency is ensured across the time series	58
	Limestone and dolomite use – CO <sub>2</sub>	Provide information on the limestone use for each industry and provide an explanation for the calculation of the estimates for limestone use in chemical industry prior to 2005 in the next annual submission	59
	Consumption of halocarbons and SF <sub>6</sub> – HFCs, PFCs and SF <sub>6</sub>	Use the notation key included elsewhere (“IE”) to indicate that the emissions from manufacture and disposal are included under the emissions “from stocks”	60
Agriculture	Transparency	Improve transparency by including the background data necessary to review the inventory for the agriculture sector in future NIRs	64
	Manure management – CH <sub>4</sub> and N <sub>2</sub> O	Provide, in the next annual submission, a more detailed explanation for the use of the EF for N <sub>2</sub> O-N/kg N for cattle and swine deep bedding with no mixing of manure, including information on storage duration and mixing practice	65
	Agricultural soils – N <sub>2</sub> O	Include, in the NIR of the next annual submission, complete information to characterize the cultivation of histosols	66
LULUCF	Transparency	Further improve the transparency of the NIR by including, in the next annual submission, information on the calculation method used for soils in cropland and grassland, and the observation periods for the national forest inventories (NFIs) which was provided to the ERT during the review week	69
	Uncertainties	Include the source of information and assumptions used for the uncertainty estimates for non-forest land categories (provided to the ERT during the review week) in the NIR of the next annual submission	71
	Forest land remaining forest land – CO <sub>2</sub>	Estimate the carbon stock changes in non-productive forests when the new NFI data become available	73
	Grassland remaining grassland – CO <sub>2</sub>	Use more recent management factors for grassland management than 2003 to reflect recent management status and report on the updated results in the next submission	74

<i>Sector</i>	<i>Category</i>	<i>Recommendation</i>	<i>Paragraph reference</i>
		Report the area of organic soils under grassland remaining grassland in the CRF table 5.C instead of using the notation key “IE”, and examine the assumption that the emissions from organic soils are included in the calculation of the mineral soil stock changes and report the results in the next annual submission	75
Waste	Transparency	Enhance the transparency of the country-specific methodology used to estimate CH <sub>4</sub> and N <sub>2</sub> O emissions from other (compost production) in the next annual submission	78
	Solid waste disposal on land – CH <sub>4</sub>	Improve transparency by describing the different waste types (in NIR tables 251 and 252) in the next annual submission	79
		Update the waste composition data with a view to improving the calculation of DOC and the CH <sub>4</sub> generation potential for residual waste	80
	Wastewater handling – CH <sub>4</sub>	Improve the description of the country-specific methodology, clarify the use of IPCC default EFs and include information on the percentage of the population connected to wastewater treatment infrastructure in the next annual submission	81
Use the notation key not occurring (“NO”), to estimate and report the generated and recovered/destroyed CH <sub>4</sub> in CRF table 6.B and explain, in the NIR of the next annual submission, that 100 per cent of the CH <sub>4</sub> is used for energy generation or is flared		82	
Article 3, paragraphs 3 and 4, of the Kyoto Protocol	Uncertainties	Assess the uncertainties for afforestation and reforestation, and deforestation activities and report the results and background information in the next annual submission	86
	Afforestation and reforestation – CO <sub>2</sub>	Carry out further methodological work to demonstrate directly human-induced afforestation and reforestation, including an analysis of the degree of accounting of afforestation and reforestation land affected by the difference in the definitions of forest, such as minimum area, of the NFI and the Austrian Forest Act	87
	Deforestation– N <sub>2</sub> O	Correct the calculation error and report the recalculated results for the estimation of N <sub>2</sub> O emissions from deforestation in the next annual submission	88
Article 3, paragraph 14, of the Kyoto Protocol		Report any changes in the information provided under Article 3, paragraph 14, in accordance with chapter I.H of the annex to decision 15/CMP.1	95

#### IV. Questions of implementation

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

## Annex I

### Documents and information used during the review

#### A. Reference documents

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

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

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

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

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

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

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

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

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

Status report for Austria 2012. Available at  
<<http://unfccc.int/resource/docs/2012/asr/aut.pdf>>.

Synthesis and assessment report on the greenhouse gas inventories submitted in 2012. Available at <<http://unfccc.int/resource/webdocs/sai/2012.pdf>>.

FCCC/ARR/2011/AUT. Report of the individual review of the annual submission of Austria submitted in 2011. Available at  
<<http://unfccc.int/resource/docs/2012/arr/aut.pdf>>.

UNFCCC. *Standard Independent Assessment Report*, parts I and II. Available at  
<[http://unfccc.int/kyoto\\_protocol/registry\\_systems/independent\\_assessment\\_reports/items/4061.php](http://unfccc.int/kyoto_protocol/registry_systems/independent_assessment_reports/items/4061.php)>.

## B. Additional information provided by the Party

Responses to questions during the review were received from Mr. Klaus Radunsky and Ms. Katja Pazdernik (Umweltbundesamt (Austrian Federal Environment Agency)), including additional material on the methodologies and assumptions used. The following documents<sup>1</sup> were also provided by Austria:

### General

Katja Pazdernik, 2012, examples of QC activities for the 2012 submission.

Katja Pazdernik, 2012, Austria's QA/QC plan.

Katja Pazdernik, 2012 April 3rd 2012, external audit report.

Katja Pazdernik, 2012, examples of Austria's inventory QA including Bottom-up/top-down "verification" techniques & calculation sheets validation following an improvement measure defined by the accreditation body. Different types of validation.

Katja Pazdernik, 2012, new revised quality manual publically available on the homepage of the Environment Agency Austria  
<[http://www.umweltbundesamt.at/umweltsituation/luft/emissionsinventur/emi\\_ueberwachung/](http://www.umweltbundesamt.at/umweltsituation/luft/emissionsinventur/emi_ueberwachung/)>.

Katja Pazdernik, 2012, Sector specific QC checklists Example for Agriculture (4.D.4 - Agricultural soils – other (sewage sludge application)).

Katja Pazdernik, 2012, Inspection Body for Emission Inventories", the accreditation.

### Energy

Katja Pazdernik, Updated NIR Annex 4.

Katja Pazdernik, Calculation sheets for category 1.A.3.d Navigation.

IPIECA/API/IAOGP, 2011, Petroleum industry guidelines for reporting greenhouse gas emissions.

IPIECA/API/IAOGP, 2003, Petroleum industry guidelines for reporting greenhouse gas emissions.

### Agriculture

Barbara Amon, Dipl.-Ing. Stefan Hörtenhuber, 2010, Revision of Austria's National Greenhouse Gas Inventory, Sector Agriculture, Vienna: Universität für Bodenkultur Wien.

Leonhard Gruber, Erich M. Pötsch, 2006, Calculation of nitrogen excretion of dairy cows in Austria.

2009, Ökostrombericht 2009, Vienna: Energie-Control GmbH.

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<sup>1</sup> Reproduced as received from the Party.

## Annex II

### Acronyms and abbreviations

AD	activity data
ARD	afforestation, reforestation, and deforestation
ARR	Annual review report
AWMS	animal waste management systems
CDM <sub>2</sub>	clean development mechanism
CF <sub>4</sub>	perfluoromethane
CH <sub>4</sub>	methane
CHF <sub>3</sub>	HFC-23
C <sub>2</sub> F <sub>6</sub>	perfluoroethane
C <sub>3</sub> F <sub>8</sub>	perfluoropropane
C <sub>4</sub> F <sub>8</sub>	perfluorocyclobutane
C <sub>4</sub> F <sub>6</sub>	hexafluorocyclobutane
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
DOC	degradable organic carbon
DOC <sub>f</sub>	fraction of DOC
EF	emission factor
ERT	expert review team
EU ETS	European Union emissions trading scheme
F-gases	fluorinated gases
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
IEF	implied emission factor
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
MCF	methane conversion factor
N	nitrogen
N <sub>2</sub> O	nitrous oxide
NA	not applicable
NE	not estimated
NF <sub>3</sub>	nitrogen trifluoride
NIR	national inventory report
NO	not occurring
PFCs	perfluorocarbons
PJ	petajoule (1 PJ = 10 <sup>15</sup> joule)
QA/QC	quality assurance/quality control
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

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