



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

**Note by the secretariat**

The report of the individual review of the annual submission of Germany submitted in 2010 was published on 18 May 2011. For purposes of rule 10, paragraph 2, of the rules of procedure of the Compliance Committee (annex to decision 4/CMP.2, as amended by decision 4/CMP.4), the report is considered received by the secretariat on the same date. This report, FCCC/ARR/2010/DEU, 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, 2010 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 in-country review of the 2010 annual submission of Germany, coordinated by the UNFCCC secretariat, in accordance with decision 22/CMP.1. The review took place from 20 to 25 September 2010 in Dessau, Germany, and was conducted by the following team of nominated experts from the UNFCCC roster of experts: generalist – Ms. Riitta Pipatti (Finland); energy – Mr. Joost Huurman (Netherlands); industrial processes – Mr. Newton Paciornik (Brazil); agriculture – Mr. Steen Gyldenkaerne (Denmark); land use, land-use change and forestry (LULUCF) – Mr. Rizaldi Boer (Indonesia); and waste – Ms. Violeta Hristova (Bulgaria). Ms. Pipatti and Mr. Paciornik 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 Germany, which provided comments that were considered and incorporated, as appropriate, into this final version of the report.

3. In 2008, the main greenhouse gas (GHG) in Germany was carbon dioxide (CO<sub>2</sub>), accounting for 85.8 per cent of total GHG emissions<sup>1</sup> expressed in carbon dioxide equivalent (CO<sub>2</sub> eq), followed by nitrous oxide (N<sub>2</sub>O) (7.2 per cent) and methane (CH<sub>4</sub>) (5.2 per cent). Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF<sub>6</sub>) collectively accounted for 1.8 per cent of the overall GHG emissions in the country. The energy sector accounted for 79.3 per cent of total GHG emissions, followed by the industrial processes sector (11.2 per cent), the agriculture sector (7.9 per cent), the waste sector (1.3 per cent) and the solvent and other product use sector (0.3 per cent). Total GHG emissions amounted to 983,714.74 Gg CO<sub>2</sub> eq and decreased by 18.8 per cent between the base year<sup>2</sup> and 2008.

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

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

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

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

	Greenhouse gas	Base year <sup>d</sup>	Gg CO <sub>2</sub> eq							Change	
			1990	1995	2000	2005	2006	2007	2008	Base year–2008 (%)	
Annex A sources	CO <sub>2</sub>	1 041 342.19	1 041 342.19	933 161.76	896 237.58	864 167.11	872 224.25	847 005.61	843 773.80	–19.0	
	CH <sub>4</sub>	107 161.01	107 161.01	91 717.10	74 368.68	57 403.99	54 364.31	52 321.81	51 514.50	–51.9	
	N <sub>2</sub> O	90 855.92	90 855.92	85 107.12	67 485.03	68 004.59	67 079.99	69 210.02	70 580.22	–22.3	
	HFCs	6 469.01	4 368.78	6 469.01	6 483.25	9 989.58	10 527.05	11 140.54	11 469.22	77.3	
	PFCs	1 749.60	2 707.58	1 749.60	781.39	706.50	569.35	528.03	530.50	–69.7	
	SF <sub>6</sub>	7 220.40	4 785.03	7 220.40	5 082.35	4 897.84	5 510.18	5 566.61	5 846.49	–19.0	
KP-LULUCF	Article 3.3 <sup>b</sup>	CO <sub>2</sub>							13 778.12		
		CH <sub>4</sub>							NO		
		N <sub>2</sub> O							0.26		
	Article 3.4 <sup>c</sup>	CO <sub>2</sub>	NA							–20 380.47	NA
		CH <sub>4</sub>	NA							3.28	NA
		N <sub>2</sub> O	NA							45.37	NA

*Abbreviation:* 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 CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O, and 1995 for HFCs, PFCs and SF<sub>6</sub>. The “base year” for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol is 1990. Data in the above table is based on 5 November 2010 resubmission of Germany.

<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 to 2008**

	Sector	Base year <sup>a</sup>	Gg CO <sub>2</sub> eq							Change	
			1990	1995	2000	2005	2006	2007	2008	Base year– 2008 (%)	
Annex A	Energy	992 418.15	992 418.15	878 686.52	836 093.67	803 302.17	808 152.37	779 113.92	779 874.57	–21.4	
	Industrial processes	123 616.16	120 038.54	123 244.02	103 424.19	104 497.30	108 195.67	114 595.31	109 801.35	–11.2	
	Solvent and other product use	5 458.04	5 458.04	4 520.25	3 784.63	3 463.91	3 407.43	3 378.41	3 378.41	–38.1	
	Agriculture	90 194.29	90 194.29	79 153.96	80 055.04	76 301.61	74 750.96	74 347.19	77 449.38	–14.1	
	Waste	43 111.50	43 111.50	39 820.25	27 080.73	17 604.61	15 768.70	14 337.78	13 211.03	–69.4	
	Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	LULUCF	NA	–20 164.79	–21 900.74	–22 060.88	34 958.73	36 450.18	38 960.77	30 185.19	NA	
<b>Total (with LULUCF)</b>		<b>NA</b>	<b>1 187 944.23</b>	<b>1 063 704.01</b>	<b>1 001 296.66</b>	<b>1 022 523.73</b>	<b>1 030 956.61</b>	<b>1 024 733.38</b>	<b>1 013 899.93</b>	<b>NA</b>	
<b>Total (without LULUCF)</b>		<b>1 211 686.64</b>	<b>1 208 109.02</b>	<b>1 085 604.75</b>	<b>1 023 357.54</b>	<b>987 565.00</b>	<b>994 506.43</b>	<b>985 772.61</b>	<b>983 714.74</b>	<b>–18.8</b>	
KP-LULUCF	Article 3.3 <sup>b</sup>										
	Afforestation & reforestation								–2 615.20		
	Deforestation								16 393.58		
	<b>Total (3.3)</b>								13 778.38		
	Article 3.4 <sup>c</sup>										
	Forest management								–20 331.82		
	Cropland management	NA							NA	NA	
Grazing land management	NA							NA	NA		
Revegetation	NA							NA	NA		
<b>Total (3.4)</b>	<b>NA</b>								<b>–20 331.82</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 CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O, and 1995 for HFCs, PFCs and SF<sub>6</sub>. The “base year” for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol is 1990. Data in the above table is based on 5 November 2010 resubmission of Germany.

<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 3  
Information to be included in the compilation and accounting database in t CO<sub>2</sub> eq

	<i>As reported</i>	<i>Adjustment<sup>a</sup></i>	<i>Final<sup>b</sup></i>	<i>Accounting quantity<sup>c</sup></i>
<b>Commitment period reserve</b>	4 381 287 024		4 381 287 024	
<b>Annex A emissions for current inventory year</b>				
CO <sub>2</sub>	833 091 862		843 773 805	
CH <sub>4</sub>	47 741 863		51 514 501	
N <sub>2</sub> O	59 380 790		70 580 216	
HFCs	11 469 223		11 469 223	
PFCs	530 501		530 501	
SF <sub>6</sub>	5 846 490		5 846 490	
<b>Total Annex A sources</b>	<b>958 060 729</b>		<b>983 714 735</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	-2 615		-2 615	
3.3 Afforestation and reforestation on harvested land for current year of commitment period as reported	NA		NA	
3.3 Deforestation for current year of commitment period as reported	16 393 582		16 393 582	
<b>Activities under Article 3, paragraph 4, for current inventory year<sup>d</sup></b>				
3.4 Forest management for current year of commitment period	-20 331 821		-20 331 821	
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				

*Abbreviations:* NA = not applicable.

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

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

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

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

6. The GHG inventory is generally in line with the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Revised 1996 IPCC Guidelines), the Intergovernmental Panel on Climate Change (IPCC) *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC good practice guidance) 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). During the review, the expert review team (ERT) identified some methodological issues with the 2010 annual submission and recommended that Germany submit revised emission estimates. Germany submitted revised estimates on 5 November 2010 in accordance with the recommendations of the ERT. The resubmission increased the total national emissions by 2.7 per cent in 2008. The revised estimates and the additional information are addressed in more detail in the sectoral chapters.

7. By submitting the revised inventories and supplying the additional information requested by the ERT, Germany has demonstrated sufficient capacity to comply 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” (hereinafter referred to as the UNFCCC reporting guidelines), the Revised 1996 IPCC Guidelines, the IPCC good practice guidance and the IPCC good practice guidance for LULUCF.

8. The 2010 inventory submission is generally of a high quality and shows significant improvement in many areas, especially in the collection of activity data (AD) which is a result of new agreements with the Federal Statistical Bureau and industry associations.

9. The ERT acknowledges that significant improvements have been made in the timeliness and quality of the AD for the energy sector. Nevertheless, further improvement is needed and the ERT reiterates the recommendation of previous review reports that Germany continue to improve the timeliness and quality of the national energy balance (NEB) (see para. 23 below).

10. Germany has submitted supplementary information required under Article 7, paragraph 1, of the Kyoto Protocol in accordance with chapter I of the annex to decision 15/CMP.1. However, the ERT identified a need for improvement in the quality of reporting under Article 3, paragraphs 3 and 4, of the Kyoto Protocol. There were numerous deficiencies and errors (see para. 24 below), which meant that the ERT was not able to assess the accuracy of the reporting. Germany was requested by the ERT to provide an action plan outlining how it plans to resolve the issues identified by the ERT. Germany provided this plan on 5 November 2010. The ERT recommends that Germany implement the planned improvements set out in this action plan as far as possible and to report thereon in its 2011 annual submission, and to provide information from its action plan in the national inventory report (NIR). In response to the draft annual review report, Germany informed the ERT that it has updated its planned improvements in the 2011 annual submission to reflect the above action plan.

11. Germany has chosen to account for activities under Article 3, paragraph 3 and 4, of the Kyoto Protocol at the end of the commitment period. Germany elected to account for forest management under Article 3, paragraph 4, of the Kyoto Protocol in accordance with decisions 13/CMP.1.

12. Germany 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 has used the standard electronic format (SEF) tables as required by decision 14/CMP.1.

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

14. The national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1, and continues to adhere to the technical standards for data exchange between registry systems in accordance with relevant decisions of the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol.

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

16. In the course of the review, the ERT formulated a number of recommendations relating to the completeness of its 2010 annual submission, transparency and the quality of the information presented in the annual submission. In response to the recommendations contained in the draft 2010 annual review report, Germany indicated to the ERT that it had partly addressed these in the 2011 annual submission and that it will implement the remaining recommendations in its 2012 annual submission.<sup>3</sup> The key recommendations are that Germany:

(a) Provide clarification of the responsibilities of the single national entity – the Federal Environment Agency, Umweltbundesamt (UBA) – and the Federal Ministry of Agriculture and Consumer Protection (BMELV) with respect to the reporting on agriculture, LULUCF and KP-LULUCF;

(b) Improve the timeliness and accuracy of the NEB;

(c) Enhance the use of data collected under the European Union emissions trading scheme (EU ETS) for the verification of emissions data in the energy and industrial processes sectors;

(d) Provide justification for time-series consistency in the energy sector where revisions do not cover the whole time series, and in the LULUCF sector where different methods are used over time;

(e) Include information on the results of the quality assurance/quality control (QA/QC) procedures;

(f) Improve the reporting of land area to ensure a consistent land-use matrix in the LULUCF sector and reporting under KP-LULUCF;

(g) Improve the quality of reporting of emissions/removals under KP-LULUCF (see para. 24 below);

(h) Provide more detailed information on the adverse impacts of policies and measures, including the impacts of the policies and measures of the European Union, implemented in Germany under Article 3, paragraph 14, of the Kyoto Protocol.

## **II. Technical assessment of the annual submission**

### **A. Overview**

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

17. The 2010 annual inventory was submitted on 15 April 2010; it contains a complete set of common reporting format (CRF) tables for the period 1990–2008 and an NIR.

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<sup>3</sup> The 2010 annual review report of Germany was published after the submission due date of the 2011 annual submission.

Germany 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 adverse impacts under Article 3, paragraph 14, of the Kyoto Protocol. The NIR was resubmitted on 12 May 2010. The SEF tables were submitted on 15 April 2010. The annual submission was submitted in accordance with decision 15/CMP.1.

18. Germany officially submitted revised emission estimates on 5 November 2010 in response to questions raised by the ERT during the course of the in-country visit for: CO<sub>2</sub> and N<sub>2</sub>O emissions from iron and steel in the energy sector; N<sub>2</sub>O emissions from natural gas in the energy sector; CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O emissions from domestic navigation in the energy sector; CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O emissions from deep sea fishing in the energy sector; CO<sub>2</sub> emissions from lime production in the industrial processes sector; CO<sub>2</sub> emissions from soda ash use in the industrial processes sector; CO<sub>2</sub> emissions from ammonia (NH<sub>3</sub>) production in the industrial processes sector; N<sub>2</sub>O emissions from nitric acid production in the industrial processes sector; CH<sub>4</sub> emissions from dairy cattle (enteric fermentation) in the agriculture sector; CH<sub>4</sub> emissions from dairy cattle (manure management) in the agriculture sector; N<sub>2</sub>O emissions from nitrogen runoff and leaching in the agriculture sector; and CH<sub>4</sub> emissions from solid waste disposal in the waste sector. The revised estimates result in an increase in total GHG emissions of 2.7 per cent in 2008 compared with the initial submission. The values in this report are based on the submission of 5 November 2010.

19. In addition, the ERT used the standard independent assessment report (SIAR), parts I and II, to review information on the accounting of Kyoto Protocol units (including the SEF tables and their comparison report) and on the national registry.<sup>4</sup> Where necessary, the ERT also used previous year's submissions during the review.

20. During the review, Germany provided the ERT with additional information. The documents concerned are not part of the annual submission but are referenced in the NIR. The full list of materials used during the review is provided in annex I to this report.

#### Completeness of inventory

21. The inventory covers all source and sink categories for the period 1990–2008 and is complete in terms of years and geographical coverage. Germany has provided CRF tables for all years of the inventory time series. During the in-country review, the ERT identified some categories for which emission estimates were not provided due to their minor importance. Estimates for these categories were included in the submission of revised estimates of 5 November 2010.

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<sup>4</sup> The SIAR, parts I and II, is prepared by an independent assessor in line with decision 16/CP.10 (paras. 5(a), 6(c) and 6(k)), under the auspices of the international transaction log administrator using procedures agreed in the Registry System Administrators Forum. Part I is a completeness check of the submitted information relating to the accounting of Kyoto Protocol units (including the SEF tables and their comparison report) and to national registries. Part II contains a substantive assessment of the submitted information and identifies any potential problem regarding information on the accounting of Kyoto Protocol units and the national registry.

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

Overview

22. Germany reported supplements to legislation and new agreements to improve the provision of data for the inventory as changes to the national system. The ERT welcomed these improvements and concluded that the national system continued to perform its required functions. However, the ERT noted areas in the institutional arrangements and in the functioning of the national system that need to be improved (see paras. 23–25).

23. In the energy sector, the NEB is a key data source for inventory preparation. The institutional arrangements for compiling the NEB are complex, resulting in problems both in the timelines and the quality of the data. The ERT reiterates the recommendation of previous review reports that Germany ensure timely provision of the NEB in support of robust and accurate preparation and reporting of emissions from the energy and industrial processes sectors. The ERT encourages Germany to explore options for improving the institutional arrangements for the NEB or the use of alternative data sources in the inventory preparation to achieve this goal.

24. The institutional arrangements for preparing the estimates for both the LULUCF sector and the KP-LULUCF activities need to be strengthened. During the in-country review, the ERT identified deficiencies and errors in the LULUCF sector which meant that the ERT was not able to assess the accuracy of reported information. During the in-country review, the ERT requested Germany to provide an action plan that identifies and sets out improvements in the preparation and reporting of LULUCF and the KP-LULUCF emission/removal estimates:

(a) Resolve issues identified by the ERT in relation to identifying areas of land use and areas of land-use change;

(b) Consistency across categories and the time series is generally good; however, the revision of AD does not cover the whole time series and the identification of land areas does not result in consistent reporting;

(c) The inventory QA/QC plan and overall quality management are robust and comprehensive. However, the ERT noted several errors and mistakes in the reporting, especially in the LULUCF sector, and concluded that the implementation of the QA/QC procedures needs to be strengthened.

25. The action plan on KP-LULUCF reporting was submitted to the ERT on 5 November 2010. This plan shows that Germany intends to change the method used for the representation of land areas to ensure consistency across activities and time series. Additional information provided on QA/QC mainly addresses organisation issues related to quality management, rather than the actual procedures. The ERT acknowledges the improvements planned for the 2011 annual submission, but strongly recommends that Germany make additional efforts to ensure complete and consistent reporting in its annual submissions. Continued inconsistencies and incompleteness in the reporting of land use and land-use change under the Kyoto Protocol could indicate a problem with the national system. The ERT also recommends that Germany enhance its QA/QC procedures for these emission/removal estimates in accordance with section 5.5 of the IPCC good practice guidance for LULUCF.

Inventory planning

26. During the in-country visit, Germany presented its national system for the preparation of the inventory. The national system was established at ministerial level, under the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU). Other ministries that are also involved in the national system include the Federal Ministry of the Interior; the Federal Ministry of Defence; the Federal Ministry of Finance; the Federal Ministry of Economics and Technology; the Federal Ministry of Transport, Building and Urban Construction; and the Federal Ministry of Food, Agriculture and Consumer Protection (BMELV). UBA is the designated single national entity. The ministries supervise the process of planning, preparation and management via the National Coordinating Committee.

27. As the single national entity, UBA is responsible for the planning, preparation and management (e.g. archiving) of each sector of the inventory (excluding the agriculture and LULUCF sectors, which are under the responsibility of the BMELV), as well as for QA/QC. The Institute for Agricultural Climate Research (AK) and the Institute of Forest Ecology and Forest Inventory (WOI) at the Johann Heinrich von Thünen-Institut (vTI) prepare the emission and removal estimates for the agriculture and LULUCF sectors as well as for KP-LULUCF. The ERT recommends that the LULUCF and agriculture experts should be better integrated into the national system led by UBA in order to improve their knowledge of the general inventory principles and processes. The ERT recommends that, in its next annual submission, the Party clarify the responsibilities of the single national entity, UBA, in relation to the reporting of the agriculture, LULUCF and KP-LULUCF sectors, especially in relation to choice of methods, data collection and QA/QC.

Inventory preparation*Key categories*

28. Germany has reported key category tier 1 and tier 2 analyses, both level and trend assessment, as part of its 2010 annual submission. The tier 2 analysis was undertaken to support the tier 1 analysis. The tier 2 key category analysis was performed for the first time in 2007 and is updated every three years. The tier 2 key category analysis for the 2010 submission was presented to the ERT during the in-country review, but the results are not included in the NIR. The ERT encourages Germany to include the results of the tier 2 analysis in its next annual submission.

29. The tier 1 key category analysis performed by Germany and that performed by the secretariat<sup>5</sup> produced similar results. The different aggregation used in the analyses are the reason for the specific differences. Germany has included the LULUCF sector in its key category analyses in accordance with the IPCC good practice guidance for LULUCF. In presenting the results of the key category analysis Germany has removed six categories from the list of identified key categories due to their small importance and declining trend. This is not consistent with the IPCC good practice guidance and IPCC good practice guidance for LULUCF. The ERT recommends that Germany present the results of the key category analysis in accordance with the IPCC good practice guidance for LULUCF. The

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<sup>5</sup> The secretariat identified, for each Party, the categories that are key categories in terms of their absolute level of emissions, applying the tier 1 level assessment as described in the IPCC good practice guidance for LULUCF. Key categories according to the tier 1 trend assessment were also identified for Parties that provided a full set of CRF tables for the base year or period. Where the Party performed a key category analysis, the key categories presented in this report follow the Party's analysis. However, they are presented at the level of aggregation corresponding to a tier 1 key category assessment conducted by the secretariat.

ERT used the secretariat's key category analysis to determine the key categories and to structure the remainder of this report.

30. Germany has identified the key categories for KP-LULUCF. Afforestation and reforestation had not been reported to be key categories. However, during the review week the Party informed the ERT that an error in the analysis, and that all KP-LULUCF categories are key categories.

31. The results of the key category analysis are a driving factor for the preparation of the inventory in Germany, particularly in the prioritization of resources and methodological choice. During the review, Germany informed the ERT that it places more emphasis on the results of the tier 1 analysis (quantitative significance of sources) than on the results of the tier 2 analysis (contribution to the uncertainty of the inventory).

#### *Uncertainties*

32. Germany reported the results of both tier 1 and tier 2 uncertainty analyses in the NIR. The tier 2 uncertainty analysis for the total national emissions in 2008 provided a slightly higher uncertainty estimate (-4.8 to +5.4 per cent) than the tier 1 analysis ( $\pm 3.8$  per cent). The uncertainty estimate for the year 2008 is lower than that presented for the year 2007 (-5.8 to +11.8 per cent using the tier 2 approach). The uncertainty in the trend is estimated to be  $\pm 4.1$  per cent for the year 2008; in 2007 the value was  $\pm 13$  per cent.

33. Germany is using the results of the uncertainty analysis to prioritize its improvements to the inventory, although it is not the main driver (see para. 31 above). Correlations are not considered in the tier 2 uncertainty analysis and this has been highlighted by Germany in its improvement plan as an area of future improvement.

34. The ERT welcomes the improvements in the completeness of categories included in the uncertainty analysis and in the transparency of the presentation of the information on the results. The uncertainties for the KP-LULUCF activities were provided in the NIR. For afforestation/reforestation and deforestation the uncertainties were provided separately from the LULUCF sector uncertainties, where the uncertainties for forest management were assumed to be the same as those for forest land remaining forest land. The ERT believes that this is a reasonable assumption.

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

35. Recalculations since the previous annual submission have been performed and reported in accordance with the IPCC good practice guidance. The ERT noted that recalculations reported by Germany of the time series 1990 to 2007 have been undertaken to take into account new and updated AD, improvements in methods, correcting of identified errors and to implement recommendations from this and previous expert reviews. Recalculations have been performed in all sectors except the solvent and other product use sector, and for all main GHGs or group of gases. The main drivers for the recalculations were:

- (a) Energy – updates of data in the energy balance;
- (b) Industrial processes – increased use of more detailed AD obtained from the industries or industry associations;
- (c) Agriculture – re-evaluation of methodological choices and reverting back to the use of defaults from the IPCC good practice guidance;
- (d) LULUCF – availability of new AD and parameters; and
- (e) Waste – updates in statistical data.

36. The major changes, and the magnitude of the impact, include an increase in estimated total GHG emissions in the base year (3.0 per cent), and an increase in 2007 (3.1 per cent). The rationale for these recalculations is provided in the NIR and in CRF table 8(b). The changes include the revised estimates provided by Germany on 5 November 2010 in response to questions from the ERT submitted to the Party at the end of the review week. Overall, the changes have been justified sufficiently and resulted in an improvement in the accuracy of the annual submission.

#### *Verification and quality assurance/quality control approaches*

37. UBA has overall responsibility for the QA/QC process for the inventory. UBA has elaborated and implemented a comprehensive QA/QC plan in accordance with the IPCC good practice guidance and decision 19/CMP.1. The provisions for the quality system are implemented at UBA through an in-house directive, and specified in the document “General minimum requirements pertaining to quality control and quality assurance in connection with greenhouse-gas-emissions reporting” which is also included in the NIR. The minimum requirements have been adopted by all participants of the German national system.

38. The quality system is based on the requirements described in chapter 8 of the IPCC good practice guidance. General tier 1 QC procedures are implemented for all categories, and category-specific tier 2 procedures for those key categories in which significant recalculations have been made due to methodological changes. The quality system is documented in a handbook, which describes the system, instruments used, time plan for the emission reporting, responsibilities in emission reporting and implementation of the inventory plan and QC checklists, as well as participation in inventory reviews. The central instrument in the quality system framework is a database that serves as the repository for all tabular documents emerging from the QA/QC process (QA/QC plan, checklists, lists of responsibilities and so on). In addition, the database contains all tabular-form correspondence relating to inventory reviews, including the Party’s answers provided since the 2004 reporting year. The quality system is continuously improved based on experience gained. The quality system is well-described in the NIR, whereas the implementation of specific QA/QC procedures for specific categories or sectors is addressed only briefly. The ERT recommends that, to build confidence in the quality system, the Party include additional information on the implementation, especially of tier 2 procedures and verification, in the NIR of its next annual submission.

39. The ERT noted that the implementation of the quality system varies across sectors. For example, the ERT identified several deficiencies, inconsistencies and errors in the LULUCF sector (see paras. 124–128, 136, 137, 139 and 140). The ERT recommends that Germany strengthen the implementation of the QA/QC procedures in those institutions outside UBA which participate in the inventory preparation.

40. The NIR describes the use of EU ETS data as a means of improving the quality of the inventory estimates. During the in-country review, the ERT was informed that comparison of the inventory data and the EU ETS data is currently done only in a limited way because of the differences in categorisation of the data between the two systems and because all relevant background data are not available to inventory compilers. The ERT encourages Germany to continue to improve the utilisation of the EU ETS for QA and verification of the inventory data.

#### *Transparency*

41. The NIR includes comprehensive information on the methodologies used to estimate emissions and removals. The ERT noted significant improvements in the clarity of reporting on the agriculture sector. In addition, the information in the NIR and CRF tables

is generally consistent and notation keys are used in an appropriate way. However, the ERT also noted areas in which transparency can be improved:

- (a) The choice of methodology and emission factors (EFs) is not sufficiently described in all cases (e.g. in the energy and waste sectors);
- (b) Some estimates in the energy sector are provided at aggregation levels which do not allow meaningful comparison of EFs and other parameters with IPCC defaults and with those of other countries; and
- (c) The descriptions of trends are provided only at a very aggregated level in the energy sector.

42. The ERT commends Germany for the improvements it has made to transparency and recommends that Germany continue to improve the transparency of the information in the NIR and recommends that the Party address, in its next annual submissions, the areas for improvement listed above as well as those given in the sectoral chapters of this report.

#### Inventory management

43. Germany has a centralized archiving system located at UBA, 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. Detailed AD, such as that obtained from the Amtliches Topographisch-Kartographisches Informationssystem (ATKIS) database values for specific points in time, calculation models and other material and data used for the agricultural and LULUCF calculations are archived only at vTI. During the review, the ERT was provided with the requested additional archived information.

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

44. Germany has implemented most of the recommendations from this, the previous and earlier reviews and describes the responses to the recommendations transparently in the NIR (Table 190 in the 2010 submission). For instance, the methodology descriptions have been improved and additional information on AD has been included in the agriculture sector, plant-specific data are used increasingly in the industrial processes sector, the reporting on recalculations and the completeness of the inventory have been improved continuously. The ERT commends Germany for these improvements. The ERT identified further improvements in the timeline of the national energy balance, enhanced use of EU ETS data for verification in the energy and industrial processes sectors, and improvements in the consistency of land area data in the LULUCF sector as areas where additional effort is needed to fulfil the recommendations from previous reviews.

### **4. Areas for further improvement**

#### Identified by the Party

45. The 2010 NIR identifies areas for improvement in the sectoral chapters but does not provide a summary of these. In the energy sector the planned improvements include: the updating of the database for CH<sub>4</sub> and N<sub>2</sub>O EFs; use of Eurocontrol data for emissions from aviation and the updating of EFs for waste incineration (including tyres) and fugitive emissions. In the industrial processes sector several projects are ongoing or planned to verify EFs and improve uncertainty estimates and improvements to AD through an expansion of data included in official statistics is mentioned as the major area for improvement. For the LULUCF sector and KP-LULUCF activities, the Party identifies

planned improvements in data on land-use change and the provision of a consistent land-use matrix, improvements in AD and parameters for estimating the carbon stock changes in soils (both organic and mineral). In the waste sector, monitoring of emissions from the disposal of mechanical biological treatment (MBT) waste will be used to verify or revise currently reported emissions. The ERT welcomes the plans for improvement. The ERT recommends that Germany summarize the information from the sectoral chapters into chapter 10 of the NIR and provide a detailed plan outlining how and when it intends to implement the identified areas for improvement.

Identified by the expert review team

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

- (a) Providing a clarification to explain the responsibilities of the single national entity UBA and the Federal Ministry of Agriculture and Consumer Production with respect to the reporting on agriculture, LULUCF and KP-LULUCF;
- (b) Improving the timeliness and accuracy of the NEB;
- (c) Providing justification on the consistency of the time series in the energy sector where revisions do not cover the whole time series, and in the LULUCF sector where different methods are used over time;
- (d) Including information on the results of the QA/QC procedures;
- (e) Improving the reporting of land area to ensure a consistent land-use matrix in the LULUCF sector and under KP-LULUCF;
- (f) Improving the implementation of the QC checks, especially in the LULUCF sector and under KP-LULUCF.

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

## **B. Energy**

### **1. Sector overview**

48. The energy sector is the main sector in the GHG inventory of Germany. In 2008, emissions from the energy sector amounted to 779,874.57 CO<sub>2</sub> eq, or 79.3 per cent of total GHG emissions. Since 1990, emissions have decreased by 21.4 per cent. The key drivers for the fall in emissions are: (i) a shift in the fuel use from solid to gaseous fuel; (ii) the closing of inefficient power and industrial plants in the former German Democratic Republic; and (iii) an increase in general energy efficiency. Furthermore, an increase in the recovery of pit gas and the modernization of the gas distribution network have significantly decreased the fugitive emissions. Within the sector, 45.8 per cent of the emissions were from energy industries, followed by 19.7 per cent from transport, 19.5 per cent from other sectors and 13.1 per cent from manufacturing industries and construction. Fugitive emissions from fuel accounted for 1.6 per cent and other (stationary energy) accounted for 0.2 per cent.

49. The NEB is prepared by the Working Group for Energy Balances (AGEB) under the auspices of the German Institute for Economic Research (DIW Berlin). The NEB is the basis of both the sectoral and the reference approaches. The ERT identified several improvements needed with respect to institutional arrangements, the timeliness, quality and transparency of the NEB.

50. The ERT acknowledges a significant improvement in the timeliness of the NEB compared with previous years; however, the final NEB was not available for inventory development and reporting on the due date under the Convention (15 April of each year). This is an area of concern because the differences between the preliminary and final NEB are, at times, significant. During the review week, Germany informed the ERT that it intends to further improve the timeliness of the final NEB, but due to circumstances beyond the control of UBA, a final NEB has not been available for inventory development and subsequent finalization of the NIR and CRF, for this and earlier years, by the due date under the Convention specified above.

51. The ERT identified significant statistical differences reported in the NEB data. During the in-country review, the Party was not able to demonstrate or indicate to the ERT how it managed these statistical differences in the emission estimates. Hence the ERT concluded that this may cause significant over- or underestimation of emissions. The ERT also identified problematic data in the NEB; for example, efficiencies in blast furnaces were given as 108 per cent. Other issues identified by the ERT in relation to the quality of the NEB include:

- (a) Not all data sources used to compile the NEB are subject to QA/QC;
- (b) Comparability of the NEB data with corresponding International Energy Agency (IEA) data is low.

52. The ERT found a significant amount of flaring/losses of natural gas in the NEB that were not transparently accounted for in the 2010 annual submission. Emissions from flaring should be reported under venting (1.B.2.c) and losses (1.B.2.b) in line with the Revised 1996 IPCC Guidelines, as elaborated by the IPCC good practice guidance. In response to a question from the ERT on this matter, the Party submitted background information on the losses on 5 November 2010. Based on this additional information, the ERT concluded that there was no underestimate in emissions from gaseous fuel. The ERT recommends that Germany provide this information in its next annual submission. The ERT also recommends that the Party further assess the nature of the flaring/losses reported in the NEB, especially in relation to the significant statistical differences reported, and to report thereon in its next annual submission.

53. The ERT noted that the process of compiling the NEB requires input from a large number of institutions and is therefore very complex. The ERT identified this as a contributing factor to the problems with regard to timeliness and quality. With respect to the NEB, the ERT recommends that Germany prepare a plan addressing the abovementioned issues and to report thereon in its next annual submission. The ERT also recommends that Germany assess whether improved institutional arrangements in compiling the NEB could reduce its current complexity.

#### Completeness

54. The energy sector is complete in terms of categories, gases, years and geographical coverage.

#### Transparency

55. The NEB does not provide AD at the same level of disaggregation as the CRF tables and hence the Party is not able to report estimates of emissions at the disaggregated level of the CRF for all categories. For example, chemical industry, which is a significant subcategory, is reported under other (manufacturing industries and construction). The ERT found that this decreases the transparency and comparability of the annual submission. The ERT recommends that, with a view to improving transparency and comparability, Germany assess whether available statistical data could be used to prepare emissions data at the same

level of disaggregation as required for reporting in the energy CRF tables, which is in line with the UNFCCC reporting guidelines.

56. The ERT found that the NIR provided information on factors affecting the choice of most EFs used in the annual submission. During the review week, Germany provided additional information and supporting documentation on other EFs used in the inventory. The ERT recommends that the Party incorporate this information in the NIR of its next annual submission.

57. The ERT noted that the NIR described the trends for the energy sector in chapter 2, but did not provide explanations of emissions trends at the category level. However, this information was provided by the Party during the review week. The ERT recommends that Germany explore including this information in its next annual submission.

58. The ERT identified the following categories that were not correctly reported in the 2010 annual submission:

(a) Navigation: biomass fuel – CO<sub>2</sub> reported as not estimated (“NE”) when the emissions should be reported under memo items;

(b) Railways: biomass fuel – CO<sub>2</sub> emissions reported as “NE” when they should be reported under memo items;

(c) Road transportation: petroleum – CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O should be reported as not applicable (“NA”).

59. The ERT recommends that Germany rectify the identified incorrect attribution of notation keys and to report CO<sub>2</sub> emissions from biomass under memo items. In its response on the draft ARR, Germany stated that the CRF Reporter software did not allow for correct reporting of CO<sub>2</sub> emissions from biomass for the CRF categories addressed in paragraph 58(a) and (b) above. The Party also informed the ERT that it has improved this reporting by changing the notation keys in question to “IE” and reported the CO<sub>2</sub> emissions from biomass consumed in railways and navigation under other transportation (1.A.3.e) to ensure correct summation under the aggregate memo item CO<sub>2</sub> emissions from biomass. The ERT welcomed these improvements in the reporting.

#### Recalculations and time-series consistency

60. Germany reported recalculations in its 2010 annual submission. The major drivers for the recalculations include:

(a) CO<sub>2</sub> – Differences between preliminary and final AD from the NEB, revision of the NEB for the period 2003–2007 and the new estimation for emissions from sour gas processing. The recalculation resulted in a 0.15 per cent increase in 1990 and a 0.85 per cent decrease in the 2007 inventory;

(b) CH<sub>4</sub> – New biomass EF. The recalculation resulted in an increase in emissions in 1990 (0.83 per cent) and in 2007 (20.89 per cent);

(c) N<sub>2</sub>O – Minor revision in the Transport Emission Model (TREMODO) used to estimate diesel emissions. The recalculation resulted in an increase in emissions in 1990 (0.21 per cent) and a decrease in 2007 (0.38 per cent).

61. The ERT found that the emission time series is not always consistent for all years. The ERT concluded that the main reason for this is the aforementioned revision of the NEB for the period 2003–2007; this revision did not include years before 2003 as the underlying statistical law for data collection (Gesetz über Energiestatistik–Energiestatistikgesetz–EnStatG) entered into force on 26 July 2002, and data for years before 2003 therefore were

“NA”. The ERT concluded that expanding the revision of the NEB to earlier years of the inventory time series with the same data is therefore not possible.

62. During the in-country review, the Party informed the ERT that a key statistic used to estimate emissions in the iron and steel industry has been discontinued. The ERT concludes that this is an important statistic and its discontinuation will affect the quality of the emission estimates in coming years. The ERT encourages Germany to explore whether this statistic can be continued and, if not, to develop a plan indicating the actions that will be taken to ensure reliable AD on the generation and consumption of blast furnace gas and time-series consistency, for future submissions.

#### Verification and quality assurance/quality control approaches

63. The ERT found that Germany uses EU ETS data for verification of emission estimates (e.g. those developed for the cement industry), and that the comparisons did not prove useful for all categories because fuel and category definitions used for the EU ETS are not comparable with those used in the inventory. The ERT encourages Germany to continue to use the EU ETS data to verify country-specific EFs and/or emission estimates, as appropriate, taking into account the mentioned differences between the EU ETS and the annual inventory submission.

## **2. Reference and sectoral approaches**

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

64. CO<sub>2</sub> emissions from fuel combustion were estimated using the reference approach and the sectoral approach. For the year 2008, total CO<sub>2</sub> emissions estimated using the reference approach are 0.08 per cent higher than those estimated using the sectoral approach. However, at the fuel-level the comparison results in larger differences, especially for solid fuels (-5.03 per cent) and liquids (7.49 per cent). The ERT also noted large differences between inventory data and corresponding IEA data. The ERT recommends that Germany explain the reasons for these differences in the reference approach and the sectoral approach in the CRF documentation box and in the NIR and, to the extent possible, also explain the differences between its data and the corresponding IEA data.

65. Germany also compares its sectoral approach data with aggregated data from all sixteen Länder. The difference in total emissions is only partly explained in the NIR. The ERT commends the Party for this additional comparison and encourages it to provide a more comprehensive explanation of the differences in its next annual submission.

#### *International bunker fuels*

66. The ERT established that Germany uses data from Eurocontrol to distinguish between domestic and international jet kerosene consumption. The share of jet kerosene consumption for domestic aviation has decreased from 20.0 per cent in 1990 to 7.9 per cent in 2010. Consumption of aviation gasoline is attributed totally to domestic aviation.

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

67. The ERT noted that the reporting of feedstocks includes the coke oven coke input of blast furnaces and that the carbon storage fractions used differed significantly from the defaults contained in the Revised 1996 IPCC Guidelines. Germany did not provide proper justification for these departures from the Revised 1996 IPCC Guidelines. The ERT recommends that the Party provide justification or reconsider the methodology and storage fractions used.

### 3. Key categories

#### Stationary combustion: solid fuel – CO<sub>2</sub> and N<sub>2</sub>O

68. CO<sub>2</sub> and N<sub>2</sub>O emissions from blast furnace gas are estimated using the quantities of blast furnace gas consumed taken from the NEB. However, the ERT found that the consumption of blast furnace gas recorded in the NEB is underestimated. The ERT came to this finding based on the following:

(a) A significant amount of flaring/losses of blast furnace gas in the NEB is not accounted for in the 2010 annual submission;

(b) The total carbon content of the consumed blast furnace gas is less than the theoretical amount of carbon needed in the reduction process in the blast furnaces;

(c) Proposed new methodologies explained to the ERT during the review week all lead to significantly higher emission estimates; and

(d) Newly available statistical information (Brennstoff-, Gas- und Stromwirtschaft der Hochofen-, Stahl- und Walzwerke sowie Schmiede-, Press- und Hammerwerke einschließlich der örtlich verbundenen sonstigen Betriebe (ohne eigene Kokerei) (BGS statistic) indicates higher consumption of blast furnace gas.

69. During the review, the ERT recommended that Germany recalculate emissions from blast furnace gas in all relevant categories using AD from the BGS statistics and the country-specific EFs for CO<sub>2</sub> and N<sub>2</sub>O. In response to the recommendation, Germany submitted revised estimates in line with the ERTs recommendation that resulted in an increase of 6,582.15 Gg CO<sub>2</sub> eq in 2008 for this category.

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

70. The petrochemical industry is one of the major emission sources in Germany. However, the structure of the NEB does not allow the ERT to review these emissions separately. Since the most important fuels used in the petrochemical industry are usually the residual gases produced (as a by-product) in the steam cracking process, the ERT would expect to see a large consumption of these gases reported in the chemical sector, but this is not reported. Partly this may be caused by the fact that steam cracking plants are mostly located near refineries and the fuel use may be included in the fuel use of refineries, but there are also stand-alone steam cracking plants. The ERT recommends that Germany investigate the fuel consumption of steam cracking and assess whether all fuel use is accounted for in the NEB.

### 4. Non-key categories

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

71. Liquid fuel use in domestic navigation has decreased from 11,188 TJ in 2006 to 5,426 TJ in 2008, but the Party did not provide any explanation for this. During the review week, Germany informed the ERT that this decrease was a possible underestimation of fuel consumption in the NEB, which will be investigated before its next annual submission. The ERT recommended that Germany investigate the decrease in fuel use and recalculate emissions, if appropriate. In response, Germany resubmitted new estimates in line with the ERTs recommendation for the category, increasing the emissions in 2008 by 430 Gg CO<sub>2</sub> eq.

72. The ERT noted that Germany reports emissions from deep sea fishing under international maritime bunkers. According to the Revised 1996 IPCC Guidelines emissions from deep sea fishing are to be reported in the category Agriculture/Forestry/Fisheries. The

ERT identified this as a potential underestimation and recommended that the Party allocate emissions from this category in line with the aforementioned guidelines, using country-specific EFs and an estimate of fuel consumption. Germany provided the estimate accordingly in the resubmission made in response to the review finding. The emissions from deep sea fishing amounted to 74 Gg CO<sub>2</sub> eq for the year 2008.

73. Emissions from domestic navigation are calculated using AD from the NEB. During the review week, the ERT received information from the Party that international transport on inland waterways (e.g. on the Rhine) is included in the domestic navigation emission estimate. This is not in line with the IPCC good practice guidance and is a potential overestimation of emissions. The ERT recommends that emissions from international navigation activities be attributed to memo items under international bunker fuels.

## 5. Areas for further improvement

### Identified by the Party

74. Sector-specific improvements identified by Germany include:

(a) CO<sub>2</sub> verification will be improved, especially via intensified cross-checking of data against data obtained by the German Emissions Trading Authority (DEHSt) in the framework of monitoring of the EU ETS. In the process, reference data from emissions calculations (primarily, activity rates) will be compared more closely with aggregated data from emissions trading;

(b) The database for EFs (apart from those for CO<sub>2</sub>) for stationary combustion will be updated. Current plans call for the results to be entered into the 2012 submission. Parts of the research project will address the N<sub>2</sub>O emissions from combustion and gas turbine systems and the CH<sub>4</sub> emissions from gas-turbine systems;

(c) The methods for calculating AD for waste incineration will be improved further;

(d) The EF for use of used tyres will be reviewed;

(e) UBA will continue to seek an agreement with Eurocontrol regarding the provision of more detailed Eurocontrol data to be used for the estimation of emissions from civil aviation;

(f) The GHG inventory for the area of maritime transports will be extensively revised;

(g) The database for calculating emissions from transport under the construction sector will be comprehensively updated;

(h) An ongoing research project will improve the accuracy of AD on pit gas emissions;

(i) Additional studies will be carried out in order to address gaps in EFs and AD for transport, refining/storage, distribution of oil products and other under the fugitive emissions from oil (1.B.2.a.iii-vi);

(j) The database on cleaning of railway tank cars will be updated, expanding it to include other cleaning areas, in keeping with the logistics approach (as reported in the NIR 2010) and determining the emissions in the pertinent added areas;

(k) For emissions determination in other (fugitive emissions from oil), plant-specific considerations will be applied. In some cases, additional estimations may be required for the purposes of extrapolation. Such considerations and possible estimations will be the subject of an additional research project.

Identified by the expert review team

75. Sector-specific improvements identified by the ERT include:

(a) Assess whether the institutional arrangement that govern the compiling of the NEB could be implemented in a way that would reduce its current complexity and improve the timelines and quality of the NEB and report thereon in the next annual submission.

(b) Assess the identified problems with statistics on flaring/losses in the NEB (see para. 52 above) and report thereon in the next annual submission, including any recalculations and their impact on the emission trend and time-series consistency;

(c) Improve statistical data with a view to prepare emission estimates at the level of the CRF tables in line with the UNFCCC reporting guidelines to improve transparency and comparability;

(d) Include all relevant information on the reasoning of choice of EFs in the NIR;

(e) Improve the trend information by also providing information at category level in the NIR;

(f) Improve the use of notation keys and report all CO<sub>2</sub> emissions from biomass under memo items;

(g) Ensure that the AD on the generation and consumption of blast furnace gas and its time-series consistency are reliable for future submissions;

(h) Reconsider the methodology and storage fractions used for estimating the feedstock and non-energy use of fuels and the amount of stored carbon;

(i) Investigate the fuel consumption of steam cracking and assess whether all fuel use is accounted for in the NEB.

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

### **1. Sector overview**

76. In 2008, emissions from the industrial processes sector amounted to 109,801.35 Gg CO<sub>2</sub> eq, or 11.2 per cent of total GHG emissions, and emissions from the solvent and other product use sector amounted to 3,378.41 Gg CO<sub>2</sub> eq, or 0.3 per cent of total GHG emissions. Since the base year, emissions have decreased by 11.2 per cent in the industrial processes sector, and decreased by 38.1 per cent in the solvent and other product use sector. The key drivers for the fall in the emissions in the industrial processes sector were the reduction of N<sub>2</sub>O emissions from adipic acid production and of CO<sub>2</sub> emissions from iron and steel production. This reduction was partially negated by the rapid increase in HFC emissions because of an increase in their use in refrigeration and air-conditioning equipment. Within the industrial processes sector, 40.4 per cent of the emissions were from metal production, followed by 25.0 per cent from chemical industry, 18.7 per cent from mineral products and 13.1 per cent from consumption of halocarbons and SF<sub>6</sub>. The remaining 2.8 per cent were from other (industrial processes).

77. Data collection has been improved, with the introduction of tier 3 methodologies for many categories relying on plant-specific data. On the other hand, deficiencies in the statistical data persist and have increased due to the discontinuation of AD collection for some categories. Documentation and archiving procedures are appropriate. The ERT considers that the inventory for the sector is generally complete. Uncertainty evaluation is appropriate.

78. The ERT noted that misallocation of some emission sources between categories reduces the comparability of the data with inventories of other Parties, and sometimes reduces the transparency and the ability of tracking the emission sources. Transparency in the NIR is adequate for the methods and criteria but could be improved in relation to data presentation, details of calculation and results. The ERT further noted that QA/QC procedures are adequate, but QC checks can be improved to prevent errors.

## 2. Key categories

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

79. Germany uses a tier 2 approach to calculate emissions from cement production based on clinker production which is consistent with the IPCC good practice guidance, and, for clinker, uses a country-specific calcium oxide content value that is slightly higher than the IPCC default value. The country-specific EF was validated by a research project conducted in 2009, as planned by the Party and recommended in previous reviews. The ERT commends the Party for this improvement.

### Lime production – CO<sub>2</sub>

80. Germany uses a tier 2 approach in relation to the collection of AD, while still relying on the stoichiometric default EF from the IPCC good practice guidance. The ERT encourages Germany to investigate the possibility of obtaining country-specific EFs that take into account the impurity of raw materials.

81. Germany did not include in the NIR data for lime produced in three small plants. This resulted in an underestimation of the emissions. In response to a potential problem identified by the ERT, Germany resubmitted the estimates for CO<sub>2</sub> emissions from lime production for the entire time series, including data for these missing plants. This amounted to 49.1 Gg CO<sub>2</sub> in 2008, and was assessed by the ERT to be in accordance with the IPCC good practice guidance.

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

82. In the 2010 submission, Germany began to report CO<sub>2</sub> emissions from NH<sub>3</sub> production using a tier 3 methodology, as planned by the Party and recommended in previous review reports. The AD and EFs are collected for each plant by the agricultural industry association, Industrieverband Agrar (IVA).

83. Germany accounts for the CO<sub>2</sub> that is recovered and sold for other uses (urea production, the beverage industry, and so on) and this amount is subtracted from the CO<sub>2</sub> emission estimates. However, in accordance with the Revised 1996 IPCC Guidelines, all CO<sub>2</sub> emissions from NH<sub>3</sub> production should be reported in the ammonia category, because this carbon will only be stored for a short time. As there is no provision in the current UNFCCC reporting guidelines for reporting the recovered CO<sub>2</sub> elsewhere, subtraction of the recovered CO<sub>2</sub> results in an underestimation of the emissions for this category.

84. In response to a potential problem identified by the ERT, Germany resubmitted the estimates for CO<sub>2</sub> emissions from NH<sub>3</sub> production for the entire 1990–2008 period with no subtraction of the CO<sub>2</sub> recovered. The new submission results were assessed by the ERT to be in accordance with the IPCC good practice guidance. In 2008, the emissions increased by 3,306.00 Gg CO<sub>2</sub> due to the recalculation.

### Adipic acid production – CO<sub>2</sub>

85. Germany reports the N<sub>2</sub>O emissions from adipic acid production using a tier 3 approach, in accordance with the IPCC good practice guidance. Adipic acid production has

more than doubled since 1990, but emissions have been reduced by 70.7 per cent due to the introduction of equipment for N<sub>2</sub>O destruction in 1998, which has been operating in all German plants since 2002.

#### Iron and steel production – CO<sub>2</sub>

86. Emissions from iron and steel production are partially reported in the category manufacturing industries and construction in the energy sector and partially reported in the category iron and steel production in the industrial processes sector, in accordance with the IPCC good practice guidance, which prescribes that emissions from the reduction process in blast furnaces should preferably be reported in the industrial processes sector. To distinguish between process emissions and combustion emissions Germany uses a theoretical approach (using the Scholz factor) but it plans to implement a carbon balance approach in line with the IPCC good practice guidance beginning with the 2011 submission.

87. In iron and steel production, Germany includes CO<sub>2</sub> emissions from limestone use in an approach that is not fully in line with the IPCC good practice guidance (see para. 91 below).

#### Aluminium production – PFC

88. PFC emissions from aluminium production are a key category due to the large reduction in emissions (90.1 per cent) between 1990 and 2008. This reduction is a result of the introduction of automatic process systems to control anode effect frequency. Accordingly, Germany uses a tier 3 approach to estimate the PFC emissions based on the number of anode effects reported by the plants and periodically measured EFs.

#### Ozone-depleting substances substitutes – HFC, PFC and SF<sub>6</sub>

89. Germany has developed detailed data collection procedures for the calculation of actual emissions of HFCs, PFCs, and SF<sub>6</sub>, including emissions associated with uses other than the ones described in the IPCC good practice guidance and the CRF tables. For many of the subcategories, the emissions are estimated through tier 3 methodologies using detailed data and country-specific EFs. The ERT commends Germany for its reporting of the fluorinated gases (F-gases).

90. Germany reports potential emissions of HFC, PFC and SF<sub>6</sub>. However, the calculations of the potential emissions are not in line with the IPCC good practice guidance. In the CRF tables, the potential emissions reported only give values for “imports” and for total potential emissions. During the in-country visit, the ERT identified that, for many categories, the values calculated as potential emissions referred only to the difference between stocks and the actual emissions. This approach is not in line with the definition of potential emissions in the Revised 1996 IPCC Guidelines. The ERT recommends that Germany correct the calculation of potential emissions in its next annual submission, applying the correct definition (potential emissions = production + imports (in bulk and inside equipment) – exports (in bulk and inside equipment)).

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

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

91. CO<sub>2</sub> emissions from limestone and dolomite use are not reported under this category although it is required by the UNFCCC reporting guidelines and in line with the Revised 1996 IPCC Guidelines, which recommends that all uses of limestone (except the use for cement production, lime production and liming of soils in agriculture) should be reported

under limestone and dolomite use. Germany reports CO<sub>2</sub> emissions from limestone use in iron and steel production, glass production and flue gas desulfurization.

92. The carbon balance for limestone use developed by Germany is a good tool for quality control, but the ERT notes that reporting emissions imbedded in the emissions of individual subcategories results in low transparency in the source of emissions and affects the comparability of the inventories among Parties. In addition, this practice can affect the assessment of key categories as the category limestone and dolomite use is on the threshold of being a key category. The ERT reiterates the recommendation of previous reviews that Germany should report the CO<sub>2</sub> emissions from limestone and dolomite use as a whole, in line with IPCC good practice guidance.

#### Soda ash production and use – CO<sub>2</sub>

93. According to the NIR soda ash production technology in Germany does not result in emissions of CO<sub>2</sub>. However, Germany does not report emissions of soda ash use under soda ash production and use; instead it reports emissions from the use of soda ash under glass production. In accordance with the Revised 1996 IPCC Guidelines, all uses of soda ash result in CO<sub>2</sub> emissions and should be reported under soda ash use based on production, import and export data of soda ash in Germany. During the in-country visit, the ERT concluded that failure to report CO<sub>2</sub> emissions from the overall use of soda ash would result in an underestimation of emissions.

94. In response to a potential problem identified by the ERT, Germany resubmitted the estimates for CO<sub>2</sub> emissions from soda ash for the entire 1990–2008 period. The new submission results, which for 2008 increased emissions with 259.97 Gg CO<sub>2</sub>, were assessed by the ERT to be in accordance with the IPCC good practice guidance.

#### Nitric acid production – N<sub>2</sub>O

95. Beginning with the 2010 submission, Germany has reported N<sub>2</sub>O emissions from nitric acid production using a tier 3 approach based on plant-specific data. The implied emission factor (IEF) is decreasing due to the introduction of N<sub>2</sub>O abatement technology. Due to a mistake highlighted by Germany during the in-country visit, the reported emissions for the period 2002–2008 were underestimated.

96. Due to this mistake, Germany submitted revised estimates for CO<sub>2</sub> emissions from nitric acid production for the entire period (1990–2008). The new submission results were assessed by the ERT to be in accordance with the IPCC good practice guidance. The emissions for the year 2008 increased by 1,364.00 Gg CO<sub>2</sub> eq.

## **4. Areas for further improvement**

### Identified by the Party

97. Sector-specific improvements identified by the Party include:

- (a) Improve the quality of the data and documentation for the cement production category, as result of a research project;
- (b) Verify the EFs in the lime production category, as a result of a research project;
- (c) Change the method of allocation of iron and steel production emissions between the energy sector and the industrial processes sector;
- (d) Improve the EF uncertainty values in the aluminium production category; and

(e) Include estimates of SF<sub>6</sub> emissions from photovoltaic cell production, HFC emissions from the disposal of refrigeration and air-conditioning equipment and consider new EF data for SF<sub>6</sub> emissions from aluminium foundries.

Identified by the expert review team

98. Sector-specific improvement needs identified by the ERT include:

(a) Improve transparency in the NIR in relation to data presentation, details of calculations and results in the next annual submission;

(b) Correct the misallocation of some emission sources between categories in order to improve the comparability of inventories and transparency;

(c) Improve QA/QC checks to prevent errors in the calculations;

(d) Correct the calculation of potential emissions of fluorinated gases in accordance with the IPCC good practice guidance.

## D. Agriculture

### 1. Sector overview

99. In 2008, emissions from the agriculture sector amounted to 77,449.38 Gg CO<sub>2</sub> eq, or 7.9 per cent of total GHG emissions. Since the base year, emissions have decreased by 14.1 per cent. The key drivers for the fall in emissions are the decreasing trends in emissions of CH<sub>4</sub> from enteric fermentation and N<sub>2</sub>O from agricultural soils, which the Party explained are a result of large reductions in the dairy and non-dairy herds, reductions in sheep and swine populations and the associated reduction of nitrogen excreted from these animals. Within the sector, 62.6 per cent of the emissions were from agricultural soils, followed by 26.8 per cent from enteric fermentation and 10.5 per cent from manure management.

100. In the NIR, Germany states that it has adopted the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the 2006 IPCC Guidelines) to report emission estimates for the agriculture sector. However, the previous ERT concluded that Germany was not able to justify its use of default EFs from the 2006 IPCC Guidelines by demonstrating that the EFs contained in these guidelines better represent national circumstances and country-specific conditions, and recommended that Germany recalculate its annual submission based on the Revised 1996 IPCC Guidelines, as elaborated by the IPCC good practice guidance, to ensure comparability, especially for key categories. This ERT reaffirms the conclusion of the previous ERT. More detailed conclusions of the ERT in relation to the use of the 2006 IPCC Guidelines are found in paragraphs 103 and 104 below.

Completeness

101. The 2010 annual submission of Germany is complete. The ERT noted that the Party reports rice cultivation, prescribed burning of savannahs and prescribed burning of agricultural residues as not occurring (“NO”).

Transparency

102. The ERT acknowledged that Germany has significantly improved its documentation of this sector in the NIR. The ERT noted that each year Germany compiles a separate, more detailed report on the inventory calculations for the agricultural sector, “Calculations of Emissions from German Agriculture – National Emission Inventory Report 2010 for 2008

Special issues 334, 2010” (hereinafter referred to as Special issue 334). The ERT recommends that Germany include this report with its annual submission.

103. Germany has introduced a new chapter in its NIR (chapter 19.4.1), which presents information regarding its use of default EFs from the 2006 IPCC Guidelines in the agricultural sector. The ERT noted the following quote from this chapter” “The following document, ‘Comparison of IPCC 2006 with IPCC 1996b’, justifies the use of the new methods described in IPCC 2006 – instead of the methods described in IPCC 1996b – for calculation of greenhouse gases in the German agricultural sector.” The ERT noted with concern that there is no mention of or reference to the IPCC good practice guidance. The ERT concluded that information contained in this chapter is, to a certain degree, selective and insufficient in its argumentation, noting the examples listed below in the context of “Reason for not using the IPCC 1996 methodology”:

(a) Dairy cattle: “A very detailed approach is used to assess feed intake, energy and nutrient intake, CH<sub>4</sub> from enteric fermentation as well as volatile solids (VS) and nitrogen excretion rates based on as much national information as possible: The national IEF exceeds the IPCC 1996 default value”;

(b) Germany states that it is using a very detailed tier 2 approach to estimate CH<sub>4</sub> emission from manure management for all animal types: “The methane conversion factor (MCF) for solid storage given by IPCC 2006 exceeds that of IPCC 1996”.

104. The ERT concludes the following, in relation to the examples listed above:

(a) With respect to statements contained in paragraph 103(a) above, the German milk production is far higher than the default value in the Revised 1996 IPCC Guidelines. Table 90 of the NIR provides a comparison of the enteric fermentation CH<sub>4</sub> IEF and milk yield between neighbouring countries. As energy intake better reflects the CH<sub>4</sub> emissions, the ERT recommends that the comparison is based on energy intake. This would have clearly shown that the German value is much lower than corresponding values used in other countries (see paras. 108–110 (enteric fermentation));

105. The ERT recommends that Germany use country-specific EFs in inventory development and document the rationale for using these accordingly and in line with the IPCC good practice guidance. The ERT also recommends that Germany review its reasoning and justification (i.e. argumentation) on the use of the 2006 IPCC Guidelines.

#### Recalculations and time-series consistency

106. The ERT noted that Germany recalculated the time series of N<sub>2</sub>O emissions for direct soil emissions using a default value from the IPCC good practice guidance of 0.0125 kg N<sub>2</sub>O-N. The ERT also found that Germany rectified a number of errors in its emission estimating module, GAS-EM, for this annual submission. The ERT welcomes these improvements.

107. In response to a question from the ERT during the review, Germany resubmitted revised estimates for the agriculture sector on 5 November 2010 for the entire time series 1990–2008, which increased the total emissions in 2008 from 66,203.27 Gg CO<sub>2</sub> eq to 77,449.38 Gg CO<sub>2</sub> eq, or 17 per cent for the inventory year 2008.

## **2. Key categories**

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

108. CH<sub>4</sub> emissions from enteric fermentation are estimated using tier 2 methods for cattle (dairy and non-dairy) and swine. CH<sub>4</sub> emissions for all other animal types are estimated using a tier 1 approach, in line with the IPCC good practice guidance. In response

to a recommendation of the previous review report, Germany revised the energy consumption for dairy cattle, resulting in a gross energy intake of 325.22 MJ/head/day. The ERT concluded that this is comparable with other countries with similar productivity.

109. Germany uses a model developed by Ellis et al. (2008) to estimate CH<sub>4</sub> enteric fermentation emissions from dairy cattle. This has resulted in a MCF of 5.34 per cent for the latest inventory year. However, the ERT noted that this model was developed based on North American conditions where there is intensive use of Monensin (a growth regulator that is known to depress the CH<sub>4</sub> formation) and other feeding additives. Monensin was banned in the European Union on 1 January 2006 and Germany confirmed that Monensin is not used in Germany. Therefore, the ERT recommended that Germany revise its estimate to be applicable for German conditions. In response, Germany submitted revised estimates on 5 November 2010 using an MCF of 6.0 per cent, which is in accordance with the IPCC good practice guidance. The revised estimate for the emissions was 1,255.80 Gg CO<sub>2</sub> eq higher than the original estimate. In its response, Germany also indicated that this value leads to a national IEF value which is higher than the IEFs of other central European countries with similar milk yields. The ERT recommends that Germany explore this issue further. The ERT also encourages Germany to make the comparison with other countries as suggested in paragraph 104(a) above.

110. The ERT found that Germany continues to use the 2006 IPCC Guidelines to estimate emissions for other cattle, which gives rise to a slightly higher emission when compared to emissions compiled using the IPCC good practice guidance. The German model differentiates between the MCF for small calves (2.0 per cent) based on national expertise) and older animals, where the default MCF of 6.5 per cent from the 2006 IPCC Guidelines is used. The ERT recommends that Germany verify the MCF for small calves in its next annual submission.

#### Indirect soil emission – N<sub>2</sub>O

111. A default factor of 0.0075 kg N<sub>2</sub>O-N/kg N from the 2006 IPCC Guidelines is used to estimate emissions from nitrogen leaching. This value is the sum of three elements: emissions from ground water (0.0025), from rivers (0.0025) and from estuaries (0.0025). The NIR outlines justification on the use of the aforementioned default factor from national research made in northern Germany (Weymann et al. 2008). The ERT found that Weymann et al. (2008) only considers N<sub>2</sub>O emissions from groundwater and not the two latter components (rivers and estuaries). The Weymann study provides groundwater values that are both lower and higher than the 0.0025 contained in the 2006 IPCC Guidelines. During the review week, Germany provided further documentation to justify the use of the factor from the 2006 IPCC Guidelines. However, this documentation provides information from rivers and riparian areas in Scotland, France, Belgium and the Netherlands. The ERT acknowledges the efforts made by Germany in this regard, but recommends that Germany develop a country-specific N<sub>2</sub>O EF for groundwater based on national circumstances. With respect to the rivers element of the default value, the ERT noted that, given the limited time available during the review week for it to review the scientific studies provided by the Party, it was not able to give a qualified judgement on the applicability of the documentation provided, which the Party had stated as being based on German conditions. Hence the ERT recommends that Germany either: develop and transparently justify the use of a country-specific EF; or use the recommended value from the IPCC good practice guidance. In response to a question from the ERT, Germany submitted revised estimates for indirect emissions from leaching where the default EF of 0.025 is used, which is in accordance with IPCC good practice guidance. The resubmitted estimate for the emissions from leaching is 9,825.91 Gg CO<sub>2</sub> eq higher for 2008 than the previous estimate.

### 3. Non-key categories

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

112. CH<sub>4</sub> and N<sub>2</sub>O as well as NH<sub>3</sub> emissions from manure stores are highly related to the surface cover. Surfaces such as solid manure and crust on slurry tanks form N<sub>2</sub>O, whereas slurry tanks without crust layer have limited N<sub>2</sub>O formation. For CH<sub>4</sub> the formation is high when no crust is occurring. The ERT found that Germany is including these principles when estimating the emissions of CH<sub>4</sub> and N<sub>2</sub>O from its manure management systems, and uses graduated surface covering combined with an EF from the 2006 IPCC Guidelines (NIR p. 387). The information provided by the Party in the NIR, the CRF and during the review week was not fully coherent nor transparent. The ERT recommends that, in its next annual submission, Germany provide detailed information on revisions to its stable type distribution and surface cover of manure stores, and recommends that the Party define and justify the NH<sub>3</sub>, N<sub>2</sub>O and CH<sub>4</sub> EFs used for each stable type.

113. The ERT found that Germany uses a tier 2 approach from the 2006 IPCC Guidelines for estimating the CH<sub>4</sub> emissions from cattle and pigs. The ERT encourages Germany to provide in its NIR an explanation on how the EFs for cattle are justified based on national circumstances.

114. Germany has used a country-specific ash content value of 13.9 per cent to estimate the amount of VS in dairy cattle manure; this value is based on a study in 1975. For other cattle, Germany uses the default value of 8.0 per cent from the IPCC good practice guidance. High-yielding dairy cattle, as in the German case, need high quality fodder. During the review week, the ERT sought justification from the Party on the assumed value and Germany subsequently acknowledged that the current value is too high. The ERT concludes that the assumed value for the ash content is too high and results in a reduction in the amount of VS in manure, and therefore is a potential underestimation of CH<sub>4</sub> emissions. The ERT therefore recommended that Germany revise its emission estimate for all years using an ash content from the Revised 1996 IPCC Guidelines. Germany submitted revised estimates on 5 November 2010 which satisfied the concerns of the ERT. The revised estimate increased the emissions from dairy cattle by 164.38 Gg CO<sub>2</sub> eq for 2008.

115. The stable type distribution in Germany has not been updated since 1999. The ERT noted that the current information on stable types and storage times appear to be insufficient (e.g. manure type for suckling cows is solid manure, whereas heifers are using deep litter), especially knowing the detailed livestock categories used by Germany to estimate emissions. The ERT is of the view that suckling cows are primarily kept on deep litter during the winter months in Northern Europe where the manure is only removed once in the spring. Noting that the CH<sub>4</sub> EF for deep litter stables is high compared with the EF for solid manure, and given that the Party did not use an updated stable type distribution taking into account storage time, the ERT concludes that the emission estimates have high uncertainties. During the review week, Germany informed the ERT that its national statistical agency together with EUROSTAT, the European Commission's statistical agency, is planning a survey of stable types in Germany. The ERT recommends that Germany update its stable type distribution and storage times for the different manure and livestock types, and to report thereon in its next annual submission.

116. The German emission model (GAS-EM) is based on mass-flow principles. In the case of nitrogen, all sources are considered, including nitrogen in bedding material. In the case of the energy-flow, Germany has excluded volatile substances in bedding material although the data are already used in the nitrogen flow. The ERT noted the following statement from the NIR (table 230): "In most cases, a detailed methodology is used to derive VS and nitrogen excretion rates. In the mass-flow approach used in any case it is important to differentiate the various housing and storage systems as these have an effect

on CH<sub>4</sub>.” The ERT considers that this approach may result in a VS content in the manure that is too low compared with real conditions, regardless if the basic principle underpinning this is in line with the IPCC good practice guidance. The ERT concludes that this exclusion may result in a high uncertainty of CH<sub>4</sub> emissions, especially in the case of deep litter bedding. The ERT encourages Germany to investigate the possible effect of excluding straw from the manure management system, and if an underestimation is occurring then revise its methodology and emission estimates and report thereon in its next annual submission.

117. Table 230 of the NIR is used by Germany to compare the effect of using the 2006 IPCC Guidelines instead of the Revised 1996 IPCC Guidelines. Furthermore, the Party concludes from this comparison that the use of the 2006 IPCC Guidelines yields the highest N<sub>2</sub>O emission. However, the ERT found that, in this comparison, the Party is using the lower bound of the uncertainty range of the EF for solid manure instead of the average EF; therefore a contradictory conclusion is noted by the ERT. The ERT recommends that Germany improve the transparency of its basis for emissions estimation, including calculations and justification (argumentations) in line with the IPCC good practice guidance.

#### **4. Areas for further improvement**

##### Identified by the Party

118. Germany is planning to update its data handling and calculation system to reduce possible errors. The ERT welcomes this plan.

##### Identified by the expert review team

119. The ERT welcomes the fact that Germany is using national data where possible. However, this has to be well documented in the NIR. The ERT recommends that Germany update the stable type distribution and manure management handling data, related to both the storage and during application of manure. This should also take into account the increasing amount of biogas treated manure in Germany.

120. For the more recent years of its inventory, Germany has used default EFs from the 2006 IPCC Guidelines. The main argument for this has been that these default EFs better represent new knowledge and actual conditions in Germany. Germany has not developed country-specific EFs and has not proved that the IPCC default EFs from the 2006 IPCC Guidelines better reflect the German conditions than the corresponding default EFs from the Revised 1996 IPCC Guidelines. Therefore the ERT recommends that Germany develop more scientifically justified country-specific EFs for inclusion in its agricultural inventory.

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

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

121. In 2008, net emissions from the LULUCF sector amounted to 30,185.19 Gg CO<sub>2</sub> eq. Since the base year, the sector has changed from a net sink to a net source. The key driver for the change is a significant decrease in carbon removals from forest land and at the same time a significant increase in emissions from other lands, particularly from cropland, grassland and settlements. The trends and reasons for the mentioned significant change were not transparently described in the NIR, but presented to the ERT during the review. The ERT recommends that this information is included in the next annual submission.

122. The ERT acknowledges the efforts of Germany to improve its GHG inventory for this sector in the 2010 annual submission. Germany has conducted an uncertainty

assessment of emission estimates most land use categories using both a tier 1 and a tier 2 (Monte Carlo simulation) method in line with the IPCC good practice guidance. The Party informed the ERT that a complete uncertainty analysis for all land use categories is planned for 2012 after completion of the Forest Inventory. Germany has also provided detailed information on the sampling process for generating AD and EFs, and information on planned improvements, QA/QC, key category analysis and verification processes. Some of the gaps identified in the previous review report have been addressed but not the development of a consistent land use matrix (LUM) and consistent time series in the LUM.

123. The LULUCF inventory is prepared by the Johann Heinrich von Thünen-Institut (vTI), with the Institute for Forest Ecology and Forest Inventory responsible for the forest land category and the Institute of Agricultural Climate Research responsible for the remaining five land use categories. The ERT noted a lack of QA/QC of the inventory preparation. The ERT recommends that the cooperation between these institutions should be strengthened, including a need to clarify the responsibility of the single national entity, UBA, for the LULUCF sector. The ERT recommends that Germany improve the current arrangements among agencies and organizations involved in the collection of the land use data to ensure the consistency and the timeliness of the data.

124. Germany is using two different methodologies to establish a complete LUM. One, based on ATKIS for the old German Länder and satellite monitoring for the new German Länder. Before the review, the ERT asked for further documentation on land use and land-use change because the pattern in land-use change differs significantly between the old and the new Länder. The ERT asked Germany to clarify, for example, the reasons for only 2 per cent of the land converted to forest in the old Länder being established on other land and this area is established in 2008, whereas in the new Länder 76 per cent of the conversion to forest is taking place on other land. Germany has not provided the ERT with examples of how the land has been identified and the ERT is therefore not in a position to verify that the proposed land-use changes are genuine or a function of the interpretation of the land use classification. It is the opinion of the ERT that the identified problems can be attributed to methodological inconsistencies related to the classification of the satellite monitoring data and the use of the detailed ATKIS vector data. Without consistent land representation, double counting or omission of an area might occur, leading to incorrect estimates of a source or a sink. The Party explained to the ERT that the inconsistency cannot be resolved before the 2011 annual submission due to limited time available for harmonizing the data from different sources with different levels of detail in the categorization of the land-use system. The ERT considers that, in its next possible annual submission, Germany has the capacity to make a proper land-use classification and recommends that Germany submit detailed information on how the two different methodologies are used consistently and in accordance with the chosen forest definition, as well as for other land use categories and subcategories for the whole of Germany in scale and time.

125. When land-use change takes place from one land use category to another land use category the IPCC good practice guidance for LULUCF has defined a default transition time of 20 years before the new equilibrium state in the soil carbon stock has been reached. For all land use categories, except for conversion to forest land, Germany is using a default transition time of one year, resulting in an apparent instant emission. The default transition time of 20 years may not be appropriate for German conditions, but as it is not possible for the soils to reach the new equilibrium within one year. The ERT recommends that Germany change its methodology to either the default linear methodology, in line with the IPCC good practice guidance for LULUCF, or develop a country-specific model taking into account national conditions which can be scientifically verified.

126. In the NIR, Germany stated that conversions to vegetation-free areas are significant (other land), and reports significant gains in the carbon stocks of 41–61 Mg C per hectare

on these lands. Such gains in carbon stock in living biomass are normally associated with land-use changes to forest land. The ERT, therefore, recommends that Germany make a detailed investigation to find out whether these areas have been misclassified and/or whether the changes in carbon stock in living biomass have been estimated incorrectly.

127. Conversion of forest lands to other land categories (deforestation) will result in forest carbon loss. In the CRF tables, the level of loss from conversion of forest to the five other land categories are the same. This means that the deforestation occurs in forest lands that have the same level of carbon stock throughout Germany and no regionalization takes place. During the in-country review, Germany was not able to provide a clarification of this uniform value. Given the size of Germany, and that the other land use classes are estimated at district level, the ERT recommends that Germany revisit the approach used in defining carbon stock of forest land subject to deforestation.

128. Conversion of land to other land-use categories will result in biomass loss or gain. In the CRF tables, the ERT found that the loss or gain of carbon in the living biomass that occurred in 2000 is considerably different from the corresponding 2001 values. During the review week, Germany explained that this significant change is partly due to the different level of land classification used before and after 2000. Before 2000, the Party used the land classification of CORINE, which has less detail than the ATKIS classification which is used after 2000. Different levels of land-use aggregation may affect the uncertainty level. In order to improve the transparency, the ERT recommends that, in its next possible annual submission, Germany report the approach for classification of the land-use categories in CORINE and in ATKIS, and how these are connected and how this is managed in the uncertainty assessment.

129. The Party has used notation key included elsewhere (“IE”) for the area classified as other land remaining other land. During the review, Germany explained that this area is settlements in the 2010 submission. This area of other land remaining other land has been reported in the 2009 annual submission. In the 2010 NIR, Germany explained that the land-use categories forest land and other land were restructured for the purposes of reporting. The restructure was necessary because the ATKIS system had to be brought into line with the Federal Forest Inventory’s definition of ‘forest’. The object type ‘wood’ (4108), which was previously reported under forest land, is now reported under other land. During the in-country review, Germany explained that the allocation of this object type to other land was not appropriate because the object type wood is close to shrubs/alleys and that, in its next annual submission, it will be moved to grassland. To improve transparency, comparability and consistency, the ERT recommends that the Party provide a description or definition of the land-use categories, and begin the process of harmonizing the land-use classifications between the two systems and their consistency with the IPCC good practice guidance for LULUCF. The ERT encourages Germany to develop CRF tables with subdivisions for each land-use category.

## **2. Key categories**

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

130. In the 2010 submission, Germany has implemented the recommendation from the previous review report to include net carbon stock changes in dead organic matter and soil organic matter from forest land remaining forest land. The estimation of annual carbon stock change in dead wood and organic soil is in line with the IPCC good practice guidance for LULUCF. In addition to dead wood and organic soils, Germany also improved the biomass data of forest carbon from an inventory project carried out in 2008. The NIR provided the results of the recalculation of carbon removal. For the estimation of carbon

stock change in organic soils, it was assumed that all organic soils in the country are drained.

131. The rate of carbon removal from forest land remaining forest land showed a significant reduction between 2001 and 2002. In 2001, the rate of carbon removal was 65,410.70 Gg CO<sub>2</sub> and in 2002 it decreased sharply to 20,531.90 Gg CO<sub>2</sub>. The main reason for this is due to Germany applying the carbon stock change methodology using measurements of the carbon stock in German forests (Bundeswaldinventur, BWI) that were sampled in 1987, 2002 and 2008. The result from the BWI showed an average increase in the forest stock from 1987 to 2002 of 1.58 Mg C/ha and from 2002 to 2008 an increase of only 0.44 Mg C/ha. These results are used directly in the inventory without any explanation for this large change in the sink in the German forests. One major factor causing such significant change may be a rapid increase in harvesting rate. For transparency, the ERT recommends that the Party provide supporting information in the next annual submission on harvesting rates and other important management issues.

132. The area of land converted to forest land in the CRF tables is reported using a time transition of 20 years. With this methodology, it is expected that the area reported in CRF table for forest land remaining forest land should decrease or at least remain at the same level. The ERT found that the area reported in the NIR for the new German Länder increased consistently from year to year and then a sudden drop in 2008 is observed. The Party explained that this is primarily due to the difficulties in harmonizing the data from different sources and it will be corrected in the next annual submission. The ERT recommends that Germany use a stringent methodology according to the IPCC good practice guidance for LULUCF when reporting the land-use changes.

133. It is assumed that a small increase in the carbon stock in mineral soils occurs in forest land remaining forest land. The development of soil carbon stock in mineral forest soils is monitored through the “Bodenzustandserhebung im Wald” (BZE). The NIR provides results from BZE1 for the period 1986–1992 and preliminary results from BZE2 (ongoing) show a large net gain in the carbon stock in the mineral soils, which is much higher than the values used in the 2010 annual submission. During the review, Germany presented updated values from the BZE2 which indicate a net increase for all forests in Germany of approximately 0.4 Mg C/ha/yr (up to 1.1 Mg C/ha/yr) to an average increase in existing forests soils of more than 10 Mg C/ha over 25 years. It is the opinion of the ERT that such increases are unlikely to take place in existing forests and therefore need to be investigated, and the ERT therefore recommends that Germany report on how the values included in the inventory have been established and investigate the results from BZE2 more closely.

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

134. The Party has reported losses of carbon stock in living biomass as “IE”. During the review week, Germany explained that the loss in living biomass is included in the gain. However, the ERT found that the gain of carbon stock in the living biomass in the conversion of crop land, grassland, wetlands, settlements and other land to forest land were all the same (1.44 Mg C/ha). Including carbon losses into the gain should lead to a different rate of gain because the amount of carbon losses in the conversion of these lands was not the same. Furthermore, it is apparent that the same methodology is not used for all years. The ERT recommends that Germany check the methodology applied and avoid the use of “IE” in its next annual submission.

#### Cropland – CO<sub>2</sub>

135. The Party has made a revision to the estimation of emissions from cropland in response to a recommendation from the previous review report. This revision resulted in

higher emission estimates, in the order of 13 per cent, when compared to the previous annual submission.

### 3. Non-key categories

#### Wetlands – CO<sub>2</sub>

136. The ERT noted that the carbon loss from living biomass in the conversion of cropland and settlements to wetlands in 2000 was considerably higher when compared with the corresponding emissions in 2001. The loss from the conversion of cropland to wetlands in 2000 was 94.1 Mg C/ha and in 2001 it was 1.7 Mg C/ha, while for the conversion of settlements to wetlands the loss in 2000 was 696 Mg C/ha while in 2001 there was no loss, but this conversion gained carbon by about 2.2 Mg C/ha. During the review week, Germany explained that this may be due to a mistake made during the calculation process and that it intends to revise the calculation in the next annual submission.

137. Germany only reports one subdivision in the wetlands category. This category includes both wetlands with peat extraction, natural wetlands and re-established wetlands. When land is converted to wetlands the inventory indicates that there is a net gain in carbon stock in the soil, whereas for wetlands remaining wetlands there is a net loss of carbon. To improve the transparency the ERT encourages Germany to report subdivisions of the wetlands category as land with peat extraction, fully water covered wetlands and partly water covered wetlands.

### 4. Areas for further improvement

#### Identified by the Party

138. In the NIR, Germany has stated that only small changes in the scrub-land data are planned.

#### Identified by the expert review team

139. The ERT has found several inconsistencies in the German inventory on the identification of the land use categories and land-use changes as well as the issue that the area in the inventory varies between years and does not correspond to the official German area. The ERT therefore recommends that Germany improve its land use classification.

140. The ERT also recommends that Germany further investigate the carbon stocks on wetlands and other land, as the current values used seem very high.

## F. Waste

### 1. Sector overview

141. In 2008, emissions from the waste sector amounted to 13,211.03 Gg CO<sub>2</sub> eq, or 1.3 per cent of total GHG emissions. Since the base year, emissions have decreased by 69.4 per cent. The key driver for the fall in emissions is in solid waste disposal on land due to increased recycling of solid waste, prohibition of disposal of biodegradable waste in landfills and the recovery of biogas at solid waste disposal sites. Within the sector, 74.7 per cent of the emissions were from solid waste disposal on land, followed by 18.2 per cent from wastewater handling and 7.1 per cent from other (waste).

142. The information provided in the NIR and CRF tables is generally transparent and complete, however the country-specific methodologies including EFs were not in all cases sufficiently explained and referenced. Recalculations were performed for N<sub>2</sub>O emissions

from wastewater treatment for the period 1992–2007 owing to an update of the database with the Food and Agriculture Organization of the United Nations Statistical Yearbook 2007–2008 and population data from the Statistisches Jahrbuch 2009 for the years 2006 and 2007. Emissions from waste incineration were updated to take into account changes in the NEB. The impact of these recalculations in 2007 is an increase of 0.4 per cent in the total emissions from the waste sector.

143. Category-specific QA/QC procedures have been implemented. Nevertheless, there are some typing mistakes and discrepancies between the data in the CRF tables and the NIR. The ERT recommends Germany to apply QA/QC procedures more strictly.

## 2. Key categories

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

144. The IPCC first order decay method was used to estimate emissions of CH<sub>4</sub> from this category. Germany uses different CH<sub>4</sub> generation rate constants (k) and degradable organic carbon (DOC) values for different waste types. The ERT noted that there is no comprehensive explanation of these parameters in the NIR. The fraction of DOC dissimilated is country-specific. Other parameters are defaults from the IPCC good practice guidance. The ERT noted that some additional information, such as the waste generation rate, is not presented in the NIR and CRF tables. The ERT recommends that Germany improve the transparency of reporting by providing more detailed information about the CH<sub>4</sub> generation rate constant, DOC, and waste generation rate in the NIR and CRF tables in the next annual submission.

145. Germany assumes that the CH<sub>4</sub> collection efficiency, taking into account both energy recovery and flaring, was 45 per cent in 1990 and it constantly increased up to 60 per cent in 2004. During the review, Germany provide additional statistical data on monitored CH<sub>4</sub> recovery for the years 2008, 2006 and 2004 and for 243 (14 per cent of total waste disposal sites), 263 and 258 managed landfills, respectively, which amounted to a CH<sub>4</sub> recovery of 21 per cent. This is significantly lower than the corresponding data reported by the Party in its NIR. Germany noted that the value is low compared with the reported value because it contains only recovery data from operational landfills and emphasized that CH<sub>4</sub> recovery in closed landfills is more significant. Germany also informed the ERT that the biogas utilisation value in the NEB supports the higher estimates. The ERT found that the documentation provided by the Party to substantiate its reported recovery was insufficient. The ERT noted that, in accordance with the IPCC good practice guidance, the default CH<sub>4</sub> recovery is zero. This default should only be changed when references documenting the amount of CH<sub>4</sub> recovery are available. The use of undocumented estimates of landfill gas recovery potential is not appropriate; as such, estimates tend to overestimate the amount of recovery. The ERT reiterated the recommendations from previous reviews and recommended that Germany use monitored data to report recovery and actual emissions after recovery, and reconstruct the full time series using methodologies in line with the IPCC good practice guidance. Following the ERT recommendation, the Party resubmitted revised estimates for the full time series. As a result, in 2008 47.3 per cent of total CH<sub>4</sub> generated by waste disposal on land (421.10 Gg) was reported as recovered and deducted from total CH<sub>4</sub> emissions. The ERT recommends that the Party provide a detailed description of the new calculation approach in its next annual submission.

146. Germany has in place a regulation that prohibits disposal of organic waste in landfills. During the review, the ERT was informed that for the period 2006–2008 small amounts of biodegradable waste (residual from MBT, construction and other waste with carbon content less than 5 per cent) have been disposed in landfills. Hence, small emissions

are occurring. As the notation key “NO” is used in CRF table 6.A, the emissions are underestimated. In response to a recommendation by the ERT, Germany submitted revised estimates of 25.72 Gg CO<sub>2</sub> eq to address the potential underestimation in line with the ERTs recommendation.

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

147. For the period 1995–2008, the German inventory includes only estimates of emissions from wastewater handling resulting from the part not connected to sewage networks and treated in cesspools and septic tanks, on the assumption that municipal wastewater treatment systems in Germany only use aerobic processes. From 1990 to 1994, the estimates also include emissions from sludge treatment, but this activity stopped after 1994. Germany estimates CH<sub>4</sub> emissions from cesspools and septic tanks using the Revised 1996 IPCC Guidelines methodology, the IPCC default value for potential CH<sub>4</sub> formation (0.6 kg CH<sub>4</sub>/kg biochemical oxygen demand) and a MCF of 0.5, based on the values used by other countries (United States of America and the Czech Republic). CH<sub>4</sub> emissions from wastewater handling decreased by 95.5 per cent from 1990 to 2008. The ERT recommends that Germany provide a justification that the MCF value represents the country-specific conditions in the next NIR.

148. Germany does not estimate CH<sub>4</sub> emissions from industrial wastewater and sludge treatment (the notation key “NO” is used in CRF table 6.B), but the ERT finds that the information provided by the Party is not transparently presented in the NIR and CRF tables. During the review, the Party provide an explanation of the production of biogas and CH<sub>4</sub>, and their recovery from industrial wastewater systems. The ERT reiterates the recommendation from the previous review report that Germany improve its reporting for this category by providing more details on the treatment of industrial wastewater in Germany and justification (including references) for the assumption that no CH<sub>4</sub> is emitted to the atmosphere from the treatment processes, in accordance with the IPCC good practice guidance, in its next annual submission.

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

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

149. The NIR explains that waste incineration is conducted solely for energy recovery and emissions are reported in the energy sector under public electricity and heat production. The ERT reiterates the recommendation from the previous review report that, in order to improve transparency, Germany provide relevant quantitative and qualitative background information on the waste that goes to incineration facilities in its next annual submission.

### **4. Areas for further improvement**

#### Identified by the Party

150. The NIR identifies several areas for improvement. These relate in particular to:

- (a) Developing a model for describing the actual emissions behaviour of MBT waste, and take into account emissions in climate reporting;
- (b) Developing new EFs for CH<sub>4</sub> and N<sub>2</sub>O in composting facilities;
- (c) Urging the Federal Statistical Office to take account, in its data collection, of versions of MBT systems that have not been included to date.

Identified by the expert review team

151. The ERT identifies the following areas for improvement:

(a) Increase the transparency of the inventory by providing more detailed descriptions and documentation on methods and parameters for all categories in the next annual submission;

(b) Apply QA/QC procedures more strictly to identify any discrepancies in reporting between the NIR and the CRF.

## **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

152. In its annual submission, Germany has reported information on Article 3, paragraph 3, (afforestation, reforestation and deforestation) and on forest management that it has elected under Article 3, paragraph 4, of the Kyoto Protocol. Germany chose to account for activities under Article 3, paragraphs 3 and 4, at the end of the commitment period. However, the ERT found that the reported information is not in line with the requirements of the IPCC good practice guidance for LULUCF and the annex to decision 16/CMP.1. The Party has not provided a consistent LUM covering Germany as a result of it using two different methodologies to establish a LUM for 1990 (i.e. the old Länder and the new Länder). During the review, the Party provided the ERT with a partial LUM for Germany covering forest land remaining forest land and land converted to forest land. For the new Länder the Party reported an increase in forest land remaining forest land from 1990 to 2007. However, chapter 10 of the NIR stated that the methodologies described in chapter 7 of the NIR (reporting under the Convention) are used as the basis for reporting under the Kyoto Protocol and that a default transition period of 20 years is used. Using this methodology, the increase in forest land remaining forest land is not possible. In chapter 11 of the NIR, Germany defined a forest as the area planted/covered by trees that amounts to over 10 per cent of the relevant area, and that the smallest area to be taken into consideration is 0.1 hectare. However, for the new Länder the Party used a minimum mapping unit of 0.5 ha. The ERT recommends Germany to update and correct its LUM so that the two different methodologies used are reflecting real conditions.

153. Germany reported that 422,100 ha has been afforested since 1990. Noting information provided by the Party in the NIR and during the review week, the ERT was not able to verify the geographical location of boundaries of these lands or the methodology used, and was unable to distinguish between the afforestation and forest management activities as required by paragraphs 6(b)(i)–(iii) and 6(c) of the annex to decision 15/CMP.1 for the first year in the commitment period. Germany is recommended in its next annual submission to verify the proposed afforestation with maps and/or other detailed data. This is especially important for the new German Ländern where major afforestation have taken place. Germany is also recommended to document that this afforestation is human-induced.

154. Germany has not accounted for soil carbon from mineral soils for forest management; justification for not including this pool is provided in the NIR and enhanced information was provided to the ERT during the review. However, the ERT recommends that Germany provide information on this pool, its variability and uncertainty to ensure that the conclusion for excluding the pool is justified (see para. 133 above).

155. Germany has reported that the specific activities under afforestation, reforestation and deforestation and for forest management began after 1 January 1990. However, given the lack of a complete LUM, the ERT was not able to verify this statement. The ERT recommends Germany to provide additional information on this issue consistent with the recommendation in paragraph 153 above.

156. Noting the above problems, the ERT strongly recommends that Germany improve the reporting for afforestation, reforestation and deforestation and forest management, including information on tracking and/or resolution of land areas, in its 2011 annual submission and subsequent submissions, consistent with the action plan submitted in response to questions raised by the ERT after the review week. The ERT also recommends that the Party include this action plan in the next annual submission with information on:

(a) The system used for the preparation of the estimates (covering: land area identification including the provision of the LUM, with the aggregation of land use subcategories of ATKIS to be consistent with the categories mentioned in the IPCC good practice guidance for LULUCF; and the definition and methodological issues related to the estimation of emissions and removals, in particular soil carbon);

(b) How to ensure consistency across activities and time series;

(c) How to solve methodological issues, particularly on soil carbon; and

(d) The QA/QC procedures (i.e., a plan, with implementation consistent with the IPCC good practice guidance for LULUCF).

157. As Germany has elected to account for KP-LULUCF activities at the end of the commitment period, the ERT further requests Germany to provide the revised estimates in accordance with this plan in the annual submission due on 15 April 2011. Germany provided the ERT with the above-mentioned action plan on 5 November 2010. The action plan covers national improvement measures for the annual submissions in 2011 and 2012. The ERT recommends that Germany improve the reporting in accordance with the action plan noting the comments in paragraphs 10 and 25.

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

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

158. The rate of carbon removal from afforestation and reforestation in 2008 was 2,615.20 Gg of CO<sub>2</sub>. Noting issues raised in section II.E (LULUCF) above, the ERT recommends that Germany revise these estimates in line with its action plan. This includes verification of the afforestation/reforestation rate, used growth rates and changes in carbon stock in soils (see paras. 156 and 157 above).

##### *Deforestation – CO<sub>2</sub>*

159. The rate of emissions from deforestation in 2008 was 16,383.32 Gg CO<sub>2</sub>. Noting issues raised in section II.E (LULUCF) above, such as land area identification (see para. 124 above) and approach used in defining carbon stock changes for these lands (see para. 126 above), the ERT recommends that Germany revise these estimates in line with its action plan. This includes verification of the deforestation rate, removed carbon and changes in carbon stock in soils (see paras. 156 and 157 above).

Activities under Article 3, paragraph 4, of the Kyoto ProtocolForest management – CO<sub>2</sub>

160. Germany has not provided a consistent LUM for the LULUCF sector, and the land area for forest land remaining forest land has increased, especially for the new Länder, according to the inventory submission 2010 (see para 132). As the forest management area is based on the estimate for forest land remaining forest, the ERT recommends that Germany implement the recommendations for improving the land area estimation and reporting (paras 132 and 153), and check and revise the area of forest management accordingly.

**2. Information on Kyoto Protocol units**Standard electronic format and reports from the national registry

161. Germany 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>6</sup> The SIAR was forwarded to the ERT prior to the review, pursuant to decision 16/CP.10. The ERT reiterated the main findings contained in the SIAR.

162. Information on the accounting of Kyoto units has been prepared and reported in accordance with chapter I.E of the annex to decision 15/CMP.1, and reported in accordance with decision 14/CMP.1 using the SEF tables. This information is consistent with that contained in the national registry and with the records of the international transaction log (ITL) and the clean development mechanism registry and meets the requirements set out in paragraph 88 (a–j) of the annex to decision 22/CMP.1. The transactions of Kyoto Protocol units initiated by the national registry are in accordance with the requirements of the annex to decision 5/CMP.1 and the annex to decision 13/CMP.1.

163. Information reported by the Party on records of any discrepancies and on any records of non-replacement was found to be consistent with information provided to the secretariat by the ITL.

National registry

164. 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.

Calculation of the commitment period reserve

165. Germany has reported its commitment period reserve in its 2010 annual submission. The Party reported that its commitment period reserve has not changed since the initial report review (4,381,287,024 t CO<sub>2</sub> eq.) as it is based on the assigned amount and not the most recently reviewed inventory. The ERT agrees with this figure.

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<sup>6</sup> The SEF comparison report is prepared by the ITL administrator and provides information on the outcome of the comparison of data contained in the Party's SEF tables with corresponding records contained in the ITL.

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

166. Germany reported changes in its national system since the previous annual submission. The changes relate to improved AD collection through enhanced legislation and agreements. The ERT concluded that, taking into account the confirmed changes in the national system, Germany's national system continues to be in accordance with the requirements of national systems set out in decision 19/CMP.1.

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

167. Germany reported changes in its national registry since the previous annual submission. These changes relate to the database structure and Germany has provided relevant testing documentation in support of this. The ERT concluded that the Party's national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1, and continues to adhere to the technical standards for data exchange between registry systems in accordance with relevant CMP decisions.

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

168. Germany has reported information on the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol, as requested in paragraph 23 and 25 of the annex to decision 15/CMP.1, in its 2010 annual submission. The information provided is an abstract of the information provided in Germany's fifth National Communication. Information requested in paragraph 24 of the annex to decision 15/CMP.1 was not provided by the Party.

169. The ERT identified that this information is reported in accordance with paragraphs 23 and 25 of the annex to decision 15/CMP.1 and, although limited, is complete and transparent and was submitted on time. The ERT encourages Germany to provide, in its next submission, more detailed information of the adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol, including the impacts of the policies and measures of the European Union, implemented in Germany.

170. Germany reported that most of the measures carried out in Germany are not expected to have adverse impacts on developing countries. Among the policies and measures highlighted in the report that the ERT considers could lead to positive indirect effects on developing countries are: the promotion of renewable energies, biofuels, CHP systems and energy efficiency; biogas use in agriculture; reforestation; and CH<sub>4</sub> separation from waste and sewage sludge. The promotion of biofuels was the only policy that Germany highlighted having the potential to cause negative indirect effects on developing countries, depending on the circumstances.

## **III. Conclusions and recommendations**

171. Germany made its annual submission on 15 April 2010 and resubmitted the NIR on 12 May 2010. The CRF tables were resubmitted on 5 November 2010 in response to questions raised by the ERT at the end of the review week. 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, accounting of 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.

172. The ERT concludes that the inventory submission is complete and the Party has submitted a complete set of CRF tables for the years 1990–2008 and an NIR; these are complete in terms of geographical coverage, years and sectors, as well as complete in terms of categories and gases.

173. The submission of information required under Article 7, paragraph 1, of the Kyoto Protocol has largely been prepared and reported in accordance with decision 15/CMP.1. However, in reporting under Article 3, paragraph 3 and 4, of the Kyoto Protocol, the ERT identified several problems with the quality of data concerning, among other things, areas of land use and areas of land-use change. Germany has prepared an action plan setting out how these can be rectified.

174. The Party's inventory is generally in line with the UNFCCC reporting guidelines, the Revised 1996 IPCC Guidelines, the IPCC good practice guidance and the IPCC good practice guidance for LULUCF. However, the land area reported in the LULUCF sector and the reporting under KP-LULUCF needs to be improved consistent with the action plan submitted by Germany in response to questions raised by the ERT during the course of the review.

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

176. The national system continues to perform its required functions as set out in the annex to decision 19/CMP.1. However, the ERT identified the need to clarify the institutional arrangements with respect to the responsibilities of the single national entity, UBA, and the Federal Ministry of Agriculture and Consumer Production in the next annual submission.

177. 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.

178. Germany 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 2010 annual submission. The ERT identified that this information is reported in accordance with paragraphs 23 and 25 of the annex to decision 15/CMP.1 and, although limited, is complete and transparent and was submitted on time.

179. In the course of the review, the ERT formulated a number of recommendations relating to the completeness of the annual submission (including Article 7.1 information), transparency and quality of the information presented in Germany's annual submission. The key recommendations are that Germany:

(a) Provide clarification of the responsibilities of the single national entity, UBA, and the Federal Ministry of Agriculture and Consumer Production with respect to the reporting on agriculture, LULUCF and reporting under Article 3, paragraphs 3 and 4;

(b) Improve the timeliness and accuracy of the national energy balance;

(c) Enhance the use of data collected under the European Union emissions trading scheme (EU ETS) for the verification of emissions data in the energy and industrial processes sectors;

(d) Provide justification for time-series consistency in the energy sector where updates do not cover the whole time series and in the LULUCF sector where different methods are used over time;

- (e) Include information on results of the QA/QC procedures;
- (f) Improve the land area reporting by the provision of a consistent land-use matrix in the LULUCF sector and reporting under Article 3, paragraphs 3 and 4;
- (g) Improve the quality of reporting of emissions/removals under Article 3, paragraph 3 and 4;
- (h) Provide more detailed information on the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol, including the impacts of the policies and measures of the European Union, implemented in Germany.

#### **IV. Questions of implementation**

180. 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/gp\\_lulucf/gp\\_lulucf.htm](http://www.ipcc-nggip.iges.or.jp/public/gp_lulucf/gp_lulucf.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 Germany 2010. Available at <<http://unfccc.int/resource/docs/2008/asr/deu.pdf>>.

Synthesis and assessment report on the greenhouse gas inventories submitted in 2010. Available at <<http://unfccc.int/resource/webdocs/sai/2010.pdf>>.

FCCC/ARR/2009/DEU. Report of the individual review of the greenhouse gas inventory of Germany submitted in 2009. Available at <<http://unfccc.int/documentation/documents/items/3595.php#beg>>.

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. Michael Strogies (UBA), including additional material on the methodology and assumptions used. The following documents<sup>1</sup> were also provided by Germany:

Anonym. Spreadsheet with stable type distribution for animals in 1990, 1995 and 1999 used in the German inventory.

Ellis, J.L., E. Kebreab, N.E. Odongo, B.W. McBride, E.K. Okine, J. France. 2007. *Prediction of Methane Production from Dairy and Beef Cattle. Journal of Dairy Science*, Vol. 90, pp 3456–3466.

Freibauer, A. 2003. *Regionalised inventory of biogenic greenhouse gas emissions from European agriculture. Europ. J. Agronomy* 19: 135–160.

Freibauer, A., D. Haenel, C. Rösemann. 2010. *Additional information why using elements from the 2006 guidelines in the agriculture sector is in accordance with the IPCC good practice guidance*. 5 pages paper received during the review week.

Garnier, J., G. Billen, G. Vilain, A. Martinez, M. Silvestre, E. Mounier, F. Toche. 2009. Nitrous oxide (N<sub>2</sub>O) in the Seine river and basin: Observations and budgets. *Agriculture, Ecosystems and Environment* 133: 223–233.

Hefting, M.M., R. Bobbink, H. De Caluwe. 2003. *Nitrous oxide emission and denitrification in chronically nitrate-loaded riparian buffer zones*. *J. Env. Quality* 32: 1194–1203.

Reay, D.S., A.C. Edwards, K.A. Smith. 2009. *Importance of indirect nitrous oxide emissions at the field, farm and catchment scale. Agriculture, Ecosystems and Environment* 133: 163–169.

Sauer, F.D., V. Fellner, R. Kinsman, J.K.G. Kramer, H.A. Jackson, A.J. Lee, S. Chen. 1998. *Methane output and lactation response in Holstein cattle with monensin or unsaturated fat added to the diet*, *J. Anim. Sci.* 76: 906–914.

Weymann, D., R. Well, H. Flessa, C. von der Heide, M. Deurer, K. Meyer, C. Konrad, W. Walther. 2008. *Groundwater N<sub>2</sub>O emission factors of nitrate-contaminated aquifers as derived from denitrification progress and N<sub>2</sub>O accumulation. Biogeosciences* 5, 1215–1226.

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

## Annex II

### Acronyms and abbreviations

AD	activity data
CH <sub>4</sub>	methane
C	carbon
CO <sub>2</sub>	carbon dioxide
CO <sub>2</sub> eq	carbon dioxide equivalent
CRF	common reporting format
DOC	degradable organic carbon
EF	emission factor
ERT	expert review team
EU ETS	European Union emissions trading scheme
F-gas	fluorinated gas
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
HFC	hydrofluorocarbons
IE	included elsewhere
IEA	International Energy Agency
IEF	implied emission factor
ITL	international transaction log
IPCC	Intergovernmental Panel on Climate Change
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
LUM	land use matrix
MCF	methane conversion factor
Mg	megagram (1 Mg = 1 tonne)
NA	not applicable
NE	not estimated
NO	not occurring
N <sub>2</sub> O	nitrous oxide
NH <sub>3</sub>	ammonia
NIR	national inventory report
PFC	perfluorocarbons
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
VS	volatile solids

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