Advance Version

COMPLIANCE COMMITTEE

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22 January 2014

Report of the individual review of the annual submission of Germany submitted in 2013

Note by the secretariat

The report of the individual review of the annual submission of Germany submitted in 2013 was published on 21 January 2014. 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 decisions 4/CMP.4 and -/CMP.9[*]), the report is considered received by the secretariat on the same date. This report, FCCC/ARR/2013/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.

[*] Compliance Committee.

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Report of the individual review of the annual submission of Germany submitted in 2013*

* In the symbol for this document, 2013 refers to the year in which the inventory was submitted, and not to the year of publication.

Contents

I. Introduction and summary

1. This report covers the review of the 2013 annual submission of Germany, coordinated by the UNFCCC secretariat, in accordance with decision 22/CMP.1. The review took place from 9 to 14 September 2013 in Bonn, Germany, and was conducted by the following team of nominated experts from the UNFCCC roster of experts: generalists – Ms. Leena Raittinen (Finland) and Mr. Dennis Rudov (Belarus); energy – Ms. Lindiwe Chola Dlamini (Swaziland), Ms. Veronika Ginzburg (Russian Federation) and Ms. Inga Konstantinaviciute (Lithuania); industrial processes and solvent and other product use – Ms. Siriluk Chiarakorn (Thailand) and Mr. Thapelo C.M. Letete (South Africa); agriculture – Ms. Yauheniya Bertash (Belarus) and Ms. Hongmin Dong (China); land use, land-use change and forestry (LULUCF) – Ms. Maria Fernanda Alcobé (Argentina) and Mr. Vladimir Korotkov (Russian Federation); and waste – Mr. Pavel Gavrilita (Republic of Moldova) and Ms. Tatiana Tugui (Republic of Moldova). Mr. Rudov and Ms. Tugui were the lead reviewers. The review was coordinated by Ms. Suvi Monni (UNFCCC secretariat).

2. In accordance with the "Guidelines for review under Article 8 of the Kyoto Protocol" (decision 22/CMP.1) (hereinafter referred to as the Article 8 review guidelines), a draft version of this report was communicated to the Government of Germany, which provided comments that were considered and incorporated, as appropriate, into this final version of the report. All encouragements and recommendations in this report are for the next annual submission, unless otherwise specified. The expert review team (ERT) notes that the 2012 annual review report of Germany was published after the submission of the 2013 annual submission.

3. In 2011, the main greenhouse gas (GHG) in Germany was carbon dioxide (CO_2), accounting for 87.1 per cent of total GHG emissions[1] expressed in CO_2 equivalent (CO_2 eq), followed by nitrous oxide (N_2O) (6.2 per cent) and methane (CH_4) (5.3 per cent). Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6) collectively accounted for 1.4 per cent of the overall GHG emissions in the country. The energy sector accounted for 83.0 per cent of total GHG emissions, followed by the agriculture sector (7.7 per cent), the industrial processes sector (7.6 per cent), the waste sector (1.6 per cent) and the solvent and other product use sector (0.2 per cent). Total GHG emissions amounted to 916,495.08 Gg CO_2 eq and decreased by 26.9 per cent between the base year[2] and 2011. The ERT concludes that the description in the national inventory report (NIR) of the trends for the different gases and sectors is reasonable.

4. Tables 1 and 2 show GHG emissions from sources included in Annex A to the Kyoto Protocol (hereinafter referred to as 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, elected activities under Article 3, paragraph 4, of the Kyoto Protocol (KP-LULUCF), by gas and by sector and activity, respectively. In table 1, CO_2, CH_4 and N_2O emissions included in the rows under Annex A sources do not include emissions and removals from the LULUCF sector.

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

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

5. Additional background data on recalculations by Germany in the 2013 annual submission, as well as information to be included in the compilation and accounting database, can be found in annex I to this report.

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[a] to 2011

			Gg CO_2 eq							*Change (%)*
		Greenhouse gas	*Base year[a]*	*1990*	*1995*	*2000*	*2008*	*2009*	*2010*	*2011*	*Base year–2011*
Annex A sources		CO_2	1 041 913.76	1 041 913.76	930 781.09	891 400.29	845 761.30	783 734.27	826 063.14	798 057.88	–23.4
		CH_4	109 940.53	109 940.53	92 631.42	75 100.10	53 605.48	51 505.22	50 385.00	48 844.09	–55.6
		N_2O	86 547.92	86 547.92	79 343.75	61 411.04	63 195.89	63 223.21	54 627.87	56 871.16	–34.3
		HFCs	7 012.18	4 592.29	7 012.18	7 623.20	8 843.03	9 442.69	8 963.13	9 176.67	30.9
		PFCs	1 780.27	2 627.47	1 780.27	792.18	472.43	337.70	285.26	229.60	–87.1
		SF_6	6 779.16	4 641.63	6 779.16	4 268.98	3 114.56	3 065.05	3 194.04	3 315.68	–51.1
KP-LULUCF	Article 3.3[b]	CO_2					–4 980.13	–5 541.43	–5 588.24	–5 633.62	
		CH_4					IE, NO	IE, NO	IE, NO	IE, NO	
		N_2O					0.02	0.02	0.03	0.04	
	Article 3.4[c]	CO_2	NA				–27 795.30	–27 770.62	–27 774.09	–27 748.47	NA
		CH_4	NA				3.28	4.62	3.20	1.32	NA
		N_2O	NA				65.79	66.07	65.72	65.27	NA

Abbreviations: IE = included elsewhere, 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.

[a] "Base year" for Annex A sources refers to the base year under the Kyoto Protocol, which is 1990 for CO_2, CH_4 and N_2O, and 1995 for HFCs, PFCs and SF_6. The "base year" for cropland management, grazing land management and revegetation under Article 3, paragraph 4, of the Kyoto Protocol is 1990. For activities under Article 3, paragraph 3, of the Kyoto Protocol and forest management under Article 3, paragraph 4, only the inventory years of the commitment period must be reported.

[b] Activities under Article 3, paragraph 3, of the Kyoto Protocol, namely afforestation and reforestation, and deforestation.

[c] Elected activities under Article 3, paragraph 4, of the Kyoto Protocol, including forest management, cropland management, grazing land management and revegetation.

Table 2
Greenhouse gas emissions by sector and activity, base year[a] to 2011

		Gg CO_2 eq								*Change (%)*
	Sector	*Base year[a]*	*1990*	*1995*	*2000*	*2008*	*2009*	*2010*	*2011*	*Base year–2011*
Annex A	Energy	1 020 323.33	1 020 323.33	902 094.32	856 188.51	805 221.45	751 530.61	789 178.80	760 572.25	–25.5
	Industrial processes	97 919.12	94 208.90	96 821.88	77 451.64	78 857.81	72 113.01	68 676.34	69 326.15	–29.2
	Solvent and other product use	4 538.56	4 538.56	3 614.92	2 971.21	1 874.24	1 687.92	1 944.49	1 855.90	–59.1
	Agriculture	87 962.62	87 962.62	75 866.02	76 021.03	71 623.61	69 617.92	68 364.71	70 359.91	–20.0
	Waste	43 230.19	43 230.19	39 930.73	27 963.38	17 415.58	16 358.67	15 354.11	14 380.88	–66.7
	LULUCF	NA	–35 758.00	–35 370.41	–34 802.27	7 759.34	8 509.95	8 720.73	9 334.60	NA
	Total (with LULUCF)	**NA**	**1 214 505.60**	**1 082 957.46**	**1 005 793.50**	**982 752.04**	**919 818.08**	**952 239.18**	**925 829.68**	**NA**
	Total (without LULUCF)	**1 253 973.83**	**1 250 263.60**	**1 118 327.87**	**1 040 595.78**	**974 992.69**	**911 308.13**	**943 518.45**	**916 495.08**	**–26.9**
	Other[b]	NA	NA	NA	NA	NA	NA	NA	NA	NA
KP-LULUCF Article 3.3[c]	Afforestation and reforestation					–5 313.15	–5 624.62	–5 699.82	–5 772.26	
	Deforestation					333.03	83.21	111.61	138.68	
	Total (3.3)					**–4 980.12**	**–5 541.41**	**–5 588.21**	**–5 633.58**	
KP-LULUCF Article 3.4[d]	Forest management					–27 726.24	–27 699.92	–27 705.17	–27 681.89	
	Cropland management	NA				NA	NA	NA	NA	NA
	Grazing land management	NA				NA	NA	NA	NA	NA
	Revegetation	NA				NA	NA	NA	NA	NA
	Total (3.4)	**NA**				**–27 726.24**	**–27 699.92**	**–27 705.17**	**–27 681.89**	**NA**

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

[a] "Base year" for Annex A sources refers to the base year under the Kyoto Protocol, which is 1990 for CO_2, CH_4 and N_2O, and 1995 for HFCs, PFCs and SF_6. The "base year" for cropland management, grazing land management and revegetation under Article 3, paragraph 4, of the Kyoto Protocol is 1990. For activities under Article 3, paragraph 3, of the Kyoto Protocol and forest management under Article 3, paragraph 4, only the inventory years of the commitment period must be reported.

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

[c] Activities under Article 3, paragraph 3, of the Kyoto Protocol, namely afforestation and reforestation, and deforestation.

[d] Elected activities under Article 3, paragraph 4, of the Kyoto Protocol, including forest management, cropland management, grazing land management and revegetation.

II. Technical assessment of the annual submission

A. Overview

1. Annual submission and other sources of information

6. The NIR of the 2013 annual inventory submission was originally submitted on 15 April 2013 with revisions submitted on 15 May 2013; common reporting format (CRF) tables were submitted on 11 April 2013; the annual submission contains a complete set of CRF tables for the period 1990–2011 and an NIR. Germany also submitted the information required under Article 7, paragraph 1, of the Kyoto Protocol, including information on: activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, accounting of Kyoto Protocol units, changes in the national system and in the national registry, and the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol. The standard electronic format (SEF) tables were submitted on 15 April 2013, with revisions submitted on 15 May 2013.

7. The full list of materials used during the review is provided in annex II to this report.

2. Overall assessment of the inventory

8. Table 3 contains the ERT's overall assessment of the annual submission of Germany. For recommendations for improvements related to cross-cutting issues for specific categories, please see the paragraphs cross-referenced in the table.

Table 3
The expert review team's overall assessment of the annual submission

		General findings and recommendations (category-specific recommendations are cross-referenced)
The expert review team's (ERT's) findings on completeness of the 2013 annual submission		
Annex A sources[a]	Complete	Mandatory: none
		Non-mandatory: none
Land use, land-use change and forestry[a]	Complete	Mandatory: none
		Non-mandatory: "NE" is reported for: CO_2, CH_4 and N_2O emissions from harvested wood products; CH_4 emissions from drainage of soils and wetlands: forest land; CH_4 and N_2O emissions from drainage of soils and wetlands: wetlands; and CO_2, CH_4 and N_2O emissions from biomass burning: settlements
KP-LULUCF	Complete	Mandatory: none
		Non-mandatory: none
The ERT's findings on recalculations and time-series consistency in the 2013 annual submission	Generally consistent	Paragraphs 53 and 62

		General findings and recommendations (category-specific recommendations are cross-referenced)
The ERT's findings on verification and quality assurance/quality control procedures in the 2013 annual submission	Sufficient	The ERT noted inconsistencies between the information included in the CRF tables and in the tables of the NIR, which specify the method and EFs used in all sectors except solvent and other product use. Germany explained that it has implemented a tier 1 QC procedure for checking the consistency of information between the text in the NIR and CRF table summary 3. The ERT recommends that Germany enhance the effective implementation of the tier 1 QC check for transcription errors. Category-specific recommendations on QA/QC and verification are included in paragraphs 63 and 67
The ERT's findings on the transparency of the 2013 annual submission	Sufficient	The ERT recommends that Germany improve transparency of the inventory by ensuring that the notation keys are used correctly and that the information is consistent between the NIR and the CRF tables for all sectors. Category-specific recommendations on transparency are included in paragraphs 21, 31, 32, 33, 35, 36, 37, 41, 43, 45, 46, 47, 49, 52, 56, 57, 60, 63, 64, 68 and 72

Abbreviations: Annex A sources = sources included in Annex A to the Kyoto Protocol, CRF = common reporting format, EF = emission factor, ERT = expert review team, 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, NE = not estimated, NIR = national inventory report, QA = quality assurance, QC = quality control.

[a] The assessment of completeness by the ERT considers only the completeness of reporting of mandatory categories (i.e. categories for which methods and default EFs are provided in the Intergovernmental Panel on Climate Change (IPCC) *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*, the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*, or the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry*).

3. Description of the institutional arrangements for inventory preparation, including the legal and procedural arrangements for inventory planning, preparation and management

Inventory planning

9. The NIR described the national system for the preparation of the inventory. The Federal Environment Agency (UBA) has been designated as the single national entity with overall responsibility for the national inventory. The single national entity's tasks include planning, preparing and archiving inventories and carrying out quality assurance and quality control (QA/QC) procedures for all important process steps. A working group on emission inventories has been set up to coordinate relevant work within UBA; it liaises with all of the agency's employees who are involved in inventory preparation.

10. UBA operates under the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety. At the ministerial level, the national system incorporates other German ministries, including 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 Development and the Federal Ministry of Food, Agriculture and Consumer Protection. All federal ministries that participate in emissions reporting are represented in the National Coordinating Committee, which has the

tasks of approving inventories, supporting the inventory process and clarifying open issues regarding the national system.

11. Other institutions and organizations integrated within the national system include the Federal Statistical Office, Johann Heinrich von Thünen Institute (TI), the Working Group on Energy Balances (AGEB) and relevant associations (e.g. the Association for Technology and Structures in Agriculture, the German chemical industry association (Verband der Chemischen Industrie e.V.), the German steel industry association (Wirtschaftsvereinigung Stahl) and the German electrical and electronic manufacturers' association (Zentralverband Elektrotechnik- und Elektronikindustrie e.V.(ZVEI)). The provision of relevant data and supporting work for the inventory from these organizations is guaranteed through legal arrangements, commissions, agreements or contracts. In addition, TI has established an in-house working group on emissions reporting to serve as liaison to the single national entity and coordinate the inventory planning and QA/QC for the agriculture and LULUCF sectors.

12. The UBA Central System of Emissions (CSE) is the national central database for emissions calculation, documentation and reporting, including storage of information on methods, activity data (AD), emission factors (EFs) and QA/QC at the data level. The Quality System for Emissions Inventories (QSE), which covers the entire national system, provides the necessary framework for good inventory practice and for routine QA/QC. The necessary QA/QC measures are summarized in a QA/QC plan. QSE specifies responsibilities and quality objectives relative to methods selection, data collection, calculation of emissions and relevant uncertainties and recording of completed quality checks and their results.

Inventory preparation

13. Table 4 contains the ERT's assessment of Germany's inventory preparation process. For improvements related to specific categories, please see the paragraphs cross-referenced in the table.

Table 4
Assessment of inventory preparation by Germany

		General findings and recommendations (category-specific recommendations are cross-referenced)
Key category analysis		
Was the key category analysis performed in accordance with 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)?	Yes	Level and trend key category analysis performed, including and excluding LULUCF
Approach followed?	Tier 1 and 2	
Were additional key categories identified using a qualitative approach?	No	

		General findings and recommendations (category-specific recommendations are cross-referenced)
Has the Party identified key categories for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol following the guidance on establishing the relationship between the activities under the Kyoto Protocol and the associated key categories in the UNFCCC inventory?	Yes	
Does the Party use the key category analysis to prioritize inventory improvements?	Yes	
Are there any changes to the key category analysis in the latest submission?	Yes	Compared with the 2012 annual submission, the number of key categories pursuant to tier 1 analysis decreased from 39 to 37 (railways – CO_2 and commercial/institutional – CH_4 are not key categories in 2013 annual submission). The number of key categories pursuant to tier 2 analysis increased by one (residential – CO_2)
Assessment of uncertainty analysis		
Approach followed?	Tier 1	Germany described in the NIR that it determines uncertainties with a tier 2 analysis every three years. The latest tier 2 uncertainty analysis was carried out in 2010, and it should have been carried out again in 2013. However, according to the NIR, Germany extensively revised the calculation algorithms, and integrated uncertainty calculation within CSE in 2012. Although initial results have already been obtained with the new approach, neither they nor the basic change in methods have yet been verified. The necessary review for verification will be carried out in 2013 and the results of the tier 2 uncertainty analysis will be reported as part of the 2014 annual submission. The ERT welcomes the plan Sector-specific findings and recommendations on uncertainties are included in paragraphs 25 and 75
Was the uncertainty analysis carried out in accordance with the IPCC good practice guidance and the IPCC good practice guidance for LULUCF?	Yes	The ERT noted that the reasons for the higher uncertainty estimates in the current annual submission were not clearly explained in the NIR. To increase transparency, the ERT encourages Germany to explain the differences in the uncertainty estimates for the consecutive annual submissions in the NIR

	General findings and recommendations (category-specific recommendations are cross-referenced)
Quantitative uncertainty (including LULUCF)	Level = 6.3% Trend = 6.5%
Quantitative uncertainty (excluding LULUCF)	Level = not provided Trend = not provided

Abbreviations: CSE = Central System of Emissions, ERT = expert review team, LULUCF = land use, land-use change and forestry, NIR = national inventory report.

Inventory management

14. Germany has a centralized archiving system at UBA, which includes the archiving of disaggregated EFs and AD (used in the CSE database), 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. During the review, the ERT was provided with the requested additional archived information.

4. Follow-up to previous reviews

15. The ERT commends Germany for the improvements undertaken in response to recommendations made in the previous review reports. An overview table in the NIR lists major inventory improvements made, including further development of the institutional and procedural arrangements of the national system, improving transparency of the reporting by extending and modifying the content of the NIR, and correcting inconsistencies between the NIR and the CRF tables.

16. The ERT noted that most of the recommendations made in the previous review report have not been addressed in the 2013 annual submission, owing to the late finalization of the annual review report, published in August 2013. In response to questions raised by the ERT during the review, Germany provided information on the status of the improvement measures initiated due to the recommendations made in the previous review reports. The ERT commends Germany for its systematic approach to inventory improvement on the grounds of review feedback, and recommends that Germany fully implement the recommendations made in the previous review reports. In particular, the ERT recommends that Germany:

(a) Improve transparency (see paras. 30, 31, 41, 43, 45–47, 62–64 and 68 below);

(b) Provide more justification for the selection of notation keys and improve their use (see paras. 45 and 60 below);

(c) Explain the differences between reference and sectoral approaches and between inventory data and International Energy Agency (IEA) data (see paras. 27 and 28 below);

(d) Report the emissions following the subcategories in the CRF tables (see para. 24 below) and those defined in the Intergovernmental Panel on Climate Change (IPCC)

Good Practice Guidance for Land Use, Land-Use Change and Forestry (hereinafter referred to as the IPCC good practice guidance for LULUCF) (see para. 65 below).

17. During the finalization of the annual review report, Germany informed the ERT that the recommendations and encouragements contained in paragraphs 21, 23, 27, 30, 33, 37, 42, 45–49, 52–57, 59, 60, 62–65, 67–69, 71, 72, 76 and 86–87 will be addressed in the 2014 annual submission. The ERT welcomes Germany's intent to address these recommendations in the 2014 annual submission.

5. Areas for further improvement identified by the expert review team

18. During the review, the ERT identified a number of areas for improvement, including some related to specific categories. These are listed in the relevant chapters of this report and in table 8.

B. Energy

1. Sector overview

19. The energy sector is the main sector in the GHG inventory of Germany. In 2011, emissions from the energy sector amounted to 760,572.25 Gg CO_2 eq, or 83.0 per cent of total GHG emissions. Since 1990, emissions have decreased by 25.5 per cent. The key drivers for the fall in emissions are the changes in the national fuel mix and improvement in energy efficiency. In the national fuel mix, the main changes were related to the shift in electricity generation from coal to natural gas and increased use of zero-emissions energy sources. The emissions from the energy sector have generally decreased over time. An increase occurred from 2009 to 2010 as a result of economic recovery.

20. Within the sector, 46.6 per cent of the emissions were from energy industries, followed by 20.7 per cent from transport, 16.1 per cent from other sectors and 15.2 per cent from manufacturing industries and construction. Fugitive emissions from fuels accounted for 1.3 per cent and the remaining 0.2 per cent were from other (fuel combustion).

21. Recalculations are listed in the NIR by category but are in some cases not transparently explained and quantified. For example, in the NIR (page 159) it is stated that a recalculation for public electricity and heat production was required "for the period as of 2004 as a result of revision of the applicable waste model". The ERT further noted that this issue was not mentioned in CRF table 8(b). In response to a question raised by the ERT during the review, Germany explained that previously a comparison between the energy and the waste statistics was possible only at an aggregated level. For the 2013 annual submission, very detailed waste incineration data according to the classification of the European Waste Catalogue became available. Additional data on the amount of waste combusted in co-incineration plants (hard coal and lignite fired power plants) were also available from the coal association and the European Union emissions trading scheme (EU ETS). The ERT commends the Party for the improvements but recommends that the Party include sufficient explanatory information justifying recalculations in the NIR to improve transparency.

22. The national energy balance, prepared by AGEB, is the main data source for the sectoral and reference approaches. The previous review reports noted several issues related to the national energy balance of Germany (such as the timelines of reporting; differences between the preliminary and the final energy balance; and the complexity of the compilation process). The ERT noted several improvements made in the 2013 annual submission. In particular, in 2012 AGEB began to submit an annual joint quality report to UBA, which documents the QA measures carried out in the preparation of energy balances. AGEB also prepared the "Energy Data Action Plan for inventory improvement" in 2012,

which outlines actions to be taken to address recommendations made in the 2011 review report. The ERT commends the Party for these improvements and recommends that the Party report on any further progress achieved. To further increase the transparency of the inventory, the ERT also reiterates the encouragement in the previous review report to include in the NIR details of primary fuel types for the entire time series.

23. The ERT noted that Germany has used EU ETS data for the verification of some emission estimates. According to the NIR, a formalized procedure has been agreed for the relevant annual data exchange. The ERT reiterates the encouragements made in the previous review reports that Germany continue to use the EU ETS data to verify EFs and/or emission estimates and to analyse any significant differences between the two data sources and report on this in the NIR.

24. The ERT noted that Germany continues to report emissions under manufacturing industries and construction in an aggregated manner: 69.7 per cent of the total emissions from manufacturing industries and construction in 2011 are reported in the subcategory other. In response to a question raised by the ERT during the review, Germany explained that QA/QC is easier at an aggregated level and a further disaggregation would increase the complexity of the inventory but not improve the quality. However, the Party mentioned that it is continuing to work on that issue. The ERT reiterates the recommendation made in the previous review report that Germany continue to assess the possibility of preparing emissions data at the level of disaggregation in the CRF tables, and report on progress in its next annual submission.

25. The ERT noted that in general, quantitative uncertainties for AD and EFs at an aggregated level are available in the NIR (table 387), but quantitative uncertainty estimates are not provided in the category-specific sections of the NIR. In response to questions raised by the ERT during the review, Germany provided the ERT with the spreadsheets which included category-specific uncertainties for AD, EFs and combined uncertainty of emissions according to the fuel type. The ERT recommends that the Party include brief information on quantitative uncertainties in the category-specific sections in the NIR.

2. Reference and sectoral approaches

26. Table 5 provides a review of the information reported under the reference approach and the sectoral approach, as well as comparisons with other sources of international data. Issues identified in table 5 are more fully elaborated in paragraphs 27–31 below.

Table 5
Review of reference and sectoral approaches

		Paragraph cross-references to recommendations
Difference between the reference approach and the sectoral approach	Energy consumption: 110.09 PJ, 1.2% CO_2 emissions: –6,213.52 Gg CO_2, –0.8%	27
Are differences between the reference approach and the sectoral approach adequately explained in the NIR and the CRF tables?	Yes	27
Are differences with international statistics adequately explained?	Yes	28
Is reporting of bunker fuels in accordance with the UNFCCC reporting guidelines?	Yes	29
Is reporting of feedstocks and non-energy use of fuels in accordance with the UNFCCC reporting guidelines?	Yes	30–31

Abbreviations: CRF = common reporting format, NIR = national inventory report, UNFCCC reporting guidelines = "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories".

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

27. In 2011, total CO_2 emissions estimated using the reference approach were 0.8 per cent lower than those estimated using the sectoral approach. However, at the primary fuel level the comparison results in larger differences, as presented in CRF table 1.A(c), especially for liquid fuels (10.5 per cent) and solid fuels (–7.4 per cent). Similar differences in emissions exist for all years since 1990. There are no explanations for the differences at the fuel level provided in the NIR. Therefore, the ERT reiterates the recommendation made in the previous review report that Germany include a detailed analysis of emission differences at the primary solid, liquid and gaseous fuel levels in the NIR.

28. The ERT noted that in 2011, the total apparent consumption reported in the CRF tables is 3 per cent lower than that reported to IEA. The ERT reiterates the recommendation made in the previous review report that Germany compare the inventory data with the corresponding IEA data at the primary fuel type level and explain the differences in the NIR.

International bunker fuels

29. Estimation of emissions from international marine bunkers is based on AD for bunkering of ocean-going ships provided in the national energy balance. The NIR includes a clear description of how the fuels sold to domestic navigation are separated from international bunkers, except for international transport in inland waterways (see para. 38 below).

Feedstocks and non-energy use of fuels

30. The ERT noted that Germany continues to use carbon storage fractions for natural gas (0.90) and liquefied petroleum gas (0.55) that differ significantly from the defaults

contained in the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Revised 1996 IPCC Guidelines) (0.33 and 0.80, respectively) and the NIR did not provide proper justifications for these differences. In response to a question raised by the ERT during the review, Germany explained that the values have not yet been changed to IPCC defaults owing to a mistake and also explained that for the 2014 annual submission, the Party will revise the carbon storage fractions. The ERT welcomes the planned improvement and reiterates the recommendation made in the previous review report that the Party provide justifications for the carbon storage fractions and for any recalculations performed.

31. As noted in the previous review reports, additional information for feedstocks and non-energy use of fuels in CRF table 1.A(d) has not been reported for any of the years. The ERT considers that inclusion of this information would increase the transparency of the reporting and facilitate understanding of the overall energy balance. The ERT reiterates the recommendation made in previous review reports that Germany include this additional information in CRF table 1.A(d).

3. Key categories

Stationary combustion: solid fuels – CO_2

32. The ERT noted that the overall trend of the CO_2 implied emission factor (IEF) in the solid fuel category for petroleum refining has decreased between 1990 (93.09 t/TJ) and 2011 (40.00 t/TJ) by 57.0 per cent. The CO_2 IEF has been constant since 1997. In 2011, the CO_2 IEF was the lowest among the reporting Parties (40.00–262.48 t/TJ) and below the range of the IPCC default values (94.60–106.70 t/TJ). In response to a question raised by the ERT during the previous stages of the review, Germany stated that this decrease can be explained by the use of coke oven gas in 2011 instead of lignite, which was used in 1990. The ERT reiterates the recommendation made in the previous review report that Germany provide a brief explanation of this issue to improve transparency.

Oil and natural gas: gaseous fuels – CH_4

33. The CH_4 emissions from natural gas production/processing increased by 17.8 per cent from 2007 to 2008 (from 2.93 Gg to 3.46 Gg) and by 11.2 per cent from 2008 to 2009 (3.84 Gg). From 2009 to 2010 (2.21 Gg) the emissions decreased by 42.4 per cent. In response to a question raised in the previous stages of the review, Germany explained that the amount of gas produced and thus also emissions have generally a decreasing trend. According to the German association of the oil and gas industry (Wirtschaftsverband Erdöl- und Erdgasgewinnung e.V.) the production plants were optimized in the years 2008–2009, which led to higher emissions in those years. Germany further stated that the variance between the yearly emission amounts is within the specified range of the uncertainty (NIR chapter 3.3.2.4.2.3). The ERT recommends that Germany provide an explanation of this issue in the NIR and ensure that the reasons for such fluctuations are appropriately reported in the NIR.

34. The CH_4 emissions from natural gas transmission increased by 19.6 per cent from 2008 (14.01 Gg) to 2009 (16.75 Gg) and decreased by 4.8 per cent from 2009 to 2010 (15.95 Gg). In response to a question raised by the ERT during the previous stages of the review, Germany explained that the volume of gas stored in reservoirs in 2009 was higher than usual, and also the reported length of steel pipeline was higher than in the years before or after 2009. Germany explained that neither the association of the oil and gas industry nor UBA can provide a reasonable explanation for these anomalies. In an attempt to avoid underestimation, Germany estimated emissions using the pipeline length reported for 2009 instead of interpolation. The Party also explained that the uncertainty of this subcategory is

20 per cent. The ERT encourages Germany to investigate this variance and report on it in the NIR.

4. Non-key categories

Stationary combustion: solid fuels – CH_4

35. The CH_4 IEF for solid fuels in the subcategory commercial/institutional has a decreasing trend: from 239.90 kg/TJ in 1990 to 108.91 kg/TJ in 2011 (–54.6 per cent). In 2011 the CH_4 IEF was considerably higher than the IPCC default value (10.0 kg/TJ), and third highest among the reporting Parties (range from 0.071 to 427.34 kg/TJ). In response to a question raised by the ERT during the review, Germany explained that a country-specific EF for CH_4 has been derived from measurement values and it can be explained by a relatively large share of small appliances with high CH_4 emissions. The ERT recommends that Germany provide a brief explanation of this issue in its NIR to improve transparency.

Stationary combustion: gaseous fuels – CH_4

36. The ERT has identified several large inter-annual changes in the CH_4 IEF for the subcategory iron and steel, including from 0.72 kg/TJ in 2002 to 5.44 kg/TJ in 2003 (increase of 652.7 per cent) and from 2.78 kg/TJ in 2008 to 0.86 kg/TJ in 2009 (decrease of 69.2 per cent). In response to a question raised by the ERT during the review, Germany explained that the fuel category gaseous fuels includes both natural gas and pit gas. Natural gas is mostly used in boilers and power plants, mixed with blast furnace gas, oxygen furnace gas and coke oven gas. Pit gas is burned in engines with considerably higher CH_4 emissions. The relationship between the two fuel types changes every year, mainly due to the availability of pit gas. The ERT recommends that Germany provide a brief explanation of this issue in its NIR to increase transparency.

Road transportation: liquid fuels – N_2O

37. The N_2O IEF for diesel oil in road transportation has an increasing trend (0.54 to 2.79 kg/TJ between 1990 and 2011), and there are several large inter-annual changes in the time series, such as a 22.0 per cent increase from 2007 (1.64 kg/TJ) to 2008 (2.00 kg/TJ); a 14.2 per cent increase from 2008 to 2009 (2.28 kg/TJ); a 12.0 per cent increase from 2009 to 2010 (2.56 kg/TJ) and a 9.3 per cent increase from 2010 to 2011 (2.79 kg/TJ). In response to a question raised by the ERT during the review, Germany explained that the development of the N_2O IEF strongly reflects the increasing share of diesel vehicles and the ongoing implementation of mitigation technologies (European emission standards) for these vehicles, especially in order to reduce nitrogen oxides emissions, resulting in higher N_2O emissions. The ERT recommends that Germany provide a brief explanation of this issue in its NIR to increase transparency.

Navigation: liquid fuels – CO_2, CH_4 and N_2O

38. The ERT noted that due to lack of usable AD, Germany cannot distinguish the small amount of bunker fuel that is used for international transport on inland waterways (such as on the Rhine river) from that used for domestic navigation, as indicated in the previous review reports. The ERT also noted that the approach of Germany leads to a potential slight overestimation of emissions from navigation. Taking into consideration the small contribution of the category to the national totals, the ERT encourages Germany to make efforts to separate the emissions from international transport associated with inland navigation from the emissions from domestic navigation, taking into account the availability of resources.

C. Industrial processes and solvent and other product use

1. Sector overview

39. In 2011, emissions from the industrial processes sector amounted to 69,326.15 Gg CO_2 eq, or 7.6 per cent of total GHG emissions, and emissions from the solvent and other product use sector amounted to 1,855.90 Gg CO_2 eq, or 0.2 per cent of total GHG emissions. Since the base year, emissions have decreased by 29.2 per cent in the industrial processes sector, and decreased by 59.1 per cent in the solvent and other product use sector. The key drivers for the fall in emissions in the industrial processes sector since 1990 are decreased production (e.g. aluminium, ferroalloys and difluoromonochloromethane (HCFC-22) production) and measures to reduce emissions (e.g. N_2O from adipic and nitric acid production, and PFCs from aluminium production). There was a slight increase in emissions from the industrial processes sector from 2010 (68,676.34 Gg CO_2 eq) to 2011 as a result of increased CO_2 emissions from iron and steel production due to a higher production level. Within the industrial processes sector, in 2011, 29.0 per cent of the emissions were from chemical industry, followed by 28.1 per cent from mineral products, 24.7 per cent from metal production and 17.7 per cent from consumption of halocarbons and SF_6. Production of halocarbons and SF_6 and other (industrial processes) accounted for 0.2 per cent each.

40. The NIR and the CRF tables are generally transparent. The notation key "IE" (included elsewhere) is used in the industrial processes sector to report CO_2 emissions from limestone and dolomite use and from ceramic production (a country-specific subcategory under other (mineral products)), CO_2 and CH_4 from pig iron, coke and sinter, and N_2O from medical use (country-specific subcategory under other (chemical industry)). In the solvent and other product use sector, emissions from aerosol cans are reported as "IE". The Party has explained under which categories the emissions are reported, but the ERT encourages the Party to decrease the number of instances where the notation key "IE" is used.

41. Not all recalculations mentioned in CRF table 8(b) are explained in the NIR (such as that for SF_6 used as trace gas). The ERT reiterates the recommendation made in the previous review report that the Party improve the consistency of the information in CRF table 8(b) with that presented in the NIR.

2. Key categories

Cement production – CO_2

42. Germany has calculated CO_2 emissions from cement production on the basis of clinker production, with a country-specific EF of 0.53 t CO_2/t clinker, which is higher than the IPCC default value (0.51 t CO_2/t clinker). Although the overall EF is higher than the IPCC default value, the previous ERT noted that Germany did not apply a correction for cement kiln dust. Germany explained in the NIR that there is no need to take account of significant losses via the exhaust-gas pathway because dust separated from the exhaust gases is returned to the burning process in the German cement industry. This means that the cement kiln dust correction factor is 1.00. Based on the explanation given by Germany in the NIR, the ERT considers that the method used corresponds to the IPCC tier 2 method, which is appropriate for this key category. In the previous review report, the Party was encouraged to verify the emission data with data from the EU ETS. In response to questions raised by the ERT during the current review, Germany provided the comparison of CO_2 emission data presented in the NIR and those in the EU ETS reports between 2005 and 2011. The ERT noted that the CO_2 emissions from cement production reported in the NIR are higher than those reported in the EU ETS reports. The range of difference is from 1.2 per cent in 2005 to 7.3 per cent in 2011. The ERT commends Germany for providing this information and encourages the Party to include CO_2 emissions at the national level from

the EU ETS report in the NIR for verification purposes, and to explain the significant difference.

Lime production – CO_2

43. According to the NIR, the German Lime Association collects lime production data for the entire time series and the NIR states that this approach ensures that all German lime production is taken into account in the inventory. Germany recalculated the emissions from lime production in the 2013 annual submission for the entire time series taking into account the default factor of 5.0 per cent impurities in raw materials, which was not included in the emission estimates in the previous annual submission. The recalculation resulted in a 5.0 per cent decrease in the CO_2 emissions from the category. The ERT concluded that the method used is in line with the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC good practice guidance). In response to questions raised by the ERT during the review, Germany provided a comparison table of CO_2 emissions from lime production between the NIR and the EU ETS for 2005–2011. The ERT noted that the CO_2 emissions reported in the NIR are lower than those from the EU ETS. The range of differences is from 11.9 per cent in 2005 to 8.9 per cent in 2011. In response to a further question raised by the ERT, the Party explained that at the moment, the correction factor for impurities used for the national GHG inventory calculations cannot be changed from the default value to a value corresponding to EU ETS results due to lack of sufficient knowledge on the issue. The ERT reiterates the recommendation made in the previous review report that Germany analyse the differences between the CO_2 emissions reported in the NIR and those from the EU ETS and report on this in the NIR. The ERT further recommends that the Party provide EU ETS methodology and the EFs used to calculate CO_2 emissions from lime production in the next annual submission to improve transparency.

Ammonia production – CO_2

44. Germany estimated CO_2 emissions from ammonia production using plant-specific data, as recommended in the Revised 1996 IPCC Guidelines. The data included in the inventory are collected from plant operators by the agricultural industry association Industrieverband Agrar (IVA) and are subject to QA checks by IVA. The equation used by IVA to estimate emissions is from the *2006 IPCC Guidelines for National Greenhouse Gas Inventories*.

45. Germany estimated the emissions based on the carbon content of the raw materials (natural gas and heavy fuel oil). In line with the Revised 1996 IPCC Guidelines, the Party included in the emissions the recovered CO_2 that is used in, for example, the production of urea. The amount of recovered CO_2 is reported as "NO" (not occurring) in the CRF tables. The ERT reiterates the recommendation made in the previous review report that the Party change the notation key to "IE". The ERT also reiterates the recommendation made in the previous review report that the Party include in the NIR information on how the carbon content of heavy fuel oil used in ammonia production is determined, to improve transparency.

Adipic acid production – N_2O

46. The emissions from adipic acid production included in the inventory for 1990 until the mid-1990s are based on IPCC default EFs and the amount of adipic acid produced, obtained from the producers. Thereafter, the emission estimates reported are based upon emission data reported by the plants. Production data and IEFs are reported as confidential. In response to a question raised by the ERT during the previous review, Germany provided the confidential production data and the time series for the calculated IEFs based on reported total emissions and production for the category. The three facilities producing adipic acid have installed abatement technologies. The ERT reiterates the recommendation

made in the previous review report that Germany improve the description of the methodological issues for the calculation of the N_2O emissions (e.g. precisely for which years the IPCC default EF is used, and the methods used to calculate N_2O emissions at each plant) in its NIR, to improve transparency.

Other (chemical industry) – CO_2

47. In 2011, CO_2 emissions from other (chemical industry) contributed 13.3 per cent of the total GHG emissions from the industrial processes sector. The main contributors to CO_2 emissions were: burn-off of coke as a catalyst at oil refineries; production of carbon black and methanol; and transformation processes. The methodology used to estimate emissions from coke burn-off in catalyst regeneration is not clearly described in the NIR. The ERT reiterates the recommendation made in the previous review report that Germany include a more detailed description of methodological issues in the NIR, including explanations of whether the emissions are the result of fuel use for the production of energy, to improve transparency.

Production of HCFC-22 – HFC-23

48. Germany reported in the NIR that up to mid-2010 there were two HCFC-22 production plants. Since production was terminated in 2010, the emissions did not occur in 2011. The ERT noted that in the CRF tables, Germany reported AD as "NE" (not estimated) and emissions as "C" (confidential). In response to a question raised by the ERT during the review, the Party explained that the correct notation key is "NO". The ERT recommends that the Party correct the use of notation keys.

Consumption of halocarbons and SF_6 – HFCs

49. In the 2013 annual submission, Germany recalculated the emissions from this category due to the introduction of a new model and data for calculating HFC emissions from commercial refrigeration, industrial refrigeration, stationary air-conditioning systems and mobile air-conditioning systems. The ERT noted that the specific refrigerant quantity (coefficient) for commercial refrigeration was changed from the unit of kg refrigerant per installed kW to the unit of kg refrigerant per m^2 of sales floor area (for medium-sized supermarkets) and to the unit of kg refrigerant per store (for discount stores). During the review the ERT asked the Party to explain the rationale for this change in specific refrigerant quantity and provide technical information on how these new coefficients were determined. In response to the question, the Party explained that the approach of estimating the refrigerant quantity in supermarkets based on sales floor area is more realistic because it accounts for the growing refrigeration area and explained that this approach is also applied by some other EU countries and in the EU fluorinated gas model AnaFgas. The Party further explained that in the case of discount stores, the coefficient is expressed in units of kg per discount store, instead of per sales floor area. This is because the discount stores are homogeneously the same size (~ 800 m^2), resulting in the coefficient of 80 kg refrigerant per store. The ERT concluded that the approach taken by the Party is in line with good practice and improves the accuracy of the inventory. The ERT commends the Party for its detailed explanation and recommends that the Party include this information in the NIR to improve the transparency.

3. Non-key categories

Limestone and dolomite use – CO_2

50. Germany continues to report CO_2 emissions from limestone and dolomite use as "IE" and the emissions are included in the categories where limestone and dolomite are consumed (e.g. under iron and steel production or public electricity and heat production (flue gas desulphurization)). However, according to the Revised 1996 IPCC Guidelines,

emissions from limestone and dolomite use, except for cement production, lime production and agriculture, are to be reported in the category limestone and dolomite use. The ERT recommends that the Party reallocate CO_2 emissions from limestone and dolomite use following the Revised 1996 IPCC Guidelines.

D. Agriculture

1. Sector overview

51. In 2011, emissions from the agriculture sector amounted to 70,359.91 Gg CO_2 eq, or 7.7 per cent of total GHG emissions. Since 1990, emissions have decreased by 20.0 per cent. The key driver for the fall in emissions is a decrease in the total animal population, which has affected the level of emissions from enteric fermentation and manure management, as well as agricultural soils. Within the sector, 59.5 per cent of the emissions were from agricultural soils, followed by 29.4 per cent from enteric fermentation. The remaining 11.1 per cent were from manure management.

52. The NIR is generally transparent. It includes methodological descriptions, aggregated parameters and EFs. However, the ERT considered that the information provided on the parameters, EFs and assumptions for subcategories was not sufficiently detailed. In response to the questions raised by the ERT during the review on providing disaggregated parameters, EFs and calculation models, as well as the process of data aggregation and related background documents, Germany provided a report, "Calculations of gaseous and particulate emissions from German agriculture 1990 – 2011. Report on methods and data (RMD) Submission 2013". The report described in detail the inventory calculation for the agriculture sector, including the model descriptions and rationale for the selection of parameters for each subcategory. The ERT noted that in 2012, Germany included as part of its annual submission a separate report and Excel files describing the inventory calculations for the agriculture sector. The ERT recommends that the Party follow a similar approach in the next annual submission, or provide the parameters and EFs by subcategory, as well as information on the process to aggregate data, in its NIR to improve transparency.

53. The NIR stated that the Federal Statistical Office carries out surveys on cattle and swine twice a year (3 May and 3 November) and that the May data were used in the inventory. The data for sheep were collected in May up to 2010, but as of 2011, November reference data have been applied. However, there is no explanation or justification in the NIR regarding the change from May to November data. In response to a question raised by the ERT during the review, the Party explained that November reference data were used to be consistent with the EU statistics on German animal populations (Eurostat). Based on EU regulation 1165/2008, Article 4, the reference date was fixed to 3 November and, therefore, the November data correspond to the officially accepted annual animal number statistics. The ERT recommends that the Party ensure time-series consistency and report on this in a transparent manner in the NIR.

2. Key categories

Enteric fermentation – CH_4

54. Germany recalculated the gross energy intake values because of updated animal performance data, allocation of cows for fattening and slaughter to the suckler cows category instead of the heifers category, and due to a new national calculation method applied in the dairy cow model. The ERT noted that the table on gross energy intake was not updated in the NIR. In response to a request by the ERT during the review to provide detailed information on the parameters used in the calculations, Germany provided an updated table on gross energy intake. The ERT welcomes the improvements in the estimation of the emissions from enteric fermentation and recommends that the Party include the updated table on gross energy intake in the NIR.

Manure management – CH_4

55. In response to the recommendation made in the previous review report to provide detailed information on the amount of treated manure used for biogas production, Germany included anaerobic digestion of cattle and swine manure in the calculation model GAS-EM. In the NIR, a table of the percentage of slurry digested in biogas plants is provided. The ERT welcomes this improvement in transparency. However, there was no information in the NIR on how the data on the amount of slurry digested in biogas plants were collected. The ERT also noted that the estimated leakage rate of the digesters (1 per cent) is low. In response to a question raised by the ERT during the review, Germany provided a background document regarding data used to estimate emissions from biogas plants (KTBL, 2012a), explained the data sources used to estimate the percentage of slurry digested in biogas plants, and clarified that the choice of a 1 per cent leakage rate is based on measurement results described in literature. The ERT recommends that Germany provide in the NIR a description of the data from which the percentage of slurry manure digested in biogas plants is derived, as well as a description of how the leakage rate is determined.

Manure management – N_2O

56. In the previous review report, it was recommended that the Party either provide well-documented information on the herd size and housing systems of cattle and swine and detailed descriptions of manure management systems to justify the low EF value (0.005 kg N_2O–N/kg N) for solid manure; or recalculate the emissions by using the default N_2O EF from the Revised 1996 IPCC Guidelines. In response to that recommendation, a new national EF of 0.013 kg N_2O–N/kg nitrogen (N) for solid manure was applied in the 2013 annual submission. The NIR provided information in an annex on the distribution of housing systems, storage systems and application techniques, as well as on the N excretion rates, which were updated for all animal types in the 2013 annual submission based on improved animal performance. However, the ERT considered that the information in the NIR was not sufficiently transparent to justify the updated EF. In response to a question raised by the ERT during the review, the Party provided a background report, "N_2O emissions from solid manure storage. Calculation of a national emission factor", to justify the new EF. In order to improve transparency, the ERT recommends that Germany summarize in the NIR the information provided in the above-mentioned report.

Direct soil emissions – N_2O

57. The ERT noted that Germany has used the amount of mineral fertilizer sold instead of the applied amount as AD to estimate N_2O emissions from N fertilization. In response to a question raised by the ERT during the review, Germany explained that no data are available on the application of mineral fertilizer in Germany. However, data are available on the amount of fertilizer sold (annually on federal-state level from July of year n to June

of year n+1). For the emission calculations it is assumed that the total amount of fertilizer sold in that period is applied in the year n+1 as there is no information on storage of mineral fertilizers. This assumption is in line with German farming practice, where most of the mineral fertilizer is applied in spring and early summer. The ERT considers that the approach of Germany is in line with good practice. The ERT recommends that Germany improve transparency by including the explanation on fertilizer data used in the NIR.

E. Land use, land-use change and forestry

1. Sector overview

58. In 2011, net emissions from the LULUCF sector amounted to 9,334.60 Gg CO_2 eq. In 1990, with net removals of 35,758.00 Gg CO_2 eq, the sector was a net sink changing in 2002 to a net source. Since 1990, net emissions have increased by 126.1 per cent. The key drivers for the fall in removals are the increase of harvest and the changes in age structures of forests for the category forest land remaining forest land. Within the sector in 2011, forest land accounted for net removals of 32,721.48 Gg CO_2 eq. Net emissions from cropland were 28,839.22 Gg CO_2 eq, followed by 8,768.43 Gg CO_2 eq from grassland, 2,256.02 Gg CO_2 eq from settlements and 2,128.10 Gg CO_2 eq from wetlands. The remaining emissions of 64.32 Gg CO_2 eq were from other (LULUCF). There were no emissions or removals reported for the category other land (reported as "NO").

59. The ERT acknowledges the improvements in the NIR, in particular the inclusion of information on annual areas subject to land-use changes among different categories for the periods 1990–2000, 2000–2005, 2005–2008 and 2008–2011. The ERT considers that inclusion of this information in the NIR improves the transparency regarding the reallocation of areas among different land-use change categories following the adoption of the new land-use change matrix based on a 20-year transition period. However, the ERT recommends that the Party include information in the NIR on how these changes in areas affect the IEFs for different land-use categories.

60. As noted in the previous review report, the notation key "NO" is used for reporting many carbon pools and categories. For example, in the 2013 annual submission, "NO" is reported for dead organic matter for: wetlands; settlements remaining settlements; and cropland, grassland, wetlands and other land converted to settlements. The ERT noted that the IPCC good practice guidance for LULUCF does not include methods for these pools. In response to a question raised by the ERT during the previous review, the Party explained that the notation key "NE" has not been used because dead organic matter only occurs on forest land and not in the other land-use categories. The Party further explained that the biomass estimates for woody grassland and wood in wetlands and settlements include the whole plant, including leaves and roots, so that an extra dead organic matter pool could lead to double counting. The previous ERT noted that the estimation methodology provided in the IPCC good practice guidance for LULUCF involves estimating the changes in different carbon pools as a result of land-use management and conversion and not the absolute level of carbon stocks. The previous ERT further noted that, in the case of woody grasslands and wood in wetlands and settlements, if the dead organic matter pool is included in the living biomass pool, the changes in those pools could alternatively be reported as "IE" instead of "NO". The present ERT also noted that "NO" is reported for emissions from biomass burning for all categories except forest land and settlements. The ERT recommends that Germany examine all cases where "NO" is reported in the LULUCF sector, and provide a transparent explanation justifying the selection of the notation key. The ERT also reiterates the recommendation made in the previous review report that the Party use other notation keys, if appropriate.

61. Germany has used the results from various forest inventories and soil surveys conducted in different years to estimate the carbon stock changes in different pools in many land-use categories. For example, forest biomass data have been derived using the national forest inventories conducted in 1987 (BWI I) and in 2002 (BWI II), and the 2008 Inventory Study, in which the national forest inventory methods were applied to a sub-sample area of the forest inventory. For litter and mineral soils, the national forest soil inventories (BZE I and BZE II/BioSoil) of 1990 and 2006 were used. The data for the other years in the time series have been derived using interpolation and extrapolation. The ERT noted that these forest inventories were conducted with different coverage. For example, for BWI I the tree biomass was measured only for the West German Länder (pre-unification), while for BWI II all the German Länder (post-unification) were considered. The change in management practices in forests and in land-use conversion areas has resulted in sharp step changes in the IEFs for changes in carbon stocks in some years for several land-use categories, such as forest land, cropland, grassland and settlements. For example, for forest land remaining forest land the net carbon stock change in living biomass varies between 1.68 and 1.69 Mg C/ha from 1990 to 2001. There is then a step change of –74.5 per cent between 2001 and 2002, and in the period 2002 to 2011 the IEF is about 0.43 Mg C/ha. The NIR provides some explanations for this issue for all land-use categories and land-use conversions.

62. In response to questions raised by the ERT during the review, the Party explained that new data from BWI III (2012) will provide updated values for biomass increment in land converted to forest land for the period 2002–2012, and that the data will be used in the 2015 annual submission. The Party also explained that in future inventories the values for 2008 onwards for dead wood in forest land remaining forest land will be recalculated, allowing a comparable calculation using the Inventory Study (2008) and BWI III (2012). The ERT welcomes the planned improvements and reiterates the recommendation made in the previous review report that, in order to ensure time-series consistency, Germany evaluate the inventory methodologies with regard to the use of data from a variety of sources that differ in their coverage and methods, and transparently document how the time-series consistency issues have been addressed.

63. Germany has provided information on QA/QC in the NIR. The NIR refers to tier 1 and tier 2 QA/QC procedures being implemented for the LULUCF sector in accordance with the provisions of the QSE manual and associated documents. However, aside from the comparison of the Party's IEFs with those of other European countries, the NIR lacks transparent information on category-specific QC checks for different land-use categories. The ERT reiterates the recommendation made in the previous report that Germany provide more detailed, transparent information on the category-specific QC checks performed for all categories in the LULUCF sector.

2. Key categories

Land converted to forest land – CO_2

64. Carbon stock changes in the litter pool for land converted to forest land were estimated on the basis of measured data from BZE I, BZE II and the BioSoil inventory. According to the information available from these inventories, two mean carbon stocks in litter were used, one referenced to 1990 (BZE I) and a second referenced to 2006 (BZE II/BioSoil). For the period 1991 to 2005, the mean carbon stocks in litter were obtained via interpolation; for the period as of 2007 they were obtained via extrapolation and used as a basis for calculating afforestation areas. According to the NIR, the annual carbon stock increase in litter was obtained by dividing the mean carbon stocks for the year in question by the number of years required for those mean carbon stocks to form. Germany assumed that it takes 40 years for average carbon stocks to form in litter. This methodology is different from the default methodology for the estimation of annual change in carbon stocks

in litter provided in the IPCC good practice guidance for LULUCF. The NIR contains no explanation for the assumption regarding the time required for carbon stocks to form in litter and there is insufficient description of the methodology used for the estimation of carbon stock change in litter and its consistency with the methodology provided in the IPCC good practice guidance for LULUCF. In response to a question raised by the ERT during the review, Germany explained that the 40-year value used was obtained as an average, taking into consideration the IPCC good practice guidance for LULUCF values for the different species composition in German forests. The ERT recommends that the Party include the information on the average time used in the NIR and reiterates the recommendation made in the previous review report that Germany transparently describe the methodology, clearly demonstrating its consistency with the methodology provided in the IPCC good practice guidance for LULUCF to improve transparency.

Wetlands – CO_2

65. Carbon stock changes in wetlands are reported using two subcategories: terrestrial wetlands and water bodies. In response to a question raised by the ERT during the review, Germany explained that the subcategory terrestrial wetlands consists of wetlands on undrained mineral soils and on organic soils. The organic soils are also divided between undrained and drained areas. The drained area is used for peat extraction, which is reported in the country-specific category terrestrial wetlands remaining terrestrial wetlands. In response to the recommendation made in the previous review report, Germany included in the NIR information on the methodology followed and EFs used, particularly for organic soils in peat extraction areas. The ERT welcomes this improvement and reiterates the recommendation made in the previous review report that Germany report the emissions and removals from wetlands according to the wetlands subcategories defined in the IPCC good practice guidance for LULUCF.

F. Waste

1. Sector overview

66. In 2011, emissions from the waste sector amounted to 14,380.88 Gg CO_2 eq, or 1.6 per cent of total GHG emissions. Since 1990, emissions have decreased by 66.7 per cent. The key drivers for the fall in emissions are the ban on disposing biodegradable waste to landfill and the increasing recycling of organic materials. Within the sector, 76.8 per cent of the emissions were from solid waste disposal on land, followed by 17.2 per cent from wastewater handling and 6.0 per cent from other (waste). Emissions from waste incineration are reported under the energy sector since all incineration facilities in Germany produce electricity and/or heat.

2. Key categories

Solid waste disposal on land – CH_4

67. According to the NIR, there are no official statistics on biodegradable waste fractions for 2011 and therefore the Party has assumed that the waste quantities remained unchanged with respect to 2010. However, the ERT noted that in the NIR (table 292), different values for landfilled garden and park waste were reported for 2010 (1 kt) and 2011 (0 kt). In response to a question raised by the ERT during the review, the Party explained that there was a transcription error from the calculation file to the NIR. The ERT recommends that Germany correct the value and strengthen its QC activities to avoid such errors.

68. The ERT noted that the explanations in the NIR on mechanical-biological waste treatment (MBT) are very limited and ambiguous. The ERT reiterates the recommendation

made in the previous review report that Germany provide further information in the NIR on the range of techniques employed in MBT processes (how MBT works and inputs and outputs of waste) and on the correlation of MBT processes with emissions from different subcategories of the waste sector in order to improve the transparency of its reporting.

Wastewater handling – CH_4 and N_2O

69. The Party used the IPCC default methane conversion factor (MCF) for septic systems (0.5) and explained in the NIR that studies are going on to determine a country-specific value. In response to a question raised by the ERT during the review, the Party explained that for the next annual submission, it has adjusted its MCF to 0.173 in order to reflect country-specific conditions. The ERT commends the Party for the development of a country-specific MCF and recommends that Germany use the adjusted MCF.

70. The Party included in the 2013 annual submission estimates of N_2O emissions from industrial wastewater for the first time. The emissions have been estimated based on annual N loads (2.0 to 2.5 per cent of the chemical oxygen demand (COD) concentration) for the four industries that account for 68 per cent of N load from industrial wastewater. The ERT commends Germany for its effort to estimate N_2O emissions from industrial wastewater and encourages the Party to determine the COD values for the other industry-specific wastewater streams.

71. According to the NIR, one of the ways to manage sewage sludge from biological wastewater treatment is recycling for substance recovery, and these emissions are reported in the agriculture sector in line with the IPCC good practice guidance. The ERT reiterates the encouragement made to the Party in the previous review report to include in the NIR more information on the use of sewage sludge from biological wastewater treatment in order to improve the transparency of its reporting.

3. Non-key categories

Waste incineration – CO_2, CH_4 and N_2O

72. The Party used the notation key "NO" in CRF table 6.C to report AD and emissions from waste incineration. According to the NIR, all waste incineration facilities in Germany produce electricity and/or heat and, therefore, emissions were reported in the energy sector under public electricity and heat production. The ERT recommends that Germany improve transparency by providing, in the NIR chapter on waste incineration, a reference to the relevant NIR chapter in the energy sector, in which more information on incineration plants in the country is provided.

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

73. Table 6 provides an overview of the information reported and parameters selected by the Party under Article 3, paragraphs 3 and 4, of the Kyoto Protocol.

Table 6
Supplementary information reported under Article 3, paragraphs 3 and 4, of the Kyoto Protocol

		Specific findings and/or recommendations (include any paragraph cross-references)?
Has the Party reported information in accordance with the requirements in paragraphs 5–9 of the annex to decision 15/CMP.1?	Sufficient	
Identify any elected activities under Article 3, paragraph 4	Activities elected: forest management Years reported: 2008, 2009, 2010, 2011	
Identify the period of accounting	Commitment period accounting	
Assessment of the Party's ability to identify areas of land and areas of land-use change	Sufficient	

74. Germany used the same data, EFs and methods for the reporting of activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol as were used for reporting of the LULUCF sector (see paras. 58–65 above).

75. In response to a recommendation made in the previous review report, Germany provided additional transparent information in the NIR: (a) on the spatial unit used to identify units of land subject to activities under Article 3, paragraph 3, of the Kyoto Protocol in chapter 7.1.3 of the NIR; and (b) a separate uncertainty analysis for the KP-LULUCF categories. The ERT commends the Party for these improvements.

76. Notation keys in the KP-LULUCF CRF tables were used inconsistently between different tables. In CRF table NIR-1, the notation key "R" (reported) is used for CO_2 emissions from liming in afforestation and reforestation land in 2011. In CRF table 5(KP-II)4 the notation keys used are "IE", "NO". In CRF table NIR-1, notation key "R" is used for reporting CO_2, CH_4 and N_2O emissions from biomass burning in afforestation and reforestation land in 2011. In CRF table 5(KP-II)5 the notation keys used are "NO", "IE". The ERT recommends that Germany use the correct notation keys in CRF table NIR-1.

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

Afforestation and reforestation – CO_2

77. Germany has reported the carbon stock changes in below-ground and above-ground biomass, litter, dead wood and soil pools using country-specific parameters in line with the IPCC good practice guidance for LULUCF, with detailed explanations. Germany recalculated the estimates for biomass, litter and mineral soil pools using, for example, updated data from the second soil survey (BZE II). The ERT commends Germany for these improvements.

Deforestation – CO_2

78. In response to a recommendation made in the previous review report, Germany provided complete and transparent information about: (a) the system of tracking land-use change that allows better tracking of the timing of deforestation; (b) the new land-use matrix that caused revisions to the land-use categories following land-use conversion from

forest land; and (c) the methodology for estimating carbon stock changes in mineral soils. The ERT welcomes these improvements.

Activities under Article 3, paragraph 4, of the Kyoto Protocol

Forest management – CO_2

79. Germany has reported carbon stock changes in the above-ground and below-ground biomass, litter, dead wood and mineral and organic soils. In response to a recommendation made in the previous review report about using the results of the second soil survey (BZE II), Germany has reported carbon stock changes in mineral soils for the first time, with detailed information and references to country-specific studies. The ERT commends the Party for these improvements.

2. Information on Kyoto Protocol units

Standard electronic format and reports from the national registry

80. 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 standard independent assessment report (SIAR) on the SEF tables and the SEF comparison report.[3] 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.

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

Calculation of the commitment period reserve

82. Germany has reported its commitment period reserve in its 2013 annual submission. The Party reported that its commitment period reserve has not changed since the initial report review (4,381,287,024 t CO_2 eq) as it is based on the assigned amount and not the most recently reviewed inventory. The ERT agrees with this figure.

3. Changes to the national system

83. Germany reported that there are changes in its national system since the previous annual submission. The Party described the change in its NIR, including further implementation and consolidation of the institutional improvements made in the LULUCF sector as a result of the remarks in the 2010 in-country review and, in the industrial processes sector, signing of a cooperation agreement with ZVEI in September 2012 to ensure long-term provision of data for the estimation of emissions from fluorinated gases, related to the activities of electrical and electronic manufacturers. The ERT concluded that

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

the Party's national system continues to be in accordance with the requirements of national systems outlined in decision 19/CMP.1.

4. Changes to the national registry

84. Germany reported that there are changes in its national registry since the previous annual submission. The Party described the changes, specifically due to the centralization of the EU ETS operations into a single EU registry operated by the European Commission called the Consolidated System of European Union Registries (CSEUR), in its NIR (see page 691). CSEUR is a consolidated platform which implements the national registries in a consolidated manner and was developed together with the new EU registry.

85. The ERT noted that there were recommendations in the SIAR related to CSEUR that had not been addressed, in particular recommendations related to public availability of information on the website, reporting a description of the changes in database structure and reporting of test results. In response to questions raised by the ERT during the review, Germany provided further information on the changes to the national registry, including on public availability of information on the website, reporting a description of the changes in database structure and reporting of test results.

86. The ERT concluded that, taking into account the confirmed changes in the national registry, including additional information provided to the ERT during the review, Germany's national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1 and continues to adhere to the technical standards for data exchange between registry systems in accordance with relevant decisions of the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol. With respect to the provision of information related to database structure specifically, the ERT encourages the Party to provide additional information in the NIR. The ERT recommends that Germany include all other additional information in response to the SIAR findings in its NIR in accordance with decision 15/CMP.1, annex, chapter I.G.

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

87. Germany did not provide information on changes in its reporting of the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol in its annual submission. In response to a question raised by the ERT during the review, the Party confirmed that there are no changes between the activities reported in the 2012 and 2013 annual submissions (except a minor editorial change). The ERT concluded that the information in the annual submission was not complete, but taking into account the clarification from the Party, the information provided is complete and transparent. The ERT recommends that the Party report any changes in the information provided under Article 3, paragraph 14, in accordance with decision 15/CMP.1, annex, chapter I.H.

88. The Party listed in the NIR a series of national measures, including the promotion of renewable energy, promotion of biofuels, promotion of a combined heat and power system and promotion of energy efficiency, and an analysis of their possible impacts on developing countries. The Party also reported on support for developing countries in energy sector diversification, including cooperation in the area of renewable energies, for example, in the Mediterranean region and with the countries of the Gulf Cooperation Council (GCC), inter alia via the EU-GCC Energy Experts Group; cooperation in research and development; the Mediterranean Solar Plan; the Regional Center for Renewable Energy and Energy Efficiency; and the contributions of the EU to the Maghreb Electricity Market Integration Project. In addition, Germany is involved in financing the Global Energy Efficiency and

Renewable Energy Fund, a regional programme for investments in developing countries in the areas of renewable energies and energy efficiency.

III. Conclusions and recommendations

A. Conclusions

89. Table 7 summarizes the ERT's conclusions on the 2013 annual submission of Germany, in accordance with the Article 8 review guidelines.

Table 7
Expert review team's conclusions on the 2013 annual submission of Germany

		Cross-references, if applicable
The ERT concludes that the inventory submission of Germany is complete (categories, gases, years and geographical boundaries and contains both an NIR and CRF tables for 1990–2011)		
Annex A sources[a]	Complete	
LULUCF[a]	Complete	
KP-LULUCF	Complete	
The ERT concludes that the inventory submission of Germany has been prepared and reported in accordance with the UNFCCC reporting guidelines	Yes	
The submission of information required under Article 7, paragraph 1, of the Kyoto Protocol has been prepared and reported in accordance with decision 15/CMP.1	Yes	
The Party's inventory is in accordance with the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*, the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* and the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry*	Yes	50, 64, 65
Germany has reported information on activities under Article 3, paragraphs 3 and 4	Yes	
The Party has reported information on its accounting of Kyoto Protocol units in accordance with decision 15/CMP.1, annex, chapter I.E, and used the required reporting format tables as specified by decision 14/CMP.1	Yes	
The national system continues to perform its required functions as set out in the annex to decision 19/CMP.1	Yes	
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	Yes	
Did the Party provide information in the NIR on changes in its reporting of the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol?	No	87

Abbreviations: Annex A sources = sources included in Annex A to the Kyoto Protocol, CMP = Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol, CRF = common reporting format, ERT = expert review team, IPCC = Intergovernmental Panel on Climate Change, KP-LULUCF = LULUCF emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, LULUCF = land use, land-use change and forestry, NIR = national inventory report, UNFCCC reporting guidelines = "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories".

[a] The assessment of completeness by the ERT considers only the completeness of reporting of mandatory categories (i.e. categories for which methods and default emission factors are provided in the IPCC *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*, the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*, or the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry*).

B. Recommendations

90. The ERT identified the issues for improvement listed in table 8. All recommendations are for the next annual submission, unless otherwise specified.

Table 8
Recommendations identified by the expert review team

Sector	*Category*	*Recommendation*	*Paragraph reference*
Cross-cutting	General	Enhance the effective implementation of the tier 1 QC checks for transcription errors	table 3
		Improve transparency of the inventory by ensuring that the notation keys are used correctly and that the information is consistent between the NIR and the CRF tables for all sectors	table 3
		Fully implement the recommendations made in the previous review reports	16
Energy	General	Include sufficient explanatory information justifying recalculations in the NIR	21
		Report on any progress achieved in further development regarding the national energy balance	22
		Continue to assess the possibility of preparing emissions data for manufacturing industries and construction at the level of disaggregation in the CRF tables, and report on progress	24
		Include brief information on quantitative uncertainties in the category-specific sections of the NIR	25
	Comparison of the reference approach with the sectoral approach and international statistics	Include a detailed analysis of emission differences at the primary solid, liquid and gaseous fuel levels	27
		Compare the inventory data with the corresponding IEA data at the primary fuel type level and explain the	28

Sector	*Category*	*Recommendation*	*Paragraph reference*
		differences	
	Feedstocks and non-energy use of fuels	Provide justifications for the carbon storage fractions and for any recalculations performed	30
		Include additional information for feedstocks and non-energy use of fuels in CRF table 1.A(d)	31
	Stationary combustion: solid fuels – CO_2	Provide a brief explanation for the decrease of the CO_2 IEF for solid fuels used in petroleum refining	32
	Oil and natural gas: gaseous fuels – CH_4	Provide an explanation of the fluctuations of the CH_4 emissions from natural gas production/processing	33
	Stationary combustion: solid fuels – CH_4	Provide a brief explanation for the development of the CH_4 IEF for solid fuels in the subcategory commercial/institutional	35
	Stationary combustion: gaseous fuels – CH_4	Provide a brief explanation for the inter-annual changes in the CH_4 IEF for iron and steel	36
	Road transportation: liquid fuels – N_2O	Provide a brief explanation for the development of the N_2O IEF for diesel oil in road transportation	37
Industrial processes and solvent and other product use	General	Improve the consistency of the information on recalculations in CRF table 8(b) with that presented in the NIR	41
	Lime production – CO_2	Analyse the differences between CO_2 emissions reported in the NIR and those from the EU ETS, and provide EU ETS methodology and the EFs used to calculate CO_2 emissions from lime production to improve transparency	43
	Ammonia production – CO_2	Use the notation key “IE” instead of “NO” for the recovered CO_2	45
		Include in the NIR information on how the carbon content of heavy fuel oil is determined, to improve transparency	45
	Adipic acid production – N_2O	Improve the description of the methodological issues for the calculation of N_2O emissions (e.g. precisely for which years the IPCC default EF is used, and the methods used to calculate N_2O emissions at each plant)	46
	Other (chemical industry) – CO_2	Include a more detailed description of the methodology used to estimate emissions from coke burn-off in catalyst regeneration, including explanations of whether	47

Sector	*Category*	*Recommendation*	*Paragraph reference*
		the emissions are the result of fuel use for the production of energy	
	Production of HCFC-22 – HFC-23	Correct the use of notation keys	48
	Consumption of halocarbons and SF_6 – HFCs	Improve transparency of the NIR by including information on the new model for calculating HFC emissions from commercial refrigeration, industrial refrigeration, stationary air-conditioning systems and mobile air-conditioning systems	49
	Limestone and dolomite use – CO_2	Reallocate CO_2 emissions from limestone and dolomite use following the Revised 1996 IPCC Guidelines	50
Agriculture	General	Include as part of the annual submission a separate report and Excel files describing the inventory calculations for the agriculture sector (as was done in the 2012 annual submission), or provide the parameters and EFs by subcategory, as well as information on the process to aggregate data, to improve transparency	52
		Ensure time-series consistency of sheep population data and report on this in a transparent manner	53
	Enteric fermentation – CH_4	Include the updated table on gross energy intake in the NIR	54
	Manure management – CH_4	Provide a description of the data from which the percentage of slurry manure digested in biogas plants is derived, as well as a description of how the leakage rate is determined	55
	Manure management – N_2O	Summarize in the NIR the information provided in the report on the development of an N_2O EF for solid manure	56
	Direct soil emissions – N_2O	Improve transparency by including the explanation on fertilizer data used in the NIR	57
LULUCF	General	Include information on how the changes in areas affect the IEFs for different land-use categories	59
		Examine all cases where “NO” is reported in the LULUCF sector, and provide a transparent explanation justifying the selection of the notation key and use other notation keys, if appropriate	60
		In order to ensure time-series consistency, evaluate the inventory methodologies with regard to the use of data from a variety of sources that differ in their coverage and methods, and transparently document how the time-series consistency issues have been addressed	62
		Provide more detailed, transparent information on the	63

Sector	*Category*	*Recommendation*	*Paragraph reference*
		category-specific QC checks performed for all categories in the LULUCF sector	
	Land converted to forest land – CO_2	Include the information on the time assumed for average carbon stocks to form in litter	64
		Transparently describe the methodology used to estimate carbon stock change in litter, clearly demonstrating its consistency with the methodology provided in the IPCC good practice guidance for LULUCF	64
	Wetlands – CO_2	Report the emissions and removals from wetlands according to the wetlands subcategories defined in the IPCC good practice guidance for LULUCF	65
Waste	Solid waste disposal on land – CH_4	Correct the value for landfilled garden and park waste for 2011 in the NIR and strengthen the QC activities to avoid such errors	67
		Provide further information on the range of techniques employed in MBT processes (how MBT works and inputs and outputs of waste) and on the correlation of MBT processes with emissions from different subcategories of the waste sector, in order to improve the transparency of the reporting	68
	Wastewater handling – CH_4 and N_2O	Use the country-specific methane conversion factor	69
	Waste incineration – CO_2, CH_4 and N_2O	Provide, in the NIR chapter on waste incineration, a reference to the relevant NIR chapter in the energy sector, in which more information on waste incineration plants in the country is provided	72
KP-LULUCF	General	Use correct notation keys in CRF table NIR-1	76
National registry		Include additional information on public availability of information on the website and reporting of test results in the NIR	86
Article 3, paragraph 14		Report any changes in the information provided under Article 3, paragraph 14, in accordance with decision 15/CMP.1, annex, chapter I.H	87

Abbreviations: CRF = common reporting format, EF = emission factor, EU ETS = European Union emissions trading scheme, IE = included elsewhere, IEA = International Energy Agency, IEF = implied emission factor, IPCC = Intergovernmental Panel on Climate Change, IPCC good practice guidance for LULUCF = *IPCC Good Practice Guidance for 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, LULUCF = land use, land-use change and forestry, MBT = mechanical-biological waste treatment, NIR = national inventory report, NO = not occurring, QC = quality control, Revised 1996 IPCC Guidelines = *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*.

IV. Questions of implementation

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

Annex I

Background data on recalculations and information to be included in the compilation and accounting database

Table 9
Recalculations in the 2013 annual submission for the base year and the most recent year

	1990	*2010*	*1990*	*2010*	
Greenhouse gas source and sink categories	*Value of recalculation (Gg CO_2 eq)*		*Per cent change*		*Reason for the recalculation*
1. Energy	435.94	6 865.89	0.0	0.9	Improved AD and EFs
A. Fuel combustion (sectoral approach)	–63.94	7 709.30	0.0	1.0	
1. Energy industries	–45.01	1 895.15	0.0	0.5	
2. Manufacturing industries and construction	–24.46	773.38	0.0	0.7	
3. Transport	5.53	225.13	0.0	0.1	
4. Other sectors		4 815.64		3.3	
5. Other		0.00		0.0	
B. Fugitive emissions from fuels	–372.00	–843.40	–1.2	–7.8	
1. Solid fuels	10.65	1.06	0.1	0.0	
2. Oil and natural gas	–382.66	–844.46	–3.7	–10.5	
2. Industrial processes	–308.82	–3 892.63	–0.3	–5.4	Improved AD and EFs
A. Mineral products	–308.82	–275.99	–1.3	–1.5	
B. Chemical industry					
C. Metal production		–903.94		–4.8	
D. Other production					
E. Production of halocarbons and SF_6		–55.56		–21.7	
F. Consumption of halocarbons and SF_6		–2 657.14		–18.4	
G. Other					
3. Solvent and other product use					
4. Agriculture	4 751.61	886.17	5.7	1.3	Improved AD and EFs
A. Enteric fermentation	2 889.82	725.53	10.8	3.6	
B. Manure management	1 721.51	166.72	19.4	2.1	
C. Rice cultivation					
D. Agricultural soils	140.27	-6.09	0.3	0.0	
E. Prescribed burning of savannas					
F. Field burning of agricultural residues					
G. Other					
5. Land use, land-use change and forestry	–8 058.76	–8 562.14	29.1	–49.5	Improved AD and EFs

Greenhouse gas source and sink categories	*1990*	*2010*	*1990*	*2010*	*Reason for the recalculation*
	Value of recalculation (Gg CO_2 eq)		*Per cent change*		
A. Forest land	–7 232.85	–8 065.54	9.9	32.3	
B. Cropland	–132.38	213.02	–0.5	0.7	
C. Grassland	–234.39	–267.27	–2.0	–3.0	
D. Wetlands	–15.24	–56.57	–0.7	–2.6	
E. Settlements	–443.89	–385.77	–16.1	–15.1	
F. Other land					
G. Other					
6. Waste	118.69	3 115.19	0.3	25.5	Improved AD, EFs, change in method
A. Solid waste disposal on land		3 045.00		34.0	
B. Wastewater handling	118.69	109.33	2.7	4.6	
C. Waste incineration					
D. Other					
		–39.13		–4.4	
7. Other					
Total CO_2 equivalent without LULUCF	**4 125.53**	**6 974.63**	**0.3**	**0.7**	
Total CO_2 equivalent with LULUCF	**–3 933.23**	**–1 587.50**	**–0.3**	**–0.2**	

Abbreviations: AD = activity data, EF = emission factor, LULUCF = land use, land-use change and forestry.

Table 10
Information to be included in the compilation and accounting database in t CO_2 eq for 2011, including the commitment period reserve

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Commitment period reserve	4 381 287 024			4 381 287 024
Annex A emissions for 2011				
CO_2	798 057 878			798 057 878
CH_4	48 844 089			48 844 089
N_2O	56 871 160			56 871 160
HFCs	9 176 671			9 176 671
PFCs	229 601			229 601
SF_6	3 315 679			3 315 679
Total Annex A sources	**916 495 078**			**916 495 078**
Activities under Article 3, paragraph 3, for 2011				
3.3 Afforestation and reforestation on non-harvested land for 2011	–5 772 264			–5 772 264
3.3 Afforestation and reforestation on harvested land for 2011	NO			NO
3.3 Deforestation for 2011	138 683			138 683
Activities under Article 3, paragraph 4, for 2011[c]				
3.4 Forest management for 2011	–27 681 889			–27 681 889
3.4 Cropland management for 2011				
3.4 Cropland management for the base year				
3.4 Grazing land management for 2011				
3.4 Grazing land management for the base year				
3.4 Revegetation for 2011				
3.4 Revegetation in the base year				

Abbreviation: NO = not occurring.
[a] "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).
[b] "Final" includes revised estimates, if any, and/or adjustments, if any.
[c] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

Table 11
Information to be included in the compilation and accounting database in t CO_2 eq for 2010

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Annex A emissions for 2010				
CO_2	826 063 137			826 063 137
CH_4	50 385 002			50 385 002
N_2O	54 627 871			54 627 871
HFCs	8 963 132			8 963 132
PFCs	285 262			285 262
SF_6	3 194 043			3 194 043
Total Annex A sources	**943 518 448**			**943 518 448**
Activities under Article 3, paragraph 3, for 2010				
3.3 Afforestation and reforestation on non-harvested land for 2010	–5 699 817			–5 699 817
3.3 Afforestation and reforestation on harvested land for 2010	NO			NO
3.3 Deforestation for 2010	111 611			111 611
Activities under Article 3, paragraph 4, for 2010[c]				
3.4 Forest management for 2010	–27 705 172			–27 705 172
3.4 Cropland management for 2010				
3.4 Cropland management for the base year				
3.4 Grazing land management for 2010				
3.4 Grazing land management for the base year				
3.4 Revegetation for 2010				
3.4 Revegetation in the base year				

Abbreviation: NO = no occurring.
[a] "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).
[b] "Final" includes revised estimates, if any, and/or adjustments, if any.
[c] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

Table 12
Information to be included in the compilation and accounting database in t CO_2 eq for 2009

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Annex A emissions for 2009				
CO_2	783 734 267			783 734 267
CH_4	51 505 223			51 505 223
N_2O	63 223 211			63 223 211
HFCs	9 442 688			9 442 688
PFCs	337 695			337 695
SF_6	3 065 048			3 065 048
Total Annex A sources	**911 308 132**			**911 308 132**
Activities under Article 3, paragraph 3, for 2009				
3.3 Afforestation and reforestation on non-harvested land for 2009	–5 624 621			–5 624 621
3.3 Afforestation and reforestation on harvested land for 2009	NO			NO
3.3 Deforestation for 2009	83 215			83 215
Activities under Article 3, paragraph 4, for 2009[c]				
3.4 Forest management for 2009	–27 699 925			–27 699 925
3.4 Cropland management for 2009				
3.4 Cropland management for the base year				
3.4 Grazing land management for 2009				
3.4 Grazing land management for the base year				
3.4 Revegetation for 2009				
3.4 Revegetation in the base year				

Abbreviation: NO = not occurring.
[a] "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).
[b] "Final" includes revised estimates, if any, and/or adjustments, if any.
[c] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

Table 13
Information to be included in the compilation and accounting database in t CO_2 eq for 2008

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Annex A emissions for 2008				
CO_2	845 761 296			845 761 296
CH_4	53 605 477			53 605 477
N_2O	63 195 892			63 195 892
HFCs	8 843 033			8 843 033
PFCs	472 435			472 435
SF_6	3 114 561			3 114 561
Total Annex A sources	**974 992 695**			**974 992 695**
Activities under Article 3, paragraph 3, for 2008				
3.3 Afforestation and reforestation on non-harvested land for 2008	–5 313 147			–5 313 147
3.3 Afforestation and reforestation on harvested land for 2008	NO			NO
3.3 Deforestation for 2008	333 028			333 028
Activities under Article 3, paragraph 4, for 2008[c]				
3.4 Forest management for 2008	–27 726 238			–27 726 238
3.4 Cropland management for 2008				
3.4 Cropland management for the base year				
3.4 Grazing land management for 2008				
3.4 Grazing land management for the base year				
3.4 Revegetation for 2008				
3.4 Revegetation in the base year				

Abbreviation: NO = not occurring.
[a] "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).
[b] "Final" includes revised estimates, if any, and/or adjustments, if any.
[c] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

Annex II

Documents and information used during the review

A. Reference documents

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

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

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

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

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

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

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

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

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

Status report for Germany 2013. Available at <http://unfccc.int/resource/docs/2013/asr/deu.pdf>.

Synthesis and assessment report on the greenhouse gas inventories submitted in 2013. Available at <http://unfccc.int/resource/webdocs/sai/2013.pdf>.

FCCC/ARR/2012/DEU. Report of the individual review of the annual submission of Germany submitted in 2012. Available at <http://unfccc.int/resource/docs/2013/arr/deu.pdf>.

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

B. Additional information provided by the Party

Responses to questions during the review were received from Mr. Michael Strogies (Federal Environment Agency (UBA)), including additional material on the methodology and assumptions used. The following documents[1] were also provided by Germany:

Association for Technology and Structures in Agriculture (KTBL). 2012a. *Dokumentation zur Datenaufbereitung der Aktivitätsdaten Biogas für den Nationalen Inventarbericht, Submission 2013 für 2011.*

Association for Technology and Structures in Agriculture (KTBL). 2012b. *N_2O Emissions from Solid Manure Storage. Calculation of a National Emission Factor*.

Rösemann, C., Haenel, H.-D., Dämmgen, U., Poddey, E., Freibauer, A., Wulf, S., Eurich-Menden, B, Döhler, H, Schreiner, C., Bauerm, B., Osterburg, B. 2013. *Calculations of Gaseous and Particulate Emissions from German Agriculture 1990 – 2011. Report on Methods and Data (RMD) Submission 2013*. Braunschweig: Thünen.

U. Dämmgen, B. Amon, N. J. Hutchings, H.-D. Haenel, C. Rösemann. 2012. *Data Sets to Assess Methane Emissions from Untreated Cattle and Pig Slurry and Solid Manure Storage Systems in the German and Austrian Emission Inventories*. Agriculture and Forestry Research 1/2 2012 (62)1-20.

U. Dämmgen, C. Rösemann, H.-D. Haenel, N. J. Hutchings. 2012. *Enteric Methane Emissions from German Dairy Cows.* Agriculture and Forestry Research 1/2 2012 (62)21-32.

[1] Reproduced as received from the Party.

Annex III

Acronyms and abbreviations

AD	activity data
CH_4	methane
CO_2	carbon dioxide
CO_2 eq	carbon dioxide equivalent
COD	chemical oxygen demand
CRF	common reporting format
EF	emission factor
ERT	expert review team
EU	European Union
EU ETS	European Union emissions trading scheme
GHG	greenhouse gas; unless indicated otherwise, GHG emissions are the sum of CO_2, CH_4, N_2O, HFCs, PFCs and SF_6 without GHG emissions and removals from LULUCF
HCFC-22	difluoromonochloromethane
HFCs	hydrofluorocarbons
IE	included elsewhere
IEA	International Energy Agency
IEF	implied emission factor
IPCC	Intergovernmental Panel on Climate Change
ITL	international transaction log
kg	kilogram (1 kg = 1,000 grams)
KP-LULUCF	land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol
kt	kilotonne
kW	kilowatt
LULUCF	land use, land-use change and forestry
m^2	square metre
MBT	mechanical-biological waste treatment
MCF	methane conversion factor
Mg	megagram (1 Mg = 1 tonne)
N	nitrogen
N_2O	nitrous oxide
NA	not applicable
NE	not estimated
NIR	national inventory report
NO	not occurring
PFCs	perfluorocarbons
PJ	petajoule (1 PJ = 10^{15} joule)
QA/QC	quality assurance/quality control
SEF	standard electronic format
SF_6	sulphur hexafluoride
SIAR	standard independent assessment report
TJ	terajoule (1 TJ = 10^{12} joule)
UNFCCC	United Nations Framework Convention on Climate Change