



**UNITED
NATIONS**



**Framework Convention
on Climate Change**

Distr.
GENERAL

FCCC/ARR/2009/DEU
13 April 2010

ENGLISH ONLY

**Report of the individual review of the annual submission of Germany
submitted in 2009***

* In the symbol for this document, 1990 refers to the year in which the inventory was submitted, and not to the year of publication.

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I. Overview

A. Introduction

1. This report covers the centralized review of the 2009 annual submission of Germany, coordinated by the UNFCCC secretariat, in accordance with decision 22/CMP.1. The review took place from 31 August to 5 September 2009 in Bonn, Germany, and was conducted by the following team of nominated experts from the UNFCCC roster of experts: generalists – Mr. Newton Paciornik (Brazil) and Mr. Tinus Pulles (Netherlands); energy – Ms. Erasmia Kitou (European Union), Mr. Hongwei Yang (China) and Mr. Gebru J. Endalew (Ethiopia); industrial processes – Mr. Menouer Boughedaoui (Algeria) and Mr. Jos Olivier (Netherlands); agriculture – Mr. Paul Duffy (Ireland) and Mr. Jacques Kouazounde (Benin); land use, land-use change and forestry (LULUCF) – Mr. Sandro Federici (Italy) and Mr. Motoshi Hiratsuka (Japan); and waste – Ms. Melissa Weitz (United States of America) and Ms. Kyoko Miwa (Japan). Mr. Duffy and Mr. Yang were the lead reviewers. The review was coordinated by Mr. Vitor Gois Ferreira (UNFCCC secretariat).

2. In accordance with the “Guidelines for review under Article 8 of the Kyoto Protocol” (decision 22/CMP.1), a draft version of this report was communicated to the Government of Germany, which provided comments that were considered and incorporated, as appropriate, into this final version of the report.

B. Emission profiles and trends

3. In 2007, the main greenhouse gas (GHG) in Germany was carbon dioxide (CO₂), accounting for 88.0 per cent of total GHG emissions¹ expressed in CO₂ eq, followed by nitrous oxide (N₂O) (5.8 per cent) and methane (CH₄) (4.5 per cent). Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF₆) collectively accounted for 1.8 per cent of the overall GHG emissions in the country. The energy sector accounted for 80.9 per cent of the total GHG emissions, followed by industrial processes (12.1 per cent), agriculture (5.4 per cent), waste (1.2 per cent), and solvent and other product use (0.3 per cent). Total GHG emissions amounted to 956,113.07 Gg CO₂ eq and decreased by 21.6 per cent between the base year² and 2007.

4. Tables 1 and 2 show total GHG emissions by gas and by sector, respectively. Table 1 includes emissions from sectors and/or source categories listed in Annex A to the Kyoto Protocol only and exclude 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 CO₂ eq excluding LULUCF, unless otherwise specified.

² “Base year” refers to the base year under the Kyoto Protocol, which is 1990 for CO₂, CH₄ and N₂O, and 1995 for HFCs, PFCs and SF₆. The base year emissions include emissions from sectors and/or source categories listed in Annex A to the Kyoto Protocol only.

Table 1. Total greenhouse gas emissions by gas, 1990–2007^a

Greenhouse gas	Gg CO ₂ eq							Change base year–2007 (%)
	Base year ^b	1990	1995	2000	2005	2006	2007	
CO ₂	1 035 580.31	1 035 580.31	922 660.23	883 683.39	851 707.74	867 021.16	841 152.19	–18.8
CH ₄	97 804.61	97 804.61	79 982.96	63 833.85	46 222.89	44 102.59	42 552.45	–56.5
N ₂ O	69 962.25	69 962.25	66 820.88	48 311.41	55 379.68	52 285.34	55 216.07	–21.1
HFCs	6 463.08	4 368.78	6 463.08	6 471.17	9 978.05	10 516.46	11 097.81	71.7
PFCs	2 707.58	2 707.58	1 749.60	781.39	706.50	569.35	528.03	–69.8
SF ₆	4 785.0	4 785.03	7 220.40	5 082.49	4 897.76	5 510.10	5 566.54	–22.9

^a Total greenhouse gas emissions include emissions from Annex A sources only (and excludes emissions/removals from the land use, land-use change and forestry sector).

^b “Base year” refers to the base year under the Kyoto Protocol, which is 1990 for CO₂, CH₄ and N₂O, and 1995 for HFCs, PFCs and SF₆. The base year emissions include emissions from Annex A sources only.

Table 2. Greenhouse gas emissions by sector, 1990–2007

Sector	Gg CO ₂ eq							Change base year–2007 (%)
	Base year ^a	1990	1995	2000	2005	2006	2007	
Energy	987 937.91	987 937.91	870 437.86	826 123.25	791 800.63	803 289.14	773 675.48	–21.7
Industrial processes	123 391.76	119 820.06	121 240.77	100 782.50	107 776.04	108 966.85	116 123.04	–5.9
Solvent and other product use	5 396.04	5 396.04	4 458.25	3 722.63	3 401.91	3 345.43	3 316.41	–38.5
Agriculture	61 631.04	61 631.04	54 432.92	55 468.77	52 800.97	52 097.47	51 479.46	–16.5
LULUCF	NA	–28 249.89	–30 855.73	–32 098.72	–21 849.48	–15 571.65	–16 127.66	NA
Waste	40 423.50	40 423.50	34 327.35	22 065.53	13 113.07	12 306.12	11 518.68	–71.5
Other	NA	NA	NA	NA	NA	NA	NA	NA
Total (with LULUCF)	NA	1 186 958.66	1 054 041.43	976 064.97	947 043.14	964 433.36	939 985.41	NA
Total (without LULUCF)	1 218 780.25	1 215 208.55	1 084 897.16	1 008 163.69	968 892.62	980 005.01	956 113.07	–21.6

Abbreviations: LULUCF = land use, land-use change and forestry, NA = not applicable.

^a “Base year” refers to the base year under the Kyoto Protocol, which is 1990 for CO₂, CH₄ and N₂O, and 1995 for HFCs, PFCs and SF₆. The base year emissions include emissions from Annex A sources only.

C. Annual submission and other sources of information

5. The 2009 annual inventory submission was submitted on 8 April 2009; it contains a complete set of common reporting format (CRF) tables for the period 1990–2007. The national inventory report (NIR) was submitted on 15 April 2009. Germany also submitted information required under Article 7, paragraph 1, of the Kyoto Protocol, including information on: accounting of Kyoto Protocol units and changes in the national system and in the national registry. The standard electronic format (SEF) tables were submitted on 8 April 2009. The annual submission was made in accordance with decision 15/CMP.1. The Party indicated that the 2009 submission is also its voluntary submission under the Kyoto Protocol.

6. Germany submitted a revised key category analysis on 22 September 2009 in response to questions raised by the expert review team (ERT) during the review.

7. In addition, the ERT used the Standard Independent Assessment Report (SIAR), Parts I and II, to review information on the accounting of Kyoto Protocol units (including the SEF tables and their comparison report) and on the national registry.³

8. Where necessary, the ERT also used the previous year's submissions during the review. During the review, Germany provided the ERT with additional information. The documents concerned are not part of the annual submission but are in many cases referenced in the NIR. The full list of materials used during the review is provided in the annex I to this report.

Completeness of the inventory

9. The inventory is complete in terms of years and geographic coverage, and covers almost all source and sink categories. The inventory still includes categories and subcategories that were reported as not estimated ("NE") and for which methodologies are available in the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Revised 1996 IPCC Guidelines), the Intergovernmental Panel on Climate Change (IPCC) *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC good practice guidance), and the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF). Germany provided explanations in the NIR for the remaining categories and subcategories reported as "NE", and provided further information to the ERT during the centralized review on ways to solve all identified problems for the next annual submission (see para. 10 below). The ERT commends the effort of the Party to improve the completeness of the inventory to the extent possible and encourages Germany to provide, in the next annual submission, estimates for all categories reported as "NE".

10. Accordingly, Germany stated that for the next submission it will include estimates of emissions and removals for the following categories and subcategories: CO₂ and CH₄ fugitive emissions from oil (CO₂ from production and CH₄ from exploration); CH₄ from flaring in oil, natural gas and combined oil and natural gas; CH₄ from enteric fermentation and from manure management from mules and asses, and N₂O from manure management from mules and asses; N₂O from nitrogen (N)-fixing crops (reported as not occurring ("NO")); changes in carbon stock in dead organic matter (DOM) and mineral and organic soils from forest land; and CH₄ and N₂O from biomass burning from wildfires (emissions from controlled burning will be reported as "NO"). Germany also indicated to the ERT that it intends to report in its next

³ The SIAR, Parts I and II, is prepared by an independent assessor in line with decision 16/CP.10 (paragraphs 5(a), 6(c) and 6(k)), under the auspices of the international transaction log administrator using procedures agreed in the Registry System Administrators Forum. Part I is a completeness check of the submitted information relating to the accounting of Kyoto Protocol units (including the SEF tables and their comparison report) and to national registries. Part II contains a substantive assessment of the submitted information and identifies any potential problem regarding information on the accounting of Kyoto Protocol units and the national registry. The SIAR is not publicly available.

submission the following categories as included elsewhere (“IE”) instead of “NE”: CO₂, CH₄ and N₂O emissions from gaseous fuels use in the subcategory food processing, beverages and tobacco (these emissions are included as a subcategory under other (manufacturing industries and construction); CO₂ from solid fuel transformation (these emissions are included under manufacture of solid fuels and other energy industries); CH₄ from other fugitive emissions from oil (these emissions are included under refining/storage); CO₂ and CH₄ fugitive emissions from venting (oil, gas and combined oil and natural gas; these emissions are included under fugitive emissions from oil production and natural gas production); N₂O emissions from aerosol cans (these emissions are included under other use of N₂O); and changes in carbon stock in DOM in cropland, grassland, wetlands, settlements and other land (these emissions/removals are included under carbon stock change in living biomass). The Party also indicated that it will report the following categories as “NO”: N₂O fugitive emissions from oil exploration; N₂O fugitive emissions from flaring in oil and natural gas; N₂O emissions from fire extinguishers; and N₂O emissions from drainage of soils and wetlands. Germany explained that it did not intend to report a sink of CH₄ from agricultural soils (other (agricultural soils)) and the estimate included in the CRF tables results from an error in the use of the CRF Reporter, which will be corrected for the next annual submission.

11. The ERT encourages the Party in its efforts to increase the completeness of the inventory. The ERT also encourages the Party to explore approaches available in scientific literature to estimate emissions for categories for which there are no methodologies prescribed in the Revised 1996 IPCC Guidelines or the IPCC good practice guidance, with a view to enhancing further, to the extent possible, the completeness and accuracy of its inventory.

D. Main findings

12. The inventory does not follow completely the Revised 1996 IPCC Guidelines, the IPCC good practice guidance and the IPCC good practice guidance for LULUCF. In fact, the ERT found that Germany decided to adopt methodologies and default EFs from the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the 2006 IPCC Guidelines) for the first time and extensively, in particular for the agriculture sector, without clearly stating that the use of these methodologies and EFs is in accordance with the IPCC good practice guidance and the “Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories” (hereinafter referred to as the UNFCCC reporting guidelines) and without showing that the accuracy of the inventory increased while comparability was maintained. In particular, the ERT noted that by adopting the 2006 IPCC Guidelines, the inventory now excludes emission estimates for the subcategory N₂O emissions from N-fixing crops in agricultural soils, which the ERT finds to be an underestimation of emissions and is not in accordance with the IPCC good practice guidance. The ERT strongly recommends that Germany revise the emission estimates in line with the IPCC good practice guidance and the UNFCCC reporting guidelines for all sectors, and in particular for the agriculture sector, for the next annual submission. Germany acknowledged this finding at the time of the review and stated that it would undertake measures to revise the emission estimates and increase the transparency of reporting accordingly in the next annual inventory submission.

13. Germany submitted, in part, on a voluntary basis supplementary information required under Article 7, paragraph 1, of the Kyoto Protocol in accordance with section I of the annex to decision 15/CMP.1. The Party did not submit on a voluntary basis information on activities under Article 3, paragraph 3, and elected activities under Article 3, paragraph 4, of the Kyoto Protocol, or information on the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol.

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

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

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

17. The ERT encourages Germany to explore the possibility of structuring its reporting, in its next annual submission, following the annotated outline of the NIR, and the guidance contained therein, which can be found on the UNFCCC website.⁴

18. In the course of the review, the ERT identified a number of additional areas where further improvements to the inventory are needed. These improvements include: improve the transparency of reporting in the NOR, in particular for the agriculture and LULUCF sector; include a key category analysis in accordance with the IPCC good practice guidance for LULUCF as provided to the ERT during the centralized review; ensure that methodologies and default EFs from the 2006 IPCC Guidelines are used in accordance with the IPCC good practice guidance; improve the timeliness of the availability of the energy balances; and improve the completeness of the inventory as planned.

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

1. Overview

19. The ERT concludes that the national system continued to perform its required functions.

20. The NIR describes the national system and institutional arrangements for the preparation of the inventory. The national system was established at the ministerial level, under the leadership of the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU). Other ministries that are also involved in the national system include the Federal Ministry of the Interior; the Federal Ministry of Defence; the Federal Ministry of Finance; the Federal Ministry of Economics and Technology; the Federal Ministry of Transport, Building and Urban Construction; and the Federal Ministry of Food, Agriculture and Consumer Protection (BMELV). The Federal Environment Agency (UBA) is the designated single national entity.

2. Inventory planning

21. The German NIR presents a detailed description of the allocation of specific responsibilities within the annual inventory cycle. Annex 7.1 to the NIR contains a copy of the agreement (referred to as the “National System principles paper on emissions reporting”) agreed on 5 June 2007 by the ministries with a role in the national system. This document established the roles attributed to the UBA, created a co-ordinating committee, and set the responsibilities for the institutions involved in data collection and their deliverance to the single national entity, quality control, documentation and data archiving. The same annex to the NIR details the status of development and implementation, during 2008, of the necessary additional agreements between the ministries and other data providers. Germany’s national system has been designed to function as a network of all the federal and Länder (state) institutions, research institutes, associations and organizations that are capable of assisting with the planning and improvement of the inventory calculations.

22. The UBA, the designated single national entity, is responsible for the planning, preparation and archiving of each sector of the inventory (excluding the agriculture and LULUCF sectors, which are under the responsibility of the BMELV), as well as carrying out quality assurance/quality control (QA/QC). The UBA is also responsible for setting annual objectives, including for the components of the inventory for which it has responsibility and for those under the direction of the BMELV. The UBA has developed several instruments to support its role as the single national entity: the quality system for emissions

⁴ <http://unfccc.int/files/national_reports/annex_i_ghg_inventories/reporting_requirements/application/pdf/annotated_nir_outline.pdf>.

inventories; the central system for emissions data (CSE), which is the national central database for emissions calculation and reporting; and the Working Group on emissions inventories, which makes the liaison between all of the experts of the UBA involved in the preparation of the inventory. Internal directive 11/2005 of the UBA establishes the detailed binding schedule of deadlines for the tasks necessary to complete the inventory.

23. The co-ordinating committee, representing all institutions involved and chaired by the BMU, was established to handle all questions arising in the national system and is responsible for official discussion and approval of the inventory and all reporting requirements related the Kyoto Protocol. The co-ordinating committee also identifies key categories and sets the minimum requirements for QA/QC.

24. During the annual cycle of the preparation of the inventory, the first formal approval of the CRF tables and the NIR, and of the inventory plan to be included in future submissions, is made within the internal co-ordination process of the UBA. As a second step, the materials are forwarded to the BMU, for the second approval phase within the framework of departmental co-ordination. Finally, the co-ordinating committee approves the CRF tables and the NIR for submission to the secretariat.

3. Inventory preparation

Key categories

25. Germany reported a key category tier 1 analysis, both level and trend assessment, as part of its 2009 submission. Germany included the LULUCF sector in its key category analysis, but the ERT considers that the analysis was not performed fully in accordance with the IPCC good practice guidance and the IPCC good practice guidance for LULUCF. The IPCC good practice guidance for LULUCF requires that the key category analysis be performed in two steps: first without the inclusion of the LULUCF categories and later with the inclusion of the LULUCF categories. The results of both analyses are taken into consideration for the identification of key categories. Germany did not elaborate a key category analysis without LULUCF. Instead, for the first step, the Party prepared a key category analysis that excluded the categories that are net removals (sinks) and included the LULUCF categories that are sources. For the second step, Germany included the LULUCF categories that are sinks.

26. During the review, the ERT recommended that Germany provide a revised key category analysis in line with the IPCC good practice guidance for LULUCF. In response to this request, Germany provided a revised key category analysis that the ERT found to be in line with the IPCC good practice guidance for LULUCF. The following changes in the list of key categories were identified by the Party: the inclusion of the category SF₆ from consumption of halocarbons and SF₆, and the exclusion of the category wetlands. The ERT recommends that Germany prepare a key category analysis in accordance with the IPCC good practice guidance for LULUCF in its next annual submission, that is, a key category analysis excluding LULUCF followed by an analysis including LULUCF for the base year and for 2008 for level and trend assessment.

27. Germany did not report a key category tier 2 analysis. According to information in the NIR, Germany performs a tier 2 analysis only every three years and it is planning to do so for its 2010 submission. The ERT considers that this approach is in accordance with the IPCC good practice guidance.

28. The key category analysis performed by Germany and that performed by the secretariat⁵ produced similar results. The few differences are explained by the different levels of disaggregation of the analysis conducted by the Party and the secretariat. The key category analysis is used by Germany to prioritize the

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

development and improvement of the inventory. Germany has not reported in annex I to the NIR detailed calculations for the key category analysis for the base year and the ERT encourages Germany to do so in its next annual submission.

Uncertainties

29. Germany provided a tier 1 level and trend uncertainty analysis. According to the NIR, the level of uncertainty of total emissions estimated for 2007 is ± 9.7 per cent and the uncertainty in trend is ± 13.0 per cent. Germany did not include a tier 2 uncertainty analysis in its 2009 submission, as it prepared an uncertainty analysis for the 2007 submission and it has decided to conduct the tier 2 analysis every three years. The ERT encourages the Party to explore, as planned by the Party, the use of a tier 2 analysis to address technical limitations in the tier 1 method in the next annual submission.

30. Germany indicated in its NIR (annex 7) that the uncertainty values have not been determined completely for all categories. In response to the draft review report the Party informed the ERT that for some categories expert judgments are not yet available, and literature values and IPCC defaults have been used to complete the data set used for the uncertainty analysis. The Party also informed the ERT that efforts are underway to collect that information from experts from departments within the Federal Environment Agency and from external institutions.

31. The ERT had difficulties assessing the uncertainty analysis for the 2009 submission, in particular it could not determine which categories were missing from the analysis, given that for some categories the NIR does not contain information about uncertainties and instead refers to the NIR of the 2007 submission (e.g. all categories reported under stationary combustion). The ERT also had difficulties finding the link between the uncertainty values presented in table 187 of the NIR (which corresponds to table 6.2 of the IPCC good practice guidance) and the uncertainty values reported in the NIR for individual categories (e.g. road transportation and railways). In response to a question raised by the ERT, Germany clarified that this is explained by the fact that the aggregation level of table 187 is different to the level of disaggregation at which categories are discussed in the NIR. The ERT recommends that Germany improve the reporting of information on the uncertainty analysis and ensure that a consistent level of disaggregation is used for reporting in table 187 and the sectoral chapters of the NIR, for its next annual inventory submission.

Recalculations and time-series consistency

32. Recalculations have been performed and reported for all years from 1990 to 2006 for all sectors and for all gases. In particular, Germany has extensively revised and recalculated the emission estimates for the agriculture and LULUCF sectors. When the 2008 and 2009 submissions are compared, the recalculated estimate of total GHG emissions in 1990 decreased by -1.0 per cent (12,479.60 Gg CO₂ eq) and decreased by -2.5 per cent (24,788.81 Gg CO₂ eq) in 2006.

33. The rationale for the recalculations is provided in chapter 10 of the NIR (recalculations and improvements) and in CRF table 8(b). However, the ERT finds that there is room for improvement: transparency could be improved (e.g. in the energy and industrial processes sectors) by providing explanations of the actions taken to ensure consistency throughout the time series when revised activity data (AD) are available for a limited number of years. In addition, the information provided in the recalculation tables in the NIR is not consistent (e.g. different total emissions are reported in tables 126, 127 and 128 of the NIR). In response to comments made by the ERT during the review, Germany stated that it is planning to improve on the explanations provided in the NIR in the next annual submission. The ERT recommends that Germany improve the reporting of recalculations in the next annual submission and ensure that information in the NIR and in the CRF tables is consistent. The information provided in the recalculation tables in the NIR is not consistent (e.g. different total emissions are reported in tables 126, 127 and 128 of the NIR). In response to the draft review report Germany informed the ERT that this issue will be resolved for the 2010 submission.

34. Recalculations have been undertaken to take into account the following: updated AD and revision of some EFs for the energy sector and the industrial processes sector; methodological changes for solvent and other product use (reporting for the first time of indirect CO₂ emissions from non-methane volatile organic compound (NMVOC) emissions from paint application, degreasing and dry cleaning and chemical products manufacturing and use); revision of methodologies, AD and carbon stock change factors; and inclusion of new categories (wetlands and settlements) in the LULUCF sector. However, the most substantial recalculations resulted from the thorough revision of the inventory for the agriculture sector.

35. In fact, for the first time Germany now adopts methodologies and default EFs from the 2006 IPCC Guidelines and excludes emission estimates for the category N₂O from N-fixing crops (reported instead as “NO”), as the 2006 IPCC Guidelines no longer considers this category. Germany also uses default EFs from the 2006 IPCC Guidelines and reports emission estimates in accordance with the 2006 IPCC Guidelines (see paras. 61 and 96) for some categories in the industrial processes sector (e.g. limestone and dolomite use) and the waste sector (e.g. CH₄ from solid wastes disposal on land). The ERT expressed its concern regarding the recalculations made to the agriculture sector resulting from the use of default EFs from the 2006 IPCC Guidelines and the exclusion of one category, and considers that these actions are not in accordance with the UNFCCC reporting guidelines and the IPCC good practice guidance.

36. At the end of the centralized review, the ERT informed the Party that the NIR and the responses by Germany during the review week were insufficient to provide a justification for using methodologies and default EFs from the 2006 IPCC Guidelines. Responding to the ERT, in accordance with paragraphs 73 and 74 of the annex to decision 22/CMP.1, Germany explained that in its next submission it would revert to the use of default EFs from the Revised 1996 IPCC Guidelines and the IPCC good practice guidance for subcategories of N₂O emissions from agricultural soils and it will report emissions of N₂O from N-fixing crops in its 2010 submission. The ERT considers this response insufficient and reminds Germany that it cannot use default EFs from the 2006 IPCC Guidelines to replace default EFs from the Revised 1996 IPCC Guidelines or the IPCC good practice guidance without a clear justification, framed on the use of the IPCC good practice guidance, showing that these EFs represent better the country-specific conditions, improve the accuracy of the estimates, and respecting the comparability principle defined in the UNFCCC reporting guidelines. The ERT noted that the UNFCCC reporting guidelines prescribe the use of default EFs from the Revised 1996 IPCC Guidelines and from the IPCC good practice guidance only. Therefore, during the centralized review the ERT reiterated its request that Germany improve the methodological description by category and gas for its agriculture inventory and provide an explanation on the appropriateness of the methodological choice, in particular when using specific methods, EFs and parameters from the 2006 IPCC Guidelines. In response to the draft review report Germany stated that it will carry out these recommendations in its next annual submission.

Verification and quality assurance/quality control approaches

37. Germany elaborated and implemented a well developed QA/QC plan in accordance with the IPCC good practice guidance and decision 19/CMP1. The requirements for QA/QC for the inventory are specified in the “Handbook for quality control and quality assurance in preparation of emissions inventories and reporting under the United Nations Framework Convention on Climate and European Union Decision 280/2004/EC” and in the “General minimum requirements pertaining to quality control and quality assurance in connection with greenhouse-gas-emissions reporting”, which is included in annex 17.2 to the NIR. According to the annual implementation plans, Germany implements general QC procedures (tier 1), as well as category-specific procedures (tier 2) for individual key categories for which significant methodological and/or data revisions have occurred. QA procedures rely on the checking of calculations by more than one expert, a detailed review of specific issues by external third parties via research projects and studies, and through workshops on the national system held at irregular intervals. As part of its role as the single national entity, the UBA is responsible for the QA/QC system for the national GHG inventory.

38. The NIR states that Germany used data from the European Union emissions trading scheme (EU ETS) for QA/QC purposes, by comparing estimates of CO₂ emissions from the EU ETS with the inventory estimates for 2006, and the NIR states that the results of this exercise confirmed the usefulness of that practice. Additionally, this work led to the establishment of a set of rules of procedure for future data exchange with the EU ETS system on a regular basis since the 2009 submission. The ERT commends the efforts made by Germany and encourages the Party to implement the use of EU ETS data as additional QC on a regular basis starting with the next annual submission. The ERT also encourages the Party report on the results of the comparison made in future annual submission.

39. Germany presents in its NIR a table comparing CO₂ emissions from energy combustion from the GHG inventory with emission estimates from the following independent sources: Ziesieng (2008); the International Energy Agency (IEA); and CO₂ estimates at state (Länder) level prepared by the Länder Working Group on Energy Balances. The Party concluded that the differences between the independent estimates and the inventory's time series are small and explainable. The ERT commends Germany for conducting this type of verification activity.

Transparency

40. The NIR is well structured and is generally transparent, presenting detailed information and explanatory material. However, the level of transparency varies across sectors and the ERT believes that it can be improved. In particular for the agriculture sector, the ERT recommends that Germany provide more explanations of the choice of methodologies, parameters and the choice of EFs and encourages Germany to include in the NIR some of the information that was presented to the ERT during the review week in the report "Calculations of Emissions from German Agriculture – NIR 2009 for 2007 Special issues 324 and 324A, 2009". The ERT also noticed that, in spite of the size of the NIR, in some cases Germany does not include all of the information in the NIR, but references to NIRs submitted in previous years (e.g. the uncertainty analysis for stationary combustion and the chapter on the development of a preliminary reference approach on the basis of the evaluation tables for the energy balance are referenced to the NIR of the 2007 submission). The ERT recommends that the Party include all relevant information in the NIR of its next annual submission.

4. Inventory management

41. Germany has a centralized archiving system, which includes the archiving of disaggregated EFs and AD, and documentation on how these factors and data have been generated and aggregated for the preparation of the inventory. The archived information also includes internal documentation on QA/QC procedures, external and internal reviews, and documentation on annual key categories and key category identification and planned inventory improvements. The archiving system also includes individual archives located in the institutions responsible for specific sectors (e.g. LULUCF), but these are also linked to the central archiving system. Germany developed a comprehensive database system, the CSE. The CSE is the national central database for emissions calculation and reporting and it is used for central storage of all information required for emissions calculation (methods, activity rates, EFs and uncertainty values), and the CSE also performs some basic calculations. The CSE database is backed up after every submission: the CRF data tables and the NIR, including the version provided to the co-ordination committee and the final version submitted to the secretariat, are transferred onto compact disks and are archived with clear identification information. The contents of the CSE database that are used for calculation purposes are also copied and archived.

F. Follow-up to previous reviews

42. In table 130 of the NIR, Germany includes detailed information on the improvements made in response to the comments and recommendations from earlier reviews, with links to the sections of the NIR where the issues listed are referred to and explained in more detail. The ERT commends Germany for this transparent way of presenting its follow-up to earlier reviews. In the 2009 submission, the most relevant improvements include:

- (a) Clarification of the roles and responsibilities in the national system, the implementation of the policy paper on the national system and reporting on the progress Germany made in the completion and strengthening of the national system;
 - (b) Implementation and further strengthening of QA/QC procedures, including the start of the use of workshops and independent organizations as QA actions;
 - (c) Revisions and corrections made to improve completeness (e.g. the inclusion for the first time of CO₂ indirect emissions from non-methane volatile organic compounds (NMVOC) emissions from solvent and other product use, and the increase of the number of categories, pools and gases estimated for the LULUCF sector), methodological assumptions and parameters (e.g. improvements in the split factor for fuel combustion and emissions for international and domestic aviation), EFs (e.g. N₂O from stationary combustion), and reporting (e.g. calculation and reporting of fluorinated gas (F-gas) emissions, revision of the use of notation keys and improved information on land-use definitions).
43. However, the ERT noted that two recommendations from previous reviews had not yet been fully implemented, relating to:
- (a) The effective improvement of the timeliness of the availability of the energy balance, although the binding schedule was already adjusted to meet the requirements of the inventory;
 - (b) The improvement of the transparency of the chapters of the NIR for the agriculture, LULUCF and waste sectors.

G. Areas for further improvement

1. Identified by the Party

44. The 2009 NIR identifies several areas for improvement. These include:
- (a) Improvement of EFs for non-CO₂ gases in stationary combustion (public electricity and heat production, petroleum refining and other unspecified industrial power plants (the subcategory other (manufacturing industries and construction))), gas turbines in natural gas compressor stations used in the construction sector, the emissions from which are reported under the category other (transportation (1.A.3.e), to be implemented in the 2012 submission;
 - (b) Address the data gaps for the category civil aviation and international aviation bunkers and expand the use of the tier 3 methodologies for the complete time series for these categories;
 - (c) Launching of a research programme to evaluate the potential for release and use of pit gas from decommissioned mines and the possible revision of emission estimates of fugitive emissions from coal mining and handling;
 - (d) Additional EFs are currently being evaluated to estimate fugitive emissions from oil and natural gas;
 - (e) A research project is underway to review the EFs used for the categories cement production and lime production. The project is expected to be completed by August 2010;
 - (f) Efforts are underway to set an institutionalized agreement to collect plant-specific data from ammonia (NH₃) and nitric acid production;

- (g) The EFs for electrode consumption in iron and steel production are being reviewed in a research project;
- (h) Review and updating of the F-gases model. Germany plans to review and update the assumptions in the model for commercial refrigeration systems, industrial refrigeration systems, refrigerated vehicles and stationary air-conditioning systems, and polyurethane foam sealants;
- (i) For the agriculture sector, Germany states in the NIR that it considers data from sources other than official statistics unsatisfactory in some areas (for example, feed-ration composition) and it is planning to expand its agricultural statistics or to conduct surveys. A relevant research programme began in 2007 and was scheduled to run until 2009. The Party is planning to revise the mass flow model and the EFs used to estimate emissions from manure management;
- (j) For the LULUCF sector, for the categories cropland and grassland, Germany plans to revise the methodologies used to assess land-use change areas, improve information data on mineral and organic soils, carbon stock changes in, and N₂O EFs for soils. For the category wetlands, studies are being carried out to analyse emissions of CO₂, CH₄ and N₂O from peat extraction and to develop models to estimate carbon stock changes and country-specific EFs;
- (k) For the waste sector, a research project is underway with the aim of improving the database for CH₄ and N₂O EFs from composting facilities.

2. Identified by the expert review team

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

- (a) Improving the transparency of the NIR in relation to the description of methods, AD, EFs and parameters, in particular for the agriculture and LULUCF sectors, and when higher tier methods are used or the methodologies and EFs diverge from those in the Revised 1996 IPCC Guidelines or the IPCC good practice guidance, and incorporating materials that are usually submitted as additional information or provided during reviews (see para. 72);
- (b) Reporting the tier 1 and tier 2 key category analysis fully in line with the IPCC good practice guidance and the IPCC good practice guidance for LULUCF;
- (c) Ensuring that the use of information on methods, EFs and parameters from the 2006 IPCC Guidelines is used in accordance with the IPCC good practice guidance;
- (d) Improving the timeliness of the completion of the energy balances, in order to improve the accuracy of emission estimates for the energy sector, the largest sector of the inventory;
- (e) Improving the plans to increase the completeness of the inventory, according to the information provided by the Party during the centralized review, by providing estimates of emissions and removals for the categories reported as "NE", if methods are available in the Revised 1996 IPCC Guidelines or the IPCC good practice guidance.

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

II. Energy

A. Sector overview

47. The energy sector is the main sector in the GHG inventory of Germany. In 2007, emissions from the energy sector amounted to 773,675.48 Gg CO₂ eq, or 80.9 per cent of total GHG emissions. Since 1990, emissions have decreased by 21.7 per cent. The key driver for the fall in emissions is the substantial decrease in emissions from fuel combustion in other sectors, and manufacturing industries and construction. Germany explains in the NIR that this trend was achieved through a change in the type of fuel used, an increase in energy and technical efficiencies, and through the use of zero-emissions energy sources. Fugitive emissions have also decreased following the increased use of pit gas, modernization of gas distribution networks and introduction of vapour recovery systems in the distribution of fuels. Within the sector, 50.4 per cent of the emissions were from energy industries, followed by 19.8 per cent from transport, 16.6 per cent from other sectors and 11.6 per cent from manufacturing industries and construction. Fugitive emissions from fuels accounted for 1.4 per cent. The remaining 0.2 per cent was from the category other (1.A.5) fuel combustion (military use of fuel).

48. The GHG inventory of the energy sector is of high quality and the reporting is transparent and comprehensive, with detailed information on methodologies, AD and EFs provided in the NIR for every category. During the review, the ERT identified a number of categories that are reported as "NE": CO₂, CH₄ and N₂O emissions from gaseous fuels use in the subcategory food processing, beverages and tobacco; CO₂ from solid fuel transformation; CO₂ from production of oil; CH₄ from exploration of oil; CH₄ from flaring in oil and natural gas; CH₄ from other fugitive emissions from oil; CO₂ and CH₄ fugitive emissions from venting; N₂O fugitive emissions from oil exploration; and N₂O fugitive emissions from flaring in oil and natural gas. Responding to the ERT during the review, the Party explained the actions it will take to increase the completeness of the inventory for the next annual submission (see para. 10 above).

49. In Germany the energy balances are prepared by the Working Group for Energy Balances (AGEB) under the responsibility of the German Institute for Economic Research (DIW Berlin) and form the basis of both the sectoral and the reference approaches. Germany could not use the energy balance for 2007 since this was not made available in time. Therefore, the Party prepared preliminary calculations of emission estimates, which are based on internal energy forecasts using available aggregated figures for energy consumption provided by the AGEB (the evaluation tables for the energy balance) as surrogate driver for projections. These preliminary calculations for 2007 will be replaced with recalculations in subsequent submissions when detailed energy balances are made available. The ERT recommends that Germany explore the possibility of avoiding such recalculations through closer coordination between the national system and the UBA, and the AGEB and DIW Berlin. The ERT also found that the NIR of the 2009 submission does not include a description of the calculations of the preliminary reference approach based on the evaluation tables for the energy balance, and only includes a reference to the NIR of the 2007 submission. During the centralized review the ERT recommended that Germany include the relevant explanations on the elaboration of the preliminary reference approach in its next annual submission, together with an updated assessment of the accuracy of the procedures used. In response to the draft review report Germany informed the ERT that an improved description of the preliminary reference approach will be included in the 2011 submission.

50. The ERT finds that the assessment of CO₂ emissions from non-energy use and feedstock use of fuels is difficult, since the relevant section in the NIR does not include substantive information: in annex 13.9 to the NIR, Germany informed the ERT that the relevant information can be found in the NIR of the 2007 submission. The ERT recommends that Germany include information on non-energy use of fuels in accordance with the UNFCCC reporting guidelines. In response to the draft review report Germany informed the ERT that an extended documentation of the non-energy fuel use will be included in its 2010 submission.

B. Reference and sectoral approaches

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

51. The CO₂ emissions from fuel combustion were calculated using the reference approach and the sectoral approach. For the year 2007, CO₂ emissions calculated using the reference approach are 0.87 per cent higher than those calculated using the sectoral approach. The differences between the reference approach and the sectoral approach are always small in the period 1990–2007, ranging between 0 per cent and +0.9 per cent. Following a recommendation from the previous review, Germany revised the conversion factors for gas/diesel, residual fuel oil, liquefied petroleum gas and coking coal in CRF table 1.A(b) and now they are correctly reported as 1.00 TJ/TJ.

52. The apparent consumption reported in the reference approach corresponds closely to that reported to IEA, with differences within 1 per cent for all years, except for 2005 (1.7 per cent). This consistency is explained by the fact that the information provided to IEA is also prepared by the AGEB and used to prepare the energy balances.

2. International bunker fuels

53. Until the 2008 submission, Germany used a constant ratio for the split of total fuel consumption between civil aviation (20 per cent) and international aviation bunkers (80 per cent) that was calculated using data from flight movements in the 1990s. The previous review report⁶ stated that the split ratio may be outdated for the most recent years. Following the recommendations from the previous review, Germany updated the split ratio using data from the European Organisation for the Safety of Air Navigation. In the 2009 submission, the split ratio varies annually, increasing from 80 per cent in 1990 to 92 per cent in 2007. The ERT commends Germany for the improvements made and encourages the Party to continue to update the time series for future annual submissions.

54. The ERT detected differences between the consumption of and CO₂ emissions from jet kerosene (for all years), and for gas/diesel oil and residual fuel oil (for the most recent years) reported in CRF table 1.C and in the column international bunkers in CRF table 1.A(b). For 2007, Germany reported the consumption of jet kerosene for international aviation as 344,953.93 TJ in CRF table 1.C, which is 13.5 per cent higher than the value reported as international bunkers in CRF table 1.A(b), 303,962.00 TJ. Also for 2007, the value reported for gas/diesel oil and residual fuel oil in international marine bunkers in CRF table 1.A(b), 98,828.00 TJ, is 30.0 per cent lower than the value reported as international bunkers in CRF table 1.C, 128,471.00 TJ. During the review, Germany explained that the discrepancies result from the use of different data sources: the reference approach uses data from the energy balances, extrapolated from previous years, while in CRF table 1.C the data originate from the Federal Office of Economics and Export Control. During the centralized review the ERT recommended that Germany improve consistency in the estimates for international bunkers for the next annual submission. In response to the draft review report the Party informed the ERT that this issue will be addressed in the 2010 submission.

C. Key categories

1. Stationary combustion: liquid, solid, gaseous and other fuels – CO₂, CH₄ and N₂O

55. According to AD provided by Germany in CRF tables 2(I).A-Gs2, pig iron production and steel production have increased between 2006 and 2007 by 2.6 per cent and 2.8 per cent, respectively, while GHG emissions from combustion in iron and steel, as reported in CRF table 1.A(a), declined substantially in the same period (–29.0 per cent between 2006 and 2007). Responding to a question raised by the ERT during the review, Germany explained that the energy balances for 2007 were not available at the time of the completion of the inventory and that the estimates of emissions from fuel combustion were based on preliminary data forecasted using recent AD trends. The ERT recommends that Germany avoid such

⁶ FCCC/ARR/2008/DEU, paragraph 28.

discrepancies in the next annual submission, for example by considering specific QC checks of emissions and AD for related categories.

56. Emissions of CO₂ from use of other fuels for iron and steel, which relates to the use of blast furnace gas, were reported as “IE” under iron and steel production in the industrial processes sector while AD on energy consumption are available and reported under iron and steel and other (manufacturing industries and construction) in the energy sector. In the NIR, Germany explains that it uses this process to avoid double counting of emissions: all of the carbon content of the reducing agents in pig iron is eventually released into the atmosphere as CO₂ and all of this carbon input is included in the inventory as CO₂ emissions from metal production regardless of whether the process gases are used in steel works or outside of steel works for energy production. In fact, Germany conducted a carbon balance check to avoid double counting errors of CO₂ emissions, which is a good QA/QC practice procedure for this category. However, the ERT considers that, because of these reporting procedures, the implied emission factor (IEF) for these categories may not be easily compared with that of other Parties, and reiterates the recommendation from the previous review that Germany investigate whether an approximate method or collection of additional data could be used to differentiate between energy emissions and process emissions.

2. Road transportation: liquid and biomass fuels – CO₂, CH₄ and N₂O

57. CO₂ emissions from biomass combustion from the use of bioethanol were calculated for the first time, as data on bioethanol consumption, expressed as per cent of gasoline consumption, are now available. Germany used this data to reallocate part of the energy consumption and emissions, from gasoline to biomass, in accordance with the available data on bioethanol consumption from 2000 to 2007. The ERT commends the improvement in accuracy and encourages Germany to continue to improve the estimates of emissions from this new fuel type, including the development of QA/QC procedures with regard to AD and EFs. The ERT recommends that the Party report data on consumption of biodiesel and bioethanol in the NIR of the next annual submission.

D. Non-key categories

Stationary combustion: biomass – CO₂

58. The NIR mentions that the energy balance includes consumption of biogas from wastewater treatment in the subcategory commercial/institutional and that the resultant CO₂ emissions are reported as biomass used under the energy sector. However, the NIR does not present quantitative information on biogas consumption and there is no corresponding information in the waste sector of the NIR about recovery of biogas from wastewater handling and its use in the energy sector. The ERT recommends that Germany provide more detailed information about CO₂ emissions from energy use of biogas from wastewater handling and recovery of CH₄ in the NIR of the next annual submission.

III. Industrial processes and solvent and other product use

A. Sector overview

59. In 2007, emissions from the industrial process sector amounted to 116,123.04 Gg CO₂ eq, or 12.1 per cent of total GHG emissions, and emissions from the solvent and other product use sector amounted to 3,316.41 Gg CO₂ eq, or 0.3 per cent of total GHG emissions. Since 1990, emissions have decreased by 3.1 per cent in the industrial processes sector, and decreased by 38.5 per cent in the solvent and other product use sector. The key driver for the fall in emissions from the industrial processes sector is the reduction of emissions from the chemical industry, metal production and mineral products; however, reductions were largely compensated for by the large increase in HFC emissions from the consumption of halocarbons and SF₆. The Party explains in the NIR that the trend reflects economic growth and increased production, and the fact that, to date, only actions to reduce emissions from adipic acid production have had some results. Within the industrial processes sector, 42.7 per cent of emissions were from metal

production, 26.5 per cent were from the chemical industry, 18.2 per cent from mineral products, 12.2 per cent from consumption of halocarbons and SF₆, 0.2 per cent from production of halocarbons and SF₆, and 0.3 per cent from the category other (industrial processes (2.G)). The main subcategories are emissions of: CO₂ and CH₄ from iron and steel production (39.8 per cent of emissions from the sector); CO₂ from cement production (12.3 per cent); HFCs and PFCs from consumption of halocarbons and SF₆ in refrigeration and air-conditioning equipment (7.4 per cent); CO₂ and N₂O from other (chemical industry) (9.0 per cent); N₂O from nitric acid production (8.2 per cent); CO₂ from CaO production (4.9 per cent); and N₂O from adipic acid production (4.8 per cent).

60. The list of recalculations made in the industrial processes sector is listed in section 10.1.2 of the NIR, and Germany also presents in the NIR short explanations under the description of each category. The Party usually presents detailed information on the reasons for the revision of estimates, and sometimes includes detailed information about the changes in the time series (e.g. comparison of the previous and new emission estimates). However, the ERT noted that Germany does not discuss how consistency in the time series was maintained in accordance with the IPCC good practice guidance, and recommends that the Party include such information in the next annual submission. The ERT also recommends that Germany improve the transparency of its reporting of recalculations, for example: presenting old and new emission estimates at the category level at which recalculations were performed and for the entire time series; providing reasons for the selection of revised EFs; and demonstrating that changes resulted in an improvement of accuracy or completeness, in particular if the new EFs are lower than in previous submissions or there is a decreasing trend in the time series.

61. The ERT noted that the Party reports emission estimates for the category limestone and dolomite use as "IE" and allocates the corresponding emissions to several categories: public electricity and heat production (CO₂ emissions from flue gas desulphurization); cement production; lime production; soda ash production and use; glass and bricks production; and iron and steel production. The ERT commends Germany for the inclusion of a limestone balance which increases transparency, but it noted that the information in the NIR is still not fully consistent with information in the CRF tables. In the NIR the Party stated that consumption also occur from the sugar industries, and from wastewater handling. The ERT recommends that the Party solve this apparent inconsistency. The NIR states that methodological aspects are described under each category, which the ERT finds increases the difficulty to assess emissions from this activity as a whole. On page 228 of the NIR, Germany stated that the report was structured in this way so that the reporting is in line with the 2006 IPCC Guidelines. The ERT finds this way of reporting inappropriate for the 2009 submission, as the Revised 1996 IPCC Guidelines should be used. The ERT also noted that the allocation of emissions used by Germany implies that the category limestone and dolomite use cannot be included in the key category analysis, and that CO₂ emissions from solid fuel combustion included in the category public electricity and heat production are reported together with non-combustion emissions from flue gas desulphurization. The ERT recommends that the allocation of emissions from limestone and dolomite use be reported in accordance with the Revised 1996 IPCC Guidelines, that is, reporting all emissions under the category limestone and dolomite use, irrespective of where the limestone and dolomite is actually used, excluding emissions from cement production, lime production and liming of soils in agriculture.

B. Key categories

1. Iron and steel production – CO₂

62. The ERT commends Germany for the transparent description of the methodology used for this category, including the detailed description of the emission sources, the explanation of the allocation of emissions between the energy sector and the industrial processes sector, and the discussion on the methodologies used by the Party to avoid double counting of emissions from the use of reducing agents. The ERT noted that the overall CO₂ intensity of steel production, calculated by adding emissions from fuel combustion in iron and steel and iron and steel production, and dividing by the quantity of steel production obtained from the CRF table 2(I).A-Gs2, decreased by 22.9 per cent from 1990 to 2007 and by

4.7 per cent between 2006 and 2007. The ERT recommends that Germany provide an explanation for these positive trends and that the Party provide supporting data, for example by reporting the trend of the share of production of electric arc furnace steel production in the same period. The ERT also recommends that Germany provide quantitative information on the fraction of coal-derived gases produced at iron and steel plants and that are sold and used outside the iron and steel industry and provide information on other industry sectors in which the coal derived gases are used, in the NIR of the next annual submission.

2. Aluminium production – CO₂ and PFCs

63. The ERT noted that the constant CO₂ IEF of 1.37 t/t is the second lowest among reporting Parties (1.2–1.80 t/t). During the review, the ERT requested additional information about the derivation of the country-specific EF that Germany is using to estimate emissions. Responding to the ERT, Germany explained that this EF is based on the average value of consumption of petrol coke anodes per tonne of aluminium (430 kg), and that this average value was obtained from an unpublished communication from the German Metal Industry Association based on the analysis of data on anode consumption by five aluminium producers in Germany. The ERT recommends that Germany improve the documentation in the NIR on how this country-specific EF was determined, for example by including in its next annual submission the additional information provided to the ERT.

64. The ERT noted that, apart from large decreases in 1997, 1999 and 2000 and a large increase in 2002, the IEF for CF₄ decreased by 21.8 per cent from 2004 to 2005 and by 30.1 per cent between 2005 and 2006, and the IEF for C₂F₆ decreased by 19.6 per cent from 2004 to 2005 and by 31.5 per cent between 2005 and 2006. Germany explains in the NIR that the annual EFs it is using are determined by multiplying the emissions per anode effect (obtained from measurements made between 1996 and 2001) by the annual number of anode effects per year and then dividing that value by total aluminium production. However, the NIR does not include detailed explanations on the strong inter-annual variations in the IEFs of CF₄ and C₂F₆. The ERT recommends that Germany provide in the NIR more specific explanations on the large changes observed in the annual IEFs in line with the explanations provided to the ERT at the end of the centralized review.

3. Ozone-depleting substances substitutes – SF₆

65. SF₆ emissions from the subcategory other (within consumption of halocarbons and SF₆) increased by 29.7 per cent between 2006 and 2007. Responding to a question raised by the ERT, Germany explained the increase in emissions by the increase in solar technology production and the increased disposal of sound-proofed windows filled with SF₆. The ERT recommends that Germany provide such explanatory information on large inter-annual variations at the appropriate subcategory level in the next annual submission.

C. Non-key categories

1. Other (mineral products) – CO₂

66. Germany reports on the recalculation made to CO₂ emissions from glass production (reported as other (mineral products)), but the ERT informed the Party during the review that the explanations in the NIR are insufficient and incomplete, and that the reason justifying the revision of estimates is not clearly presented. Responding to the ERT, the Party clarified that a revision of the estimates was made after comparing emission estimates with data reported to the EU ETS, which resulted in a revision of the quantities of cullet used as raw material. During the review, the Party presented, as an example, the old and new percentage of cullet used for flat glass production: the values were revised from 8.8–16.4 per cent to a constant value of 35 per cent and the CO₂ EF changed from 174.0–189.7 kg/t molten glass to 135.2 kg/t molten glass. The ERT recommends that Germany, for reporting recalculations in its next annual submission and in particular when recalculations result in a reduction in emission estimates, improve transparency in this category by using as an example the information provided during the centralized review.

2. Ferroalloys production – CO₂

67. In the NIR, Germany reports emissions of CO₂ from ferrochrome production under the category ferroalloy production. The Party uses, in the period 1990–2007, a constant value of 25,000 t of ferroalloy produced, the reason being that the Party could not obtain the full time series from official statistics due to confidentiality constraints and instead used a typical value of annual production provided by the only producer in the country. The ERT explained to the Party that production data for ferroalloys production in Germany are available from the United States Geological Survey, the British Geological Survey and the United Nations Industrial Commodity Production Statistics, which cover not only the production of ferrochrome but also silicon metal and other ferroalloys. Responding to the ERT, Germany clarified that the carbon used in the production process for silicon metal and other ferroalloys is used as a reducing agent and emissions from its use are already included in the energy sector, since separate data are not available in the energy statistics. The ERT recommends that Germany update the AD for ferrochrome production using actual production data from the single industrial plant existing in the country, and check the consistency with statistical information in international databases. The ERT informed the Party that the CO₂ IEF reported from 1995 to 2007 (0.11 t/t metal ferroalloy produced) is one order of magnitude lower than the default IPCC EF (1.3 t/t product). The Party explained this low value by the fact that this EF includes only emissions from consumption of electrodes and not the use of reducing agents, which are not used in Germany. The ERT recommends that Germany include these explanations in the NIR of future submission, together with the exact reference for the EF. The ERT also recommends that Germany provide explanations clarifying that emissions from the use of reducing agents in the production of other ferroalloy categories are included in the energy sector. In response to the draft review report Germany informed the ERT that these explanations will be included in the 2011 submission.

3. Solvent and other product use – CO₂

68. Germany estimates indirect emissions of CO₂ from NMVOC emissions using a conversion factor (carbon content of NMVOCs) of 75 per cent. During the review, Germany explained that this value of carbon content was determined as the average value of the values reported by other Parties, which range from 60 to 85 per cent. To improve transparency, the ERT recommends that Germany add these explanations in its next annual submission. The ERT also recommends that the Party explore alternative methods to determine a country-specific carbon content of NMVOCs.

IV. Agriculture

A. Sector overview

69. In 2007, emissions from the agriculture sector amounted to 51,479.46 Gg CO₂ eq, or 5.4 per cent of total GHG emissions. Since the base year, emissions from agriculture have decreased by 16.5 per cent. The key drivers for the fall in emissions are the trends of emissions of CH₄ from enteric fermentation and N₂O from agricultural soils. The trend in emissions from these categories in the period from 1990 to 2007 is explained by large reductions in the dairy and non-dairy herds (35.9 and 34.4 per cent, respectively), reductions in sheep and swine populations (23.3 and 12.0 per cent, respectively) and the associated reduction of N excreted from these animals. Germany reduced the amount of synthetic fertilizer applied to soils by 26.1 per cent over the same period. Within the sector, 51.7 per cent of the emissions were from agricultural soils, followed by 33.0 per cent from enteric fermentation and the remaining 15.3 per cent from CH₄ and N₂O emissions from manure management. Germany indicated that emissions from rice cultivation, prescribed burning of savannahs and prescribed burning of agricultural residues are reported as “NO”.

70. Germany states in the NIR that, for the first time it has adopted the 2006 IPCC Guidelines to report emission estimates for the agriculture sector. This change resulted in the use of revised methodologies, the use of default EFs from the 2006 IPCC Guidelines and the exclusion of emission estimates for the category N₂O from N-fixing crops, as the 2006 IPCC Guidelines no longer considers this category. The ERT expressed its concern about the recalculations made in the agriculture sector, in

particular those resulting from the use of default EFs from the 2006 IPCC Guidelines, and the exclusion of one category, and considers that those actions are not in accordance with the UNFCCC reporting guidelines and the IPCC good practice guidance.

71. At the end of the centralized review, the ERT requested Germany to prepare estimates of emissions from agriculture in accordance with the methods described in the Revised 1996 IPCC Guidelines, as elaborated in the IPCC good practice guidance, and ensure that appropriate methods are used to estimate emissions from the key categories. Responding to the ERT, Germany sent information comparing EFs and parameters used in the 2009 submission and the default EFs and parameters in the Revised 1996 IPCC Guidelines, showing that emission estimates made in accordance with the new methodologies result in emission estimates that are higher than those resulting from the use of the Revised 1996 IPCC Guidelines and the IPCC good practice guidance, with the exception of direct N₂O emissions from agricultural soils. The Party stated that it will revert to the use of the IPCC default (0.0125 kg N₂O-N) for all subcategories from direct N₂O emissions from agricultural soils for the 2010 submission and subsequent submissions. The ERT notes to Germany that it cannot use default EFs from the 2006 IPCC Guidelines to replace default EFs from the Revised 1996 IPCC Guidelines or the IPCC good practice guidance without a clear justification framed on the use of the IPCC good practice guidance, showing that these EFs better represent the country-specific conditions and keeping in mind the principle of comparability defined in the UNFCCC reporting guidelines. The ERT reiterated the request that Germany provide a detailed methodological description by category and gas, and that methods, EFs and parameters from the 2006 IPCC Guidelines are used in accordance with the IPCC good practice guidance and the UNFCCC reporting guidelines in the next annual submission. In response to the draft review report Germany informed the ERT that it intends to address this recommendation in the next annual submission.

72. The ERT is of the view that the emission estimates provided by Germany for the agriculture sector, along with the documentation in the NIR, have not improved since the previous submission despite the recommendations in the previous review report. The ERT informed the Party that the methodological descriptions provided in the NIR have not been improved regarding transparency, in particular where higher tier methods are used. Responding to the ERT, Germany provided additional information and complementary information to the NIR, in particular the reports “Calculations of Emissions from German Agriculture – National Emission Inventory Report 2007 for 2005 Special issues 304 and 304A, 2007” and “Calculations of Emissions from German Agriculture – National Emission Inventory Report 2009 for 2007 Special issues 324 and 324A, 2009” (hereinafter referred to as Special issue 324). The Party expressed its intention to improve its GHG estimates and methodological descriptions in the 2010 inventory submission. The ERT is of the view that the chapter of the NIR on agriculture should be thoroughly revised and improved in the 2010 submission, and recommends that Germany incorporate into the NIR of its next annual submission the information provided during the review and the relevant parts of the additional detailed information in the above-mentioned reports. In particular, the ERT recommends that Germany provide a revision of methodological descriptions by category and gas for N₂O from manure management and direct and indirect N₂O emissions from sub-categories of agricultural soils; and a detailed characterization of livestock and an explanation of livestock trends. In response to the draft review report Germany informed the ERT that it intends to address this recommendation in the next annual submission.

B. Key categories

1. Enteric fermentation – CH₄

73. Germany estimates emissions of CH₄ from enteric fermentation using a tier 2 method for cattle (dairy and non-dairy cattle) and swine. Emissions of CH₄ for all other animals are estimated using a tier 1 approach in line with the IPCC good practice guidance. The ERT reiterated the recommendation from the previous review that Germany provide detailed information, at the level of animal subclasses listed in table 71 of the NIR of the 2009 submission, on gross energy intake, milk yield and all other parameters

underlying the calculation of the country-specific EFs in its next NIR. The provision of such detailed information would enhance the transparency of the NIR and enable the ERT to understand better the CH₄ IEFs at the appropriate animal category level. In response to questions raised during the review, Germany stated that it intends to provide detailed information on population size, animal weights, milk yield, pregnancy, gross energy intake and digestibility of feed in its next annual submission. The ERT welcomes this intended improvement and recommended that Germany incorporate into the NIR of its next annual submission any relevant additional information from Special issue 324. In response to the draft review report Germany informed the ERT that it intends to address this recommendation in the next annual submission.

74. The ERT noted that the dairy cattle herd in Germany produces a high milk yield (19.19 kg milk/day) in comparison to the relatively low average gross energy intake per head (264.15 MJ/head/day). In response to a question raised during the review, Germany stated that the energy calculation for dairy cattle was incorrect (the energy requirements for maintenance was too low) and that it will report the correct value (328.60 MJ/head/day) in its next annual submission. The ERT recommended that the Party revise the calculations and clarify if the emission estimates are affected. In response to the draft review report Germany informed the ERT that it intends to address this recommendation in the next annual submission.

2. Manure management – CH₄

75. Germany uses a tier 2 approach, together with detailed country-specific parameters, to estimate CH₄ emissions from manure management for cattle and swine and a tier 1 approach and default EFs for all other animals. This is in accordance with the IPCC good practice guidance. The ERT recommends that Germany improve the transparency of the NIR in its next submission by providing detailed information on EFs, volatile solids excretion rate, methane producing potential and methane conversion factor (MCF) by animal subcategory and animal waste management system (AWMS). During the review, Germany provided additional information to the ERT that was included in the Special issue 324 report. The ERT recommends that Germany add the relevant information from this report into the methodological description in its next NIR.

3. Direct soil emissions – N₂O

76. The ERT considers that the transparency of reporting of direct N₂O emissions from agricultural soils could be further improved in the next annual submission. The ERT recommends that Germany provide additional information on the amounts of N added to the soil for each component (N balance), including the amounts of N imported as manure from other countries. The ERT is of the view that the transparency of the NIR would be greatly improved if the explanations concerning gases other than N₂O (nitrogen oxide, NH₃ and NMVOCs), were included in a separate section. In response to the draft review report Germany acknowledged this view and informed the ERT that it intends to address this recommendation in the next annual submission.

77. Germany uses a default EF of 0.01 kg N₂O-N, instead of the default EF of 0.0125 kg N₂O-N from the Revised 1996 IPCC Guidelines, to estimate direct emissions of N₂O from application of synthetic fertilizers, animal manure applied to soils and crop residue. The EF used by Germany is the default EF from the 2006 IPCC Guidelines. The ERT is of the view that the use of default EFs other than those in the Revised 1996 IPCC Guidelines and the IPCC good practice guidance is not in line with the UNFCCC reporting guidelines, and that Germany did not provide sufficient explanations for the use of the default EF from the 2006 IPCC Guidelines to show that their use is in accordance with the IPCC good practice guidance and it is improving the accuracy of the emission estimates. The ERT noted that the emission estimates for this key category may be underestimated by 11.8 per cent. During the review, in response to a question raised by the ERT, Germany stated that it will revert to using the default EF from the Revised 1996 IPCC Guidelines in its next annual submission and subsequent submissions.

78. The ERT noted that Germany reported emissions of N₂O from N-fixing crops as “NO” even though AD (N input to soil) are provided for this category in CRF table 4.D and emissions were reported in previous submissions. During the review, Germany clarified that there are indeed N-fixing crops in the country and the reason for not reporting emissions is based on the guidance in the 2006 IPCC Guidelines that biological N fixation should no longer be considered as a source of direct N₂O emissions (chapter 11.2.1, page 11.6, footnote 2). The ERT strongly recommends that Germany report emissions of N₂O from this subcategory in its next annual submission, as the ERT is of the view that Germany’s agriculture inventory is incomplete and not in accordance with the 1996 Revised IPCC Guidelines and the IPCC good practice guidance. During the review, Germany stated that it will report emissions from this subcategory in its next annual submission.

4. Pasture, range and paddock manure – N₂O

79. The ERT found that Germany reported an EF of 0.0167 kg N₂O-N for emissions from pasture, range and paddock manure, which is different from the IPCC default (0.02 kg N₂O-N). One of the reasons for the difference is the fact that Germany is using a lower EF (0.01 kg N₂O-N) for sheep, goats and horses, which is the default EF in the 2006 IPCC Guidelines for those animal species. The ERT does not agree with the use of this EF for the same reasons stated for the EF for direct emissions of N₂O from application of synthetic fertilizers, animal manure applied to soils and crop residue (see para. 77). During the review, in response to the comments by the ERT, Germany stated that it will revert to using the default EF from the Revised 1996 IPCC Guidelines in its next annual submission and subsequent submissions.

80. The ERT found that the amount of N reported as N from pasture, range and paddock in CRF table 4.D differs from the total amount under this AWMS in CRF table 4.B(b). In response to a question raised during the review, Germany stated the amount of N reported in CRF table 4.D is incorrect because it does not include buffalo and goats, and that the value reported for the IEF is therefore incorrect. The ERT recommended that Germany correct this in the next annual submission and carry out additional QC checks to avoid such errors in future. In response to the draft review report Germany informed the ERT that it intends to address this recommendation in the next annual submission.

5. Indirect emissions – N₂O

81. The ERT was unable to reconcile, from the information in CRF tables 4.D, the amounts of N used for AD in estimating emissions of N₂O from atmospheric deposition and leaching and run-off, with the amount of N reported as synthetic fertilizers, animal manure applied to soils and as sewage sludge, taking into account the reported values of $Frac_{GASF}$ (0.054 NH₃-N+NO_x-N/kg of synthetic fertilizer N applied) and $Frac_{GASM}$ (0.282 NH₃-N+NO_x-N/kg N exerted), and using equations 14 and 15 in the NIR. The ERT reiterated the recommendations from previous reviews that Germany provide a mass balance of all N amounts used in estimating emissions from indirect emissions from soils and report in the next NIR detailed information on the derivation of $Frac_{GASM}$ and $Frac_{GASF}$ values, in accordance with the definition of these fractions in the IPCC good practice guidance. In response to the draft review report Germany informed the ERT that it intends to address this recommendation in the next annual submission.

82. Germany reports an EF of 0.0075 kg N₂O-N in estimating emissions from leaching and run-off, which is the default EF from the 2006 IPCC Guidelines (table 11.3). The ERT is of the view that using default EFs other than those in the Revised 1996 IPCC Guidelines and the IPCC good practice guidance is not in line with the UNFCCC reporting guidelines, and that Germany did not provide sufficient explanations for the use of the EF from the 2006 IPCC Guidelines to show that its use is in accordance with the IPCC good practice guidance and it is improving the accuracy of the emission estimates. The ERT strongly recommends that Germany provide a justification for the use of this factor or use the default IPCC EF from the Revised 1996 IPCC Guidelines (0.025 kg N₂O-N).

C. Non-key categories

1. Manure management – N₂O

83. The ERT could not reconcile the amount of N reported in each of the AWMS in CRF table 4.B(b) for each animal type with the percentage allocations reported in CRF table 4.B(a). In response to a question raised during the review, Germany stated that the CRF tables contained some calculation errors. The ERT recommended that Germany correct these errors in its next annual submission, and ensure that the appropriate QC checks take place on all CRF tables before submission. In response to the draft review report Germany informed the ERT that it intends to address this recommendation in the next annual submission.

2. Direct soils – CH₄

84. Germany reports a sink of CH₄ (CH₄ consumption in agricultural soils) in the subcategory other (agricultural soils (4.D.4)) for all years from 1990 to 2007. There is a brief description of these emissions provided in section 6.4.2.1 of the NIR of the 2009 submission. During the course of the review, the Party stated that “Germany has calculated a CH₄ sink in agricultural soils (NIR 2009, table 104) but has not included the CH₄ sink in the CRF tables (“NE”) because this is not an anthropogenic sink. The natural CH₄ sink in aerobic soils is even reduced by N fertilization. Indeed there is no guidance in the Revised 1996 IPCC Guidelines or the IPCC good practice guidance on this CH₄ sinks because, according to Annette Freibauer, the Coordinating Lead Author of this part in the IPCC good practice guidance, there was no consensus on how to address the reduction of the natural CH₄ sink by fertilization.” In the light of this response, the ERT strongly recommends that Germany exclude this sink from the inventory in the next annual submission. In response to the draft review report Germany informed the ERT that it intends to address this recommendation in the next annual submission.

V. Land use, land-use change and forestry

A. Sector overview

85. In 2007, net removals from the LULUCF sector amounted to 16,127.66 Gg CO₂ eq. Since the base year, net removals have decreased by 42.9 per cent. The key driver for the fall in net removals is forest land converted to settlements, where net CO₂ emissions increased by 2,686.9 per cent from 1990 (418.48 Gg) to 2007 (11,662.72 Gg). Within the sector, 55.7 per cent of the emissions/removals were from forest land, followed by 23.3 per cent from cropland, 9.9 per cent from grassland and 8.3 per cent from settlements. Wetlands accounted for 2.0 per cent, other land for 0.3 per cent and the category other (5.G) accounted for 0.5 per cent. The remaining 0.3 per cent was from other land.⁷

86. The ERT appreciates the efforts made by Germany to improve the completeness of the inventory for the LULUCF sector and to revise the use of the notation keys. However, the following net carbon stock changes are still reported as “NE”: DOM, mineral soils and organic soils for land converted to forest land; DOM for land converted to cropland, total grassland, total wetlands, total settlements and total other land; N₂O emissions from drainage of soils and wetlands; and CO₂, CH₄ and N₂O from biomass burning in forest land converted to grassland, in settlements and in other land. In response to a question raised by the ERT on this issue, the Party indicated that it will improve the completeness of the inventory by providing estimates for changes in carbon stock in DOM and mineral and organic soils from forest land, and CH₄ and N₂O from biomass burning from wildfires in the next annual submission. Germany declared that, for the next annual submission, it will use the notation key “IE” for changes in carbon stock in DOM from cropland, grassland, wetland, settlements and other land, the emissions/removals from which are in fact already included under carbon stock change in living biomass, and it will use the

⁷ The percentages for each category were calculated by comparing the net emissions/removals expressed as an absolute value, to the sum of the absolute values of the categories forest land, cropland, grassland, wetlands, settlements, other land and other.

notation key “NO” to report N₂O emissions from drainage of soils and wetlands. Further, commenting on the draft review report, the Party informed the ERT that estimates for changes in carbon stock change in DOM will be reported in the 2011 national submission, when data results from ongoing research projects will be available. The ERT commends the Party for the actions it is planning to carry out in order to improve the completeness of the inventory and to improve the transparency of reporting.

87. Germany has not developed a complete and consistent land representation system for all land-use categories, and the ERT noted that without consistent land representation, double counting or omission of an area might occur, leading to incorrect estimates of a source or a sink. Indeed, the ERT found that the total reported area was 35,921,924 ha in 1990, changes every year of the time series, and it was 35,196,286 ha in 2007 while the total area of Germany should be equal to 35,702.10 thousand ha for the whole time series. Moreover, a discontinuity between the years 2000 and 2001 was detected in the AD time series for land converted to cropland (1,146.0 per cent increase), land converted to grassland (810.3 per cent increase), land converted to wetlands (6,467.8 per cent increase), land converted to settlements (292.4 per cent increase) and land converted to other land (262.3 per cent increase), while no justification for these inter-annual variations is provided in the NIR. Responding to a question raised by the ERT during the review, Germany explained that the annual variation in total land area is due to different positions of the coastline when data are collected (changes in the tide and movements of sand-banks), and that it is planning to resolve this problem for the next annual submission. Further, commenting on the draft review report, Germany informed the ERT that the discontinuity between 2000 and 2001 is explained by the move from the low-resolution and low-accuracy CORINE data source to the high-resolution and high-accuracy ATKIS data source, and that a research project is on-going aiming to minimize the uncertainty and to maximize the consistency between CORINE and ATKIS for the time series back to 1990. The ERT encourages Germany to report a consistent time series of AD for each land use and land-use change category, established in accordance with the IPCC good practice guidance for LULUCF, and includes a complete set of annual land use and land-use change matrices in the next submission.

B. Key categories

1. Forest land remaining forest land – CO₂

88. The Party reported as “NO” net carbon stock changes in DOM and soil organic matter from forest land remaining forest land, assuming that these carbon stocks are in an equilibrium state (tier 1). The ERT is of the view that the NIR does not present information supporting these assumptions and even includes contradictory information (e.g. the Party states on page 494 of the NIR that “dead wood tend to increase, rather than decrease, between 1990 and 2002”). Considering that this is a key category, the ERT recommends that Germany either report information supporting the underlying assumptions or provide estimates of emissions and removals for this category in the next annual submission. In response to the draft review report Germany informed the ERT that it intends to address this recommendation in the next annual submission.

2. Land converted to forest land – CO₂

89. The ERT noted that Germany estimates of AD and, consequently, carbon stock changes in land converted to forest land in the new German Länder (states formerly included in the Democratic Republic of Germany) are incomplete, that is, for this region it only has available data on net area of new forest between 1993 and 2003. Therefore, Germany only reports estimates for 1993 onwards for the new Länder, which is not consistent with the estimates provided for the old Länder, where separation of newly forest land from deforested land was carried out for the entire time series. Therefore, the ERT recommends that Germany report under the category land converted to forest land each carbon stock change occurring in land converted to forest land, and that Germany apply the relevant methodologies provided in the IPCC good practice guidance for LULUCF in order to reconstruct a complete time series, from 1990 to 2007, of land-use changes and related changes in carbon stocks for the whole national

territory. In response to the draft review report Germany informed the ERT that it intends to address this recommendation in the next annual submission.

3. Cropland – CO₂

90. The Party reported changes in the carbon stock in living biomass in cropland remaining cropland from changes occurring in management practices, and for the following land use changes: from annual to perennial crops and vice versa and in categories land converted to cropland and cropland converted to other land uses. The ERT noted that usually in the annual carbon balance the living biomass stocks for annual crops are present for only a fraction of the year, and after harvesting, they are moved to other pools, DOM and mineral soils, or are oxidized by respiration. The methodological information reported in the NIR of the 2009 submission does not clarify whether or how the methodology applied for estimating carbon stock changes in living biomass and mineral soils of cropland remaining cropland and land converted to cropland addresses the temporal (presence of living biomass carbon stocks for part of the year) and spatial factors (presence of the same carbon stock in living biomass and in mineral soils in two different, and subsequent, parts of the same year). Therefore, the ERT recommended that Germany report all the relevant information and that it revise the applied methodologies if it is not able to address the issue raised during the review. In response to the draft review report the Party informed the ERT that the requested information will be included in the 2011 submission.

4. Settlements – CO₂

91. Germany reported that in order to avoid double counting of emissions, carbon stock changes in DOM (which covers mostly grass and tree cuttings) are not reported under settlements but, because these fractions are normally composted, their emissions are reported under the waste sector. The ERT noted that it is good practice to report all losses of carbon stock change occurring in each pool of managed land regardless of the causes of the loss and the final use of the removed stock. The ERT also noted that the Party did not report emissions of CO₂ from composting under the waste sector (the category other (waste)). Therefore, the ERT recommended that losses of DOM be reported under the category settlements in the next annual submission. Commenting on the draft review report Germany informed the ERT that two projects to collect the necessary information are on-going, and it intends to report DOM under category settlements as soon as data are available.

C. Non-key categories

Biomass burning – CH₄ and N₂O

92. The ERT noted that CH₄ and N₂O emissions as a result of biomass burning in forest land were reported as “NO” even though AD are provided in CRF table 5(V) for wildfires on managed forest land (forest land remaining forest land) and CO₂ emissions are reported as “IE” under carbon stock change in living biomass from forest (CRF table 5.A). Therefore, the ERT recommends that Germany estimate and report CH₄ and N₂O emissions from biomass burning in forest land emissions in its next annual submission. In response to the draft review report Germany informed the ERT that it intends to address this recommendation in the next annual submission.

VI. Waste

A. Sector overview

93. In 2007, emissions from the waste sector amounted to 11,518.68 Gg CO₂ eq, or 1.2 per cent of total GHG emissions. Since 1990, emissions have decreased by 71.5 per cent. The key drivers for the fall in emissions are the increased recycling of solid waste, which is encouraged by law (e.g. prohibition of disposal of biodegradable waste in landfills, which has been in effect since 2005), and the recovery of biogas at solid waste disposal sites on land, that have caused the substantial decrease of CH₄ emissions from solid waste disposal on land. Within the sector, 71.3 per cent of the emissions were from solid waste disposal on land, followed by 21.2 per cent from wastewater handling. Germany estimated emissions

from composting and mechanical-biological waste treatment, and reported these under the category other (waste); these emissions accounted for the remaining 7.5 per cent of emissions. CH₄ from solid waste disposal on land is a key category for both level and trend assessment and CH₄ from wastewater handling is a key category by trend.

94. Germany states in the NIR that it reports the following emissions from the waste sector in the energy sector, in accordance with the IPCC good practice guidance and the UNFCCC reporting guidelines: emissions from the use of landfill gas from solid waste disposal on land and from wastewater handling with energy recovery by combustion or flaring; and CO₂, CH₄, and N₂O from incineration of waste with energy recovery. However, the ERT considers that an overview of the flows and quantities of gases that are generated, indicating the parts of emissions that are reported in the waste and in the energy sectors, will help the ERT to assess the completeness and consistency between those sectors.

95. According to the information in CRF table 6.A for 2006, recalculations have been carried out for CH₄ emissions from solid waste disposal on land, and for CH₄ and N₂O emissions from the category other (waste), which refers to composting and mechanical-biological treatment. However, the ERT noted that, contrary to what is reported in the CRF tables, the NIR states that no recalculations were required for these categories. The ERT could not verify if the recalculations were done in accordance with the IPCC good practice guidance or if they resulted in an increase in the quality of the inventory. The ERT recommends that Germany provide the background information on recalculations in order to increase transparency in its next annual submission. In response to the draft review report Germany informed the ERT that it intends to address this recommendation in the next annual submission.

B. Key categories

1. Solid waste disposal on land – CH₄

96. Germany estimates CH₄ emissions from solid waste disposal on land using the tier 2 first order decay method from the IPCC good practice guidance. The ERT noted that Germany departs slightly from the IPCC good practice guidance when it considers a time lag in the calculation of emissions: emissions from waste deposited in a given year only start to be calculated the following year. Responding to a question by the ERT, Germany stated that the effect of the time lag is small and does not affect emission estimates after 2006 when deposition of biodegradable waste stopped. Germany uses half-life parameters (k) for different waste type, degradable organic carbon (DOC) is country-specific and also disaggregated by waste type, the fraction of DOC converted into landfill gas degradable organic carbon degraded is country-specific and based on a study referenced in the NIR. Other parameters are defaults from the IPCC good practice guidance: MCF, the proportion of CH₄ in landfill gas, and the oxidation factor. During the review, the Party provided additional information showing that the half-lives (k) were determined using the IPCC 2006 Guidelines (table 3.4), but the ERT noted that this origin was not clearly stated in the NIR, and the ERT can not verify if its use is in agreement with the IPCC good practice guidance. The ERT recommends that Germany improve the transparency of reporting by providing detailed explanations for the derivation of country-specific EFs and justifying the applicability of the use of defaults from the IPCC 2006 Guidelines in accordance with the IPCC good practice guidance.

97. In 2007, 59.5 per cent of total CH₄ generated by waste disposal on land (575.00 Gg CO₂ eq) is reported as recovery for energy use and deducted from CH₄ emissions. Germany estimates the amount of CH₄ recovered using several assumptions about the percentage of landfill facilities with recovery: in 1993, 35 per cent of landfill facilities had gas recovery gas systems installed; and the number of recovery systems increased by 5 per cent a year, reaching 95 per cent in 2005 from 3 per cent in 1980. Germany assumes that CH₄ collection efficiency, taking into account both energy recovery and flaring, was 45 per cent in 1990 and it constantly increased up to 60 per cent in 2004. However, the NIR states that monitored data are available at the Länder level, and that the Federal Statistical Office will collect and publish data on biogas recovery from surveys. The ERT noted that, in accordance with the IPCC good practice guidance, the default CH₄ recovery is zero, only reporting using monitored data is consistent with good practice, and the use of undocumented estimates of landfill gas recovery potential is not appropriate,

as such estimates tend to overestimate the amount of recovery. Further, the NIR states that the landfill gas used is reported under the energy sector, but the ERT could not find information in the NIR or in CRF table 1.A.1(a) on the use of biogas from landfill sites. The situation does not allow the ERT to decide whether the reported amount of CH₄ recovery is appropriate. The ERT reiterates the recommendations from previous reviews and encourages Germany to use monitored data to report recovery and actual emissions after recovery, and reconstruct the full time series using methodologies in line with the IPCC good practice guidance. Further, the ERT recommends that Germany improve the transparency of reporting of the use of biogas from landfills and emissions in the sectoral parts of the NIR on waste and energy in the next annual submission.

2. Wastewater handling – CH₄

98. For the period 1995–2007, the German inventory includes only estimates of emissions from wastewater handling resulting from the part not connected to sewage networks and treated in cesspools and septic tanks, considering that municipal wastewater treatment systems in Germany only use aerobic processes. From 1990 to 1994, the estimates also include emissions from sludge treatment, but this activity stopped after 1994. Germany estimates CH₄ emissions from cesspools and septic tanks using the IPCC tier 1 methodology, the IPCC default value for potential methane formation (0.6 kg CH₄/kg BOD₅) and a MCF of 0.5, based on the values used by other countries (United States of America and Czech Republic). CH₄ emissions from wastewater handling decreased by 90.5 per cent from 1990 (54.10 Gg) to 2007 (5.13 Gg). The ERT commends the Party for the improvements made in reporting, such as the separation of emissions from wastewater and sludge treatment. The ERT encourages Germany to provide a justification that the MCF value represents the country-specific conditions.

99. Germany does not estimate CH₄ emissions from industrial wastewater and sludge treatment, but the ERT finds that the information provided by the Party is not transparently presented in the NIR and CRF tables, whether emissions occur and are under-estimated, or if the CH₄ generated is fully recovered, as explained in the footnotes to CRF table 6.B. Germany plans to start in 2010 a research project to assess the production of biogas and CH₄, and its recovery from industrial wastewater systems. The ERT welcomes the effort made by Germany to improve completeness, and recommends that Germany improve its reporting for this category, in particular if CH₄ is generated and fully recovered, the quantity recovered should be reported in CRF table 6.B.

C. Non-key categories

1. Waste incineration – CO₂, CH₄ and N₂O

100. The NIR explains that in Germany waste incineration is conducted solely for energy recovery, which is the reason why emissions are not reported and discussed in the waste sector, but are reported in the energy sector. The ERT recommends that Germany provide relevant background quantitative and qualitative information on the waste that goes to incineration facilities in order to improve transparency in the next annual submission.

2. Other composting/mechanical/biological waste treatment – CH₄ and N₂O

101. Germany reports CH₄ and N₂O emissions from composting and mechanical-biological waste treatment under the category other (waste). The ERT noted that, in accordance with CRF table 8(a), emissions of CH₄ from composting were recalculated for the period 2004–2006, but the NIR states that no recalculations were carried out for this subcategory. During the review, Germany explained that recalculations were made after updated AD were made available after the latest inventory submission. Germany is encouraged to provide the background information on recalculations in the NIR in order to improve transparency. In response to the draft review report Germany informed the ERT that it intends to address this recommendation in the next annual submission.

102. Germany uses country-specific EFs by waste type and by technology type, and references are provided in the NIR. Given the relatively rapidly increasing trend of this category, the ERT recommends that Germany include in the NIR the AD in its next annual submission.

VII. Supplementary information required under Article 7, paragraph 1, of the Kyoto Protocol

A. Information on Kyoto Protocol units

1. Standard electronic format and reports from the national registry

103. Germany reported information on its accounting of Kyoto Protocol units in the appropriate SEF tables, as required by decisions 15/CMP.1 and 14/CMP.1. The ERT took note of the findings included in the SIAR on the SEF tables and their comparison report.⁸ 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.

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

2. National registry

105. The ERT took note of the SIAR and its finding that the reported information on the national registry is complete and has been submitted in accordance with the annex to decision 15/CMP.1. The ERT further noted from the SIAR and its findings that the national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1, and continues to adhere to the technical standards for data exchange between registry systems in accordance with decisions 16/CP.10 and 12/CMP.1. The national registry fulfilled requirements regarding the public availability of information in accordance with paragraphs 45–48 of the annex to decision 13/CMP.1. The national registry has adequate security, data safeguard and disaster recovery measures in place and its operational performance is adequate.

3. Calculation of the commitment period reserve

106. Germany did not report its commitment period reserve in its 2009 annual submission. In response to questions raised by the ERT during the review, the Party reported that its commitment period reserve has not changed since the initial report review (4,381,287,024 t CO₂ eq), as it is based on the assigned amount and not the most recently reviewed inventory. The ERT agrees with this figure. The ERT recommends that the Party include information on its commitment period reserve in its next annual submission.

B. Changes to the national system

107. Germany reported changes in its national system since the previous annual submission. The information is included in the NIR in the chapter 'Inventory improvements', which is dedicated to

⁸ The SEF tables comparison report is prepared by the administrator of the international transaction log (ITL) 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.

recalculations (table 130 of the NIR). The ERT acknowledges the following changes in the national system:

- (a) The co-ordination committee was established in 2008, consisting of representatives of several ministries. The role of this committee is to handle all questions arising in the national system and to be responsible for official discussion and approval of the inventories and all reporting requirements under the Kyoto Protocol. The co-ordination committee also has the role of identifying key categories and setting the minimum requirements for QA/QC;
- (b) The role of FAL in the preparation of the inventory for the agriculture and LULUCF sectors was transferred to the vTI. The vTI was commissioned to implement reporting under Article 3, paragraphs 3 and 4, of the Kyoto Protocol.

108. The ERT concludes that, taking into account the confirmed changes in the national system, the Party's national system continues to be in accordance with the requirements of national systems outlined in decision 19/CMP.1. The ERT recommends that the Party, in its next annual submission, continue to report any changes in its national system in accordance with section I.F of the annex to decision 15/CMP.1. Although the required information about changes in the national system is included in the NIR, the ERT encourages the Party to report the information in a more transparent way, for example by using a separate section under the reporting of supplementary information required under Article 7, paragraph 1, of the Kyoto Protocol and by following the annotated outline of the NIR.

C. Changes to the national registry

109. Germany reported no change in its national registry since the previous annual submission. However, the SIAR identifies changes in the national registry. These include the improvement of security measures, the improvement of the list of information that is publicly accessible, and the provision of supplementary test results that were previously not submitted. The ERT concludes that, taking into account the confirmed changes in the national registry, 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 CMP decisions. The ERT recommends that the Party report in its next annual submission any change(s) in its national registry in accordance with section I.G of the annex to decision 15/CMP.1.

VIII. Conclusions and recommendations

110. Germany made its annual submission on 8 April 2009, and the NIR was submitted on 15 April 2009. The Party indicated that the 2009 annual submission is a voluntary submission under the Kyoto Protocol. The annual submission contains the GHG inventory (comprising CRF tables and an NIR) and supplementary information under Article 7, paragraph 1, of the Kyoto Protocol (information on Kyoto Protocol units and information on changes to the national system and the national registry). This is in line with decision 15/CMP.1.

111. The ERT concludes that the inventory submission of Germany was prepared and reported generally in accordance with the UNFCCC reporting guidelines. The inventory submission is complete and the Party has submitted a complete set of CRF tables for the years 1990–2007 and an NIR; these are complete in terms of geographical coverage, years and sectors, as well as generally complete in terms of categories and gases. Some of the categories were reported as "NE", including: CO₂ and CH₄ fugitive emissions from oil; CH₄ from flaring in oil, natural gas and combined oil, and natural gas; CH₄ from enteric fermentation and manure management, and N₂O from manure management from mules and asses; N₂O from N-fixing crops; changes in carbon stock in DOM and mineral and organic soils in forest land; and CH₄ and N₂O from biomass burning from wildfires. Germany stated that it will include estimates of emissions and removals for all of these categories in the next annual submission.

112. The submission on a voluntary basis of information required under Article 7, paragraph 1, of the Kyoto Protocol was prepared and reported in accordance with decision 15/CMP.1, including information on: the accounting of Kyoto Protocol units, and changes in the national system and in the national registry. However, Germany did not report on a voluntary basis on activities under Article 3, paragraph 3 and 4, of the Kyoto Protocol, or provide information on the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol.

113. The Party's inventory does not follow completely the Revised 1996 IPCC Guidelines, the IPCC good practice guidance and the IPCC good practice guidance for LULUCF. Germany decided to adopt for the first time methodologies and default EFs from the 2006 IPCC Guidelines, in particular in a extensive way for the agriculture sector, and the ERT concludes that the Party did not perform these recalculations with a clear justification that the methodologies and EFs used are in accordance with the IPCC good practice guidance and the UNFCCC reporting guidelines. Germany acknowledged this finding at the time of the review and, in response to the draft review report, reiterated its intention to address these recommendations in its next annual submission.

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

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

116. 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.

117. In the course of the review, the ERT formulated a number of recommendations.⁹ The key recommendations are that Germany in the next annual submission:

- (a) Ensure the completeness of the inventory, by providing emission estimates for those categories currently reported as "NE" and for which methods for estimating emissions are available in the Revised 1996 IPCC Guidelines or in the IPCC good practice guidance;
- (b) Enhance the transparency of reporting in the NIR, in particular for the agriculture and LULUCF sectors when higher tier methods are used or the methodologies and EFs diverge from those in the Revised 1996 IPCC Guidelines or the IPCC good practice guidance, and incorporating materials that are usually only submitted as additional information or provided in response to the reviews;
- (c) Report the key category analysis fully in line with the IPCC good practice guidance and the IPCC good practice guidance for LULUCF;
- (d) Ensure that the use of methods and default EFs and parameters from the 2006 IPCC Guidelines is in accordance with the IPCC good practice guidance and the UNFCCC reporting guidelines for all sectors, and in particular for the agriculture sector;
- (e) Improve the timeliness of completion of the energy balances, in order to improve the accuracy of emission estimates for the energy sector, the sector responsible for the major part of total emissions;
- (f) Improve plans to increase the completeness of the inventory, in accordance with the information provided by the Party during the centralized review, by providing estimates

⁹ For a complete list of recommendations, the relevant chapters of this report should be consulted.

of emissions and removals for the categories reported as “NE”, if methods are available in the Revised 1996 IPCC Guidelines or the IPCC good practice guidance.

IX. Questions of implementation

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

Annex I**Documents and information used during the review****A. Reference documents**

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

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

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

Intergovernmental Panel on Climate Change. *Good Practice Guidance for Land Use, Land-Use Change and Forestry*. Available at <<http://www.ipcc-nggip.iges.or.jp/public/gp/landuse/gp/landuse.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 2009. Available at <<http://unfccc.int/resource/docs/2009/asr/deu.pdf>>.

Synthesis and assessment report on the greenhouse gas inventories submitted in 2009. Available at <<http://unfccc.int/resource/webdocs/sai/2009.pdf>>.

FCCC/ARR/2008/DEU. Report of the individual review of the greenhouse gas inventory of Germany submitted in 2007 and 2008. Available at <<http://unfccc.int/resource/docs/2009/arr/deu.pdf>>.

UNFCCC. Standard independent assessment report, Parts I and II. Unpublished document.

B. Additional information provided by the Party

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

Dämmgen, U., Haenel, D., Lüttich, M., Döhler, H., Eurich-Menden, B., Osterburg, B. *Calculations of Emissions from German Agriculture – National Emission Inventory Report (NIR) 2007 for 2005. Volumes I and II.* (Berechnungen der Emissionen aus der deutschen Landwirtschaft – Nationaler Emissionsbericht (NIR) 2007 für 2005. Sonderheft 304 (Band 1): Einführung, Methoden und Daten (GAS-EM); Sonderheft 304 A). Landbauforschung Völkenrode, Bundesforschungsanstalt für Landwirtschaft (FAL).

Ulrich Dämmgen. 2009. *Calculations of Emissions from German Agriculture – National Emission Inventory Report (NIR) 2009 for 2007. Volumes I and II.* (Berechnungen der Emissionen aus der deutschen Landwirtschaft – Nationaler Emissionsbericht (NIR) 2009 für 2007. Sonderheft 324 (Band 1): Einführung, Methoden und Daten (GAS-EM); Sonderheft 324 A). Special issues SH324 and 324a. vTI Agriculture and Forestry Research (Landbauforschung).

Weiss, M., Neelis, M. and M. Patel. 2006. *Estimating CO₂ Emissions from the Non- Energy Use of Fossil Fuels in Germany. Final Report, 15 November 2006.* Federal Environmental Agency (Umweltbundesamt UBA), Dessau, Germany.

Annex II**Acronyms and abbreviations**

AD	activity data	IPCC	Intergovernmental Panel on Climate Change
AWMS	animal waste management system	ITL	international transaction log
CH ₄	methane	kg	kilogram (1 kg = 1 thousand grams)
CO ₂	carbon dioxide	LULUCF	land use, land-use change and forestry
CO ₂ eq	carbon dioxide equivalent	MCF	methane conversion factor
CRF	common reporting format	N	nitrogen
CMP	Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol	NE	not estimated
DOC	degradable organic carbon	NH ₃	ammonia
DOM	degradable organic matter	NMVOC	non-methane volatile organic compound
EF	emission factor	NO	not occurring
ERT	expert review team	N ₂ O	nitrous oxide
EU ETS	European Union emissions trading scheme	NIR	national inventory report
F-gas	fluorinated gas	PFCs	perfluorocarbons
GHG	greenhouse gas; unless indicated otherwise, GHG emissions are the sum of CO ₂ , CH ₄ , N ₂ O, HFCs, PFCs and SF ₆ without GHG emissions and removals from LULUCF	QA/QC	quality assurance/quality control
HFCs	hydrofluorocarbons	SEF	standard electronic format
IE	included elsewhere	SF ₆	sulphur hexafluoride
IEA	International Energy Agency	SIAR	Standard independent assessment report
IEF	implied emission factor	TJ	terajoule (1 TJ = 10 ¹² joule)
		UNFCCC	United Nations Framework Convention on Climate Change
