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Report of the individual review of the greenhouse gas inventory of Germany submitted in 2005*

* In the symbol for this document, 2005 refers to the year in which the inventory was submitted, and not to the year of publication.

CONTENTS

I. Overview

A. Introduction

1. This report covers the centralized review of the 2005 greenhouse gas (GHG) inventory submission of Germany, coordinated by the United Nations Framework Convention on Climate Change (UNFCCC) secretariat, in accordance with decision 19/CP.8. The review took place from 10 to 15 October 2005 in Bonn, Germany, and was conducted by the following team of nominated experts from the roster of experts: Generalists – Mr. Riccardo de Lauretis (Italy) and Mr. Tinus Pulles (the Netherlands); Energy – Mr. Simon Eggleston (United Kingdom of Great Britain and Northern Ireland), Mr. Tomas Gustafsson (Sweden) and Mr. Francis Yamba (Zambia); Industrial Processes – Ms. Maria Jose Lopez (Belgium) and Ms. Virginia Sena (Uruguay); Agriculture – Mr. Jorge Alvarez (Peru) and Ms. Britta Hoem (Norway); Land Use, Land-use Change and Forestry (LULUCF) – Mr. Sandro Federici (European Community) and Walter Oyhantçabal (Uruguay); Waste – Mr. Faouzi Ahmed Senhaj (Morocco) and Mr. Jose Villarin (Philippines). Mr. Tinus Pulles and Mr. Jose Villarin were the lead reviewers. The review was coordinated by Mr. Harald Diaz-Bone and Mr. Javier Hanna (UNFCCC secretariat).

2. In accordance with the "Guidelines for the technical review of greenhouse gas inventories from Parties included in Annex I to the Convention", a draft version of this report was communicated to the Government of Germany, which provided comments that were considered and incorporated, as appropriate, in this final version of the report.

B. Inventory submission and other sources of information

3. In its 2005 submission, Germany submitted a complete set of common reporting format (CRF) tables for the years 1990–2003, a complete set of LULUCF tables and a national inventory report (NIR). Where needed, the expert review team (ERT) also used previous years' submissions, additional information provided during the review and other information. The full list of materials used during the review is provided in the annex to this report.

C. Emission profiles and trends

4. In 2003, the most important GHG in Germany was carbon dioxide (CO_2), contributing 85.0 per cent to total[1] national GHG emissions expressed in CO_2 equivalent, followed by methane (CH_4), 7.4 per cent, and nitrous oxide (N_2O), 6.3 per cent. Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6) taken together contributed 1.3 per cent of the overall GHG emissions. The Energy sector accounted for 85.2 per cent of total GHG emissions, followed by Agriculture (8.6 per cent), Industrial Processes and Solvent and Other Product Use (4.9 per cent) and Waste (1.4 per cent). Total GHG emissions amounted to 1,017,511 Gg CO_2 equivalent and decreased by 18.2 per cent from 1990 to 2003.

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

D. Key categories

5. Germany has reported a key category tier 1 analysis, both level and trend assessment, as part of its 2005 submission. The Party performed the key category analysis at a more detailed level than the secretariat.[2] The results of the two analyses are similar and largely consistent.

E. Main findings

6. The NIR provides clear and detailed information on the methods applied, the activity data (AD) and the emission factors (EFs) used. The German submission is therefore generally very transparent and well organized, and almost all necessary information is provided. A number of details could, however, be further improved. Areas of such possible improvements were identified by the ERT and are reported in detail in the following sections.

F. Cross-cutting topics

1. Completeness

7. Germany has provided inventory data for the years 1990–2003 and included all the required tables. The notation keys are used throughout the tables. Germany has provided the LULUCF reporting tables as required by decision 13/CP.9 for the years 1990–2003. However, data are not included in the following tables of the LULUCF CRF: Summary 3 (1990–2002), and tables 7, 9 and 10 (1990–2003).

2. Transparency

8. Germany's 2005 submission is transparent and well documented. Germany's NIR is well structured and contains a detailed table of contents, lists of figures and tables that provide rapid access to specific information in the NIR, despite the considerable size of the document (506 pages). The ERT noted that accessibility could be slightly improved by using consecutive page numbering, as Germany did in its 2004 NIR, instead of restarting numbering in each chapter.

9. Germany's NIR contains a clear and concise summary, providing a quick overview of all major modifications in the methods and EFs applied. It also clearly summarizes the follow-up of the 2004 in-country review. The ERT noted that Germany has not followed the recommendation of the 2004 review report that it should make more use of annexes to provide detailed technical information. The ERT reiterates this recommendation that Germany should consider making further use of annexes for such details in order to improve readability.

3. Recalculations and time-series consistency

10. The ERT noted that recalculations reported by the Party of the time series 1990–2003 had been undertaken to take into account improved methods, and updates of AD and EFs. The major changes include: improvement of the CH_4 and N_2O EFs in Stationary Combustion and Aviation; updated AD and EFs in the Agriculture sector; and updated CH_4 EFs for Industrial Processes. The rationale for these recalculations is provided in the NIR.

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[2] The secretariat identified, for each individual Party, those source categories which are key categories in terms of their absolute level of emissions, applying the tier 1 level assessment as described in the Intergovernmental Panel on Climate Change *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*. Key categories according to the tier 1 trend assessment were also identified for those Parties providing a full CRF for the year 1990. Where the Party has 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.

11. The secretariat compared the emissions data contained in CRF summary table 2 as submitted in 2005 with the corresponding data submitted in 2004, and the result of this comparison was checked against the recalculations that the Party has reported for the latest year (2002) and the base year (1990) in CRF table 8(a). This comparison shows inconsistencies in the estimates of CH_4 from Energy (in 1990 and 2002), of N_2O from Waste (in 1990), and of SF_6 from Industrial Processes (in 2002). The ERT recommends that the Party correct these inconsistencies in its next submission.

4. Uncertainties

12. Germany has provided detailed information on uncertainties in the sectoral chapters of the NIR. Aggregated uncertainties are calculated and reported using the tier 1 approach. In doing this, Germany has followed the recommendation of the 2004 review. The NIR does not provide information on how the results of the uncertainty assessment are used in prioritizing inventory improvements. The ERT recommends that Germany use these results in planning and carrying out improvements to the inventory.

5. Verification and quality assurance/quality control approaches

13. The NIR states that a quality assurance/quality control (QA/QC) plan is being prepared. This work is still to be completed. Germany reports in the NIR that in November 2003 a trial period of QA/QC procedures started at the level of data delivered to the National Coordinating Agency[3] in relation to data consistency, follow-up of earlier reviews, and data available to the agency from independent sources. The implementation of the requirements of 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) in the preparation of the inventory and a complete assessment of uncertainties on the basis of the QA/QC plan are still ongoing.

6. Follow-up to previous reviews

14. Germany has implemented a number of the recommendations of the 2004 in-country review, in particular regarding the harmonization of the time series, the completeness and consistency of the CRF, and the timeliness of the submission.

G. Areas for further improvement

1. Identified by the Party

15. The NIR identifies several areas of improvements of the national emissions inventory, especially regarding the EFs and AD used in all the sectors, on the basis of the QA/QC plan. The formulation of a proposal for suitable institutional arrangements of the national inventory system by the end of 2005 is also planned.

2. Identified by the ERT

16. The ERT recommends that the Party consider the following cross-cutting issues for improvement. The Party should:

(a) Provide the reference approach in full detail for the years 2000 and later as these are essential as an independent cross-check on the quality of the reporting in Energy sector;

(b) Report emissions from coke use in Iron and Steel Production in the Industrial Processes sector, rather than as part of fuel combustion activities in the Manufacturing Industries and Construction category;

[3] Nationale Koordinierungsstelle für das Nationale System Emissionsinventare nach Klimarahmenkonvention und Kioto-Protokoll beim Umweltbundesamt.

(c) Estimate and report (as memo items) emissions of CO_2 from biomass combustion, and to distinguish clearly and report separately the biomass fractions in solid fuels;

(d) Improve the completeness of the CRF, especially the LULUCF tables;

(e) Use the QA/QC and the uncertainty assessment to plan improvements to the inventory;

(f) Quantify uncertainties for the LULUCF sector.

17. Recommended improvements relating to specific source/sink categories are presented in the relevant sector sections of this report.

II. Energy

A. Sector overview

18. In 2003, the Energy sector accounted for 85.2 per cent of total national GHG emissions. CO_2 comprised 97.1 per cent of emissions from the Energy sector, while CH_4 and N_2O contributed 1.8 per cent and 1.1 per cent, respectively. Fuel combustion accounted for 98.4 per cent of the sectoral emissions, and fugitive emissions for the remaining 1.6 per cent. Energy Industries were clearly the largest contributor to the sectoral total (42.3 per cent in 2003), followed by Other Sectors (20.7 per cent), Transport (20.2 per cent) and Manufacturing Industries and Construction (15.0 per cent).

19. Total GHG emissions from the Energy sector decreased by 16.4 per cent over the period 1990–2003. Section 2.2 of the 2005 NIR explains that the reduction in CO_2 emissions is closely linked to developments in the Energy sector. In this sector, fuel conversions, efficiency improvements via construction of new facilities – especially in the new Länder – and extensive energy-saving measures have led to a considerable decrease in emissions.

20. CO_2 emissions from biomass are generally reported as "0.00". The Party states that it is in accordance with the UNFCCC "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 revised UNFCCC reporting guidelines) to report "CO_2 – neutrally". However, the ERT noted that the IPCC good practice guidance (chapter 2 section 2.2.1.4) requires that estimates of CO_2 emissions from biomass are reported as memo items, but not included in the national totals. The Party is recommended to include the estimates for CO_2 emissions from biomass in the CRF tables.

21. The ERT noted that in some categories (e.g. Manufacture of Solid Fuels and Other Energy Industries) combusted waste has been included in solid fuels. This results in variations in the implied emission factor (IEF), as the biogenic portion of the carbon is deducted. The ERT recommends that the Party include biogenic waste as biomass and to use the appropriate EF. Also, the ERT recommends that Germany report waste used as a fuel under "other fuels" and the biomass fraction therein under biomass as a memo item. This will make it possible to estimate the biogenic CO_2 emissions without including these in the national totals.

22. It was noted that in some places there is a discontinuity in the time series between 1994 and 1995 (e.g., the IEF for CO_2 for gaseous fuels from Public Electricity and Heat Production). All these discontinuities are small but the cumulative impact might be significant. The Party discusses in the NIR the measures taken to ensure that the data for 1990 and 1991–1994 are consistent with those for subsequent years. The ERT encourages Germany to conclude this work and incorporate the results in its next submission.

23. In a number of categories there are unusual changes in the trends of both the IEF and emissions, including the AD: the IEF for CO_2 for other fuels for Manufacturing Industries and Construction; fuel

consumption for Road Transportation; the IEF for N_2O for gasoline in Road Transportation; the IEF for CO_2 for solid fuels for Other Sectors; CH_4 emissions for Coal Mining and Handling; and the IEF for CH_4 for Fugitive Emissions from Oil and Natural Gas. The ERT recommends that Germany explain these changes in the next NIR.

24. For Manufacturing Industries and Construction the aggregated values for emissions and AD are provided, but not the disaggregated values for the individual subcategories, which are reported as "included elsewhere" ("IE"). The Party is again encouraged to provide emission figures for the subcategories of Manufacturing Industries and Construction.

B. Reference and sectoral approaches

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

25. For the years 1990 to 2003, CO_2 emissions from fuel combustion have been calculated using the reference approach and the sectoral approach. However, the results of the reference approach for the years 2000 to 2003 are based on aggregated preliminary figures of energy consumption, since a more detailed energy balance was not yet available for these years. Germany reports in the documentation box of CRF table 1.A(c) that the results are marked as preliminary and will be recalculated and replaced after the publication of the energy balance for this period. Also in its response to questions raised during earlier stages in the 2005 review, the Party indicated that complete balances for 2000 onwards are expected to be available in future submissions. In 2003, there is a difference of 1.4 per cent in the CO_2 emission estimates between the two approaches. The NIR provides reasons for the differences between the two approaches over the years. For 1990 and 1991, table 1.A(c) has not been completed. The ERT urges the Party to submit a complete time series for the reference approach in its future submissions.

26. The ERT noted systematic differences between the reference and sectoral approaches, which are largely due to non-energy-related consumption of fuels. The Party addresses the issue of non-energy-related combustion in the reference approach. In its response to questions raised during earlier stages in the 2005 review, Germany stated that the share of feedstocks that is combusted, and inevitably emitted (after the removal of carbon stored), is only partly included in the emissions estimates for Energy in the sectoral approach for the whole time series. It is strongly recommended that Germany correct this deficiency in its next submission. The Party explains that the relevant methods are currently being improved. The ERT recommends that Germany undertake comparisons with the non-energy consumption of fuels in the Industrial Processes sector in order to clarify the rationale behind these differences.

27. The International Energy Agency (IEA) AD for jet kerosene (8,472 TJ) for the year 2003 are 85.5 per cent lower than the AD for jet kerosene shown in the 2003 CRF (58,523 TJ). While the IEA data and the CRF data will not match, since the Party assumes a ratio of 20 : 80 for domestic : international jet kerosene, the figures for overall fuel consumption of jet kerosene should be consistent. The Party is encouraged to check whether there are differences in the overall level of jet kerosene consumption between the IEA data and the data in the CRF tables (1.A(a)s3 and 1.C. In its response to the draft review report, Germany informed that the domestic jet kerosene reported by the IEA is not in accordance with the definition given in the IPCC good practice guidance. The ERT invites Germany to explain this issue in the next NIR.

2. International bunker fuels

28. AD and emissions from jet kerosene and aviation gasoline for Aviation Bunkers are reported as "not estimated" ("NE"); however, 234,092 TJ is reported as the total for Aviation Bunkers (IEA reports 301,424.48 TJ; the IEA data were delivered by the Federal Ministry of Economy and Technology). The absolute amount of aviation gasoline is of minor importance, and the German energy balance therefore

does not publish a separate value. The ERT recommends that the Party report data for aviation gasoline as "IE".

29. The Party assumes a 20 : 80 split between domestic and international aviation. The ERT understands that Germany expects a more detailed modelled approach to become available in future. The ERT recommends that the Party improve on its calculation of this split by using a method that is consistent with the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Revised 1996 IPCC Guidelines), if its own detailed approach is not ready for use in time for the next inventory.

30. Activity data and emissions from gasoline, lubricants and coal for Marine Bunkers are reported as "NE". The ERT noted that "NE" in table 1.C should read "IE". In response to questions raised by the ERT during the earlier stages in the 2005 review, the Party stated that this will be corrected in its next submission.

C. Key categories

1. Civil aviation: Liquid – CO_2

31. The IEFs for CO_2 from jet kerosene for Civil Aviation (73.27 t/TJ until 1999 and 74.0 t/TJ subsequently) are the highest of reporting Parties and higher than the IPCC default value (72.8 t/TJ). The ERT noted that the step change in EF between 1999 and 2000 produces a time-series inconsistency. The Party explained in its response to the draft review report that the EF is derived from the assumption that jet kerosene would typically be dodecane ($C_{12}H_{23}$). The ERT notes that jet kerosene however is a mixture with important quantities of decane and undecane, apart from a range of other petrochemicals. The ERT recommends that Germany review this issue and to improve the time series inconsistency in the next submission.

2. Fugitive emissions from coal mining and handling: Coal – CH_4

32. CH_4 emissions from Coal Mining and Handling show an unusual trend: the 2003 value is 73.2 per cent lower than the 1990 value. The Party states that the method used to calculate these emissions will be updated for its next submission, with changes to both the AD and the EFs. The ERT encourages the Party to update the methodology in time for the next submission and to describe the new method and any trends clearly in its next NIR.

3. Fugitive emissions from oil and natural gas: Natural gas, oil – CH_4, CO_2

33. Previous reviews have stated that efforts should be made to differentiate the data for Venting and Flaring according to the CRF tables. Germany has stated that this is most likely to happen in 2006 in conjunction with the implementation of the European Union Emissions Trading Directive. This effort is encouraged by the ERT since the EFs for Venting and Flaring differ from those for the other sources. At present, the notation key "IE" is used for CO_2 from Flaring. The ERT recommends that, since no CO_2 emissions are currently estimated, "NE" should be used.

34. Oil category shows a strong decline, with emissions in 2003 being 39.3 per cent lower than the 1990 value. The NIR explains that this trend is mainly due to the introduction of vapour-tight machinery, sealing systems and vapour-recovery equipment in refineries. However, the NIR states that the EF used for Refining/Storage is assumed to be 10 per cent of the EF for non-methane volatile organic compounds (NMVOCs). It also states that the origin of the EF for NMVOC is not sufficiently substantiated. The ERT therefore recommends the Party either to use an IPCC default or to validate and document in the NIR both the 10 per cent assumption and the varying EFs for NMVOC.

D. Non-key categories

1. Navigation: Liquid – CO_2

35. The trend in fuel consumption emissions from Navigation is unusual. The 2003 value is 62.5 per cent lower than the 1990 value. The Party reports in the NIR that this is caused by responses to changes in tax regimes, causing foreign ships to bunker in Germany or German ships to bunker abroad. The Party is encouraged to devise a method of correctly distinguishing domestic and international shipping according to the definitions given in the IPCC good practice guidance.

2. Fugitive emissions from coal mining and handling: Coal – CO_2

36. As noted in previous reviews, fugitive emissions of CO_2 have not been estimated in the German inventory. For emissions from Coal Mining and Handling, the NIR states that an ongoing project on estimating CH_4 emissions will investigate whether the available data can be used as a basis for estimating CO_2 and N_2O emissions from this source as well. The ERT noted that these releases may be significant and recommends that such efforts should also cover corresponding emissions from oil and gas operations (see paragraph 37 below). The Party is encouraged to report these emissions in its future submissions.

3. Fugitive emissions from oil and natural gas: Natural gas, oil – CO_2

37. Some of the CO_2 emissions are reported as "NE". The Party has announced that emissions estimates for Oil – Transport will be made in future years. The ERT encourages these plans and recommends that Germany provide appropriate documentation both in the CRF and in the NIR of its next submission.

III. Industrial Processes and Solvent and Other Product Use

A. Sector overview

38. In 2003, the Industrial Processes sector in Germany accounted for 4.7 per cent of total national GHG emissions and Solvent and Other Product Use for 0.2 per cent. CO_2 accounted for 49.6 per cent of sectoral emissions in 2003, N_2O for 21.8 per cent (mainly from nitric acid and adipic acid production), and actual emissions of fluorinated gases (F-gases) for 27.7 per cent (HFCs alone accounting for 17.3 per cent). In the period 1990–2003, CO_2 equivalent emissions from Industrial Processes decreased by 20.7 per cent, mainly because of decreases in N_2O emissions as a result of the introduction of abatement measures in adipic acid production.

39. The ERT acknowledged Germany's improvements to the inventory as compared to previous submissions, such as the review and updating of the AD for Cement Production and Lime Production, and the inclusion of Calcium Carbide as well as estimates of Methanol and Ethylene Dichloride emissions.

40. According to the information provided in the 2005 NIR, no calculations have been made for the source categories 2.A.3 Limestone and Dolomite Use, 2.A.4 Soda Ash Production and Use, 2.A.5 Asphalt Roofing and 2.C.2 Ferroalloys Production. The ERT noted that Germany plans to estimate emissions from these categories as soon as data are available and welcomes the planned improvements. The ERT encourages the Party to provide estimates for these categories in its next submission.

41. In the Solvent and Other Product Use sector, only N_2O and NMVOC emissions are reported. Germany assumes these emissions to be constant over the whole time series. The ERT recommends that Germany provide a time series and encourages it to estimate emissions of other gases and the other sources in order to improve the completeness of the inventory.

B. Key categories

1. Cement production – CO_2

42. According to the information provided in the NIR, a source-specific review of the CO_2 emissions from Cement Production for the period 1990–1999 will be carried out by the Party. The ERT welcomes the planned review and encourages the Party to check the consistency of the whole time series and to recalculate if necessary.

2. Lime production – CO_2

43. Emissions from the decomposition of limestone to produce lime are reported, but emissions from the decomposition of dolomite to produce dolomitic "quick" lime are not estimated. Germany considers these emissions as less significant than emissions from the decomposition of limestone. The ERT encourages Germany to include an estimate of emissions from dolomite decomposition in this category in its next submission in order to improve the completeness of the inventory.

3. Nitric acid production – N_2O

44. The 2003 value for N_2O emissions from Nitric Acid Production is 40.9 per cent higher than the 1990 value. The trend is unstable and fluctuates. The reasons for changes in volumes of production are not explained, except for the sharp rise value from 2002 to 2003 (the number of production plants rose from four to six). The ERT encourages the Party to verify the changes in production volumes and include this information in the NIR.

45. The six different plants that produce nitric acid in Germany have different emissions abatement techniques. Because N_2O from Nitric Acid Production is a key category, the ERT encourages Germany to collect plant-specific data which take into account different production and emissions abatement technologies.

4. Aluminium production – PFCs

46. Primary aluminium production was identified as a key category by the Party following the trend assessment but not by the secretariat. Different AD are reported for Aluminium Production in tables 2.(I).A-G (Aluminium Production) and 2.(II).C,E PFCs from Aluminium Production). The ERT invites the Party to explain why the AD reported in these tables are different in future submissions.

5. Production of halocarbons and SF_6 – HFC-23

47. The 1996 IEF for the production of HCFC-22 (0.0074 kg/t) is the lowest of reporting Parties, and the 1997 IEF (1,152 kg/t) is the highest of reporting Parties. The ERT recommends that Germany validate the AD provided in 1997 and clarify the methods used to estimate emissions for the whole time series.

6. Consumption of halocarbons and SF_6 – HFCs, SF_6

48. Emissions from Other – Soundproof Glazing are reported as follows: "NE" (1991–1994), "0.00" (1995–2000) and 0.05 Gg (2001–2003). The estimates for emissions from Consumption of Halocarbons and SF_6 in 2002 and 2003 have the same value. The ERT encourages Germany to ensure time-series consistency for these sources.

C. Non-key categories

1. Ammonia production – CO_2

49. The trend in CO_2 emissions from Ammonia Production fluctuates. The 2003 value is 14.3 per cent higher than the 1990 value. Most of the increase from 1990 to 2003 is due to the 9.1 per cent increase between 2002 and 2003. Germany states that the estimate is based on AD, but the reason for changes in volumes of production are not explained. The ERT encourages the Party to identify and report the reasons for the increase in ammonia production.

50. As indicated in previous 2005 review stages, the IEF value for CO_2 from Ammonia Production (0.69 t/t) is the lowest of reporting Parties for the years 1990–2001, which is lower than the IPCC default value range (1.5–1.6 t/t), and is not well documented. Germany plans to begin using the IPCC default value range. The ERT recommends that Germany follow this approach.

2. Iron and steel production – CO_2

51. CO_2 emissions from Iron and Steel Production are reported as "IE". The explanation given in CRF table 8 (Completeness) is that CO_2 emissions are included in the Manufacturing Industries and Construction category of the Energy sector. In its response to questions raised during the previous 2005 review stages, Germany announced that it will estimate process and combustion emissions from iron and steel production separately in its next submission. The ERT encourages it to carry out this work as it will help to improve the transparency of the inventory and might identify Iron and Steel Production as a key category.

IV. Agriculture

A. Sector overview

52. In 2003, the Agriculture sector in Germany accounted for 8.6 per cent of total national GHG emissions, reaching 87,328 Gg CO_2 equivalent. Emissions in this sector decreased by 19.9 per cent between 1990 and 2003. In 2003, CH_4 emissions contributed 54.6 per cent to total sectoral emissions, and N_2O accounted for the remaining 45.4 per cent. Agricultural Soils, Manure Management and Enteric Fermentation were the major source categories in the sector, contributing 41.4 per cent, 29.8 per cent and 28.8 per cent, respectively.

53. Germany has made a detailed tier 1 key category analysis for both the level and the trend assessment, and identified the following key categories: Direct and Indirect Emissions from Agricultural Soils – N_2O; Enteric Fermentation in domestic livestock (Dairy and Non-Dairy Cattle) – CH_4; and Manure Management (Dairy and Non-Dairy Cattle, Swine) – CH_4. This is in line with the key category analysis made by the secretariat. The NIR provides a general description of the methodologies and data sources used. Germany has reported complete CRF tables for the whole time series in the Agriculture sector.

B. Key categories

1. Enteric fermentation – CH_4

54. The Party plans to upgrade the estimation of emissions from enteric fermentation to a tier 2 method from 2004 onwards. The ERT encourages these plans as this will bring Germany's approach into line with the IPCC good practice guidance.

55. The ERT noted that Germany reports the highest IEFs for Non-dairy Cattle (72.6 to 74.0 kg/head/year) of the reporting Parties. These IEFs are higher than the IPCC default value for Western Europe (48 kg/head/year). The ERT recommends that the Party validate the EFs used and explain the reason for the high value of the EF in its next submission.

2. Manure management – CH_4

56. The ERT noted that Germany reports the highest IEFs for Dairy Cattle (65.15 to 85.56 kg/head/year) of the reporting Parties. These IEFs are higher than the IPCC default value (14 kg/head/year). The ERT recommends that the Party validate the EFs used and explain the reason for the high value of the EF in its next submission.

57. The change in the IEF for CH_4 from Dairy Cattle between 1993 and 1994 (–27.5 per cent) has been identified as an outlier. The ERT encourages the Party to ensure consistency in the calculation of the EFs throughout the time series.

58. Germany's IEFs for Swine (ranging from 25.14 to 29.25 kg/head/year) are higher than the IPCC default value for cool regions (3 kg/head/year).

3. Animal production – N_2O

59. The value for nitrogen (N) excretion rate on Pasture Range and Paddock given in table 4.B(b) for 2003 (203,408,986 kg N) is not consistent with the value used as AD in table 4.D (196,058,233 kg N). The ERT encourages the Party to clarify this issue in its 2006 submission.

C. Non-key categories

Agricultural soils – NO_X

60. Germany reports emissions of nitrogen oxides (NO_X) from Agricultural Soils. The ERT noted that these emissions are high compared to the equivalent emissions reported by Austria and Switzerland, which are the only other Parties that report emissions data for NO_X. It was not clear to the ERT whether the N used in the calculations of NO_X influences the amount of N that is used as AD in the N_2O emission calculations. The ERT recommends that the Party clarify this issue in its 2006 submission.

V. Land Use, Land-use Change and Forestry

A. Sector overview

61. The ERT acknowledged the effort made by Germany to report its data using the LULUCF tables, pursuant to decision 13/CP.9.

62. In 2003, the LULUCF sector in Germany represented a net sink of –35,690.29 Gg CO_2 which offset 4.1 per cent of total CO_2 emissions. Comparing net CO_2 removals by the LULUCF sector in 2003 with those for 2002, the removals show a slight increase of 1.3 per cent. The time series shows that since 1990 the LULUCF sector has been a net sink throughout the period, with a growing trend, going from –28,943.98 Gg CO_2 in 1990 to –35,690.29 Gg CO_2 in 2003.

63. The NIR is well structured and most methodologies and sources of data are clearly explained in a concise manner. In general the methodologies used follow the IPCC *Good Practice Guidance for Land Use, Land-use Change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF), mostly using a tier 2 approach, and the emissions/removals calculations are appropriate for the LULUCF sector. Most AD and EFs have been derived from very detailed national studies and all sources of data are well documented. However, the ERT recommends that the Party avoid some repetition between the main text and the annexes to the NIR.

64. The ERT noted that a general problem of completeness and transparency derives from the system of detection of land use and tracking of land-use changes, as referred to in section 2.1 of IPCC good practice guidance for LULUCF. This problem results in two major consequences: the Party has not reconstructed, and consequently has not reported, a complete and consistent time series for any land use

since 1989, or for land-use change since 1990, which affects its category estimations in both directions (under- and overestimation); and the uncertainty analysis reported by the Party for the area designation (land representation) shows very high errors in the detection of land-use change, of up to 7,000 per cent. The ERT recommends that Germany combine inventory data with remote sensing techniques in order to be able to detect any land use and land-use change at national level, and reconstruct complete time series.

65. The ERT noted that many cells of the CRF tables have been left empty or filled in with "0.00". The ERT therefore recommends that the Party report either data or a notation key for all cells, as requested by the revised UNFCCC reporting guidelines (e.g. if, applying the stock change method, a net increase in living biomass results, then in the decrease column the notation key "not applicable" ("NA ") should be reported and if a net decrease results then "NA" should be entered in the increase column).

66. The ERT noted a format problem: Germany reports data in CRF tables 5.B, 5.C and 5.F by filling in the shaded cells of the tables (which are reserved for automatic calculation, i.e. summing) instead of using the appropriate blanks. The ERT recommends that Germany report data using the CRF Reporter software in order to avoid this problem.

67. An uncertainty analysis carried out for Forest Land Remaining Forest Land and for Cropland Remaining Cropland revealed both the high quality of Germany's forest statistics (both AD and EFs) and the need to improve the system of land representation (which Germany is already planning). The ERT encourages Germany to extend the uncertainty analysis to other categories.

B. Sink and source categories

68. The 2003 CRF tables include only estimates of CO_2 emissions/removals from LULUCF. Emissions of non-CO_2 gases are reported as "not occurring" ("NO") or "NE" for the different land categories. Net emissions and removals from soils are reported only for Cropland Remaining Cropland and Grassland Remaining Grassland, and for Carbon (C) Emissions from Agricultural Lime Application.

69. The ERT noted that in the NIR (page 14–69) for Fallow Land to Vineyards and for Grassland/Forest/Fallow Land to Cropland the EFs reported show a wrong sign (the EFs should be –15.2133 and –30.4266, respectively). The ERT recommends that Germany correct them and check the cases where they have been applied in estimating changes in carbon stock for mineral soil as a result of land-use changes.

1. Forest land

70. The ERT noted that, even if N_2O and CH_4 emissions from forest fires are small, they do occur. It therefore recommends that Germany replace the notation key "NO" by "NE". Since Germany reports accurate data on AD for forest fires in the NIR and has a new and detailed forest inventory, the ERT considers that it should be feasible for the Party to provide data on non-CO_2 emissions by forest fires.

2. Cropland

71. In section 14.5.2.3.2.2 of the NIR, Germany reports a C stock change in living biomass for the Land Converted to Cropland due to non-perennial crops which is consistent with the IPCC good practice guidance for LULUCF (section 3.3.2.1.1.2, page 3.87). However, the ERT noted that applying the provisions of the IPCC good practice guidance for LULUCF (sections 3.3, 3.3.1.1.1 and 3.3.2.1.1.1, pages 3.69 – 3.71 – 3.85), could have resulted in not reporting such C stock change. The ERT noted that this is not consistent with the IPCC good practice guidance for LULUCF because all the carbon contained in the biomass of a non-perennial crop present on a cropland is moved to other pools (e.g. soil) or to the atmosphere (e.g. harvest) in the same year in which is produced. The ERT therefore recommends the Party not to include non-perennial crop in the estimate of C stock changes in living biomass.

72. In Table 5(IV), Germany reports applications of lime and dolomite together because the national statistics do not make it possible to distinguish between them. The ERT recommends that, in order to be conservative, Germany could use as the EF for liming an average value between the limestone and dolomite EFs (i.e. 0.125 t C /t limestone or dolomite).

3. Grassland

73. Land Converted to Grassland is reported as a net source in the years 1990–1999 (1990–1992: 95.67 Gg CO_2; and 1993–1999: 65.69 Gg CO_2). For the years 2000–2003, this category is reported as net sink (–139.65 Gg CO_2). However, the area decreased by 26.8 per cent between 1999 (33.56 kha) and 2000 (24.55 kha). Germany indicated in its response to previous stages of the 2005 review that there was a problem in the data transmission and stated that corrections will be made in the 2006 submission.

VI. Waste

A. Sector overview

74. In 2003, the Waste sector accounted for about 1.4 per cent of Germany's total GHG emissions, with Solid Waste Disposal on Land contributing the largest portion (83.0 per cent) of emissions from this sector, and Waste-water Handling contributing the remaining 17.0 per cent. Emissions from the sector had decreased by 60.9 per cent since 1990. A continuous decrease of CH_4 emissions from landfills since 1992 accounts for most of this change (63.0 per cent from 1990 to 2003). CH_4 emissions from Waste-water Handling, although smaller in magnitude, decreased by 95.0 per cent between 1990 and 2003.

75. As already mentioned in the previous (2004) review report, the ERT recommends that Germany provide estimates for N_2O emissions from Waste-water Handling and complete the additional information tables in CRF tables 6.A and 6.B, as required by the revised UNFCCC reporting guidelines.

76. The NIR and CRF table 11 state that recalculations have been made for CH_4 emissions from Solid Waste Disposal on Land (cf. § 8.1.1.5). The ERT noted that this contradicts the information given in CRF table 8 for the years prior to 2003. The ERT recommends that Germany resolve this in its next submission.

77. The ERT recognizes Germany's problems in terms of availability of statistics in trying to set up a consistent time series. The ERT encourages the Party to continue investigations in this area. If a consistent time series is not available, the Party is recommended to use the splicing techniques provided in the IPCC good practice guidance.

B. Key categories

1. Solid waste disposal on land – CH_4

78. The value of the fraction of degradable organic carbon (DOC) in landfilled waste needs to be backed up by waste composition data. The ERT recommends that these waste composition data be provided in the NIR of Germany's next submission and presented as well in the "additional information" in CRF table 6.A.

79. Data on waste generation rate and number of sites with CH_4 recovery are not reported. The ERT recommends that the "additional information" table and the documentation box in CRF table 6.A be filled in and used to provide explanations.

2. Waste-water handling – CH_4

80. To clarify and simplify the presentation in the NIR of the waste-water handling systems in Germany, the ERT recommends that a schematic presentation (e.g. a flow diagram) be provided for Germany's future submissions. The terminology used in the NIR should be the same as that used in the IPCC documents (e.g. "municipal wastewater" instead of "domestic and commercial wastewater").

81. The ERT recommends that the Party investigate the inter-annual changes in the IEF for CH_4, notably in the period 1998–2000. The ERT noted that the change in AD for 1998 reported by the Party in the CRF tables does not resolve the issue.

82. In CRF table 6.B, CH_4 emissions from industrial waste water are reported as "NO". In the documentation box this is explained by the statement that "wastewater is generally treated aerobically in Germany". However, the NIR reports that the waste-water handling process includes anaerobic "purification" and that "gas formed is either used for energy recovery or flared off". The ERT noted that the notation key "NO" is therefore not appropriate. The ERT recommends that the Party report "NE"(as well as in reporting CH_4 emissions from sludge, for which currently the value 0.0 has been adopted) and include explanations in the documentation box.

C. Non-key categories

Waste-water handling – N_2O

83. The NIR reports N_2O emissions only from human sewage, but not from industrial or domestic and commercial waste-water handling. The notation key "NE" is used in CRF table 6.B without an explanation being given in the documentation box or in the NIR. The ERT recommends that the Party provide more information about and estimates of the key category Wastewater Handling in its 2006 submission.

Annex

Documents and information used during the review

A. Reference documents

IPCC. Good practice guidance and uncertainty management in national greenhouse gas inventories, 2000. Available at <http://www.ipcc-nggip.iges.or.jp/public/gp/english/>.

IPCC. Good practice guidance for land use, land-use change and forestry, 2003. Available at <http://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf.htm>.

IPCC/OECD/IEA. Revised 1996 IPCC Guidelines for national greenhouse gas inventories, volumes 1–3, 1997. Available at <http://www.ipcc-nggip.iges.or.jp/public/gl/invs1.htm>.

UNFCCC. 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/2004/8. Available at <http://unfccc.int/resource/docs/2004/sbsta/08.pdf>.

UNFCCC. 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>.

UNFCCC secretariat. Status report for Germany. 2005. Available at <http://unfccc.int/files/national_reports/annex_i_ghg_inventories/inventory_review_reports/application/pdf/2005_status_report_germany.pdf>.

UNFCCC secretariat. Synthesis and assessment report on the greenhouse gas inventories submitted in 2005. FCCC/WEB/SAI/2005. Available at <http://unfccc.int/files/national_reports/annex_i_ghg_inventories/inventory_review_reports/application/pdf/sa_2005_part_i_final.pdf>.

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B. Additional information provided by the Party

Responses to questions during the review were received from Mr. Michael Strogies (Federal Environmental Agency) including additional information on the methodology and assumptions used.

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