UNITED NATIONS
NATIONS UNIES

FRAMEWORK CONVENTION ON CLIMATE CHANGE - Secretariat
CONVENTION - CADRE SUR LES CHANGEMENTS CLIMATIQUES - Secrétariat

FCCC/WEB/IRI(3)/2003/DEU 26 February 2004

GERMANY

REPORT OF THE INDIVIDUAL REVIEW OF THE GREENHOUSE GAS INVENTORY SUBMITTED IN THE YEAR 2003[1]

(Centralized review)

I. OVERVIEW

A. Introduction

1. In accordance with decision 19/CP.8 of the Conference of the Parties, the United Nations Framework Convention on Climate Change (UNFCCC) secretariat coordinated a centralized review of the 2003 greenhouse gases (GHG) inventory submission of Germany. The review took place from 8 to 12 September 2003 in Bonn, Germany, and was conducted by the following team of nominated experts from the roster of experts: Generalists – Mr. Paul Filliger (Switzerland) and Ms. Helen Plume (New Zealand); Energy – Mr. Riad Chedid (Lebanon), Mr. Dario Gomez (Argentina) and Ms. Chia Ha (Canada); Industrial Processes – Ms. Kristina Saarinen (Finland) and Ms. Kristine Zommere (Latvia); Agriculture – Mr. Sergio González (Chile) and Mr. Vlad Trusca (Romania); Land-use Change and Forestry – Mr. Wojciech Galinski (Poland) and Mr. Goran Stahl (Sweden); Waste – Mr. Philip Acquah (Ghana) and Mr. Takashi Morimoto (Japan). Mr. Sergio González and Ms. Helen Plume were the lead reviewers of this review. The review was coordinated by Mr. Javier Hanna (UNFCCC secretariat).

2. In accordance with the UNFCCC "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 2003 submission, Germany submitted a complete set of common reporting format (CRF) tables for the years 1990–2001 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 annex 1 to this report.

C. Emission profiles and trends

4. In the year 2001, the most important GHG in Germany was carbon dioxide (CO_2), contributing 87.5 per cent to total[2] national GHG emissions expressed in CO_2 equivalent, followed by nitrous oxide (N_2O) – 6.1 per cent, and methane (CH_4) – 5.2 per cent. Perfluorocarbons (PFCs), hydrofluorocarbons (HFCs) and sulphur hexafluoride (SF_6) taken together contributed 1.2 per cent of the overall GHG

[1] In the symbol for this document, 2003 refers to the year in which the inventory was submitted, and not to the year of publication. The number (3) indicates that this is a centralized review report.

[2] In this report, the term total emissions refers to the aggregated national GHG emissions expressed in terms of CO_2 equivalent excluding Land-use Change and Forestry, unless otherwise specified.

emissions in the country. The Energy sector accounted for 87.8 per cent of total GHG emissions, followed by Agriculture (6.6 per cent), Industrial Processes (4.3 per cent), Waste (1.1 per cent) and Solvent and Other Product Use (0.2 per cent). Total GHG emissions (excluding Land-use Change and Forestry (LUCF)) amounted to 995,337 Gg CO_2 equivalent and decreased by 18 per cent from 1990 to 2001. The ERT considers that the trends for the different gases and sectors could be better explained in the NIR. The Party reports that this is of high priority and will be done within the 2004 NIR. In addition the ERT has concerns about time-series consistency (see section E below).

D. Key sources

5. Germany has reported a tier 1 key source analysis, both level and trend assessment, as part of its 2003 submission but based on the year 2000 instead of 2001. The key source analysis performed by the Party and the secretariat[3] produced slightly different results as a result of the difference in year of calculation and of a different split of the Energy sector. The Party is encouraged to use the latest year for key source calculation and to use a standard format for presentation in the main text of the NIR. The NIR indicates that the results of the key source analysis will be used to examine the tier 2 calculation methods recommended by 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).

E. Main findings

6. The transparency of Germany's inventory has been considerably enhanced by the submission of an NIR this year, and the ERT encourages Germany to continue its efforts in this area in the interests of closer conformity to the UNFCCC guidelines, particularly regarding the provision of information on the methods used in each sector and on the choice of emission factors (EFs). High priority should be given to developing a consistent time series in the CRF. Energy balances were calculated for the old and the new Länder separately until 1994, and after that date the calculations were made for Germany as a whole. At the same time, changes were made to the method of producing the national energy balance. The ERT is concerned about these changes in the mid-1990s because they may influence trends considerably. A more detailed discussion on the subject should be provided in the NIR, and the ERT considers the improvements planned by the Party in this field to be important. The Party points to a joint research project of EUROSTAT and the German Federal Environmental Agency (UBA) to get a consistent energy balance for Germany for the years 1990–1994. Consistent time series on Energy will be given in 1990–2002 CRFs. The ERT also encourages Germany to pay attention to the way it presents data in the LUCF sector, as the current application of "averaging" seems to be inconsistent with the IPCC methods. Germany intends to correct this deviation (refer to paragraph 53). Work is under way on quantifying uncertainties and addressing quality assurance/quality control (QA/QC) issues, and the ERT notes Germany's intention to cover these matters in its next submission.

F. Cross-cutting topics

Completeness

7. The ERT noted that the inventory is complete in terms of coverage of gases and source/sink categories. However, there are some gaps in the CRF: data for table 8 (recalculations) and table 9 (completeness) are missing for the whole time series, and tables 1.A(b) and 1.A(d) are missing for the years 2000 and 2001. With regard to the latter tables, the NIR explains that there is a two-year backlog

[3] The secretariat had identified, for each individual Party, those source categories which are key sources in terms of their absolute level of emissions, applying the tier 1 level assessment as described in the IPCC good practice guidance. Key sources 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 source analysis, the key sources presented in this report follow the Party's analysis. However, they are presented at the level of aggregation corresponding to a tier 1 key source assessment conducted by the secretariat.

of work on the German energy balance. The Party reports that this issue will be addressed in the 2004 NIR.

Transparency

8. The submission of an NIR for the first time has added greatly to the transparency of Germany's inventory reporting, but efforts to make the inventory more transparent where methods, recalculations and time-series consistency are concerned should continue. Documentation is essential to explain the methodological approaches and also to track changes made in response to findings from the review process. The ERT noted that the present NIR provides explanations of some of the issues raised in previous review reports, although more improvements are still needed. The Party reports that priority for 2004 improvements will be given to efforts to make the inventory more transparent in the methods used in the Energy sector and continuous improvement is in progress as part of the QC.

Recalculations and time-series consistency

9. The ERT noted that recalculations are missing in the CRF and the NIR (table 8 in the CRF is missing for all years). The Party states that significant changes in the inventory are anticipated in 2003, which will be included in the 2004 submission, and recalculations will not be provided until the 2005 submission. The ERT recommends that Germany should not wait until 2005 before reporting recalculations, as these should be incorporated into each annual submission according to the UNFCCC reporting guidelines. Germany, in response to the draft review, reported that recalculations are of high priority in the inventory improvement plan and standardized procedures for numerical recalculations will be made available in 2004 within the German inventory database. Time series seem to be consistent but the Party reported major changes of method in the calculation of the national energy balance in 1995 that could cause inconsistencies. The ERT presumes that these problems related to change in methods will be resolved with the above-mentioned improvement of the inventory.

Uncertainties

10. Some qualitative information (table 7 of the CRF) is available but no systematic quantitative uncertainty estimates are presented in the NIR. The Party reports that within the context of a new project a systematic determination of uncertainties will be available and will be included in its 2004 submission. The ERT encourages Germany to complete this work and to use the uncertainty analysis to prioritize further improvements to the inventory.

Verification and quality assurance/quality control approaches

11. Although no QA/QC plan in accordance with the IPCC good practice guidance is included in the NIR, the ERT noted the considerable efforts made to date in this direction. The NIR contains an outline of the project in this field that is under way, and the ERT understands that the results will be incorporated in the 2004 submission.

Follow-up to previous reviews

12. The most significant improvement since previous reviews is the provision of an NIR for the first time. The CRF tables are much more complete than those in earlier submissions and sectoral background tables are now available. In general, the Party has presented much more information, which makes a thorough review possible for the first time.

G. Areas for further improvement

Identified by the Party

13. The Party announces major changes for the next submission in terms of methods (e.g., for the calculation of indirect N_2O from agricultural soils), revision of EFs (e.g., for aviation), revision of

activity data (AD) (e.g., for road transport), the inclusion of uncertainty estimates and the introduction of a QA/QC plan.

Identified by the ERT

14. The ERT identified the following major areas for improvement related to cross-cutting issues in Germany's inventory: recalculation tables should be filled in; a quantified uncertainty estimate should be provided; a QA/QC management system should be set up; and attention should be given to time-series consistency when there are changes in methods. The ERT also recommends that, in line with the IPCC good practice guidance, Germany use the key source analysis to help identify where resources could be applied to improve its inventory reporting.

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

II. ENERGY

A. Sector overview

16. GHG emissions from the Energy sector (874,399 Gg of CO_2 equivalent) constituted 87.8 per cent of the total emissions of Germany in 2001. This sector includes ten key source categories, namely: six sources for CO_2 (coal, oil, gas and other fuels stationary combustion together with road transport and aviation transport), three sources for CH_4 (fugitive emission from coal, oil and gas operations, and stationary combustion of coal), and one source for N_2O (road transport).

17. The time series of CO_2 and N_2O emissions for the period 1990–2001 are estimated for fuel combustion activities. CH_4 emissions are presented for both energy categories 1.A. and 1.B, and are dominated by fugitive emissions. The general trends for CO_2, CH_4 and N_2O from 1990 to 2001 are a 14 per cent decrease, a 57 per cent decrease and a 5 per cent increase, respectively. The time series are presented as part of the CRF, and the overview of emission and removal trends is discussed in the NIR, although the specific trends for the Energy sector are not addressed. Nevertheless, the comment in the NIR on the cold weather conditions in 1996 and 2001 serves to explain the peaks observed in the CO_2 series. There is an abrupt decrease from 1994 to 1995 in the N_2O series for which no explanation is provided. This is only one of the sharp variations in the time series of the German submission, which are related to the fact that Germany is dealing with two systems of statistics. From 1990 to 1994 the Eastern and Western parts were treated separately and since 1995 the country has been dealt with as a whole. Data harmonization for these two periods will improve accuracy and transparency and serve to eliminate spurious fluctuations from the time series. The ERT acknowledges that this is a cumbersome task. Germany, in its response to the draft version of this report, comments that the decrease in the N_2O series is caused by inconsistent time series data in the source category 1.A 4 Other Sectors. This will be checked by the Party and eventually commented on in the 2004 inventory submission.

18. The CRF contains emission estimates for all direct and indirect GHGs relative to the Energy sector that were obtained using the sectoral approach. CO_2 emissions for 2001 have not been estimated using the reference approach and no comment is included in the documentation box of table 1.A(c) explaining the reasons for this absence. However, they are explained in the NIR and relate to the fact that the energy balances for Germany for the period 1999–2001 are provisional. The energy section of the NIR presents the methodological issues concerning energy balances, the reference approach and the AD in depth. However, the ERT considered that the NIR should focus more on the sectoral approach reported in the CRF, in particular regarding EFs employed and the rationale for their selection. The ERT noted that many of the issues identified in sections C and D below could be resolved if information regarding choice of EFs were provided in the NIR.

19. The ERT noted that no recalculations are reported for the Energy sector, and no estimation of uncertainty, although uncertainties and time-series consistency have been given specific treatment for the

reference approach and for categories 1.A.3b Road Transportation and 1.A.4 Other Sectors, where specific QC procedures were also applied.

B. Reference and sectoral approaches

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

20. The reference approach for 2001 is not reported in the CRF. Nevertheless, the NIR does include a thorough discussion of the methodology used for calculating it, the plan for improvements in the national energy balances, and the series of CO_2 estimates for the period 1990–1999 calculated using the reference approach. A QC procedure that consists of comparing the calculations performed by UBA (the agency in charge of the inventory) with other national and international data was also implemented. Germany provides explanations in the NIR for the differences between the reference and the sectoral approaches.

International bunker fuels

21. Domestic and international fuels consumed by navigation are separated in the national energy balance on the basis of the tax system for fuel sold in ports. While the previous 2003 review activities commented on the fluctuations in the trend of CO_2 emissions, particularly for the period 1990–1997, the ERT is more concerned about the constancy of fuel consumption from 1997 onwards. The distinction between domestic and international aviation does not follow the IPCC good practice guidance recommendations. The NIR states that fuel consumption divides into 20 per cent for domestic and 80 per cent for international aviation. However, the CO_2 emission estimates in the CRF tables correspond to a 25:75 per cent split.

Feedstocks and non-energy use of fuels

22. Carbon stored from feedstocks and non-energy use of fuels is not calculated; at present the data are only used within the context of the reference approach. In the response to the draft version of this report, Germany informed the ERT that a research project on carbon from non-energy use of fuels is to be started in 2004 since no data for this calculation is available thus far.

C. Key sources

Stationary combustion: coal, oil, gas and other fuels – CO_2

23. The CO_2 implied emission factor (IEF) for liquid fuels for subcategory 1.A.1.a Public Electricity and Heat Production dropped from about 78 t/TJ in 1999 to about 71 t/TJ in 2000. The UBA generally employs figures between 74 t/TJ (for light oil) and 78 t/TJ (for heavy oil) for the reference approach. The CO_2 IEFs for other fuels for subcategories 1.A.1.a Public Electricity and Heat Production and 1.A.2 Manufacturing Industries and Construction are relatively low. In the response to the draft version of this report, Germany indicated that these low values are due to the exclusion of organic material in waste fuels. The inclusion in future NIRs of a better identification of the waste fuels that are used and provision of all such explanations may clarify these issues. The sharp increase in the CO_2 IEF for solid fuels for subcategory 1.A.1.b Petroleum Refining between 1995 and 1996 merits explanation. Germany should clarify in future whether this is the result of fuel switching or associated with the data problems related to reunification of the country. In its response, Germany informed the ERT that since 1996 mainly brown coal has been used instead of coke oven gas that was used before. The ERT encourages Germany to provide all such explanations in its next NIR. The different rates of decrease of CO_2 emissions and fuel consumption for subcategory 1.A.2 Manufacturing Industries and Construction also require an explanation and further elaboration about fuel switching. Germany states that trend explanations will be improved in the 2004 inventory submission.

Mobile combustion: road transportation – CO_2 and N_2O

24. The CO_2 IEF for diesel oil for 1.A.3b Road Transportation is about 78 t/TJ for the period 1990–1994 and about 74 t/TJ for 1995–2001. This is apparently related to a change in EFs and may imply an inconsistency with the reference approach, since the NIR reports that the value of 74 t/TJ has been used since 1991. The high value of the N_2O IEF for diesel oil for 1.A.3b Road Transportation merits explanation. There is a big divergence between the N_2O emissions and the diesel consumption time series. The time series of N_2O emissions also diverges noticeably from those of CO_2 and CH_4. It is recommended that Germany revise the N_2O EF for diesel. Germany, in its response to the draft version of this report, informed the ERT that this will be checked and eventually commented on in the 2004 inventory submission.

Fugitive emissions: oil and gas operations – CH_4

25. CH_4 emissions have been estimated for some subcategories. Fugitive emissions from venting and flaring have not been estimated. To improve completeness, it is recommended that these emissions be included in future inventories. Germany informed the ERT that fugitive emissions from venting and flaring are addressed in the inventory improvement plan. Furthermore, checking of availability and adequacy of emission factors is ongoing.

D. Non-key sources

Stationary combustion: coal, oil and gas – CO_2

26. The time series of CO_2 IEFs for solid, liquid and gaseous fuels for subcategory 1.A.4 Other Sectors decrease abruptly from 1994 to 1995 and remain fairly constant for the period 1996–2001. The ERT recommends that Germany clarify whether this is mainly associated with issues relating to the reunification of the country. In its response to the draft version of this report, Germany states that trend explanations will be improved in the 2004 inventory submission.

Mobile combustion: oil and gas – CH_4 and N_2O

27. The steady rate of decrease of the CH_4 IEF for gasoline requires an explanation (at both the 1.A.3 Transport source category and the 1.A.3b Road Transportation subcategory levels). The ERT recommends that the change of CH_4 and N_2O IEFs for natural gas between 1994 and 1995 should also be explained (i.e., the Party should specify whether it is related to reunification). Germany, in its response to the draft version of this report, informed the ERT that this will be checked and eventually commented on in the 2004 inventory submission.

Mobile combustion – navigation: oil – CO_2

28. The decreasing trend of CO_2 emissions from domestic navigation parallels the corresponding trend in fuel consumption. The ERT encourages the Party to review the AD for domestic and international navigation.

Fugitive emissions: coal, oil and gas operations – CO_2 and N_2O

29. CO_2 and N_2O emission estimates from fugitive emissions are incomplete and reported as "not estimated" ("NE"). To improve completeness, it is recommended that these emissions be included in future inventories. In its response to the draft version of this report, Germany informed the ERT that these emission estimates are addressed in the inventory improvement plan and that checking of availability and adequacy of emission factors is ongoing. Furthermore, the scientific needs for N_2O emission reporting according to the guidelines will be addressed in a research project this year whose first preliminary results are expected to be available at the end of 2004.

III. INDUSTRIAL PROCESSES AND SOLVENT USE

A. Sector overview

30. The Industrial Processes sector contributed 4.3 per cent and the Solvent and Other Product Use sector 0.2 per cent to the total GHG emissions of Germany in the year 2001. Germany has identified only two key sources in the Industrial Processes sector (level assessment) – CO_2 from mineral products and total emissions of HFCs – while the secretariat identified five key sources: CO_2 from cement production (level assessment), CO_2 from lime production (level assessment), N_2O from adipic acid production (trend assessment), HFCs and PFCs from consumption of halocarbons and SF_6 (level and trend assessment), and SF_6 from consumption of halocarbons and SF_6 (trend assessment). Emissions from the Industrial Processes sector were quite stable from 1990 to 1997, and have fallen by approximately 33 per cent since then. In particular, emissions from adipic acid production have fallen substantially since 1997. The ERT noted that the reasons for these reductions are largely unexplained, as the NIR does not provide a sector-related trend analysis, and recommends that Germany provide detailed and complete information in its future submissions. The Party informed the ERT that complete descriptions were not given due to confidentiality issues and that this status will change as a third producer started in 2002.

31. The ERT observed that reporting in this sector is not complete. There are gaps in the CRF; and notation keys are often not used and sometimes have been used incorrectly. Germany does not estimate CO_2 emissions from iron and steel production in the Industrial Processes sector of the inventory, and has used the notation key "NE" in the CRF. The ERT noted, however, that the NIR indicates that work to improve completeness is under way, and recommends that Germany improve the transparency and consistency of the NIR for industrial sources by providing descriptions of the methodologies used. The Party reports that corrections have been made in April 2003 after the initial check.

32. The NIR does not indicate where QA/QC procedures are currently applied in the calculation of industrial process emissions. No uncertainty analysis has been carried out in this sector, but the ERT noted that a project is under way. In many cases the improvements planned for the Industrial Processes sector are documented in the NIR. Germany has reported actual emissions of fluorinated gases (F–gases) for the reporting years 1995–2001 and also potential emissions for part of the time series. No explanation is given as to why the remaining potential emissions are not estimated.

B. Key sources

Cement and lime production – CO_2

33. Between 1990 and 2001, CO_2 emissions for cement production decreased by 14.2 per cent, and between 2000 and 2001 they decreased by 11.4 per cent. CO_2 emissions from lime production decreased by 9.97 per cent between 1990 and 2001, and by 4.95 per cent between 2000 and 2001. The ERT recommends that Germany provide an explanation of the trends the NIR, particularly as CO_2 emissions from cement production appear to fluctuate. The current calculation procedures for CO_2 emissions are described in the NIR and the ERT noted that these procedures are being revised. The ERT observed small discrepancies between the data in the NIR and those in the CRF, and recommends that Germany provide explanations in its future submissions.

Consumption of halocarbons and SF_6 – HFCs, PFCs and SF_6

34. As no detailed description of the methodology is provided in the current NIR and there are no references to documentation of the methodology, it was not possible for the ERT to assess the methods used. The ERT recommends that this detailed information be provided in future submissions. As consumption of HFCs, PFCs and SF_6 is a key source for Germany, descriptions of the QA/QC procedures and uncertainty analysis are important. The ERT recommends that Germany revise the notation key for potential emissions of HFCs, PFCs and SF_6 in table 2(I)s2, using "included elsewhere" ("IE") instead of

"NE". Germany has indicated that improvements to the calculations will be made in the next submission in 2004.

Adipic acid production – N_2O

35. The N_2O IEF is identified as an outlier in 2001 (0.044 t/t) and decreased from 1990 to 2001 by 657 per cent. The NIR does not provide any documentation for the calculation, although the CRF states the method to be country-specific. As this is a key source, the ERT recommends that full documentation of the country-specific approach be provided in the NIR. The Party informed the ERT that it is foreseen to implement transparent reporting via National System, which is intended to be in place by 2005.

C. Non-key sources

Iron and steel production – CO_2

36. It is unclear from the NIR how CO_2 emissions from iron and steel production are included in Germany's GHG inventory. Information about AD is provided in the CRF, but no IEF and no emissions estimates are provided, except the notation key "NE". The ERT recommends that Germany estimate these emissions using a methodology that is compatible with IPCC methods. Regarding the AD for steel production in 2001, the CRF shows 44,803 kt, while UN statistics show 10,289 kt, representing a difference of 77 per cent. The ERT recommends that the sources of AD be checked and any differences explained. Germany informed the ERT that explanations will be undertaken in the 2004 submission.

SF_6 used in aluminium and magnesium foundries – SF_6

37. The quantity of SF_6 used for magnesium production (consumption, activity) is equated with emissions in accordance with the *Revised 1996 Intergovernmental Panel on Climate Change Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC Guidelines). Germany obtains SF_6 consumption data directly from the foundries. These input data are almost exactly consistent with the quantities sold by the gas dealers in this sector, who were also surveyed. The method outlined was applied for the reporting years 1995, 1997, 1998, 2000 and 2001. The missing annual data are obtained by means of interpolation. The ERT observed that the IEF for SF_6 decreased from 0.001605 kg/t in 1995 to 0.000788 kg/t in 2001, a decrease of 104 per cent. Actual emissions increased from 3.25 t in 1995 to 13.96 t in 2001, an increase of 330 per cent. The Party informed the ERT that this sector has been enlarged by one more source. The ERT recommends that Germany provide the explanation for this increasing trend in its next NIR.

IV. AGRICULTURE

A. Sector overview

38. In terms of CO_2 equivalent and excluding LUCF, emissions from the Agriculture sector contributed around 6.6 per cent of total national greenhouse gas emissions in 2001, showing a 20.1 per cent decrease from 1990 to 2001; the most important emissions from the sector were N_2O (mainly from agricultural soils). Emissions from rice cultivation, prescribed burning of savannas and field burning of agricultural residues are reported as not occurring ("NO"). The information provided in the NIR on methodological issues (methods and EFs) is not sufficient to allow the ERT to fully understand the underlying assumptions and emission estimates. No uncertainty analysis has been performed, however Germany informed the ERT that an uncertainty analysis will be undertaken in 2004. The numeric values for EFs reported in the NIR are mainly taken from the IPCC Guidelines; EMEP/CORINAIR (2000) EFs have been used in a few places (sheep – enteric fermentation, and sheep and horses – manure management).

39. Germany has performed a key source analysis following tier 1 quantitative analysis. Some differences were found between the results of this exercise and the results of the secretariat's key source analysis: in manure management – CH_4 (which is a trend key source in the Party's analysis but not a key

source in the secretariat's key source analysis); in manure management – N_2O (which is a level/trend key source in the Party's analysis but only a level key source in the secretariat's key source analysis); and in agricultural soils – N_2O (a level/trend key source for the Party but only a level key source (direct and indirect N_2O emissions) in the secretariat's key source analysis). Germany informed the ERT that it will implement a detailed improved key source analysis based on the last reported year.

40. In its next submission Germany plans to provide estimates of emissions from enteric fermentation according to the IPCC tier 2 methodology, and indirect emissions from agricultural soils using nitrogen mass flow calculation techniques for animal husbandry, avoiding the use of default values. As Germany moves forward with these improvements the ERT encourages it also to document fully the underlying assumptions, methods and EFs in its NIR.

B. Key sources

Enteric fermentation – CH_4

41. CH_4 emissions have been estimated using EMEP/CORINAIR simpler methods, adopted as IPCC tier 1, and the EMEP default EFs for Western Europe, which is not in line with the IPCC good practice guidance for key sources. As noted above, Germany plans to use IPCC tier 2 for its next submission. With this move to tier 2, the ERT encourages Germany to include goats separately from sheep. AD are taken from the federal statistics agencies, except for the former German Democratic Republic, where the RAUMIS model was applied to estimate livestock numbers for the years 1990 and 1991. No information is provided on this model. The quality of estimates is reported as high.

42. Some potential inconsistencies were found in the CRF tables, such as the inclusion of parameters for IPCC tier 2, the summing of methane conversion factor values from diary and non-diary cattle into a single value for cattle, the emission trend not being fully explained by animal population trends, and big changes in population sizes between two consecutive years without any accompanying documentation to explain the changes. The ERT noted that some IEFs in this sector were identified as outliers in the previous 2003 review activities, and Germany is encouraged to pay particular attention to these as it could improve its reporting. Germany informed the ERT that the mistake of reporting aggregated data in submission 2003 will be corrected in submission 2004.

Manure management – N_2O

43. This source is reported in the NIR as 6.2. Storage of commercial fertilizers (4.B), which does not cover all the issues included under the source category. The NIR noted that simpler EMEP/CORINAIR methods, which are consistent with IPCC defaults, are used, that EFs are taken from the IPCC defaults, and that AD come from the federal statistics agencies. However, the ERT also noted that no explanation was included on the calculation of nitrogen (N) excretion rates although Germany reports that the details are described in the document GAS-EM (reference was provided). The quality of estimates is reported as high. The ERT encourages Germany to provide more explanation in the NIR and to use the IPCC tier 2 methodology, taking into account that this is a key source.

44. Some inconsistencies were found in the CRF tables, mainly related to units and values, and to differences in the same parameter between tables (N excretion per animal waste management systems (AWMS), reported as a percentage instead of as kg N/yr as requested). IEFs for some AWMS are reported as "NE" but emission estimates from them are reported. The ERT recommends more careful checking before submission.

Agricultural soils – direct N_2O emissions

45. In the CRF, the Party states that emissions were estimated by country-specific methods and EFs, but the NIR states that EMEP/CORINAIR simpler methods and IPCC default methods and default EFs were used. The NIR reports a publication where information on methods, EFs and AD can be found, but does not provide sufficient information to enable the ERT to verify these, including some IEFs identified

as outliers in the 2003 previous review activities. The ERT encourages Germany to increase the transparency of its reporting.

46. The ERT found that the description of N-fixing crops in CRF table 4.D has been changed but the IEFs have remained the same. Further explanation would be valuable.

Agricultural soils – indirect N_2O emissions and N_2O emissions from animal production

47. In the CRF, the use of country-specific EFs is reported, whereas default values are reported in the NIR. These values differ from the default and seem to be country-specific. The ERT encourages Germany to provide more complete documentation in the NIR.

C. Non-key sources

Manure management – CH_4

48. In the CRF, Germany states that emissions were estimated by using EMEP/CORINAIR simpler methods, consistent with the IPCC default methods. The EMEP default EFs for Western Europe have been applied. As no detailed information was provided in the NIR, the ERT encourages Germany to provide more information on these issues. AD are taken from the federal statistics agencies.

49. The allocations of animals to different AWMS do not add up to 100 per cent in the case of non-diary cattle. There appear to be differences between the methods applied as reported in the CRF and in the NIR. The IEF for sheep (0.04 kg/head/year) was identified as an outlier in the previous 2003 review activities and it has not been calculated for some years in the time series. The IEF for horses (1.00 kg/head/year) differs from the default EF values for some years. The Party has informed the ERT that deviation of the IEFs will be checked. The ERT encourages Germany to improve the data in table 4.B(a), leaving the columns for volatile solid excretion (VS) and maximum methane-producing capacity (Bo) blank as they are related to IPCC tier 2.

V. LAND-USE CHANGE AND FORESTRY

A. Sector overview

50. Germany follows the IPCC Guidelines for the LUCF sector and provides summary level data in table 5 of the CRF. The 2003 submission shows that during the period 1990–2001 LUCF in Germany constituted a net sink, with a decrease of 29.7 per cent. The drop resulted from intensive harvest following damage caused by a hurricane (in the last two years). The dynamic of changes within the sector is obscured by the use of fixed five-year averages in reporting changes in forest woody biomass stocks.

51. The inventory is relatively complete. However, the notation key "NE" is reported for several entries in tables 5.B, 5.C and 5.D, and no alternative data tables are reported as required by the UNFCCC reporting guidelines. The data and methods applied for estimations reported in table 5.A are presented in a transparent way in the NIR. In addition, the text provides data, which appear to be applicable for at least an initial estimation of GHG emissions from soil, but these are not reported in the CRF. Germany is planning recalculations to include emissions from liming beginning from the year 2003, but has reported no other plans for improvements in this sector. No QA/QC procedures are reported in this sector and uncertainty analysis is limited to qualitative considerations. The ERT recommends numerical reporting in all the CRF tables or the use of alternative tables, as allowed in the UNFCCC reporting guidelines, including providing data on soil carbon, in order for the Party to improve its LUCF reporting and to make it more complete and transparent. The ERT also recommends that Germany make better use of the IPCC Guidelines, including the application of rolling averages. Germany has informed the ERT that it intends correcting this deviation from the IPCC Guidelines, recalculating the entire time series from 1990 using data from its second National Forest Inventory due in 2005 at the earliest.

B. Sink and source categories

Changes in forest and other woody biomass stocks – CO_2

52. Germany follows the IPCC Guidelines. Emission and removal factors, as well as activities, are appropriate and are soundly based in the scientific literature or recognized statistical publications. However, plantations, non-forest trees and traditional fuelwood are not included in the AD, and Germany is encouraged to fill this data gap in future submissions. Germany has informed the ERT that plantations are implicitly included in the inventory. The same pertains to traditional fuelwood, which is included into the harvest data. Germany confirmed the need to improve harvest statistics, in particular relating non-commercial fellings in small holder privately owned forests as Germany informed the ERT that non-forest trees are excluded from reporting due to lack of national statistics. Germany reports only net removals, while gross emissions and removals should be reported to provide transparency. Germany has informed the ERT that this will be corrected it the 2004 submission.

Changes in forest and other woody biomass stocks – non-CO_2 gases

53. Non-CO_2 gases are not reported for this category. The ERT recommends that the reasons for this be explained in the NIR. Germany has informed the ERT that it will consider including these gases, according to the guidance from GPG for LULUCF.

All other categories – all GHG gases

54. No numerical estimates are provided for any of these categories. Germany has informed the ERT that there are no data available or that some of the activities do not occur in Germany; however, initial estimates of GHG balance for soils will be included in the NIR 2004. The ERT recommends that more information on the national data availability should be provided in the NIR in order to justify leaving some categories unreported.

VI. WASTE

A. Sector overview

55. Emissions from the Waste sector contributed approximately 1.1 per cent to total national GHG emissions in 2001. Emissions decreased substantially – by 65.6 per cent – from 1990 to 2001. This decreasing trend is due to a decline in waste disposal to landfill and also increasing waste incineration. CH_4 emissions from solid waste disposal on land are identified as a key source by level and trend assessment.

56. The inventory is practically complete in terms of gases, sources and years covered. Information and documentation on methodologies, AD and country-specific EFs are adequately provided and referenced in the NIR. Transparency has improved compared with the previous submission. Germany reports only qualitative analysis of uncertainty assessment. The ERT encourages Germany to include the Waste sector in the country project on uncertainty analysis in order to prioritize further improvements to the inventory.

57. Major improvements in the 2003 submission include the reporting in the NIR of research study results of N_2O emissions from mechanical–biological treatment plants for domestic and commercial waste-water handling, including human waste. The ERT notes that the country-specific EFs developed from this study should be used to estimate and report N_2O emissions in this source category in the CRF in future submissions.

B. Key sources

Solid waste disposal on land – CH_4

58. The IPCC tier 1 methodology is used for calculating emissions from solid waste disposal on land for the period 1990–2001. This methodology is largely consistent with the IPCC Guidelines and the IPCC good practice guidance. However, the ERT noted that CH_4 emissions from this source category are identified as a key source. It therefore encourages Germany in its plans to use IPCC tier 2 methodology for estimating CH_4 emissions from solid waste disposal on land, bringing this source into line with good practice, and to implement the research project to develop methodologies for reporting emissions from sewage sludge application, waste composting and the application of composting residues.

59. CH_4 emissions from solid waste disposal on land decreased by 63.8 per cent between 1990 and 2001. This decreasing trend is due to increasing waste incineration and a decline in waste disposal to landfill under the Closed Substance Cycle and Waste Management Act of 1996. Available AD indicate that waste incineration increased by 52 per cent in 2001 compared to 1990.

60. The methodology, EFs and AD provided in the NIR are consistent with the IPCC tier 1 methodology. The ERT noted that additional information in CRF table 6.A should have been provided in order to achieve greater transparency and comparability. The methodology described in the NIR indicates that the methane recovery rate from landfill gas is 44 per cent. The ERT noted that this value should be reported in CRF table 6.A.

C. Non-key sources

Waste incineration

61. CO_2 emissions from biogenic and non-biogenic waste incineration are reported as "NO" instead of "IE" in sectoral table 6.C in the CRF. The ERT noted that biomass (waste fuels) contributes 15 per cent to public district heating under the Energy sector as reported in the NIR. CO_2 emissions from biogenic sources should be reported as memo items to avoid double counting in the Energy sector.

VII. OTHER SECTORS

62. No country-specific sources were reported by Germany under sector 7 Other.

ANNEX 1: MATERIALS USED DURING THE REVIEW

A. Support materials used during the review

2002 and 2003 Inventory submissions of Germany. 2003 submission including CRF for years 1990–2001 and an NIR.

UNFCCC secretariat. "Report of the individual review of the greenhouse gas inventory of Germany submitted in the year 2001 (Centralized review)." FCCC/WEB/IRI(3)2001/DEU (available at http://unfccc.int/program/mis/ghg/countrep/deucentrev.pdf).

UNFCCC secretariat. "2003 Status report for Germany" (available at http://ghg.unfccc.int/download/reviews2003/Germany_SR2003.zip).

UNFCCC secretariat. "Synthesis and assessment report of the greenhouse gas inventories submitted in 2003. Part I." FCCC/WEB/SAI/2003 (available at http://ghg.unfccc.int/download/reviews2003/S&A_Part_I.zip) and Part II – the section on Germany) (unpublished).

UNFCCC secretariat. "Review findings for Germany "(unpublished).

UNFCCC secretariat. "Handbook for review of national GHG inventories." Draft 2003 (unpublished).

UNFCCC secretariat. "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/CP/1999/7 (available at http://www.unfccc.int/resource/docs/cop5/07.pdf).

UNFCCC secretariat. "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. Database search tool – *Locator* (unpublished).

IPCC. *IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories, 2000* (available at http://www.ipcc-nggip.iges.or.jp/public/gp/gpgaum.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).

B. Additional materials

Responses to questions during the review were received from Michael Strogies, German Federal Environmental Agency (UBA).

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