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Report of the individual review of the greenhouse gas inventory of Austria 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.

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CONTENTS

I. Overview

A. Introduction

1. This report covers the centralized review of the 2005 greenhouse gas (GHG) inventory submission of Austria, 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 Austria, which provided comments that were considered and incorporated, as appropriate, in this final version of the report.

3. Comments providing explanations of issues or indicating that the Party will consider the remarks made by the expert review team (ERT) in its future submissions in some cases are not specifically addressed in this final review report, as the ERT's recommendation to include such explanations in future national inventory reports (NIRs) is still valid.

B. Inventory submission and other categories of information

4. In its 2005 submission, Austria submitted a complete set of common reporting format (CRF) tables for the years 1990–2003 and an NIR. The ERT acknowledges the effort made by Austria to submit the LULUCF reporting tables required by decision 13/CP.9. The full list of materials used during the review is provided in the annex to this report.

C. Emission profiles and trends

5. In 2003, the most important GHG in Austria was carbon dioxide (CO_2), contributing 82.3 per cent to total[1] national GHG emissions expressed in CO_2 equivalent, followed by methane (CH_4), 8.5 per cent, and nitrous oxide (N_2O), 6.1 per cent. Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6) taken together contributed 2.2 per cent of the overall GHG emissions in Austria. The Energy sector accounted for 75.7 per cent of total GHG emissions, followed by Industrial Processes (12.1 per cent), Agriculture (8.0 per cent) and Waste (3.7 per cent). Total GHG emissions amounted to 91,566 Gg CO_2 equivalent and had increased by 16.5 per cent from 1990 to 2003. The overall trends are consistent with the course of economic development in Austria.

D. Key categories

6. Austria has reported a key category tier 1 analysis, both level and trend assessment, as part of its 2005 submission. Austria has not included LULUCF in its key category analysis. In its response to the previous 2005 review stages, Austria indicated that LULUCF will be included in the key category

[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.

analysis in its next submission. The key category analyses performed by the Party and the secretariat[2] produced consistent results. The ERT recommends that Austria consider arranging the key categories table in descending order of magnitude of contribution to total national GHG emissions following the recommendations 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) to simplify comparison with the secretariat's analysis, if possible.

E. Main findings

7. Austria's 2005 submission is in very good order. The NIR provides clear and detailed information on the methods applied, the activity data (AD) and the emission factors (EFs) used. The ERT commends Austria for a high-quality inventory submission. A number of issues were identified by the ERT, mainly concerning time-series consistency (see below).

F. Cross-cutting topics

1. Completeness

8. Austria's 2005 submission is generally complete. A complete time series of all categories and sinks for the territory of Austria is provided.

2. Transparency

9. The ERT acknowledged that Austria's inventory submission is well structured and concise. The NIR provides clear information to support the review of the data in the CRFs for all years. In some cases Austria provides comprehensive tables which, although they contain useful information, could be moved to the NIR annexes, with a brief summary in the main text, referring to the specific annex and pinpointing the most important entries in these tables.

3. Recalculations and time-series consistency

10. The ERT noted that recalculations have been undertaken for the years 1990–2002 to take into account improved methodologies and updated AD and EFs. Austria has provided recalculated estimates (tables 8(a)) and explanatory information for the years 1990–2002. The effect of the recalculations for the base year (1995) (as reported in the CRF tables) is an increase of 1.5 per cent in the estimates of total national GHG emissions. The rationale for these recalculations is provided in the NIR together with an exhaustive quantitative list of all changes for all CRF categories and all gases. The ERT recommends that the Party consider moving these tables to an annex to the NIR in its future submissions, and include a brief summary on the quantitative effects of the recalculations in the main text.

11. For some categories (2.C.1 Iron and Steel and 4.A.1 Enteric Fermentation - Dairy Cattle (milk yield)) the data sources change within the time series, causing inconsistencies in the time series. Austria is encouraged either to use the same data source for all years or to apply the methods provided in the IPCC good practice guidance to improve time-series consistency. In its response to the draft review report, Austria provided explanations and announced that will include this information in the next NIR.

[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.

4. Uncertainties

12. The NIR states that an IPCC tier 2 uncertainty analysis has been performed for relevant categories for the years 1990 and 1997, based on earlier submissions. For the current submission, Austria provides uncertainty data for the key categories only. To assess the overall uncertainty in the inventory, Austria uses an analysis based on the variance in successive submissions. This approach is not described in the IPCC good practice guidance and the ERT was not convinced that this approach provides a valid analysis. However, since uncertainty data are available for all key categories, the ERT noted that in principle Austria has at its disposal all the information needed to make use of the uncertainty assessment as a tool in inventory improvement planning. The ERT recommends that the Party provide a tier 1 uncertainty assessment and use values based on expert judgement for non-key categories.

5. Verification and quality assurance/quality control approaches

13. The Department for Air Emissions of the Austrian Federal Environmental Agency (Umweltbundesamt), which is the entity responsible for the national GHG inventory, has implemented a quality management system based on the European Standard ISO 17020 that specifies general criteria for the operation of the various types of body which perform inspections; furthermore, the accreditation of the Department of Air Emissions as an inspection body is scheduled for autumn 2005. The quality management system covers all the relevant requirements considered in the IPCC good practice guidance. The principles of the quality management system are adequately explained in the NIR.

6. Follow-up to previous reviews

14. Austria lists its responses to the results of the 2004 review clearly in a specific table in the NIR. Improvements in reporting and in the recalculation of emissions have been made across all sectors. However, not all issues have been resolved in this submission. In these cases, Austria intends to follow up on the issues in its future submissions.

G. Areas for further improvement

1. Identified by the Party

15. Austria is working towards full implementation of the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Revised 1996 IPCC Guidelines) and the IPCC good practice guidance in order to avoid adjustments. The NIR identifies source-specific planned improvements to achieve this goal in the sector chapters. Austria has established an improvement programme in order to comply fully with the "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories" (hereinafter referred to as the revised UNFCCC reporting guidelines).

2. Identified by the ERT

16. The ERT identifies the following cross-cutting issues for improvement. The Party should:

(a) Provide tier 1 quantified uncertainty estimates following the IPCC good practice guidance and use the results of this analysis to plan improvements to the inventory;

(b) Improve time-series consistencies:

(i) For those source categories where AD are derived from different data sources for different years;

(ii) By extrapolation or interpolation of EFs and AD wherever such data for specific years are not available rather than keeping such values constant to avoid discontinuities in trends;

(c) Provide more detailed descriptions of the methodologies used in cases where the country-specific EFs deviate significantly from the IPCC default values or fall outside the ranges provided by the Revised 1996 IPCC Guidelines.

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 75.7 per cent of Austria's total GHG emissions. CO_2 from fuel combustion contributed 73.9 per cent of total national emissions and 88.7 per cent of total CO_2 emissions. Between 1990 and 2003, emissions from fuel combustion increased by 26.0 per cent, from 54,566 Gg in 1990 to 68,776 Gg in 2003, mainly caused by an 82.0 per cent increase in emissions from Transport which accounted for 25.1 per cent of total national GHG emissions in 2003.

19. The inventory addresses all the IPCC categories for the Energy sector and covers all years and all gases. The level of disaggregation is in line with the Revised 1996 IPCC Guidelines. Estimates of emissions of the indirect GHGs and sulphur dioxide (SO_2) are reported in the CRF. All the CRF tables, including the sectoral background tables, are provided.

20. The reporting of the Energy sector is generally transparent. The calculation methodologies are well documented in the NIR. The NIR provides sufficient back-up information to make it possible to follow the calculations.

21. Recalculations carried out in the Energy sector are well documented in the NIR. They are the result of the revision of the national energy statistics for the years 1990–2002 by Statistics Austria and affect all emissions estimates for category 1.A Fuel Combustion from 1990 onwards.

B. Reference and sectoral approaches

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

22. CO_2 emissions from fuel combustion have been calculated using the reference approach and the sectoral approach. For the year 2003, there is a difference of 6.7 per cent in the CO_2 emissions estimates between the reference approach and the sectoral approach. Explanations are provided in the documentation box of CRF table 1.A(c). In addition, the NIR provides explanations for the fluctuations in the differences between the two approaches over the years.

23. Apparent consumption in Austria's reference approach for 2002 corresponds closely to the International Energy Agency (IEA) data. For 2003, there is a difference of 0.1 per cent in apparent consumption between the reference approach and the IEA data, and the differences are less than 1 per cent for all available years (1990–2003). The ERT encourages the Party to provide explanations for these differences in its future NIRs.

24. In its response to previous 2005 review stages, Austria explained that for natural gas it used conversion factors between net calorific value (NCV) and gross calorific value (GCV) which are different from those of the IEA (Austria: NCV = GCV*0.909; IEA: NCV=GCV*0.9). The ERT recommends that the Party provide this information and possibly explanations of this in its next NIR.

25. For the years 1996–2003, the lignite production figures given in the Austrian CRF are about 10 per cent higher than the IEA data. The ERT noted that this is due to a decrease in the NCV for lignite reported to the IEA, while the CRF uses the default IPCC NCV for the whole time series. If the country-specific NCVs for Austria are derived in accordance with the IPCC good practice guidance, the ERT recommends that the Party use these values in its calculations.

2. International bunker fuels

26. AD for Marine Bunkers are reported as "0.00", while emissions from this source are reported as "not occurring" ("NO"). The Party is encouraged to use "NO" consistently in the CRF tables.

C. Key categories

1. Fuel combustion: Gas – CO_2

27. For the years 1990–2003, a constant implied emission factor (IEF) for CO_2 from gaseous fuels of 55 t/TJ is applied for all source categories. This IEF is among the lowest of reporting Parties and lower than the IPCC default value (56.1 t/TJ). In its response to previous 2005 review stages, Austria acknowledged the problem and stated that verification was foreseen. The ERT encourages the Party to introduce a complete validation process for the CO_2 EFs from natural gas.

2. Public Electricity and Heat Production: Other fuels – CO_2

28. The following inter-annual changes in the IEF for CO_2 from Public Electricity and Heat Production – Other Fuels have been identified as outliers: 2000–2001 (–9.4 per cent) and 2001–2002 (–6.0 per cent). Austria explained during the review that it aims to provide more information on the EFs selected in its next NIR. The ERT encourages this and recommends that in particular the low value of the EF for CO_2 for waste (10 t/TJ) be explained.

3. Manufacturing Industries and Construction: Solid fuels – CO_2

29. The following inter-annual changes in the IEF for CO_2 from Iron and Steel – Solid Fuels have been identified as outliers: 1990–1991 (–5.3 per cent), 1992–1993 (+8.9 per cent), 1996–1997 (+4.4 per cent), 1997–1998 (–22.5 per cent), 1998–1999 (+11.5 per cent), 2001–2002 (+6.3 per cent), 2002–2003 (–6.0 per cent). Furthermore, the CO_2 IEF values (ranging from 73.7 t/TJ to 93.4 t/TJ) for the years 1991, 1992, 1995, 1996 and 1998–2002 are among the lowest of reporting Parties and outside the IPCC default range (ranging from 94.6 t/TJ to 106.7 t/TJ). Austria explained in response to questions during previous 2005 review stages that the AD are not consistent with CO_2 emissions from solid fuels and that this issue will be resolved in time for its next submission. The ERT encourages the Party to update the data and include relevant information in its next NIR.

4. Manufacturing Industries and Construction: Other fuels – CO_2

30. The trend in the CO_2 IEFs from Other – Other Fuels (Manufacturing Industries and Construction) is unstable and fluctuates. The following inter-annual changes are significant: 1990–1991 (–47.2 per cent), 1991–1992 (+22.7 per cent), 1992–1993 (–60.0 per cent), 1993–1994 (+37.2 per cent), 1995–1996 (–15.1 per cent), 1996–1997 (+19.0 per cent), 1997–1998 (–37.6 per cent) and 1998–1999 (+106.0 per cent). Austria explained in response to previous 2005 review stages that the AD and emissions are not taken from the same source and this leads to strong fluctuations of the IEFs. Austria plans to update the AD on waste incinerated in the cement industry. The ERT encourages the Party to carry these plans through and to document the change thoroughly in the NIR.

5. Road transportation: Gasoline and diesel – CO_2

31. While Austria has used constant EFs for gasoline and diesel in kg CO_2/kg fuel, there is a step change between 1992 and 1993 in the IEF, because it uses a different NCV prior to 1993. The ERT encourages Austria to validate the NCV applied for road transport fuels.

D. Non-key categories

1. Stationary combustion – Other: liquid – CO_2

32. In the NIR, the Party reports that military aviation is reported under 1.A.3e Other Transportation. However, this is not mentioned in the NIR section for 1.A.3e. The Party is encouraged to clarify how emissions from military aviation are estimated and where they are reported. Military aviation should be reported under 1.A.5.b Other – Mobile according to the Revised 1996 IPCC Guidelines and the revised UNFCCC reporting guidelines. In its response to the draft review report, the Party remarked that this is an error in the NIR that will be corrected in the next submission.

2. Mobile Combustion – Water-borne Navigation: liquid – CO_2, CH_4 and N_2O

33. The AD for diesel oil for Water-borne Navigation in 2003 are 66.1 per cent higher than those published by the IEA (1,022 TJ and 347 TJ, respectively). During previous 2005 review stages, Austria informed the ERT that, since the total amounts of diesel consumed in the Transport category are the same as those given in the IEA data, the overall CO_2 emissions in the category will not be over- or underestimated. However, the ERT noted that this is not the case for CH_4 and N_2O as their EFs can vary within the Transport category. The ERT recommends that Austria bring the fuel allocation methods for the CRF and the IEA data into agreement and reflect this information in its next NIR.

3. Fugitive Emissions: Coal Mining and Handling – CH_4

34. Austria stated in response to previous 2005 review stages that a wrong value for the AD for 2003 was inserted for Coal Mining and Handling. The ERT recommends that Austria correct this in its next submission.

4. Fugitive Emissions: Oil and Gas Operations – CH_4

35. Fugitive emissions from Oil – Transport, Oil – Other and Natural Gas – Other Leakage are currently reported as "not estimated" ("NE"). Austria explained during previous 2005 review stages that this source category will be surveyed for its next submission. The ERT encourages the Party's plan to survey the sector and evaluate whether there are such emissions in this sector.

III. Industrial Processes and Solvent and Other Product Use

A. Sector overview

36. In 2003, emissions from the Industrial Processes and Solvent and Other Product Use sectors accounted for 12.5 per cent of total national GHG emissions. CO_2 emissions accounted for 72.7 per cent of the total GHG emissions of these sectors taken together, while HFCs, N_2O, SF_6 and PFCs contributed 11.4 per cent, 9.7 per cent, 5.2 per cent, and 0.9 per cent, respectively. Iron and Steel Production is the main source of total CO_2 emissions of these sectors taken together (54.3 per cent), followed by Mineral Products (36.7 per cent), Chemical Industry (6.7 per cent) and Solvent and Other Product Use (2.3 per cent). Emissions of N_2O come mainly from Nitric Acid Production (79.2 per cent) and from Solvent and Other Product Use (20.8 per cent). Between 1990 and 2003, total emissions from the Industrial Processes sector increased by 8.8 per cent due to an increase in CO_2 emissions from the chemical and metal production industries (the consequence of an increase in production) and an increase in HFC and SF_6 emissions (due to an increase in their use), although these increases were offset by a decrease in N_2O

emissions from production of nitric acid (thanks to abatement efforts by industries) and a decrease in PFC emissions (due to the termination of primary aluminium production). During the same period, emissions from the Solvent and Other Product Use sector decreased by 17.3 per cent.

37. The Party identified 12 key categories, some of which are additional to the key categories identified by the secretariat. Magnesia Sinter Plants – CO_2, Aluminium Production – PFCs, Aluminium and Magnesium Foundries – SF_6 and Other Sources – SF_6, as well as Solvent and Other Product Use – CO_2, are considered key categories by the Party.

38. Austria has improved the completeness of its inventory in relation to the previous (2004) submission, since it has included emissions estimates from the categories Ferroalloys Production, Soda Ash Production and Use, and Asphalt Roofing and Road Paving with Asphalt for the first time, and carried out the corresponding recalculations. The ERT noted that the methodologies and data categories used are clearly described in the NIR, and the EFs and AD used are presented in a transparent manner.

B. Key categories

1. Cement Production – CO_2

39. The previous (2004) submission reported constant AD for clinker production from 1998 to 2002, since statistical data were not available. Here an improvement has been made since the actual AD for this period are now provided and the necessary recalculations have been performed. Because the actual emissions and AD values for 2003 were not available, Austria has reported the 2002 values for 2003. The ERT recommends that the Party ensure the timely annual reporting of emissions, as well as the corresponding AD.

2. Lime Production – CO_2

40. AD for Lime Production in 2003 were also not available, and the Party has reported the same value for 2003 as for 2002. The ERT recommends that Austria ensure the timely annual reporting of emissions, as well as the corresponding AD.

3. Other (Mineral Products): Magnesia Sinter Plants – CO_2

41. The trend in CO_2 emissions from Magnesia Sinter Plants fluctuates between 1990 and 2003. The 2003 value is 22.4 per cent lower than the 1990 value. The inter-annual changes were explained by the Party during the review, except for the initial decrease (emissions for 1991 are 18.7 per cent lower than emissions in 1990). The ERT noted from the information on production trend provided in the NIR that this initial drop is due to a fall in production but was not able to find an explanation for this sudden decrease in production. The ERT encourages Austria to provide this information in its future NIRs.

4. Other (Mineral Products): Bricks and Tiles (decarbonizing) – CO_2

42. The trend in CO_2 emissions from decarbonizing of bricks and tiles fluctuates between 1990 and 2003, the lowest value being 112 Gg and the highest 143 Gg. For this source, Austria has based its emission calculations from 1990 to 1997 on the IEF obtained for 1998, whereas the calculations of emissions for 2002 and 2003 are based on the IEF obtained for 2001. The NIR states that emission values from 1998 to 2001 were reported by the Association of the Stone and Ceramic Industry, and different IEFs were reported for each year, from 1998 to 2001, presenting an increasing trend. The ERT recommends that Austria provide more information about the data verification activities in this subsector and in particular explain why these IEFs rose between 1998 and 2001.

43. The ERT noted that the 2001 IEF (0.061 t/t) for CO_2 is 20.0 per cent higher than the 1990 value (0.050 t/t). The ERT encourages the Party to implement the planned recalculations of the time series in its next submission.

5. Ammonia Production – CO_2

44. All the CO_2 IEF values (ranging from 0.86 to 1.04 t/t) are among the lowest of reporting Parties and lower than the IPCC default range, and several inter-annual changes have been identified as outliers. The ERT considers that these inter-annual changes are well explained in the NIR, but, since the CO_2 IEFs are significantly lower than the default range, the ERT recommends that Austria provide information in the NIR regarding the QA/QC procedures carried out for the emissions reported by the only producer of ammonia in the country.

6. Nitric Acid Production – N_2O

45. The change in the N_2O IEF between 1994 and 1995 (+7.7 per cent) has been identified as an outlier. The ERT noted that the Party provided an explanation during the review for this increase. Since emissions and AD are provided directly by the very few producers of nitric acid in Austria, the ERT encourages the Party to explain the particular operating conditions that caused the sudden increase in the IEFs.

7. Iron and Steel – CO_2

46. The trend in IEF values for CO_2 from Iron and Steel Production - Pig Iron is unstable and fluctuates. The 2003 value is 7.3 per cent lower than the 1990 value and the following inter-annual changes have been identified as outliers: 1995–1996 (+8.3 per cent) and 2001–2002 (+5.0 per cent). The ERT noted that the change in 2001–2002 could be explained by a change in the data source: the 2001 AD are taken from national statistics, while the 2002 AD were directly reported by the industry (although the industry reported emissions directly in both years). The ERT was unable to find an explanation for the increase between 1995 and 1996 and encourages Austria to provide further information on this issue in its next NIR.

8. Consumption of Halocarbons and SF_6 – HFCs and PFCs

47. The change in the ratio potential/actual emissions for HFC-134a between 1999 and 2000 has been identified as an outlier (the 2000 value is 33.1 per cent higher than the 1999 value). During the review, Austria informed the ERT that this change is due to HFC-134a beginning to be used in the production of hard foam in the year 2000, pointing out that the EF of HFC-134a in hard foam is much lower than the one for soft foam, where HFC-134a has been used since 1990. The ERT recommends that the Party include in its future inventories explanations regarding the introduction of the use of HFC-134a for the production of hard foam in 2000.

48. The following inter-annual changes in actual emissions from 'Consumption of Halocarbons and SF_6 – Semiconductor Manufacture have been identified as outliers: a) for perfluoromethane (CF_4) emissions: 1997–1998 (–68.1 per cent) and 1998–1999 (+77.8 per cent); and (b) for perfluoroethane (C_2F_6) emissions: 1990–1991 (+92.0 per cent), 1991–1992 (+47.9 per cent), 1996–1997 (+46.5 per cent) and 1997–1998 (–35.0 per cent). During the review, the Party informed the ERT that between 1997 and 1998 one semiconductor manufacture quadrupled his exhaust air purification capacity, and that the increases in emissions of CF_4 and C_2F_6 in the other years are due to increasing semiconductor production. The ERT therefore encourages the Party to include information in its future inventories regarding the quadrupling of the air purification capacity in semiconductor manufacture, and to provide the necessary supporting information regarding the control of emissions in order to explain the trends.

9. SF_6 Used in Magnesium Foundries

49. The SF_6 IEF for the SF_6 Used in Magnesium Foundries for the base year (1995) is very high (11.96 kg SF_6/t magnesium (Mg) produced) compared to the IEFs for all the following years. The ERT encourages Austria to provide an explanation for the decrease in the IEF in its future NIRs.

IV. Agriculture

A. Sector overview

50. In 2003, the Agriculture sector accounted for 8.0 per cent of Austria's total national GHG emissions, reaching 7,349 Gg CO_2 equivalent. Over the period 1990–2003, emissions in this sector decreased by 13.1 per cent. In 2003, CH_4 emissions contributed 54.3 per cent and N_2O the remaining 45.7 per cent of emissions from the sector. Enteric Fermentation, Agricultural Soils and Manure Management were the major emission categories in the Agriculture sector, contributing 42.1 per cent, 36.3 per cent and 21.6 per cent, respectively.

51. Austria has performed a key category analysis using the IPCC tier 1 method, in which it identifies the following key categories: Direct and Indirect N_2O Emissions from Agricultural Soils – N_2O, Enteric Fermentation in domestic livestock (Cattle) – CH_4, Manure Management (Cattle, Swine) – CH_4 – and Manure Management (Cattle) – N_2O. This is in line with the key category analysis performed by the secretariat. The NIR provides a transparent and informative description of the methodologies and data categories used.

52. The ERT noted that the trend in the population of dairy cattle is unusual: over the years 1990–1996, it decreased by 24.9 per cent, followed by an interim increase of 4.4 per cent over the period 1996–1998, and another decrease of 25.7 per cent during the period 1998–2003. For the whole time series, the populations decreased by 38.3 per cent. The ERT noted that in 1995 and in 2000 the populations decreased by more than 10 per cent. The ERT recommends that the Party review these data and provide more information about the drivers behind these changes in its next submission.

53. The ERT acknowledged that Austria has included CH_4 emissions from Enteric Fermentation for Deer and Poultry for the first time. This a follow-up from the 2004 review report, which stated that all emissions relating to all relevant animal categories should be reported.

54. The ERT noted that the trend in the population of swine is unusual: in 1998, 2001 and 2003 the population increased by more than 3 per cent, whereas in 1996, 1999, 2000 and 2002, it decreased by more than 3 per cent. The ERT recommends that the Party review these data and provide more information about the reasons for these changes in its next submission.

B. Key categories

1. Enteric Fermentation – CH_4

55. The ERT noted that the inter-annual change in milk yield of dairy cattle between 1994 and 1995 has been identified as an outlier (12 per cent). The Party explained that this inter-annual variability is due to introducing a new AD source as of 1995. The ERT encourages the Party to use the methods, provided in the IPCC good practice guidance to correct the resulting time series inconsistency.

2. Manure Management – N_2O

56. As mentioned in earlier reviews, Austria uses a country-specific value for the nitrogen (N) excretion rate (34 kg/head/year) for Non-Dairy Cattle that is about the half of the IPCC default value. This value is derived from three different categories for the four actual livestock categories. The ERT encourages the Party to provide an explanation in its next NIR of the country-specific circumstances that explain this lower value.

3. Agricultural Soils – N_2O

57. The ERT noted that the amount of N in animal manure left for spreading on agricultural soils shown in table 191 of the NIR, corrected for ammonia (NH_3) volatilization by the $Frac_{GASM}$ values, is not

consistent with the number given in CRF table 4.D. For 2003 the numbers are 111,908 tonnes N/year and 110,686 tonnes N/year, respectively. The ERT encourages the Party to clarify this in its 2006 submission.

58. The ERT noted that the weighted average mean of N in fertilizer and urea given in table 186 of the NIR, corrected for NH_3 and nitrogen oxide (NO_X) volatilization by the $Frac_{GASF}$ values, is not consistent with the number in CRF table 4.D. For 2003 the numbers are 100,150 tonnes N/year and 99,937 tonnes N/year, respectively. The ERT encourages the Party to clarify this in its 2006 submission.

59. In the additional table of CRF table 4.D no value for $Frac_{FUEL}$ is given. The Party is recommended to use the notation key "NO" for $Frac_{FUEL}$ if burning of manure as fuel does not in fact occur in the country.

60. The ERT noted that the value for $Frac_{NCRBF}$ (0.005) is the lowest of the reporting Parties for the years 1990–2003 and is much lower than the IPCC default value (0.03). The value for the fraction of N dry matter crop residues is based on a national study (Götz 1998). The ERT encourages the Party to describe in the NIR the specific national circumstances that explain this low value.

V. Land Use, Land-use Change and Forestry

A. Sector overview

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

62. In 2003, the LULUCF sector in Austria represented a net sink of –12,772.52 Gg CO_2, offsetting 16.8 per cent of total CO_2 emissions. Since 1990, the LULUCF sector has continuously been a net sink, ranging from 5,191.59 Gg CO_2 in 1996 to 13,645.91 Gg CO_2 in 2000.

63. The CRF for 2003 includes only estimates for CO_2 emissions/removals under LULUCF, but no estimates for any other gases. Net emissions and removals from soils are reported only for Cropland remaining Cropland and Grassland remaining Grassland and for Carbon Emissions from Agricultural Lime Application. No changes of carbon stocks in dead organic matter and soil are reported for category 5.A Forest Land. Emissions of non-CO_2 gases are reported as "NE" for the different land categories.

64. 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 in all cells either data or a notation key, as requested by the revised UNFCCC reporting guidelines (e.g., if a net increase in living biomass results when the stock change method is applied, then the "not applicable" ("NA") notation should be reported in the decrease column).

65. Austria reports a complete uncertainty analysis only for the living biomass component of the category Forest land remaining forest land. The ERT encourages Austria to extend the uncertainty analysis to other categories.

B. Sink and source categories

66. Even though a tier 1 approach for land representation has been applied, the ERT considered that there is a general problem of completeness and transparency that is caused by the system adopted for the detection of land use and the tracking of land-use changes, as referred to in section 2.1 of the IPCC *Good Practice Guidance for Land Use, Land-use Change and Forestry*. This problem results in three major consequences: (a) the Party has not reconstructed a complete and consistent time series for any land-use and land-use change category since 1971; (b) the Party does not report area data for any kind of land use and land-use change; (c) the Party states a high uncertainty of the estimates. The ERT noted that a combination of inventory data with some proximal and remote sensing techniques might facilitate the detection of land use and land-use change at national level.

1. Forest land

67. The ERT noted that two conversion factors from fresh volume of stemwood (m^3) to dry matter (t) of the whole tree are constant since 2000 and have not been changed even though data are available from the new forest inventory. Since these factors are applied to the whole forest stocks of the country they should be derived by averaging species-related data and weighting them on the basis of the contribution of every species to the whole forest stock. Considering that the contributions of different species to the whole forest stock are likely to change between two consecutive forest inventories, the ERT suggested that the Party should consider taking the opportunity to update these values. Austria, in its comments to the draft review report, responded that "the conversion factors differ very slightly between the inventory periods (<1 %). As a consequence (including the fact of the uncertainty of these factors) means were used for all years. In the last year new biomass functions for several tree species were developed on the basis of numerous Austrian single tree data. These new functions will be used for the coming submission (for the complete time-series since 1990) instead of the previously used conversion factors".

2. Cropland

68. In table 5(IV), Austria reports in an aggregated way applications of lime and dolomite, because the national statistics do not make it possible to distinguish between them. The ERT recommends that, in order to be conservative, Austria could use as the EF for liming an average value between the limestone and dolomite EFs (i.e. 0.125 tonnes C (tonne limestone or dolomite)$^{-1}$).

3. Grassland

69. The ERT noted that country-specific data on carbon stock changes in soils show a very different trend compared to the IPCC default values. The ERT suggests that Austria consider the use of country-specific data instead of the IPCC default values only in cases when such data exhibit only a low uncertainty and are obtained following peer-reviewed methodologies.

VI. Waste

A. Sector overview

70. In 2003, the Waste sector in Austria accounted for 3.7 per cent of total national GHG emissions. Between 1990 and 2003, sectoral emissions decreased by 24.2 per cent. Most of this decrease can be attributed to the pattern of CH_4 emissions from Solid Waste Disposal on Land, which decreased by 31.7 per cent during this period. Since the category Solid Waste Disposal on Land accounted for 82.8 per cent of emissions from the Waste sector 2003, changes in this source category will significantly affect the country's overall emission patterns.

71. The ERT noted that the 2005 recalculations of the estimates for base year (1990) resulted in a 10.2 per cent increase in the figures for CH_4 emissions and a 10.5 per cent decrease in the figures for N_2O emissions. These modifications were due to changes made in the CH_4 oxidation factor (from 0.2 to 0.1) as recommended by the 2004 review, changes in the AD for solid waste and waste water, and additional CH_4 emissions from waste oil incineration.

72. Austria has responded adequately to concerns raised by the 2004 review and is to be commended for a thorough and well-structured presentation of the information in its 2005 submission.

73. The Austrian inventory for this sector is largely complete, most of the CRF tables being completed appropriately with data and the correct notation keys.

B. Key categories

1. Solid Waste Disposal on Land – CH_4

74. As mentioned in previous reviews, Austria is encouraged to extrapolate rather than use a constant value for its AD on "non-residual" waste for the years prior to 1998. Another method is to explore the use of proxy indicators such as population, industrial or commercial activity, and so on to determine AD.

75. In Austria's first-order decay (FOD) calculations, a decay rate constant of 0.035 is used. The ERT encourages Austria to re-examine the use of this value, noting that this rate changes not only with environmental conditions at the waste disposal site, but with the composition of solid waste as well. The constantly decreasing amount of degradable organic carbon (DOC) throughout the years (from 0.23 in the 1960s to 0.12 in 2003) will affect the value of this constant.

76. In its FOD model, Austria uses a 31-year time horizon. It is not clear how the AD for the years before base year are determined. The ERT recommends that the Party elaborate on this issue in its next submission.

77. The IPCC good practice guidance recommends that historical data should span between three and five half-lives for the FOD to yield reasonably accurate results. For a decay rate constant of 0.035, this implies a half-life of about 20 years. The ERT therefore recommends that Austria extend its historical data set to beyond its present 31-year time horizon, if possible.

78. Austria explains in the NIR (table 219) the decreasing trend of DOC. However, as the previous (2004) review report mentioned, these changes are not reflected in the waste composition data reported in the CRF sectoral background data table (table 6.A) which remain constant throughout the years. The ERT recommends that the Party update these background tables in order to improve the quality of its inventory and facilitate comparability between the different Parties' inventories.

2. Waste-water Handling – CH_4 and N_2O

79. As mentioned in the previous review, it is not good practice to determine industrial waste-water CH_4 emissions from a static IEF value (based on 1993 values) which uses population as an indicator or driver. As Austria develops its methodology for its 2006 submission, the ERT reiterates the recommendation of the 2004 review that the Party should consider applying the methods described in the IPCC good practice guidance.

80. It remains unclear what the basis is for assuming that industrial waste-water N_2O emissions are 30 per cent of urban emissions (NIR, page 261). The ERT noted that this would imply that the generation of industrial waste-water emissions depends on the release from urban waste water. Austria is encouraged to re-examine its estimation of emissions from this source category.

C. Non-key categories

Waste incineration – CO_2, CH_4, N_2O

81. The AD for waste oil are constant from 1999 to 2003. The ERT recommends that Austria update these values or extrapolate the AD for those years in which waste oil data are not available.

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>.

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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>.

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UNFCCC secretariat. Synthesis and assessment report of the greenhouse gas inventories submitted in 2005. Part I: 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. Klaus Radunsky (Federal Environmental Agency/Umweltbundesamt) including additional material on the methodology and assumptions used.

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