COMPLIANCE COMMITTEE

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2 March 2009

Report of the individual review of the greenhouse gas inventories of Austria submitted in 2007 and 2008

Note by the secretariat

The report of the individual review of the greenhouse gas inventories of Austria submitted in 2007 and 2008 was published on 27 February 2009. For purposes of rule 10, paragraph 2, of the rules of procedure of the Compliance Committee (annex to decision 4/CMP.2, as amended by decision 4/CMP.4), the report is considered received by the secretariat on the same date. This report, FCCC/ARR/2008/AUT, contained in the annex to this note, is being forwarded to the Compliance Committee in accordance with section VI, paragraph 3, of the annex to decision 27/CMP.1.

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Report of the individual review of the greenhouse gas inventories of Austria submitted in 2007 and 2008*

* In the symbol for this document, 2008 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 2007 and 2008 greenhouse gas (GHG) inventory submissions of Austria, coordinated by the UNFCCC secretariat, in accordance with decision 22/CMP.1. In accordance with the conclusions of the twenty-seventh session of the Subsidiary Body for Implementation, the focus of the review was on the most recent (2008) submission.[1] The review took place from 15 to 20 September 2008 in Bonn, Germany, and was conducted by the following team of nominated experts from the UNFCCC roster of experts: generalists – Mr. Justin Goodwin (United Kingdom of Great Britain and Northern Ireland), Mr. Jan Pretel (Czech Republic); energy –Mr. Javier Gonzalez (Spain), Mr. Simon Wear (New Zealand), Mr. Scott McKibbon (Canada); industrial processes – Mr. Stanford Mwakasonda (South Africa), Mr. Eilev Gjerald (Norway); agriculture – Mr. Tom Wirth (United States of America), Mr. Jorge Alvarez (Peru); land use, land-use change and forestry (LULUCF) – Ms. Thelma Krug (Brazil), Mr. Chris Cameron (New Zealand); and waste – Mr. Mark Hunstone (Australia), Mr. Qingxian Gao (China). Mr. Goodwin and Mr. Mwakasonda were the lead reviewers. The review was coordinated by Ms. Astrid Olsson and Mr. Vitor Gois Ferreira (UNFCCC secretariat).

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

B. Inventory submission and other sources of information

3. The 2008 annual inventory was submitted on 15 April 2008; it contains a complete set of common reporting format (CRF) tables for the period 1990–2006 and a national inventory report (NIR). This is in line with decision 15/CMP.1. Austria indicated that the 2008 submission is also its voluntary submission under the Kyoto Protocol.[2] In its 2007 submission, Austria included a complete set of CRF tables for the period 1990–2005 and an NIR. Where necessary the expert review team (ERT) also used the 2006 submission, 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 2006 (as reported in the 2008 annual inventory submission), the main GHG in Austria was carbon dioxide (CO_2), accounting for 84.8 per cent of total GHG emissions[3] expressed in CO_2 eq; methane (CH_4) accounted for 7.6 per cent and nitrous oxide (N_2O) for 5.9 per cent of total GHG emissions. Hydrofluorocarbons (HFCs), perfluorocarbons and sulphur hexafluoride (SF_6) together (F-gases) accounted for 1.6 per cent of total GHG emissions. The energy sector accounted for 76.7 per cent of the total GHG emissions, industrial processes for 11.8 per cent, agriculture for 8.7 per cent, waste for 2.4 per cent, and solvent and other product use for 0.4 per cent. Total GHG emissions amounted to 91,090.25 Gg CO_2 eq and increased by 15.1 per cent between the base year[4] and 2006. In 2005 (as reported in the 2007 inventory submission), total GHG emissions amounted to 93,279.54 Gg CO_2 eq. The shares of gases and sectors in 2006 (2008 annual inventory submission) were similar to those in 2005 (2007 inventory submission).

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[1] FCCC/SBI/2007/34, paragraph 104.

[2] Parties may start reporting information under Article 7, paragraph 1, of the Kyoto Protocol from the year following the submission of the initial report, on a voluntary basis (decision 15/CMP.1).

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

[4] Base year refers to the base year under the Kyoto Protocol, which is 1990 for all gases. The base year emissions do not include any possible emissions from deforestation; however, if applicable, these are taken into account when the assigned amount is calculated.

5. Tables 1 and 2 show GHG emissions by gas and by sector, respectively.

D. Key categories

6. Austria used the IPCC tier 1 approach to identify its key categories using the level and trend assessment. The key category analyses performed by Austria and by the secretariat[5] produced similar results. Austria has included the LULUCF sector in its key category analysis. This approach is consistent with the Intergovernmental Panel on Climate Change (IPCC) *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC good practice guidance) and the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF). The ERT encourages Austria to include a tier 2 key category analysis in future submissions when it has a complete set of uncertainty analyses for all categories. The same key categories were identified in the 2007 submission. The key category analysis is a driving factor for the preparation of the inventory. Austria is using the analysis to prioritize the development and improvement of the inventory.

E. Main findings

7. Austria has submitted a complete set of CRF tables for the years 1990–2006 and an NIR. The submission is complete in terms of geographical coverage, years and sectors, and also in terms of categories and gases. The inventory is generally in line with *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Revised 1996 IPCC Guidelines), the IPCC good practice guidance and the IPCC good practice guidance for LULUCF. The 2008 annual inventory submission is generally of a high quality and complete but the ERT identified a need for further improvements in the following areas: correction of some errors and improvements to methods in the waste and LULUCF sectors as described in the sectoral chapters; transparency for a few categories in the energy, industrial processes, agriculture, LULUCF and waste sectors as indicated in paragraph 11 below and the documentation of category-specific quality assurance/quality control (QA/QC) procedures for all categories and especially for the waste sector where no information is provided; and full inclusion of the LULUCF sector in the uncertainty analysis.

8. The NIR provides information on the methodologies used, activity data (AD) and emission factors (EFs) needed to assess the inventory. By supplying the additional information requested by the ERT during the review Austria has demonstrated sufficient capacity to comply 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 UNFCCC reporting guidelines) and IPCC good practice guidance. The ERT recommends that Austria include in its next NIR the additional information provided to the ERT during the review.

F. Cross-cutting topics

1. Completeness

9. The inventory covers all categories for the whole period 1990–2006 and is complete in terms of geographical coverage. Austria has submitted a complete set of CRF tables covering all years and all gases. There are no changes to the completeness of the inventory between 2007 and 2008.

[5] The secretariat identified, for each Party, the categories that are key categories in terms of their absolute level of emissions, applying the tier 1 level assessment as described in the Intergovernmental Panel on Climate Change (IPCC) *Good Practice Guidance for Land Use, Land-Use Change and Forestry*. Key categories according to the tier 1 trend assessment were also identified for Parties that provided a full set of CRF tables for the base year. Where the Party performed a key category analysis, the key categories presented in this report follow the Party's analysis. However, they are presented at the level of aggregation corresponding to a tier 1 key category assessment conducted by the secretariat.

Table 1. Greenhouse gas emissions by gas, 1990–2006

Greenhouse gas emissions	Gg CO_2 eq								Change Base year–2006 (%)
	Base year[a]	1990	1995	2000	2003	2004	2005	2006	
CO_2	62 084.94	62 084.94	63 965.22	65 928.38	78 271.39	77 529.03	79 515.42	77 282.75	24.5
CH_4	9 184.05	9 184.05	8 543.04	7 621.74	7 382.76	7 224.40	7 071.42	6 936.59	–24.5
N_2O	6 297.68	6 297.68	6 640.48	6 284.00	6 086.95	5 373.74	5 353.37	5 397.21	–14.3
HFCs	23.03	23.03	267.34	596.26	862.75	896.56	907.68	857.80	3 624.5
PFCs	1 079.24	1 079.24	68.69	72.21	102.39	125.68	125.22	135.67	–87.4
SF_6	502.58	502.58	1 139.16	633.31	593.52	513.12	286.50	480.24	–4.4

[a] Base year refers to the base year under the Kyoto Protocol, which is 1990 for all gases. The base year emissions do not include any possible emissions from deforestation; however, if applicable, these are taken into account when the assigned amount is calculated.

Table 2. Greenhouse gas emissions by sector, 1990–2006

Sectors	Gg CO_2 eq								Change Base year–2006 (%)
	Base year[a]	1990	1995	2000	2003	2004	2005	2006	
Energy	55 728.43	55 728.43	58 049.17	59 652.70	71 629.77	70 953.20	72 423.61	69 845.50	25.3
Industrial processes	10 110.82	10 110.82	9 729.22	10 034.18	10 662.00	9 986.89	10 300.26	10 773.09	6.6
Solvent and other product use	515.17	515.17	422.38	413.52	414.92	399.10	363.74	385.29	–25.2
Agriculture	9 168.74	9 168.74	9 240.12	8 384.71	8 021.07	7 876.41	7 854.41	7 889.33	–14.0
LULUCF	NA	–14 340.60	–17 113.77	–18 025.19	–18 329.27	–18 487.08	–18 119.45	–18 154.32	NA
Waste	3 648.36	3 648.36	3 183.04	2 650.78	2 572.01	2 446.93	2 317.61	2 197.05	–39.8
Other	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total (with LULUCF)	NA	64 830.93	63 510.16	63 110.71	74 970.49	73 175.46	75 140.17	72 935.93	NA
Total (without LULUCF)	79 171.53	79 171.53	80 623.93	81 135.90	93 299.76	91 662.54	93 259.62	91 090.25	15.1

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

[a] Base year refers to the base year under the Kyoto Protocol, which is 1990 for all gases. The base year emissions do not include any possible emissions from deforestation; however, if applicable, these are taken into account when the assigned amount is calculated.

2. Transparency

10. The NIR, together with the information provided during the review, provides much of the information necessary to assess the inventory. This greatly improved the understanding of the major underlying assumptions and rationale behind the choices of data, methods and other inventory parameters. However, the ERT identified a few areas where transparency should be increased. These are included in the sectoral chapters. The ERT acknowledges that Austria has provided additional descriptions of time series in the NIR including detailed descriptions of different components of the trends in accordance with recommendations from previous reviews.

3. Recalculations and time-series consistency

11. The ERT noted that recalculations reported by Austria of the time series from 1990 to 2005 are well documented in the NIR. Recalculations have been undertaken to take into account changes in methods and data sources for the energy, waste and LULUCF sectors for 1990, and for all sectors for 2005. For energy, estimates for N_2O from road transportation have been recalculated due to an update of N_2O EFs for road transportation. For industrial processes, estimates for F-gases have been recalculated for 2005. For LULUCF, new AD have resulted in significantly increased estimates for N_2O from land converted to cropland. For waste, estimates for N_2O from managed waste disposal, wastewater handling and compost production have increased in both the base year and recent years. Agriculture recalculations have been undertaken to include the distribution of dairy livestock among housing systems, resulting in changes to the amount of manure nitrogen applied to soils, with lower estimates for direct N_2O emissions from agricultural soils and higher estimates for indirect N_2O emissions. For agriculture, the nitrogen content of crop residues and the nitrogen content of crops have also been revised, resulting in higher estimates for direct N_2O emissions from agricultural soils. The impact of these recalculations was an increase in total GHG emissions of 0.15 per cent in 1990 and a decrease of 0.02 per cent in 2005.

4. Uncertainties

12. Austria reports both tier 1 and tier 2 uncertainty analyses. Austria's tier 2 analysis is an improvement for the 2007 and 2008 inventories following recommendations from the review of the 2006 submission. Austria's uncertainty for the 2006 inventory is 3.79 per cent at tier 1 and 5.32 per cent at tier 2. However, both tiers' analyses exclude LULUCF and the tier 1 analysis only includes key categories. During the centralized review Austria confirmed that its tier 1 and 2 uncertainty analyses do not yet include the LULUCF sector. Category-specific uncertainty estimates are partly included in the respective subchapters of the NIR. A complete uncertainty analysis of the LULUCF sector is planned and will be included in future inventories. Austria's uncertainties have not changed much between the 2006, 2007 and 2008 annual inventory submissions.

5. Verification and quality assurance/quality control approaches

13. Austria has a QA/QC plan in place and has implemented general and category-specific procedures in accordance with the IPCC good practice guidance. During the review, Austria provided information on the QA/QC activities including the QA/QC plan/manual, evidence of the implementation of the plan with examples of second party audit reports, check of implied emission factors (IEFs) (time series) and comparison of EFs with IPCC default values. The Party also provided information on plausibility checks of dips and jumps, an improvement list (external and internal findings), use of uncertainties in prioritization of improvements, reviews of Federal provinces air emission inventory and reports on the check of methodology and CO_2 emissions by the Austrian Institute of Economic Research. The ERT considers the Austrian QA/QC activities to be in good order and encourages the Party to continue with improvements to the description of category-specific QA/QC made since the 2006 review. The ERT noted that a discussion of category-specific QA/QC procedures is still not included for all categories and there is no discussion of QA/QC procedures for the waste sector in the NIR; it encourages Austria to include a description of QA/QC procedures used for all categories in future NIRs.

6. Follow-up to previous reviews

14. The ERT acknowledges the improvements, in response to previous reviews, in the Austrian inventory in a number of areas of its inventory methodology, including descriptions of category-specific QA/QC procedures for some categories; a tier 2 uncertainty assessment analysis; inclusion of the energy balance; improved methodological descriptions for, for example, consumption of halocarbons and SF_6, and volatilization losses in the agricultural sector; and information on supporting studies for the agricultural sector.

15. The ERT noted that Austria has not followed up on some of the recommendations from previous ERTs: for example, it has not included descriptions of category-specific QA/QC procedures for all categories (and the waste sector does not have any description of QA/QC procedures); it has not included the whole LULUCF sector in the uncertainty analysis; and it has not moved to higher tier methods for estimating some of the carbon pools in the LULUCF sector.

G. Areas for further improvement

1. Identified by the Party

16. The 2008 NIR identifies several areas for improvement across all sectors. The NIR states that an improvement plan has been established, and is updated in January each year. The overall goal is to produce emission inventories which are fully consistent with the UNFCCC reporting guidelines and the Revised 1996 IPCC Guidelines. The improvements include:

(a) A new study to review and harmonize the CRF data with data from the International Energy Agency (IEA) on consumption of jet kerosene for international aviation;

(b) Plans to investigate availability of data for implementing a higher tier method for the key category fugitive emissions from fuels for natural gas, in response to previous ERT recommendations;

(c) Plans to derive country-specific EFs for all types of energy from waste and apply revised EFs back to 1990 if applicable;

(d) Plans to determine the fossil carbon content of diesel fuel by analysis of the mixed biofuels and fossil diesel;

(e) A proposed study to update information on animal waste management systems (AWMS) distribution, because it has probably changed over the time period. Austria will incorporate these new data in future inventory submissions;

(f) Reassessment of forest soils, uncertainty and cropland biomass;

(g) Plans for a further study to update the amount of CH_4 recovery from 2002 onwards for solid waste disposal to land.

2. Identified by the expert review team

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

(a) Descriptions of QA/QC procedures for all categories in the NIR;

(b) A complete uncertainty analysis including the LULUCF sector.

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

II. Energy

A. Sector overview

19. The energy sector is the main sector in the GHG inventory of Austria. In 2006, emissions from the energy sector amounted to 69,845.5 Gg CO_2 eq, or 76.7 per cent of total GHG emissions. Emissions from the sector increased by 25.3 per cent between 1990 and 2006. The key driver for the rise in emissions is road transportation, which accounted for 33.1 per cent of 2006 energy emissions, and increased by 82.5 per cent from 1990 to 2006. Manufacturing industries and construction, energy industries and energy use in other sectors account for 22.9, 22.2 and 20.3 per cent, respectively, of sector emissions.

20. There were recalculations between the 2006 and 2007 inventory submissions. The recalculations were small and well within prescribed tolerances (zero at two decimal places) for 1990. There were recalculations between the 2007 and 2008 annual inventory submissions, mainly for N_2O from road transportation. Austria explains in the NIR that these changes were due to an update of N_2O EFs for road transportation. When comparing the 2007 and 2008 submissions, the overall energy emissions estimates for the latest common year (2005) show a small decrease (0.1 per cent).

B. Reference and sectoral approaches

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

21. Table 1.A(c) of the CRF shows a difference of between 3.56 and 7.10 per cent between the reference and sectoral approaches. Section 3.3 of the NIR explains that in the reference approach the IPCC default net calorific values are used to calculate energy consumption, whereas in the sectoral approach country-specific net calorific values are used.

22. Consumption of jet kerosene for international aviation reported in table 1.C of the CRF differs from the IEA value by about 5 per cent. Austria has advised the ERT that a new study is planned to update aviation data; this is expected to harmonize the CRF data with IEA data. The ERT acknowledges that Austria has plans to improve aviation data and looks forward to new aviation data being used in future submissions.

23. The ERT commends Austria for providing a well laid out energy balance in the NIR. This was of assistance to the ERT during the review, and enabled reviewers to confirm the data without the need to go back to the Party for further clarification.

2. International bunker fuels

24. Fuel consumption for domestic aviation is separated from that for international aviation; table 1.C of the CRF provides information on this separation. As noted in paragraph 22 above, Austria plans a new study to improve international aviation data. As Austria is not a maritime nation, no emissions are reported for marine bunker fuels. The ERT encourages Austria to use the documentation box in the CRF to explain the situation with marine bunker fuels.

3. Feedstocks and non-energy use of fuels

25. Information on feedstocks and non-energy use is well documented both in the CRF (table 1.A(d)) and in the NIR. The ERT acknowledges that Austria has provided data for naphtha in its 2008 submission, which was reported as “included elsewhere” (“IE”) in the 2006 submission, and has used the correct notation key of “not occurring” (“NO”) for ethane, which was reported as “IE” and “not applicable” (“NA”) in the 2006 submission.

C. Key categories

1. Stationary combustion: liquid, other fuels – CO_2

26. The ERT has observed a downward trend in the IEF from chemicals for other fuels (i.e. combustion of waste) since 2005 when the European Union emissions trading scheme (EU ETS) began operating and was used to provide improved data for this category. During the review Austria informed the ERT of plans to derive country-specific EFs for all types of waste and to apply revised EFs back to 1990 if applicable. The ERT encourages the Party to consider further use of facility-level data to improve the consistency of the inventory, or to verify estimates based on national statistics back to 1990.

27. The ERT observed that IEFs for liquid fuels for commercial/institutional fluctuate considerably. During the review Austria explained that this variation was due to the changes in the composition of liquefied petroleum gas, fuel oil and gasoline in the fuel mix. The ERT recommends that the Party provide descriptive text about this variation in future NIRs.

28. Austria informed the ERT that it assumes CO_2 emissions from this category to be overestimated for the period 1990–2004 because AD taken from the energy balance include heat of reaction and lean gas (mainly hydrogen) from production processes. The ERT recommends that Austria correct the emission estimates in its next annual submission.

29. The ERT notes that residential energy consumption and emissions in Austria fluctuate over the whole time series. However, Austria has advised the ERT that this variation is related to climatic conditions and that there is a close correlation with heating degree days. The ERT reiterates the recommendation from the previous ERT that Austria provide this information in its next NIR.

2. Stationary combustion: biomass – CH_4

30. The IEFs for biomass for residential are among the lowest of reporting Parties (30.00–1,158.00 kg/TJ) and lower than the IPCC default value (300.00 kg/TJ). The IEF for this category has decreased by 40.7 per cent between 1990 and 2006. Austria reported in the NIR that the changes are due to improvements in home heating. During the review Austria explained that the total organic carbon measurements from home-heating flue gases provide the estimate of volatile organic compounds, of which 25 per cent is assumed to be CH_4. The ERT recommends that the Party provide further documentation of this process in the NIR. According to the IPCC good practice guidance, EFs may be developed by national programmes that are already measuring emissions of indirect GHGs such as nitrous oxides (NO_X), carbon monoxide and non-methane volatile organic compounds, but because the associated uncertainty ranges are dependent on the instruments used and on the frequency of measurements, these uncertainty ranges should be described and reported.

3. Road transportation: diesel – CO_2

31. The 2005 and 2006 values of the CO_2 IEF for diesel (72.54 t/TJ and 69.74 t/TJ, respectively) are among the lowest of reporting Parties (56.78–79.45 t/TJ) and lower than the IPCC default value for Europe (74.00 t/TJ). The trend is quite stable, with decreases in the period 2004–2006 (1.5 per cent between 2004 and 2005, and 3.9 per cent between 2005 and 2006). Austria explained that from 2005 to 2006 the proportion of mixed biofuels in overall transport fuels increased. There are plans to determine the fossil carbon content of diesel fuel by analysis. However, the amount of biodiesel used in 2006 (321,000 t) is reported in the NIR but not in the CRF tables. The ERT recommends that the Party improve the consistency between the NIR and the CRF tables in its next submission, and provide more transparent information on the use of biofuels, for example, by including a table on biofuel use and type for each year.

4. Fugitive emissions: natural gas – CO_2 and CH_4

32. The ERT notes that Austria has not yet implemented a higher tier method for the key category fugitive emissions from fuels for natural gas, but notes that Austria reports plans to investigate the availability of data for implementing a higher tier method. The ERT welcomes this planned improvement.

III. Industrial processes and solvent and other product use

A. Sector overview

33. In 2006, emissions from the industrial processes sector amounted to 10,773.09 Gg CO_2 eq, or 11.8 per cent of total GHG emissions, and emissions from the solvent and other product use sector amounted to 385.29 Gg CO_2 eq, or 0.4 per cent of total GHG emissions. Between 1990 and 2006 emissions from the industrial processes sector increased by 6.6 per cent, and emissions from the solvent and other product use sector decreased by 25.2 per cent.

34. The key driver for the rise in emissions for industrial processes is consumption of HFCs as substitutes for ozone depleting substances. Within the industrial processes sector, 47.4 per cent of GHG emissions were from metal production, 30.6 per cent were from mineral products, 13.7 per cent were from consumption of halocarbons and SF_6, and 8.3 per cent were from the chemical industry.

35. The industrial sector emissions are complete. No categories are reported as "not estimated". Transparency was also good, and confidentiality was reported only for SF_6 from aluminium foundries and semiconductor manufacture.

36. Austria incorporated documentation of QA/QC procedures in the industrial process sector as well as uncertainty analysis in the 2008 annual inventory, as recommended by the previous ERT. The ERT commends Austria for its QA/QC documentation.

B. Key categories

1. Cement production – CO_2

37. Austria's CO_2 IEF for clinker (0.53–0.57 t/t) is higher than the IPCC default factor (0.51 t/t). Austria explained that this is due to different compositions of raw materials used. The ERT noted that a study was conducted to determine EFs for each cement plant, taking into consideration raw material composition. AD were sourced from the Association of the Austrian Cement Industry, and for 2005 and 2006 a data verification process under the EU ETS was in place. The ERT recommends that Austria continue with periodic monitoring of the raw materials.

2. Lime production – CO_2

38. Austria uses a country-specific method based on detailed production data, with AD and emission values reported by the Association of the Stone & Ceramic Industry. For 2005 and 2006, verified emissions reported under the EU ETS were used. The CO_2 IEF varies across the years and Austria explains this by variations in the calcium oxide content in the lime.

39. The ERT recommends that Austria provide, in its next NIR, clear documentation on lime production, limestone and dolomite use and soda ash use, with respect to non-marketed lime production.

3. Limestone and dolomite use – CO_2

40. Austria reported limestone and dolomite use for activities in the glass industry, in the iron and steel industry and in desulphurization in chemical industries. Emissions from this category increased by 33.2 per cent between 1990 and 2006, mainly due to increased limestone use in the iron and steel industries.

41. Glass production data were reported by the Association of the Glass Industry for the years 2002–2004; for the years before 2002, AD were based on a constant ratio of limestone and dolomite used per tonne of glass produced. During the review Austria explained that such backtracking of limestone and dolomite consumption in the glass industry already includes production from recycled glass. The ERT recommends that Austria include this information in its next NIR.

4. Ammonia production – CO_2

42. Austria reports CO_2 and CH_4 emissions from ammonia (NH_3) production. Austria reports on a downstream production of melamine, produced from urea, in which carbon is considered to be stored for a long time, and hence subtracted from ammonia production emissions. Melamine is reported in the NIR to be a carbon stock; it is fire resistant and heat tolerant, with a highly stable structure. Carbon stored in melamine was calculated stoichiometrically from urea input for melamine production. During the review, Austria explained to the ERT that emissions of CH_4 come from leakage in ammonia production and from start-ups during ammonia production, which are subsequently subtracted from CO_2 emissions to avoid double counting. The ERT recommends that Austria give a clearer explanation of these emissions in its next inventory report.

IV. Agriculture

A. Sector overview

43. In 2006, emissions from the agriculture sector amounted to 7,889.33 Gg CO_2 eq, or 8.7 per cent of total GHG emissions. Emissions from the sector decreased by 14.0 per cent between 1990 and 2006. The key drivers for the fall in emissions are reduced emissions from enteric fermentation, from agricultural soils and from manure management, largely as a result of a decreasing cattle population. Within the sector, 40.1 per cent of the emissions were from enteric fermentation, 37.1 per cent were from agricultural soils, 22.2 per cent were from manure management, and less than 1 per cent was from field burning of agricultural residues.

44. As requested by previous ERTs, Austria has improved the transparency of the NIR by providing more information about the supporting studies used in developing estimates of gross energy intake, volatile solids excretion and the nitrogen excretion rate used for the categories of enteric fermentation (CH_4) and manure management (CH_4, N_2O). Austria has also provided additional information on its country-specific approach for estimating volatilization losses of NH_3-N + NO_X-N from animal manure applied to soils.

45. A comparison of the 2007 submission against the 2008 submission shows no major changes in the estimates or major improvements to the transparency in the description of the estimates. Two minor changes were made – to the distribution of dairy livestock among housing systems, and to the nitrogen content of crop residues. The new data on distribution of dairy housing systems led to changes to the amount of manure nitrogen applied to soils, resulting in lower direct N_2O emissions from agricultural soils and higher indirect N_2O emissions. Revision of the nitrogen content of crops resulted in higher direct N_2O emissions from agricultural soils. These recalculations resulted in decreases in agricultural GHG emissions of 0.5 per cent in 1990 and 0.3 per cent in 2005.

B. Key categories

1. Enteric fermentation – CH_4

46. Austria uses methods in line with the IPCC good practice guidance. For cattle, a tier 2 approach is used, and for all other livestock a tier 1 approach is used. The tier 2 method for cattle includes a country-specific approach to developing the gross energy intake values based on annual milk yields. The approach is well documented and the gross energy values are comparable to those of other countries with similar livestock management practices. Austria used livestock statistics from Statistik Austria 2006 to

determine all livestock populations. Austria provided detailed background information to explain the trend changes over the 1990–2006 time period for all livestock categories.

47. In order to improve the transparency of the inventory the ERT recommends that Austria report emissions from non-dairy mother cows and young cattle separately. These emissions are currently combined into a single category, making evaluation of the IEFs difficult. Transparency would also be improved by explicitly indicating in which category bulls are included.

2. Manure management – CH_4, N_2O

48. Austria currently applies a single AWMS distribution across the entire time series based on a study carried out in 1995. In previous reviews ERTs have recommended that Austria update its information on AWMS distribution as it has probably changed over the time period. Austria is currently carrying out a study to update its AWMS distribution information and will incorporate the new data into the inventory in coming years. The ERT welcomes this development and recommends that Austria report on the results in its next NIR.

3. Agricultural soils – N_2O

49. In response to an issue raised in previous 2008 review stages, Austria has changed the values for the fraction of nitrogen in both N-fixing ($Frac_{NCRBF}$) and non-N fixing ($Frac_{NCRO}$) crops. The new value for $Frac_{NCRBF}$ is 0.03 kg N/kg dry matter, which matches the IPCC default value. For $Frac_{NCRO}$ the Austrian value is 0.009 kg N/kg dry matter and the IPCC default value is 0.015 kg N/kg dry matter. The ERT considers these values appropriate for Austrian circumstances.

50. In order to develop the AD time series for synthetic nitrogen fertilizer additions, Austria is using annual sales data for nitrogen synthetic fertilizers. During the review of the 2006 submission, Austria was requested to consider revising the time series using actual data on fertilizer use, but Austria is not currently able to develop a time series based on actual fertilizer use. The ERT considers the use of sales data on fertilizer use an appropriate alternative.

51. Austria has also improved its country-specific approach for estimating volatilization losses of NH_3-N and NO_X-N from animal manure applied to soils. Rather than using the default $Frac_{GASM}$ value of 0.2 kg for both NH_3-N and NO_X-N/kg of nitrogen excreted by livestock, Austria accounts for NH_3-N losses during storage, management and application of the manure, and NO_X-N losses during application, using country-specific factors. The approach used by Austria is transparent and is in line with the IPCC good practice guidance.

V. Land use, land-use change and forestry

A. Sector overview

52. In 2006 the LULUCF sector in Austria accounted for net removals of 18,154.32 Gg CO_2 eq. This represents 19.9 per cent of total GHG emissions. Removals from the sector increased by 26.6 per cent between 1990 and 2006. The key driver for the increase in removals is the increase of carbon stocks in forest land remaining forest land. Austria includes all land uses, gases and pools in its reporting for the LULUCF sector.

53. The NIR provided by Austria provides an adequate level of transparency for emissions and removals from LULUCF. The ERT notes that descriptions for representation of land areas could be improved to provide detail on how each category is calculated and evidence of the methods used for interpolation of land-use areas across the full time series.

54. An uncertainty analysis is provided for forest land, cropland and grassland. Uncertainties are estimated for wetlands and settlements based on expert judgement. There is no analysis of uncertainty for "other land". During the review the ERT was informed that an uncertainty analysis for the whole

LULUCF sector is being prepared. The results of this new analysis are expected for 2010 and will also include uncertainties for the estimates of the subsectors 5.C, 5.D and 5.E.

55. Overall the impact of recalculations in the sector is low. However, it is noted that due to new AD, the estimates for emissions from land converted to cropland have increased considerably.

56. Planned improvements for the LULUCF sector include reassessment of forest soils, uncertainty and cropland biomass. The ERT noted that Austria had presented a thorough analysis of useful improvements for this difficult sector.

57. There are no major changes between the 2007 and 2008 annual inventory submissions. These submissions were both changed from the 2006 submission, with AD allocated into the appropriate "converted" and "remaining" categories. Austria now reports and tracks all land-use change categories in conversion status for 20 years. After 20 years they are accounted in the "remaining" categories. This was recommended in a previous review and Austria is commended for this improvement.

B. Key categories

1. Forest land – CO_2

58. Methods used for forest land (remaining and converted) are appropriate and in line with the IPCC good practice guidance for LULUCF.

2. Cropland – CO_2

59. For cropland (remaining and converted) a country-specific method is used for soil carbon stock changes. For the biomass carbon pools of vineyards and orchards, tier 1 methods and default parameters from the IPCC good practice guidance for LULUCF are used. The ERT recommends that Austria consider higher-tier methods for these pools, provided that country-specific data become available.

3. Land converted to grassland – CO_2

60. The ERT notes that Austria now uses a tier 2 method to estimate emissions/removals for grassland. The Party has also removed the use of the discount factor to estimate carbon stock changes in soils for land-use conversions in line with previous ERT recommendations (2006 review). For land converted to grassland a country-specific method is used for soil carbon stock changes.

4. Land converted to settlements – CO_2

61. Reporting is generally in line with the IPCC good practice guidance for LULUCF, but although emissions from land converted to settlements are increasing, the total area converted to settlements shows a decrease over the time period. It appears that the areas used for "converted" categories may be incorrect. As currently reported, the increase in removals of CO_2 is a result of the increase in land in the "remaining" category not the "converted" category. Austria provided the ERT with additional information during the review, which included detection of an error in the areas used. The ERT recommends that this error be corrected and that Austria ensure the appropriate use of "converted" and "remaining" categories in its future submissions.

VI. Information on activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol

A. Overview

62. Austria has not elected activities under Article 3, paragraph 4. An annex to the NIR provides supplementary information under Article 3, paragraph 3, of the Kyoto Protocol. In addition Austria has provided CRF tables with data for 2006.

63. In line with the comment made on inventory reporting (see para. 53), the ERT notes that descriptions for the representation of land areas could be improved, providing more detail on how each category is calculated and evidence of the methods used for interpolation of land-use areas across the full time series.

B. Article 3, paragraph 3, activities

64. Austria uses reporting method 1 from the IPCC good practice guidance for LULUCF, in which units of land are encompassed within a geographical boundary subject to multiple activities (based on a sampling grid across the country). The ERT recommends that Austria provide more detail on how sampled data are used to determine boundaries of land areas. National or regional maps indicating land allocation to afforestation, reforestation and deforestation activities, and for tracking these changes over time, would be useful. It is important for Austria to show that these activities have occurred since 1990.

65. Austria has indicated that all pools were accounted for, but that litter is included with the soil carbon pool. Deadwood is reported as "not occurring" for afforestation and reforestation and is included with soil/litter for deforestation. The ERT recommends that Austria report each carbon pool separately, and provide evidence that no deadwood occurs upon afforestation and reforestation.

66. With regard to harvesting of afforested and reforested (AR) areas, Austria reports this as "not occurring". The ERT recommends that further evidence be provided to support the assertion that no harvesting occurs on AR lands.

67. Harvesting and land-use change are separately determined in the reporting. However, it is not clear how Austria determines that a definite land-use change has occurred. The ERT recommends that this be clarified in the reporting in line with section 4.2.6.2.1 of the IPCC good practice guidance for LULUCF.

68. Austria indicates that impacts from CO_2 concentrations above pre-industrial levels, indirect nitrogen deposition and dynamic effects of age structure resulting from activities carried out before 1 January 1990 have not been factored out. The ERT notes that factoring out these impacts is the intent of the forest management cap included in the appendix to the annex of decision 16/CMP.1 for the first commitment period.

VII. Waste

A. Sector overview

69. In 2006, emissions from the waste sector amounted to 2,197.05 Gg CO_2 eq, or 2.4 per cent of total GHG emissions. Emissions from the sector decreased by 39.8 per cent between 1990 and 2006. The key driver for the fall in emissions is a reduction of emissions from solid waste disposal. Within the sector, 80.1 per cent of the emissions were from solid waste disposal on land, 14.6 per cent were from wastewater handling, 4.8 per cent were from other (compost production) and 0.6 per cent were from waste incineration. CH_4 emissions accounted for 83.5 per cent and N_2O for 15.9 per cent, while the remaining 0.6 per cent was emitted as CO_2.

70. All categories from within Austria's waste sector are reported. Emissions from sludge spreading are reported appropriately in the agriculture sector and emissions from the use of landfill and sludge gas for energy purposes are reported in the energy sector.

71. Recalculations have been performed for managed waste disposal, wastewater handling and compost production. The net effect of these recalculations is a 0.01 per cent reduction in emissions in the base year and a 1.5 per cent increase in 2005. All recalculations are well documented in the NIR and CRF tables.

72. There is no sector-specific QA/QC discussion in the NIR.

73. No differences between the 2007 and 2008 submissions have been identified.

B. Key categories

1. Solid waste disposal on land – CH_4

74. Austria uses the IPCC first order decay model and a mixture of default and country-specific parameters to estimate emissions from the disposal of solid waste. The discussion of model parameters and AD is well structured and transparent. Transparency would be further improved if additional information on the assumptions behind the derivation of the 'residual waste' degradable organic carbon (DOC) value and the percentage composition of 'non-residual waste' could be included in future NIR submissions. The ERT encourages Austria to include this information.

75. Austria uses a DOC_f value of 0.77 for sludge disposal in landfills. The Party confirmed during the review that lignin carbon is included in special sludge originating from the paper industry. This is not consistent with the IPCC good practice guidance. It is recommended that the Party adopt the appropriate DOC_f value (0.5–0.6) for DOC including lignin. Similar consideration should be given to biowaste, should it also contain lignin.

76. Austria reports a value for DOC degraded greater than 100 per cent in CRF table 6.A throughout the time series. It is recommended that the Party correct this information in its next submission.

77. Landfill CH_4 recovery data are based on a questionnaire study (Rolland and Oliva, 2002). Data from 2002 onwards are constant. Austria plans a further study to update the rate of CH_4 recovery from 2002 onwards. The ERT encourages Austria to complete this work and incorporate the results in future submissions.

2. Wastewater handling – N_2O

78. Austria calculates emissions of N_2O from wastewater treatment at treatment plants and households not connected to the sewerage system. A country-specific method has been used for wastewater treatment plants and the IPCC default method has been used for households. Methods and AD are transparently documented in the NIR.

79. Previous reviews had questioned the assumption that industrial wastewater contributes 30 per cent of the N_2O emissions from wastewater handling. The Party has conducted further research as suggested; this has confirmed the validity of this assumption.

C. Non-key categories

Wastewater handling – CH_4

80. Austria estimates emissions of CH_4 from cesspools and septic tanks using the IPCC default method and a country-specific CH_4 conversion factor of 0.27, based on well-documented research. Emissions from wastewater treatment plants and industrial wastewater are assumed to be negligible due to the use of aerobic processes. Similarly, sludge treatment is either aerobic or subject to 100 per cent CH_4 recovery and thus emissions are negligible.

81. CH_4 emissions from wastewater treatment show a decreasing trend between 1990 and 2003 with the largest inter-annual decreases ranging between 8.0 and 11.3 per cent between 1995 and 2003. The Party has explained that the decreasing trend is due to a reduction in the population using cesspools and an equivalent increase in the size of the population connected to the sewerage system. The ERT encourages Austria to expand on the trend discussion in the NIR to further explain any remarkable trends or fluctuations in the time series.

82. The Party has undertaken to further clarify the distinction between the population not connected to the sewerage system and the population using cesspools and septic tanks. The ERT welcomes this undertaking, as it will enhance the transparency of the NIR.

VIII. Other issues

1. Changes to the national system

83. The Party has confirmed (in its NIR) that no changes to its national system have taken place in 2007 or 2008.

2. Changes to the national registry

84. The Party reported on changes in its national registry in the 2008 submission. The changes include one more person being added to the list of registry administrators and additional checks being made to minimize discrepancies. The ERT considers these changes to be in accordance with the requirements of national registries as defined in decision 13/CMP.1. Austria has also provided additional information clarifying the database structure of the national registry and stating that Austria runs an independent registry and does not cooperate with other Parties by maintaining its national registry in a consolidated system.

3. Commitment period reserve

85. Austria has not reported its commitment period reserve in the 2008 submission. In response to questions raised by the ERT during the review, Austria reported that its commitment period reserve has not changed since the initial report review (309,479,408 t CO_2 eq). The ERT agrees with this figure. The ERT recommends that the Party include information on its commitment period reserve in its next annual submission.

IX. Conclusions and recommendations

86. Austria has submitted a complete set of CRF tables for the years 1990–2006 and an NIR, which are complete in terms of geographical coverage, years and sectors as well as being complete in terms of categories and gases. There are no changes to the completeness of the inventory between the 2007 and 2008 submissions.

87. Austria's institutional arrangements are fully functional and designed to use the best expertise and resources available to develop, prepare and compile the inventory.

88. The Austrian inventory is generally in line with the Revised 1996 IPCC Guidelines, the IPCC good practice guidance and the IPCC good practice guidance for LULUCF. However, for LULUCF it appears that the areas used for "converted" categories may be incorrect, and for waste, lignin carbon is included in special sludge originating from the paper industry.

89. The 2008 annual inventory submission is generally of a high quality and complete, but the ERT identified a need for further improvements in the following areas: correction of some errors including LULUCF sectors in estimates for "converted" categories and the use of higher tier methods for key categories (cropland and land converted to grassland); correction of overestimated CO_2 emissions in stationary combustion for other fuels for the period 1990–2004; and improvements to methods for waste in the estimation of emissions from special sludge and biowaste in landfill.

90. The ERT also identified the need for improvements in transparency, including:

(a) Descriptions of QA/QC procedures for all categories in the NIR;

(b) A complete uncertainty analysis including the LULUCF sector;

(c) Description of trends, changes in residential energy consumption and emissions fluctuations over the whole time series;

(d) Inclusion of more transparent information on the use of biofuels;

(e) Documentation on lime production, limestone and dolomite use and soda ash use, with respect to non-marketed lime production;

(f) Inclusion of additional information on limestone and dolomite consumption in the glass industry;

(g) Reporting of emissions of CH_4 from leakage in ammonia production and from start-ups during ammonia production;

(h) Reporting of emissions from non-dairy mother cows and young cattle separately;

(i) Description for representation of land areas;

(j) Assumptions behind the derivation of the 'residual waste' DOC value.

X. Questions of implementation

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

Annex

Documents and information used during the review

A. Reference documents

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

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

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

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

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

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

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

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

Status report for Austria 2007. Available at <http://unfccc.int/resource/docs/2007/asr/aut.pdf>.

Status report for Austria 2008. Available at <http://unfccc.int/resource/docs/2008/asr/aut.pdf>.

Synthesis and assessment report on the greenhouse gas inventories submitted in 2007. Available at <http://unfccc.int/resources/webdocs/sai/2007.pdf>.

Synthesis and assessment report on the greenhouse gas inventories submitted in 2008. Available at <http://unfccc.int/resources/webdocs/sai/2008.pdf>.

FCCC/ARR/2006/AUT. Report of the individual review of the greenhouse gas inventory of Austria submitted in 2006. Available at <http://unfccc.int/resource/docs/2007/arr/aut.pdf>.

FCCC/IRR/2007/AUT. Report of the review of the initial report of Austria. Available at <http://unfccc.int/resource/docs/2007/irr/aut.pdf>.

B. Additional information provided by the Party

Responses to questions during the review were received from Mr. Helmut Hojesky (Federal Ministry of Agriculture, Forestry, Environment and Water Management), including additional material on the methodology and assumptions used. The following documents were also provided by the Party:

Anderl. 2008. *Qualitätsmanagement-System Emissionsbilanzen Checkliste/Verzeichnis der Unstimmigkeiten (IPCC sector 4).* ATCR08_EMI_Unstimmigkeiten_4. Vienna. UBA-Vienna.

Brunner, Judith, Manuela Wieser, Klaus Radunsky. 2008. *Qualitätsmanagement - System Emissionsbilanzen. Teil II – Verfahrensanweisungen*. ATCR08_EMI_K05V01_106.Vienna. UBA-Vienna.

Foelsche-Trummer, Eva. 2008. Bundesländer-Arbeitskreis Emissionskataster / BLI-Koordination Protokoll der Sitzung vom 12.03.2008 in Salzburg. ATCR08_Emikat-BLAK_Protokoll_2008-03-12. Vienna. UBA-Vienna.

Muik, Anderl, Schodl, Köther, Pazdernik, Weiss. 2008. *Qualitätsmanagement-System Emissionsbilanzen Verzeichnis der Audits*. ATCR08_EMI_Verzeichnis_Audits. Vienna. UBA-Vienna.

Poupa, Muik, Anderl, Schodl, Köther, Pazdernik, Weiss. 2008. *QA/QC Plan.* The QA/QC plan lists all tasks of and documents that have to be provided by personnel of the inspection body. ATCR08_QMSplan_english. Vienna. UBA-Vienna.

Poupa, Muik, Anderl, Schodl, Köther, Pazdernik, Weiss. 2008. *Systemaudit zur Umsetzung der Wirksamkeit des QMS 2008*. Systemaudit zur Umsetzung der Wirksamkeit des QMS 2008. SO 01/2008. ATCR08_Beilage_EMI_Audit_34. Vienna. UBA-Vienna.

Poupa, Muik, Anderl, Schodl, Köther, Pazdernik, Weiss. 2008. *Überprüfung der Wirksamkeit des QMS/ Umsetzung.* ATCR08_EMI_Audit_34. Qualitätsmanagement-System Emissionsbilanzen. Checkliste Systemaudit. Vienna. UBA-Vienna.

Poupa, Stephen. 2008. *Qualitätsmanagement-System Emissionsbilanzen*. Checkliste Validierung. ATCR08_OLI_2007_CL_VALIDIERUNG 1 A Stat. Vienna. UBA-Vienna.

Ritter. 2008. *Comparison table of CO2 Fuel Oil Emission Factors*. ATCR08_CO2_WIFO_UBA. Vienna. UBA-Vienna.

Rolland, Christian, Judith Oliva. 2002. *Erfassung von Deponiegas. Statusbericht von österreichischen Deponien*. Umweltbundesamt. Wien.

Weiss, Peter. 2008. *Qualitätsmanagement-System Emissionsbilanzen. Notiz im Sektor IPCC 5*. ATCR08_Beilage_EMI_Audit_33. Vienna. UBA-Vienna.

Weiss, Peter. 2008. *Validierung der neuen Methoden mit CS Faktoren im Sektor IPCC 5*: Qualitätsmanagement-System Emissionsbilanzen. Checkliste Vertieftes Verfahrensaudit. ATCR08_EMI_Audit_33. Vienna. UBA-Vienna.

Wieser, Manuela. 2008. *Überwachungsstelle Emissionsbilanzen Unterlagen zum Management Review*. 2008ATCR08_MR 2008. Vienna. UBA-Vienna.

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