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REPORT OF THE INDIVIDUAL REVIEW OF THE GREENHOUSE GAS INVENTORY OF AUSTRIA SUBMITTED IN THE YEAR 2001[1]

(Centralized review)

I. OVERVIEW

A. Introduction

1. The Conference of the Parties (COP), at its fifth session, by its decision 6/CP.5, adopted guidelines for the technical review of greenhouse gas (GHG) inventories from Parties included in Annex I to the Convention (Annex I Parties), hereinafter referred to as the review guidelines,[2] for a trial period covering GHG inventory submissions for the years 2000 and 2001. The COP requested the secretariat to conduct individual reviews of GHG inventories for a limited number of Annex I Parties. The secretariat was requested to use different approaches to individual reviews by coordinating desk reviews, centralized reviews and in-country reviews.

2. In response to the mandate by the COP, the secretariat coordinated a centralized review of seven national GHG inventories submitted in 2001 (Austria, Belgium, Estonia, the European Community, Germany, Greece and Spain), which took place from 8 to 12 October 2001. The review was carried out by a team of nominated experts from the roster of experts working at the headquarters of the UNFCCC secretariat in Bonn. The members of the team were: Mr. Charles Russell (New Zealand), Mr. José Ramon Villarin (Philippines), Mr. Hristo Vassilev (Bulgaria), Ms. Irina Yesserkepova (Kazakhstan), Ms. Nadzeya Zaleuskaya (Belarus), Mr. André Van Amstel (The Netherlands), Ms. Punsalmaa Batima (Mongolia), Mr. Rizaldi Boer (Indonesia), Mr. Josef Mindas (Slovakia), Mr. Charles Jubb (Australia) and Mr. Emilio Sempris (Panama). The review was coordinated by Ms. Rocio Lichte (UNFCCC secretariat). Mr. Charles Russell and Mr. José Ramon Villarin were lead authors of this report.

3. The principle objective of the review of the GHG inventories was to ensure that the COP had adequate information on the inventories. The review should also further assess the progress of the Parties toward fulfilling the requirement outlined in the UNFCCC reporting guidelines.[3] In this context, the review team checked the Parties' responses to questions raised in the previous stages of the review process, and the consistency of inventory submissions with the UNFCCC reporting guidelines and the Revised 1996 IPCC Guidelines for National Greenhouse Gas

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[1] In the symbol for this document, 2001 refers to the year in which the inventory was submitted, and not to the year of publication. The number (3) indicates that for Austria this is a centralized review report.

[2] For the UNFCCC review guidelines and decision 6/CP.5, see document FCCC/CP/1999/7, pages 109 to 114 and 121 to 122 respectively.

[3] 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 (FCCC/CP/1999/7) are referred to as the UNFCCC reporting guidelines in this report.

Inventories (hereinafter referred to as the IPCC Guidelines), and identified possible areas for improvement in the inventories of the seven Annex I Parties. Each IPCC sector was reviewed by two experts.

4. The review team also assessed to a certain degree whether the reporting fulfilled the requirements included in the IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories (hereinafter referred to as the IPCC good practice guidance).[4]

5. In accordance with the UNFCCC review guidelines, 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.

B. Inventory submission and other sources of information

6. The centralized review team was provided with the common reporting format (CRF) tables for all years from 1990 to 1999 and the national inventory report (NIR) as submitted by Austria for the 2001 inventory submission. The NIR in an abbreviated form was submitted by April 15, 2001, while the complete NIR was submitted in July 2001. The NIR was submitted in hard copy and the summary report was submitted electronically. The complete NIR is more detailed and informative than the summary report submitted as an electronic copy.

7. The figures presented in the NIR replace data reported earlier by the Austrian Federal Government under the reporting framework of the UNFCCC. The data that have been revised were included in the inventory chapter of the 1997 Second National Climate Report of the Austrian Federal Government (Austria's Second National Communication, chapter 4) and in Austria's 2000 submission to the UNFCCC (Austrian Annual National Greenhouse Gas Inventory 1980 to 1998).

8. The status report 2001 and the draft synthesis and assessment (S&A) report 2001 prepared by the secretariat, together with the Party's responses to the draft S&A report, were made available to the review team. In addition, the secretariat's preliminary key source analysis (level and trend assessment)[5] was used as supporting material. This enabled comparisons to be made with the key source analysis prepared by the Party and presented in the NIR. In addition, the expert review team (ERT) had access to the secretariat's GHG inventory database through the provision of a data search tool.

9. Other sources of information used during the review include: Austria's inventory submission of 2000 (CRF for 1998 and brief NIR), results of the review of the 2000 inventory submission (S&A report 2000), the preliminary guidance for experts participating in the individual review of GHG inventories, and the UNFCCC reporting and review guidelines.

10. During the review the Party was not contacted to request additional information.

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[4] According to the conclusions of the Subsidiary Body for Scientific and Technological Advice (SBSTA) at its twelfth session, the IPCC good practice guidance should be applied by Annex I Parties as far as possible for inventories due in 2001and 2002, and should be used for inventories due in 2003 and beyond.

[5] The UNFCCC secretariat had identified, for each individual Party, those source categories that are *key sources* in terms of their absolute level of emissions, applying the tier 1 level assessment as described in the IPCC good practice guidance. Key sources according to the tier 1 trend assessment were also identified for those Parties that provided a full CRF for the year 1990. The key sources presented in this report are based on the secretariat's preliminary key sources assessment. They might differ from the key sources identified by the Party itself.

C. Emissions profiles, trends, key sources

11. Austria's principal emissions are carbon dioxide (CO_2) which have increased slightly in proportion in the years 1990 to 1999, from 80.7% to 83.0%. Emissions of methane (CH_4) have decreased from 14% to 12% over the same period. Nitrous oxide (N_2O) levels have increased slightly from 2.6% to 2.9%. Hydrofluorocarbons (HFC) emissions have increased dramatically since 1995 and represented 1.1% of Austria's GHG emissions in 1999 compared to 0.005% in 1990. There have been significant decreases in perfluorocarbons (PFC) emissions since 1993 and an overall 97% decrease in emissions between 1990 and 1999.

12. The profile of Austria's emissions is similar to that of other Annex I Parties. CO_2 is the main GHG emitted followed by CH_4 and N_2O. Significant growth in emissions of HFCs since 1990 (4 Gg CO_2 equivalent in 1990 compared with 870 Gg CO_2 equivalent in 1999) is consistent with the trend to be expected in Annex I countries as HFCs rapidly displace ozone-depleting substances (ODSs), especially from 1995 onwards.

Table 1. GHG emissions by gas, 1990-1999 (Gg CO_2 equivalent)

GHG	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
	CO_2 equivalent (Gg)									
CO_2 emissions (excluding LUCF)[(a)]	62,132	66,024	60,154	59,901	61,756	63,754	64,889	66,829	65,489	65,778
CH_4	11,290	11,069	10,804	10,675	10,502	10,279	10,108	9,862	9,640	9,541
N_2O	2,033	2,119	2,136	2,196	2,260	2,275	2,266	2,253	2,282	2,279
HFCs	4	6	9	12	17	546	625	718	816	870
PFCs	963	974	576	48	54	16	15	18	21	25
SF_6	518	683	725	823	1,033	1,175	1,246	1,148	955	730
Total (with net CO_2 emissions/removals)	67,724	67,371	65,748	64,674	67,759	70,790	73,765	73,195	71,570	71,591
Total (excluding CO_2 from LUCF)	76,939	80,875	74,404	73,656	75,621	78,044	79,150	80,828	79,203	79,224

(a) LUCF: land-use change and forestry

13. The energy sector is the largest source of emissions, contributing 76.2% of total net national GHG emissions in CO_2 equivalent (total including net CO_2 emissions/removals from land-use change and forestry (LUCF)) in 1999. The industrial processes sector comprised 19.1% of total net national emissions, the waste sector contributed 7.4% and the agriculture sector contributed 6.9%.

14. Emissions from the energy sector increased by 9.3% from 1990 to 1999, industrial processes sector emissions decreased by 4.6%, agriculture emissions fell by 16.7%, waste sector emissions declined by 14.6%, and the net sink for land-use change and forestry decreased by 17.2%.

Table 2. GHG emissions by sector, 1990-1999 (Gg CO_2 equivalent)

GHG SOURCE AND SINK CATEGORIES	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
	CO_2 equivalent (Gg)									
1. Energy	49,929	54,483	49,669	49,357	50,613	52,389	54,024	54,779	54,238	54,556
2. Industrial processes	14,420	14,063	12,625	12,366	13,220	14,102	13,746	14,828	13,980	13,752
3. Solvent and other product use	755	669	614	593	594	613	612	638	628	628
4. Agriculture	5,591	5,520	5,367	5,334	5,282	5,140	5,077	5,048	5,044	4,958
5. LUCF	-9,215	-13,504	-8,656	-8,982	-7,862	-7,254	-5,385	-7,633	-7,633	-7,633
6. Waste	6,243	6,139	6,129	6,005	5,912	5,799	5,691	5,535	5,313	5,330
7. Other	0	0	0	0	0	0	0	0	0	0

15. The preliminary key source analysis prepared by the UNFCCC secretariat shows CO_2 mobile combustion – road vehicles (21.7%), CO_2 stationary combustion – gas (19.2%), CO_2 stationary combustion – oil (15.4%), and CO_2 from the iron and steel industry (10.7%) to be the most significant key sources. Each of these sources contributed more than 10% of total emissions. Mobile combustion – road vehicles and CO_2 stationary combustion – gas were substantial contributors to the growth in emissions as indicated by the key source trend assessment, contributing 18.2% and 19.9% respectively to the growth in emissions. The most significant contributor to emissions growth from 1990 was CO_2 stationary combustion – coal at 23.6% (table 3).

Table 3. Key sources Austria: Level and trend assessment (UNFCCC secretariat)[(a)]

Key source	Gas	Level assessment for 1999 %	Cumulative total %	Contribution to trend %
Mobile combustion – road vehicles	CO_2	21.7	22	18.2
Stationary combustion – gas	CO_2	19.2	41	19.9
Stationary combustion – oil	CO_2	15.4	56	3.2
Iron and steel production	CO_2	10.7	67	1.9
Stationary combustion – coal	CO_2	7.0	74	23.6
Solid waste disposal sites	CH_4	5.6	80	6.7
Enteric fermentation in domestic livestock	CH_4	3.4	83	3.7
Fugitive emissions: oil & gas operations	CO_2	3.4	86	2.3
Cement production	CO_2	3.0	89	4.5
ODS substitutes	All HFCs and PFCs	1.1	90	4.7
Agricultural soils	CH_4	0.9	91	
Mobile combustion – road vehicles	N_2O	0.7	92	1.3
Manure management	CH_4	0.7	93	
Ammonia production	CO_2	0.6	93	
Other waste	CH_4	0.6	94	
Other mineral products	CO_2	0.5	95	0.9
Semiconductor manufacturing	All HFCs, PFCs, SF_6			1.5
Stationary combustion – other fuels	CO_2			1.0
Magnesium production	SF_6			1.3

(a) See footnote 5 of this report.

16. Austria performed a key sources assessment following the tier 1 IPCC good practice guidance, which is reproduced in table 4 below. The Party's key source analysis differs from that produced by the UNFCCC secretariat. For example, other sectors stationary – oil in the Party's

analysis is shown as 8.55% compared with what is assumed to be the same sub-sector, CO_2 stationary combustion – oil, in the secretariat analysis with a figure of 15.4%. Stationary combustion – gas is shown as 6.64% compared with the secretariat estimate of 19.2%.

17. It is important that the Party examines the key source analysis and identifies the reasons for the differences that exist between the Party's estimates and those of the secretariat. It is clear that some of the differences arise as a result of different subsectoral classifications, but this does not explain all of the differences.

Table 4. Austria's key source analysis for 1999 (from the national inventory report)

Key source	Gas	Level assessment %	Cumulative total %
Road transport – diesel	CO_2	13.57	13.57
Iron and steel	CO_2	10.67	24.24
Other sectors stationary – oil	CO_2	8.55	32.79
Road transport – gasoline	CO_2	8.15	40.94
Manufacturing industries and combustion – gas	CO_2	7.79	48.73
Stationary combustion – gas	CO_2	6.64	55.37
Waste disposal on land	CH_4	5.58	60.95
Stationary combustion – coal	CO_2	4.81	65.76
Other sectors stationary – gas	CO_2	4.69	70.45
Enteric fermentation	CH_4	3.17	73.62
Fugitive emissions – other oil	CO_2	3.11	76.73
Cement production	CO_2	3.00	79.73
Stationary combustion – oil	CO_2	2.85	82.58
Manufacturing industries and combustion – oil	CO_2	2.40	84.98
Transport agriculture and forestry	CO_2	1.63	86.61
Other sectors stationary – coal	CO_2	1.54	88.15
Agricultural soils	N_2O	1.28	89.43
Consumption of HFCs, PFCs and SF_6	HFCs	1.10	90.53
Agricultural soils	CH_4	0.93	91.46
Consumption of HFCs, PFCs and SF_6	PFCs	0.92	92.38
Manufacturing industries and combustion – coal	CO_2	0.67	93.05
Ammonia production	CO_2	0.60	93.65
Road transport – gasoline	N_2O	0.58	94.23
Waste (other)	CH_4	0.53	94.76
Solvent and other product use	CO_2	0.50	95.26
Magnesium production	CO_2	0.43	95.69
Manufacturing industries and combustion – other	CO_2	0.03	95.72
Consumption of HFCs, PFCs and SF_6	SF_6	0.03	95.75

D. General assessment of the inventory

1. Completeness and transparency of reporting

18. Austria's inventory is comprehensive and substantially complete. The inventory covers the direct GHGs, CO_2, CH_4, N_2O, and reporting of both actual and potential HFC, PFC and sulphur hexafluoride (SF_6) emissions. Disaggregated estimates of HFCs, PFCs and SF_6 are included in the CRF. The precursor gases CO, NO_X and NMVOC, and SO_2 are also covered. All major IPCC source/sink categories are reported in the inventory. Austria submitted CRF

tables for the years 1990 to 1999 which include most of the required tables. The main omission is the recalculation tables.

19. Austria uses the notation keys appropriately throughout the CRF; table 9, however, which provides information on why notation keys are used, and table 7 (which provides an overview of the information submitted) have not been completed.

20. The information submitted in the NIR is consistent with the CRF.

21. The complete CRF tables for 1990 to 1999 together with the NIR provide a high level of transparency. Methodologies, data sources and sources of emission factors are explained in the NIR. This includes:

(a) Identification of references used that are relevant to the methodologies, data and emission factors. The references note the dates when relevant data or factors were derived and whether they have been updated.

(b) Uncertainty estimates.

(c) Comment on proposals to improve inventory quality by updating data or factors dating from earlier inventory years.

2. Cross-cutting issues

Institutional arrangements

22. Review of institutional arrangements is more appropriately undertaken during in-country reviews. Part II of Austria's NIR provides a detailed description of the national inventory system used for compiling the inventory. Section 2 of part II describes the quality management system, and methodologies and calculations are documented in section 3.

Verification and quality assurance/quality control (QA/QC) approaches

23. In the NIR, the Party describes in detail a quality management system being implemented. It will use the European standard EN 45004 system, a quality management standard system which is similar to the ISO 9000 series. This quality management system was expected to be fully implemented in June 2001. At the time of the review, the secretariat had not received any further information from the Party regarding the implementation of this system.

Recalculations and changes in relation to previous years

24. No data on recalculations have been provided in the CRF. The NIR notes that recalculations for several subsectors have been undertaken. It is important that the Party completes the recalculation tables of the CRF when parts of the inventory are revised.

25. Furthermore, in the NIR the Party discusses the need to change the methodology in order to reduce uncertainty, to accommodate the change of an emission source from a non-key source to a key source, to accommodate the change in data input format, to accommodate the use of an improved methodology, and to accommodate the use of the recommended methodology provided by UNFCCC experts. The Party does not explain the extent of the expected improvement in the quality of the estimates due to changes in methodology, activity data or emission factors.

Uncertainty

26. Austria describes the uncertainty analysis performed on the Austrian inventory for the years 1990-1997, following the IPCC good practice guidance. Results are reported for 1990 and 1997 only. For 1998 to1999, the NIR does not include any uncertainty analysis. The NIR includes an analysis of the systematic and random uncertainty for those emission sources that the Party considers to be most important in respect of uncertainty. These sources are specified in table 16 of the NIR (p. 35) and the uncertainty analysis results are presented in tables 17 and 18 (p. 36*)*.

27. The results show overall uncertainty for the three main gases (CO_2, CH_4 and N_2O). The overall relative uncertainty calculated for the year 1990 was 9.8%; for the year 1997 it was 8.9%. The random uncertainty calculated for the year 1990 was 4.5%; for the year 1997 it was 3.8%.

28. Monte Carlo analysis was undertaken; however, uncertainties for the individual source categories and how these are combined to produce a national uncertainty estimate were not included by the Party, nor were the distributional assumptions for each variable and the uncertainty ranges specified. It is not possible to determine the contribution of the individual sectors to the overall uncertainty analysis.

29. It would be helpful if, consistent with the requirements of the IPCC good practice guidance, more information were to be provided on the assumptions used for the analysis such as the distributional assumptions that have been made in order to implement the uncertainty analysis.

30. Austria referenced a report (Winiwater and Rypdal, 2001) which is the source of the uncertainty estimates.

3. Areas for further improvement

Planned or ongoing work by the Party

31. Austria has noted the following areas for further improvement:

(a) The S&A report and also the review identified the fact that some emission sources have been allocated to the wrong subsector or sector. The Party has accepted the need to reallocate emissions and has undertaken steps to implement the reallocation in the next submission.

(b) Methodologies and emission factors: The Party has indicated that it intends to review some methodologies and emission factors that are based on data from the early 1990s.

Issues identified by the expert review team

32. The review team noted the following with regard to future inventories:

(a) Reporting: All CRF tables should be completed. The three important omissions from the CRF are the failure to complete the overview table (table 7), the recalculation tables (tables 8(a) and 8(b)) and the completeness table (table 9). It is important that these tables be completed in future submissions, especially given the undertaking of the Party to correct several misallocations of emissions.

(b) Reporting: All cells in the CRF tables should contain a notation or data.

(c) Uncertainty: More explicit documentation of the assumptions used to compile the uncertainty analysis would be of assistance in providing a complete understanding of the Party's approach to uncertainty analysis.

4. Consistency with the UNFCCC reporting guidelines and the IPCC Guidelines

33. The Austrian GHG inventory for the period 1990 to 1999 was compiled according to the UNFCCC reporting guidelines according to decision 3/CP.5.

34. The NIR and CRF are substantially consistent with the IPCC Guidelines and the UNFCCC guidelines for estimating and reporting emissions. The NIR is an important and relatively comprehensive source of information on the Party's inventory (methodologies, emission factors, quality assurance/quality control) and application of the IPCC good practice guidance.

5. Conclusion

35. The Austrian submission, comprising the CRF for all years from 1990 to 1999 and a comprehensive NIR, provides adequate information on the GHG inventory and GHG emission trends. Overall the inventory submission is of a high standard. In addition, where issues have been identified by the S&A report, the Party has responded and has agreed to implement changes to the inventory.

II. ENERGY SECTOR

A. Sector overview

36. The sector's share of total emissions is 67.1%. According to the key source analysis undertaken by Austria, the main key source is CO_2 from mobile combustion (road vehicles) followed by CO_2 from stationary combustion (gas, oil and coal), fugitive emissions (oil and gas) and N_2O from mobile combustion (road vehicles).

37. The trend in emissions from the energy sector from 1990 to 1999 for CO_2, CH_4 and N_2O is +9.2%, –24% and +45% respectively.

1. Completeness

38. The sector is covered completely in terms of IPCC source categories, and data are reported at the level of summary, sector and background tables of the CRF. There are summary level estimates for indirect GHGs.

2. Transparency

39. No inconsistency was identified in the data provided in the CRF tables and the NIR. The CRF tables provide no indication of confidential data and the NIR does not provide any information on confidentiality. Additional information on confidential data would be of assistance.

3. Methodologies, emission factors and activity data

40. Austria uses the CORINAIR (Core Inventory Air) calculation method for quantifying national emissions. The underlying energy source data are derived from official and approved

energy balances which are provided on an annual basis by the Austrian Institute for Economic Research (WIFO) for 1980-1995 and by Statistics Austria for 1996-1999. A consistent revision of the time series from 1990 onwards is envisaged by Statistics Austria for the year 2001, resolving remaining inconsistencies between the two series.

41. Austria's energy sector emissions have been transferred to the CRF using CORINAIR standard procedures, in order to comply with UNFCCC reporting requirements and to ensure comparability of the reported data.

42. Emission factors are predominantly country-specific with oil and gas fugitive emissions using both country-specific and plant-specific factors.

4. Recalculations

43. The emission data reported (for each year from 1990 to 1999) are revised and updated data, derived in line with the most recent findings on the comprehensive estimation of GHG emissions. However, no recalculation tables have been provided in the CRF.

5. Conformity with the UNFCCC reporting guidelines and the IPCC Guidelines

44. The Austrian GHG energy sector inventory for the period 1990 to 1999 conforms to the UNFCCC reporting guidelines and the IPCC Guidelines. Detailed explanations of methodologies, data sources and emission factors are provided in the NIR.

B. Reference and sectoral approach

1. Comparison between reference and sectoral approach

45. CO_2 emissions from fuel combustion were calculated using both the reference and the sectoral approach. There is a difference of only 0.8% between the estimates.

46. Results from the reference approach are documented in CRF table 1.A(b) but without disclosing the natural (mass or volume) units for quantity used as production, export, import and stock change. Data are given in TJ. In its response to the draft of this review report, Austria explained that this unit had been chosen for reasons of consistency to the national energy balance and the sectoral approach, which are based on calorific units.

47. The draft S&A report 2001 indicated specific differences between the data used in the reference approach and the International Energy Agency (IEA) energy balances. The response to the draft S&A report from Austria addresses these differences and states that big differences in lignite imports compared with IEA data are due to the inclusion of Braunkohlenbriketts (BKB) and patent fuel in CRF lignite data. This is a matter that merits further consideration. The Party noted that in order to explain the differences between CRF and IEA data for gasoline stocks and gas/diesel imports, the detailed IEA statistics are needed.

2. Treatment of feedstocks and non-energy use of fuels

48. Feedstock is reported in the CRF. Refinery feedstock is included in oil sub-products.

3. International bunker fuels

49. Austria reports only one international bunker fuel – aviation jet kerosene. It is included in exports of jet kerosene in table 1.A(b).

C. Key sources

1. Mobile combustion: road vehicles – CO_2

Emission trends

50. CO_2 from mobile combustion (road transportation) represented 21.7% of total aggregate GHG emissions in CO_2 equivalent (excluding LUCF). These emissions increased by 29.5% from 1990 to 1999.

Completeness

51. There are estimates for all years 1990 to1999 in the CRF, covering all relevant sources.

Methodology

52. Estimation of emissions is based on a model method. Although the model is briefly explained in the NIR, the level of detail is not sufficient to allow a reviewer to assess it. The time series are consistent.

Emission factors

53. The emission factors used for CO_2 emissions are country-specific. The implied emission factors (IEFs) are in the range of the tier 1 emission factor.

Activity data

54. Estimation is based on energy consumption data. Transport sector activity is not currently reported in the NIR. This is related to the format and the structure of the data on types of vehicles.

2. Stationary combustion – CO_2

Emission trends

55. Emissions from stationary combustion (gaseous, liquid and coal fuels) encompass several key sources for Austria, representing 41.6% of total aggregate GHG emissions in terms of CO_2 equivalent (excluding LUCF). Austria reports CO_2 emissions from stationary combustion as approximately constant at 33 Mt in 1990 and 1999.

56. CO_2 emissions from the stationary combustion of liquid fuels represent 15.4% of all reported emissions in 1999 (excluding LUCF); there was a 1.06% decrease compared to 1990.

57. CO_2 emissions from the stationary combustion of solid fuels represent 7% of all reported emissions in 1999 (excluding LUCF); there was a 41.7% decrease compared to 1990.

58. CO_2 emissions from the stationary combustion of gaseous fuels represent 19.2% of all reported emissions in 1999 (excluding LUCF); there was a 37.6% increase compared to 1990.

Completeness

59. Estimates for all relevant sources are provided in the CRF for all years from 1990 to1999.

Methodology

60. Estimation of emissions is based on the CORINAIR method (1999 with SNAP97 code version) for 1.A.1 Energy industries and 1.A.2 Manufacturing industries and construction, and is country-specific for 1.A.4 Other sectors. Although the country-specific methodology is explained briefly in the NIR, the level of detail is not sufficient to allow a reviewer to assess it.

Emission factors

61. The emission factor used for CO_2 emissions estimation is country-specific. The values are given in chapter 3.1.2 of the NIR.

62. The CO_2 IEF from liquid fuels has a low value (40.1 t/TJ) compared to the IEF for other activities of the energy sector (range: 60.70-69.40 t/TJ). This IEF is a result of including emissions from petroleum refining in category 1.B.2 (fugitive emissions – oil and natural gas). It is inconsistent with the general assumption about the transformation nature of refinery products.

63. The very low CO_2 IEF from solid fuels calculated in 1999 for the manufacturing industries and construction subsector is due to the assumption that only about 10% of solid fuels was combusted. The other 90% are treated as process emissions in category 2.C.1 Iron and steel production. It is followed in the response provided to the draft S&A report 2001.

Activity data

64. The underlying energy source data are derived from the energy balances commonly approved as official, which are provided on an annual basis by WIFO for 1980-1995 and by Statistics Austria for 1996-1999.

65. No gaseous energy consumption was reported by the Association of Austrian Petroleum industry.

66. The coking coal needed for transformation of fuel to coke is not reported in the NIR.

67. The activity data for category 1.A.4.c are included in the categories 1.A.4.a and 1.A.4.b.

68. Activity data from categories 1.A.2.a-e are not reported in a disaggregated manner. In its response to the draft of this review report, Austria explained that at the time of submission there was no consistent time series available for the energy balance to disaggregate the fuel consumption.

3. Fugitive and fuel emissions: oil and gas operation – CO_2

Emission trends

69. CO_2 emissions from oil and gas operations represented 3.4% of all reported emissions (excluding LUCF). Austria reports a CO_2 emissions rise of 24.3% during 1990-1999.

Completeness

70. There are estimates in the CRF for all years from 1990 to 1999 with no omissions of clearly specified sources.

Methodology

71. Estimation of emissions is based on CORINAIR and country-specific methods.
It is not clear why for the oil subsector, only CO_2 emission estimates were provided, but no CH_4 fugitive emissions (included elsewhere ("IE")/not estimated ("NE") reported).

Emission factors

72. The emission factors used for estimating CO_2 emissions are country-specific and plant-specific.

73. The CO_2 IEF for gas production – 3.3E-1 (3.3×10^{-1}) – is substantially higher, by many orders of magnitude, than the value recommended in the IPCC good practice guidance (p. 2.86 of the good practice guidance: 9.5E-05 (9.5×10^{-5}).

74. The CO_2 emission factor for gas distribution must be documented in more detail in the NIR. The IEF differs from that in the good practice guidance (p. 2.86 of the good practice guidance – value is zero).

Activity data

75. The underlying energy source data are derived from the official energy balances, which are provided on an annual basis by WIFO for 1980-1995 and by Statistics Austria for 1996-1999.

76. No CH_4 emissions were reported in this category due to a lack of information on activity data.

4. Mobile combustion: road vehicles – N_2O

Emission trends

77. N_2O from mobile combustion (road transportation) is a key source for Austria, although it represents only 0.7% of total emissions (excluding LUCF). From 1990 to 1999 emissions increased by 82.3%.

Completeness

78. There are estimates in the CRF for all years from 1990 to 1999. There are no obvious omissions of sub-sources.

Methodology

79. Estimation of emissions is based on the model method. Although the model is briefly outlined in the NIR, the explanation is not sufficiently transparent to allow a reviewer to assess it. The time series are consistent.

Emission factors

80. The emission factors used for N_2O emissions are country-specific. The IEFs are in the range of the tier 1 emission factors.

Activity data

81. Estimation is based on energy consumption data. Transport sector activity data are not currently reported in the NIR.

D. Non-key sources

82. The following non-key sources were identified in the draft S&A report, with the following emission trends:

(a) CH_4 from fuel combustion – biomass decreased from 1990 to 1999 by 31.3%.

(b) CH_4 from road transportation decreased from 1990 to 1999 by 46.8%.

(c) CO_2 from civil aviation increased from 1990 to 1999 by 58.7%.

(d) CH_4 from fugitive fuel emissions – oil and gas increased from 1990 to 1999 by 32.2%.

1. Completeness

83. There are estimates for all years from 1990 to 1999 in the CRF. CH_4 emissions from 1.B.2(a)(iv) oil refining/storage and 1.B.2(b)(i) gas production/processing are shown as "NE".

2. Methodology

84. Estimation of emissions is based on CORINAIR and country-specific methods.

3. Emission factors

85. The emission factor for CH_4 emissions from fuel combustion – biomass was selected with regard to the IPCC Guidelines.

86. The emission factor for CH_4 emissions from road transportation is a little low but within the range of the IPCC default emission factor.

87. IEFs for CO_2 emissions from civil aviation will be changed as a result of incorrect transformation of activity data.

88. IEFs for CH_4 emissions from fugitive fuel emissions – oil and gas were not calculated.

4. Activity data

89. The underlying energy source data are derived from energy balances compiled by Statistics Austria for 1999.

(a) Activity data for CH_4 emissions from fuel combustion – biomass are correct.

(b) Activity data for CH_4 emissions from road transportation are correct.

(c) Activity data for CO_2 emissions from civil aviation are incorrect and updated as noted in the Party's answer to the draft S&A report 2001.

(d) Activity data for CH_4 emissions from fugitive fuel emissions – oil and gas are not reported due to lack of information.

90. Austria provided a detailed response to the issues raised in the 2000 and draft 2001 S&A reports, which are considered within the corresponding subsections of this energy section.

E. Areas for further improvement

91. The following improvements are suggested by the ERT:

(a) Explanations as to whether data are confidential are desirable. It is not clear whether confidentiality is an issue in respect of fuels or whether data collections mean that energy units are more appropriate than mass or volume units (natural units).

(b) An important omission is the failure to complete the completeness table. A large number of sub-sources in the energy sector are shown as "IE". Although the NIR provides explanations in respect of pyrogenic emissions included in industrial processes, these should be summarised in the CRF. This is also important where the notation key "NE" is used.

III. INDUSTRIAL PROCESSES AND SOLVENT USE

A. Sector overview

92. Emissions from industrial processes represented around 19.1% of total net GHG emissions (including estimates from LUCF) in terms of CO_2 equivalent in 1999. The industrial processes and solvent use sectors include several key source categories as follows:

(a) CO_2 from iron and steel production – 11.0% in 1990 and 10.7% in 1999

(b) CO_2 from cement production – 4.0% in 1990 and 3.0% in 1999

(c) PFCs from aluminium production – 1.2% in 1990 and no longer a key source in 1999

(d) CO_2 from other mineral products – 0.7% in 1990 and 0.5% in 1999

(e) CO_2 from solvent and other product use – 0.7% in 1990 and no longer a key source in 1999

(f) Consumption of halocarbons (HFCs) (ODS substitutes) and SF_6 – not a key source in 1990 and 1.1% in 1999

(g) CO_2 from ammonia production – 0.5% in 1990 and 0.6% in 1999.

93. Both PFCs from aluminium production and CO_2 from solvent and other product use have declined in significance since 1990. The important addition to key sources in 1999 compared with 1990 is consumption of halocarbons and SF_6.

1. Completeness

94. All tables on the industrial processes sector are included for 1990 to 1999 using the CRF. All relevant sources and gases are included. In the NIR 2001, estimates for HFC, PFC and SF_6 emissions are reported for the whole time series from 1990 to 1999. In the previous submission, estimates for the years 1995 to 1998 were provided.

95. The NIR describes the methodology for deriving activity data and emission factors including the process of direct reporting of data from industry and industry associations to the Federal Environment Agency, as well as the national methodology used to derive emissions of HFCs, PFCs, and SF_6.

96. Table 10 (trends) provides the required information for CO_2, N_2O, and HFC, PFC and SF_6 emission trends.

2. Transparency

97. The methodology used is generally country-specific or plant-specific. Extended information is provided on the major sources as well as the rationale for selection. The Party provides detailed comments on the S&A report concerning methods used and procedures applied to estimate emissions from iron and steel production, consumption of halocarbons and aluminium production. The omission of entries in tables 7, 8 and 9 detract from the transparency of the submission and this needs to be addressed.

98. For example, the Austrian CRF table 3 uses the notation "IE" in the cells for CO_2 emissions from degreasing and drycleaning. However, table 9 does not provide any additional information and there is no documentation to show where these emissions are included. Further explanation is required.

3. Recalculations

99. The CRF on recalculations has not been completed. The NIR makes reference to some revisions. The rationale for recalculations, such as updated data, methodology improvements and changes, and changes in sectoral allocation, are noted. The NIR documents the results of recalculations for CO_2, CH_4, N_2O, HFCs, PFCs and SF_6. The original and revised data should be included in the CRF.

4. Consistency with the UNFCCC reporting guidelines and the IPCC Guidelines

100. The inventory comprising the CRF and NIR is substantially consistent with the UNFCCC reporting guidelines and the IPCC Guidelines.

B. Key sources

1. 2.C.1 Iron and steel production – CO_2

101. CO_2 from iron and steel production contributed 10.7% to total GHG emissions in 1999. This amount is similar to that of 1990, although emissions have varied from year to year. Significant growth occurred from 1993 to 1995, and in 1997. Substantial declines are apparent for the years 1992, 1996 and 1998.

102. The CO_2 emissions are reported directly from industry and represent plant-specific data. The Party provided clarification that iron and steel production is concentrated mainly at two integrated sites operated by the same company.

Methodology

103. The methodology was reported as using a carbon mass balance while no emission factors applied.

Emission factors

104. The CO_2 IEF for crude steel of 1.78 t/t is high compared to the IPCC default value of 1.6 t/t. The Party explained that using the directly-reported CO_2 emissions and activity data from industry, an annual CO_2 emission rate of 1.78 t/t was calculated. From information in the NIR, it seems possible that the factor also includes some pyrogenic emissions from smaller electric arc furnace (EAF) plants. Further clarification is required.

105. In the S&A report a noticeable difference between available production data and UN data (+9.6%) and an even larger difference between CRF pig iron production data and UN data (-17.7%) were identified. The Party responded that the production data contained the amount of raw steel. Not included was the amount of steel produced in EAF steel plants.

2. 2.A.1 Cement production – CO_2

106. Emissions from cement production contributed 3% to total GHG emissions in 1999. Emissions have varied from year to year. The most significant change was in 1995 when there was a decrease of 21.7% compared with the previous year. There was an overall 30% decrease from 1990 to 1999.

107. The Party has explained that the CO_2 emissions from 1994 to 1995 declined by 21.7% because the production rate of cement fell by nearly 20% from 1994 to 1995.

Methodology

108. The method is specified as country-specific. It is explained in the NIR that information about CO_2 emissions from cement production is taken from two studies of emissions from the Austrian cement production industry. CO_2 emissions from all cement production plants in Austria were investigated involving recording and evaluation of plant-specific records and also plant-specific measurements and analyses. There is no distinction between pyrogenic emissions (fuel) and process emissions.

Emission factors

109. The draft S&A report 2001 commented that the calculated IEF for CO_2 (0.66 t/t) is the highest among the Parties and higher than the IPCC default (0.499).

110. The Party explained that its emission factor was higher than the IPCC default value because it considered total CO_2 emissions from cement production (emissions from the use of fossil fuels (pyrogen CO_2) and emissions from calcination), while the IPCC emission factor considered only CO_2 emissions from the calcination process.

Activity data

111. In the CRF it is not specified whether activity data for clinker or cement are used. The Party has clarified that the data used are for cement production because the time series for clinker production has not been updated since 1996.

112. The NIR provides the time series for both clinker and cement production. The Party has indicated that it plans to update the data on emission factors and production.

3. 2.F Consumption of halocarbons and SF_6 – HFCs

113. Emissions from consumption of halocarbons and SF_6 contributed 1.1% to total GHG emissions in 1999.

114. Table 2(II)s2 reports the total potential emission of halocarbons as “IE”, but no explanation is provided.

Methodology

115. The methodology used, together with the emission factors, are reported as being country-specific. The detailed disaggregated information by consumption categories is outlined in the NIR. In response to the S&A report by the Party the method for emissions from fire extinguishers was specified as follows: The annual potential emissions correspond to the annual consumption of halocarbons plus the potential emissions from the previous year.

116. The draft S&A report noted that the potential to actual emissions ratios for many HFCs (other than HFC-143a) and for SF_6 were high compared to those of other Parties.

117. Austrian officials responded that HFC-152a is used for XPS/PU (expandable polystyrene/polyurethane) plates and that in Austria the consumption per head of XPS/PU plates is very high (the highest in Europe).

118. The Party further stated that HFC-125, HFC-143a and HFC-32 are not in use as individual gases but are parts of the blends used for stationary refrigeration where actual emissions normally accord with the respective equipment installation stock.

119. HFC- 23 and HFC-227a are used for fire extinguishers.

120. Very high potential emissions of SF_6 in Austria were explained by the use of SF_6 by all Austrian switchgear/controlgear companies in their systems. From 1990 to 1999 actual emissions of SF_6 decreased by 168%.

121. A methodology for calculation of SF_6 emissions which is consistent with the IPCC Guidelines was clearly explained in the recent response by the Party to the S&A report.

122. The potential emissions for HFC-134a are less than the actual emissions, making the ratio of potential to actual emission less than one. The change from 1990 to 1999 in actual HFC-134a emissions is 44,474%. The most significant increase was in 1995 of 6,060% compared to the previous year.

123. Reported revisions for HFCs, PFCs and SF_6 resulted in a 2.1% change in GHG emissions for the year 1995 in comparison to the previous submission. The Party declared HFCs, PFCs and SF_6 gases as the main reason for the increases in national total emissions reported in earlier

submissions. Changes in HFCs, PFCs and SF_6 emissions are provided in a separate table in the NIR. It was explained that the methodology did not change, but more data from industry and importers were obtained to improve the estimates.

4. 2.B.1 Ammonia production – CO_2

124. Emissions from ammonia production contributed 0.6% to total GHG emissions in 1999.

125. There was an overall 19.2% increase from 1990 to 1999. The most significant increase was in 1995, of 22.8% compared with the previous year.

Methodology

126. Plant-specific data are obtained from the only ammonia producer in Austria, and so emissions are derived using the annual ammonia activity and emission data. The NIR provides the information that the calculation is based on direct measurements which are undertaken several times per year. The emission rate for 1994 was applied to earlier years due to a lack of data.

127. The draft S&A report 2001 raised the Party's response to the finding in the S&A report 2000 regarding the low value of the CO_2 IEF (0.86 t/t) compared with the IPCC default values (1.5-1.6 t/t).

128. The Party indicated that in the 2001 submission the value of the IEF would be 0.96 t/t. But the draft S&A report pointed out that IEF reported for all years during the reporting period is greater than one; for 1999 the IEF is 1.772 t/t. The Party stated that there was a possible transcription error and pointed out that the actual emission rate is 0.96 t/t.

129. In a further explanation, the Party distinguished between calculation methods applied to the time series 1994-1999 and those applied to 1990-1993, where emissions were calculated by applying the calculated annual emission rate from 1994. The Party has described the measurement methodology in detail. It would be valuable if confusion could be avoided by the provision of a comprehensive explanation in such cases.

C. Non-key sources

1. 2.B.2 Nitric acid production – N_2O

130. N_2O emissions increased by 35% from 1990 to 1999.

Methodology and emission factors

131. From 1995 to 1999 plant-specific information was obtained from the only nitric acid producer in Austria, based on regular measuring of N_2O emissions. Emissions for 1990 to 1994 were reported to have been calculated by applying the calculated annual emission rate from 1995. The activity data in CRF table 2(I) for the year 1999 are stated to be incorrect, with a probable transcription mistake noted.

132. The value of the N_2O IEF (0.001 t/t) is low compared to the IPCC default values (0.002-0.009 t/t). The Party has not provided any explanation or comments.

2. 2.A.2 Lime production – CO_2

133. The methodology uses activity data from the stone and ceramic industry association and an emission factor which does not distinguish between types of lime. For 1990 to 1993, only national data on the total amount of lime used in Austria (including imported lime) were available. From 1995 production was held constant at the 1995 value.

134. The draft S&A report 2001 commented that the IEF is constant from 1990 to 1999 even though emissions have changed over the period. The Party did not comment on the fact that the value of CO_2 IEF (0.37 t/t) is low compared to most Parties and lower than the IPCC default values (0.79 –0.91 t/t). However, the NIR recognizes the need to differentiate between types of lime. No concrete plans were mentioned for either improving activity data or distinguishing between different types of lime. However, in its response to the draft of this report, Austria noted that improvements concerning data and emission factor values are planned to be carried out in 2002.

3. 2.C.3 Aluminium production – CO_2 and PFCs

135. Aluminium production was reported as confidential, with CO_2 emissions shown as "NE" and CF_4 and C_2F_6 emissions as "NO". UN data report secondary production and primary production (1990-1992). The NIR notes that primary aluminium production ceased in 1992. The ERT assumes that secondary aluminium production still occurs. No information is provided by the Party in the NIR. Austria confirmed in its response to the draft of this report that there is production of secondary aluminium in Austria.

4. Solvent and other product use

136. The sectoral report for solvent and other product use provides emissions derived using a methodology that is stated to be a variant of the CORINAIR detailed method.

137. Future methodological changes are proposed. Methodological changes and correction of inconsistencies in the statistical data are expected to lead to improvements in the top-down method by combining it with a bottom-up approach. Part of the improvements will be to change the assumption of an 85% NMVOC content in all products. This is not proposed in the near future.

138. In table 3 and table 3.A-D Austria reported emissions from degreasing and dry cleaning as "IE". Austria clarified in its response to the draft of this report that emissions from degreasing and dry cleaning are reported under category 3.D Other.

D. Areas for further improvement

1. Planned or ongoing work by the Party

139. Austria has provided responses to the main queries raised in the S&A report and has submitted a detailed NIR.

2. Issues identified by the ERT

140. There are several areas for improvement that have been identified by the review team, as follows:

(a) The Party should consider separating the pyrogenic emissions from process emissions. In most cases the composition of inputs that give rise to process emissions is an important quality control parameter. For example, the calcium carbonate content of the raw meal used in clinker production is important in determining the lime content of the clinker, which is a key parameter influencing the quality of the resultant cement.

(b) The low IEF for nitric acid production requires clarification.

(c) A more detailed timetable for differentiating between the types of lime produced would be valuable.

(d) Comment on whether there is secondary aluminium production and the use of cover gases would be of assistance.

IV. AGRICULTURE

A. Sector overview

Table 5. Summary overview: Provision of information in the agriculture sector

Sectoral report tables – agriculture	Available
Notation keys – agriculture	Available
Sectoral background tables – agriculture	Not complete
National inventory report – agriculture	Yes
Methods	CORINAIR and country-specific
Emission factors	Country-specific
Explanation of non IPCC method	No
Uncertainty	Yes
Emission trends	Yes (1990-1999)
Procedure for QA/QC	No
Complete set of CRF tables – agriculture	No
Plans for future improvements	Implementation of IPCC good practice guidance

141. Emissions from the agriculture sector in Austria decreased from 1990 to 1999 (-11%). According to a key source assessment for 1999 in the NIR, the sector includes three key sources: CH_4 enteric fermentation – cattle (3.17%), total N_2O agricultural soils (1.28%), and total CH_4 emissions from agricultural soils (0.93%).

142. The Austrian Federal Environment Agency derives the estimates for agriculture. There is no information about the involvement of other institutes.

1. Completeness

143. In its 2001 submission Austria has submitted all CRF tables for 1990 to 1999 for agriculture (tables 4, 4.A, 4.B(a) and (b),4.C, 4.D, 4.E and 4.F). All emissions for dairy and non-dairy cattle, sheep, goats, horses, swine and poultry are reported. Some information in the background tables has been omitted. For example, except for population size and IEFs other information is reported as “NE” in enteric fermentation; in table 4.B(a) no additional information was given. The Party has not estimated N_2O and NMVOC emissions from manure management.

Only a total estimate for N_2O from agricultural soils is given, with no details for subsectors. No implied emission factors are given for N_2O from agricultural soils.

2. Transparency

144. Methodology, activity data, and emission factors were documented sufficiently in the NIR and CRF tables.

3. Methodologies, emission factors and activity data

145. Estimation of GHG emissions for agriculture are based on a very simple methodology. The same methodology and a constant emission factor from 1990 to 1999 are used. Changes in the emissions trend arise from changes in activity data.

146. Austria uses a CORINAIR calculation method with constant country-specific emission factors for quantifying national emissions of CH_4 from enteric fermentation and CH_4 from manure management. A country-specific method with constant country-specific emission factors is also used for quantifying national emissions from agricultural soils.

4. Recalculations

147. A comparison with earlier submissions was not made. Recalculation table 8(a) has not been completed.

5. Conformity with the UNFCCC reporting guidelines and the IPCC Guidelines

148. The CRF tables and NIR are largely consistent with the UNFCCC reporting guidelines. All CRF tables have been provided, although some cells do not include data or notation keys. A better explanation of the assumptions underlying the development of country-specific emission factors is needed in the NIR.

149. The inventory was compiled according to the recommendations for inventories set out in the IPCC Guidelines.

150. The methods in agriculture are not yet consistent with the IPCC good practice guidance.

B. Key sources

1. 4.A Enteric fermentation – CH_4

151. Enteric fermentation emissions declined by 17% between 1990 and 1999. This is due mainly to a reduction in numbers of dairy cattle (22.8%) and non-dairy cattle (13.3%). However, enteric CH_4 emissions from sheep have increased by 13.9% due to increasing population numbers.

Methodology

152. Emissions were estimated using the CORINAIR calculation method with country-specific emission factors.

153. The draft S&A report 2001 noted that the IEFs for CH_4 from enteric fermentation for dairy and non-dairy cattle were low compared to the IPCC default factors for Western Europe, but there is no information in the NIR that could explain the use of such low emission factors. Emission factors for sheep, goats, horses and pigs were chosen equal to the IPCC defaults.

Activity data

154. Activity data for dairy and non-dairy cattle and for sheep and swine are documented. Average daily feed intake is reported as not occurring ("NO") for buffalo, camels and llamas, "IE" for mules and asses and "NE" for others. Population statistics are on a yearly basis.

155. The draft S&A report 2001 noted a difference of 48% in pig population data compared to Food and Agriculture Organization of the United Nations (FAO) data (2,570 thousand head in the CRF versus 3,810 according to the FAO); in the S&A report 2000 for the year 1998, the difference was 29%.

156. In its response to the S&A report 2000, Austria explained that national statistics give concise information, but that piglets below 20 kg are currently not counted. Austria stated its intention to include piglets below 20 kg as part of its implementation of the IPCC good practice guidance. This was not reflected in the latest inventory submission.

Emission factors

157. *CH_4 IEF*: For dairy and non-dairy cattle, the IEFs (92 and 38 kg CH_4/hd/yr) were in the lower half of the range of IEF values and rather low compared to the IPCC default emission factors for Western Europe (92 versus 100 and 38 versus 48 kg CH_4/hd/yr, respectively).

158. In its response to the S&A report 2000, Austria stated its intention to use IPCC default emission factors as part of its implementation of the IPCC good practice guidance. In the latest submission this had not been implemented.

159. *CH_4 emission factor*: Emission factors for sheep, goats, pigs and horses equal the IPCC defaults (the Party reported the use of country-specific emission factors for enteric fermentation).

Trends

160. The dairy cattle population decreased by 13% between 1994 and 1995; the non-dairy cattle population increased by 7% between 1994 and 1995 and decreased by 6% between 1996 and 1997. Some annual changes in the pig population are as high as 10% (10% increase for 1992-1993 and 10% decrease for 1998-1999). According to table 10s2 of the CRF, CH_4 from enteric fermentation was decreasing and declined by 16.9% between 1990 and 1999.

161. The horse population increased by 66% between 1990 and 1999, with annual changes up to 18% (1990-1991). The goat population increased by 56% between 1990 and 1999, with annual changes up to 20% (1992-1993).

Responses to the draft S&A report

162. The latest comments (11 October 2001) from Austria on the draft S&A report 2001 on 4.A Enteric fermentation (CH_4) are as follows:

(a) *Activity data*: The difference in pig population data compared to FAO data is due to the fact that piglets under 20kg were not counted when calculating the emission data.

(b) *CH_4 IEF for dairy and non-dairy cattle*: Part of the inventory improvement programme within the study mentioned above will be to develop country-specific emission factors and include references.

(c) *CH_4 IEF for sheep and pigs*: Summary 3 of the CRF format should include the notation key default ("D") next to notation key country-specific ("CS") for emission factors used in the category enteric fermentation.

(d) *Trend in activity data*: A reason for the decreasing dairy cattle population and the increasing non-dairy cattle population could be a change in agricultural policy to support mother-cow holdings instead of milk production. Population data are published by Statistics Austria in the statistical yearbook and are based on a general counting of domestic livestock, carried out according to national regulations.

163. The review team concluded that the population statistics show a large fluctuation range that is not explained. Uncertainties may be high and should be provided for these data.

2. 4.D Agricultural soils – N_2O

164. The second key source is N_2O from agricultural soils. Only the total is given without disaggregated estimates according to subcategories. All subcategories are reported as “IE” but it is not stated where they are included. Due to the lack of transparency no assessment could be made

Trend

165. According to table 10s3 of the CRF, there has been a 1.2% decline in N_2O emissions from agricultural soils.

Activity data

166. No disaggregated data are provided. “NE” is noted under activity data of table 4.D.

3. 4.D Agricultural soils – CH_4

167. The third key source is CH_4 from agricultural soils. Only totals are estimated. This is not transparent. All sub-sources under 4.D (4.D.1, 4.D.2, 4.D.3) were reported as “IE” but no indication was provided as to where CH_4 is included. Austria explained in its response to the draft of this report that this is meant to indicate that the emissions are included in the aggregate value.

Methodology and emission factors

168. Austria uses a country-specific method with country-specific emission factors for estimating CH_4 emissions from agricultural soils.

Trends

169. A constant value of 35 Gg CH_4 is given for the year 1990 and the period 1994 to 1999 (table 10s2). For the years 1991 to 1993 an estimated value of 36 Gg CH_4 was reported.

Activity data

170. No data were provided.

171. The Party’s comments (11 October 2001) on the draft S&A report 2001 are as follows: *4.D Agricultural soils – N_2O and CH_4:* The national method uses different categories from those of the IPCC Guidelines. Activity data are collected on an area basis (according to CORINAIR 97

snap level 3) and are multiplied by a corresponding emission factor. Aggregate emissions are reported. Disaggregated reporting is anticipated in submission 2003.

C. Non-key sources

172. Non-key sources are CH_4 emissions from manure management and CH_4 and N_2O emissions from field burning of agricultural residues.

1. 4.B Manure management – CH_4

Methodology and emission factors

173. Emissions were estimated using the CORINAIR calculation method with country-specific emission factors (table Summary 3).

Trends

174. According to table 10s2 of the CRF, CH_4 emissions from manure management decreased by 7% from 1990 to 1999.

Activity data

175. Animal population statistics are given but nitrogen excretion is not estimated, and nitrogen excretion per animal waste management system is also not estimated.

Findings from S&A report

176. *CH_4 IEF*: IEFs for cattle (dairy and non-dairy) were among the lowest compared to those of other reporting Parties, and low compared to IPCC defaults for cool Western Europe (8.7 versus 14 kg CH_4/hd/yr, and 4.3 versus 6 kg CH_4/hd/yr).

177. In its response to the S&A report 2000, Austria stated its intention to use IPCC default emission factors as part of its implementation of the IPCC good practice guidance. In the latest submission this was yet to be implemented.

178. In respect of the CH_4 IEF the Party responded to the latest comments (11 October 2001) in the S&A report that part of the inventory improvement programme within the new study will be to develop country-specific emission factors and to provide references.

2. 4.F Field burning of agricultural residues – CH_4 and N_2O

Trend

179. A constant value (0) was reported for 1990 to 1999 for both CH_4 and N_2O emissions from field burning of agricultural residues (table 10s2,3).

Activity data

180. Except for "biomass burned", no numerical information on activity data was reported (all data for cereals were included under wheat).

Finding from the S&A report

181. The emission factor for 4.F.1 cereals – wheat (0.119 kg N_2O/t dm) was the highest value among seven reporting Parties.

182. The Party commented:

(a) Straw burning on open fields in Austria is legally restricted and only occasionally permitted on a small scale.

(b) The calculation of emissions is based on a simple methodology: the amount of straw is multiplied by a corresponding emission factor (amount of straw and emission factors are expert judgements).

(c) The contribution of emissions from the category field burning of agricultural residues to total emissions is very low.

D. Areas for further improvement

183. The Party has responded to the draft S&A report 2001 that, as part of the inventory improvement programme, work is in progress to use more accurate methodologies for the estimation of GHG in the sectors of enteric fermentation, manure management and agricultural soils. A new study covering the requirements of the IPCC good practice guidance in emissions estimation as well as taking into account the change in national agricultural structure (extensive-intensive farming), is expected to be completed by the end of 2002. Recalculated data will be provided with submission 2003, which should also address N_2O emissions from manure management. Missing additional information in the background tables of the CRF will be provided accordingly.

1. Planned or ongoing work by the Party

184. Agriculture shows the highest uncertainty in the methods used for the estimation of GHG emissions. Austria is planning improvements for this sector. The methodology used for enteric fermentation and agricultural soils does not meet the requirements of the IPCC good practice guidance. Austria intends to use a more detailed methodology in order to reduce the uncertainty and to allow an assessment of the impact of different management practices.

2. Issues identified by the ERT

185. The review team noted that clear explanations and documentation are needed for estimation methods with country-specific emission factors, including their comparability to IPCC defaults.

V. LAND-USE CHANGE AND FORESTRY

A. Sector overview

Table 6. Summary overview: Provision of information in the LUCF sector

Sectoral report tables	Available
Notation keys	Available
Sectoral background data	Available
National inventory report	Available
Methods	IPCC
Emission factors	Country-specific
Explanation of non-IPCC method	-
Uncertainty	Available
Emission trends	Yes (1990-1999)
Procedure for QA/QC	No information
Complete set of CRF tables (LUCF)	No (tables 5, 5.A only)
CO_2 reported	Yes
Non-CO_2 gases reported	No
Plans for future improvements	No information

186. Land-use change and forestry (LUCF) is an important sector in Austria. Based on data from 1990 to 1999, the sector could offset emissions from other sectors by about 11% per year. However, the data suggest that the capacity of the sector to offset emissions of other sectors decreased consistently, by about 4.3% per annum. In 1990, the sector removed 9,215 Gg CO_2 from the atmosphere compared with 7,633 Gg in 1999. The CO_2 removal capacity is mainly from commercial temperate trees (evergreen and deciduous). The Party notes that temperate plantation may also contribute to the removal capacity although this was not estimated.

187. By including the LUCF sector, total CO_2 emissions from all sectors in 1990 were about 67,725 Gg, and in 1999 they were around 71,591 Gg, 5.7% above the 1990 level. The capacity for CO_2 removal by the LUCF sector tends to decrease the overall CO_2 reduction required from other sectors. CO_2 emissions from the waste, agriculture and industrial sectors have declined consistently from year to year in the 1990 to 1999 period.

1. Completeness

188. In its 2001 submission, Austria provides all sectoral background data for LUCF for the years 1990 to 1999 using the CRF. The Party estimated emissions and removals of CO_2 only under category 5.A Changes in forest and other woody biomass stocks. The Party has used notation keys in all categories, namely “NO”, “NE”, “IE” and “0” (emissions and removals of GHGs estimated to be less than one half the unit being used to record the inventory table, and which would therefore appear as zero after rounding).

189. GHGs other than CO_2 were not reported. Austria indicated that there were conversions of coniferous broadleaf and mixed broadleaf/coniferous to other uses. The emissions due to these activities were reported as “IE”, that is under category 5.A. In category 5.A, information was not clearly detailed. The ERT considered that the Party may have included the CO_2 emissions for these activities under biomass removed in commercial harvest. If this assumption was followed by the Party, it is misleading, since in the IPCC Guidelines commercial wood harvesting is not considered as a forest conversion activity. Similarly, under category 5.C CO_2 removals due to

tree growing on abandoned managed lands (for forest categories of coniferous broadleaf, mixed broadleaf/coniferous) was also reported as "IE", that is under category 5.A. Therefore, further clarification of the notation "IE" under categories 5.B and 5.C is required, and specifically, the definitions of forest and grassland conversion and abandoned lands used by the Party.

2. Transparency

190. The Party has provided detailed information in the NIR on the development of the GHG inventory. The inventory is considered to be largely transparent.

3. Recalculation

191. In the NIR, the Party indicated that data had been revised and updated. The updated calculation methods were also applied to earlier time series. Thus figures presented in the 1990 to 1998 inventories might have altered from the earlier reported data. However, the Party did not complete the recalculation table showing the change in the estimates (table 8(a)) and there was no explanation concerning the type of activity data, emission factors or calculation methods that have been altered for this sector.

4. Uncertainty estimates

192. An explanation of the calculation of the uncertainty in the CO_2 emission/removal estimates under 5.A was given in the NIR. The IPCC good practice guidance has been used to some extent for the calculation of uncertainty. The quantitative uncertainty of the annual net carbon (C) balance of category 5.A was reported to be about +748 kt. The level of uncertainty varied from year to year. It was reported that the uncertainties varied between +20% and +74% (mean +30%) for individual years of the period 1960 to 1996. However, the overview table of the CRF (table 7) showing the estimates and the quality of the estimates (table 7) was not completed.

5. Conformity with the UNFCCC reporting guidelines and the IPCC Guidelines

193. Austria's GHG inventory for LUCF in the CRF and NIR is consistent with the UNFCCC reporting guidelines and the IPCC Guidelines.

B. Source and sink categories

194. In the NIR, for the LUCF sector the Party estimated emissions and removals of CO_2 only for activities under category 5.A. For other categories, 5.B, 5.C, 5.D and 5.E, the Party reported notation keys ("IE", "NE", "NO" and "0").

1. 5.A Changes in forest and other woody biomass stocks

195. Under this category, the Party indicated that CO_2 removals might also occur in forest plantations and other types of forest. However, the Party did not estimate the carbon removal from these activities ("NE"). An explanation for not estimating C removal under these categories was not provided.

Methodology

196. The Party described clearly in its NIR the approaches and methods used to estimate the forest area, volume of growing stock, wood harvest and conversion factors converting the measured m^3 stemwood over bark to t C increment and t C harvest of whole trees (including

below-ground biomass). All relevant references were also provided. Estimation of CO_2 emissions and removals followed the IPCC Guidelines.

Activity data

197. There are no significant changes in the areas of the two types of forest (evergreen and deciduous forest) in the period 1990 to 1999. However, the area of evergreen forest tended to decrease at a rate of seven thousand ha per year from 1990 to 1994 and then remained constant at 2,534 thousand ha up to 1999. For deciduous forest, the area tended to increase at a rate of 10 thousand ha per year from 1990 to 1994 and then remained constant at 818 thousand ha up to 1999.

198. Total biomass removed from commercial harvest was also relatively stable, that is, 12,492 kt dm. From 1997 to 1999, the total of harvested biomass remained constant at 12,389 kt dm per year.

Emission factors

199. The average annual growth rate (MAI) of commercial evergreen forest and deciduous forest used in the inventories for 1990 to 1999 varied from year to year. For evergreen forest the MAI ranged from 4.77 to 5.95 t dm/ha while for deciduous forest the range was from 4.99 to 6.22 t dm/ha. The change in MAI of the two types of forest occurred only for 1990 to 1994. From 1995 to 1999, the MAI of the two types of forest remained constant, that is 4.91 t dm/ha for evergreen and 5.15 t dm/ha for deciduous (smaller than the mean of the MAI used for 1990-1994).

200. In comments on the S&A report, Austria stated that the MAI may differ from year to year due to weather conditions. If this is the case, the MAI for the years 1995 to 1999 should not be constant. The higher MAI used in Austria is due to the inclusion of below-ground biomass.

2. 5.B Forest and grassland conversion

201. Austria considered that for category 5.B, emissions due to forest and grassland and other types of land use conversion may also occur in the country, but the Party did not provide carbon emission estimates for these activities (“NE”) and no explanation was given. In addition, estimates of CO_2 emissions due to conversion of coniferous, broadleaf and mixed broadleaf/coniferous forest were reported as “IE”. It was explained that they were included in 5.A. As mentioned previously, the Party might consider this activity as harvesting activity. No explanation was given to clarify this.

3. 5.C Abandonment of managed lands

202. Under category 5.C, Austria used the notation “IE” for forest categories of mixed broadleaf/coniferous, coniferous and broadleaf, and the notation “NE” under the category grassland. The use of these notations was not explained in the NIR.

4. 5.D CO_2 Emissions and removals from soil

203. The Party considered that there might be CO_2 emissions and removals from soil (5.D), but did not provide any estimates for this category and no explanation is provided.

C. Areas for further improvement

204. Plans for the further improvement of estimates of emissions and removals for the LUCF sector were not presented in the NIR. In future submissions, the Party should describe actions proposed for estimating emissions or removals under all categories with the notation “NE”. Further clarification of the estimates with the notation “IE” should be presented. Similarly, information regarding the impact on the quality of the estimates of improvements to methodology, activity data or emission factors should be provided.

VI. WASTE

A. Sector overview

205. Emissions from the waste sector comprised 6.7% of total aggregated GHG emissions in 1999 compared with 8.1% in 1990. CH_4 emissions, the major GHG from this sector, declined by 16% from 1990 to 1999. The waste sector has two key sources: 6.A Solid waste disposal on land, which represents 5.6% of total emissions (compared with 7.1% in 1990), and 6.D Other (sludge spreading and compost production) which comprises 0.6% of total emissions (unchanged from 1990).

1. Completeness

206. All CRF tables specific to the waste sector contain data and notation keys, although there are some omissions from the tables. Tables 6.A and 6.C do not include notation in the additional information table for urban population, CH_4 oxidation factor, CH_4 generation rate constant, and time lag considered. It is suggested that these should be noted as not applicable (“NA”) since the methodology used by the Party does not provide single values for these variables. An important omission relevant to both solid waste disposal sites (SWDS) and wastewater handling is that there is no estimate of methane recovery.

207. Several notation keys in the tables are not clear. Table 6.A notes that data for unmanaged waste disposal sites are “IE” and other variables are shown as “NE”. This appears to be inconsistent. Table 9 Completeness was not completed; consequently it is not clear where the data that is noted as “IE” is included. Austria explained in its response to the draft of this report that unmanaged waste disposal sites are not occurring in Austria. Therefore, the notation key used was incorrect.

208. The entry for CH_4 emissions from sludge in table 6.B is shown as “IE”. Table 9 provides no indication as to where these emissions are included. The reference to table 6 leads to the conclusion that these emissions are included under 6.D Other – sludge spreading. In its response to the draft of this review report Austria explained that emissions from sludge (shown as “IE” table 6.B) are reported under waste water and under 6.D Other – sludge spreading.

209. It is noted that in the NIR, the Party has indicated that in future, emissions from sludge spreading are to be included in 6.B Wastewater handling. To ensure comparability of subsectoral emissions across all years, all years should be revised to reflect the change in allocation of these emissions.

210. The NIR also notes that in future years compost production emissions are to be allocated to managed waste disposal on land. As with sludge spreading, it is recommended that all years be revised to reflect the change in allocation of emissions.

211. Table 6.C includes notations of IE for emissions from industrial waste and wastewater sludge incineration. No information is provided as to where these emissions are included.

212. Table 6.C provides emission estimates for open burning of agricultural waste and incineration of waste oil. It is suggested that open burning of agricultural waste is more appropriately included in agriculture, 4.F (this matter was raised in the S&A report 2000 and draft S&A report 2001 and has been noted by the Party). In respect of waste oil, Austria needs to ensure that accounting for emissions from waste oil incineration under the waste sector does not lead to double-counting of emissions when oil is accounted for under the energy sector.

213. The Party has not provided estimates of N_2O emissions from human sewage. The NIR states that as from 2002 the IPCC default method will be used to estimate emissions. This should be applied to estimate emissions from 1990 onwards.

2. Transparency

214. The CRF tables, read in conjunction with the Party's NIR, provide a high level of transparency. Methodologies used for estimating emissions from the waste sector are summarized in a relatively accessible format. Comments are provided on sources of data and emissions factors, and an indication provided of revisions proposed for the future.

3. Recalculations

215. Austria has not provided any information on recalculations in tables 8(a) and 8(b). The NIR notes that there have been recalculations, and a check of the UNFCCC secretariat database indicates some recalculations. The Party should ensure that recalculations are documented in the CRF with explanations provided in table 8(b).

216. The NIR comments that revisions to population data have impacted on the estimate of emissions from wastewater for 1998, resulting in a slight increase in CH_4 emissions (0.01Gg) (p. 31).

4. Consistency with the UNFCCC reporting guidelines and the IPCC Guidelines

217. Under the IPCC Guidelines, Parties are permitted to develop and apply country-specific methodologies to estimate emissions, provided that the methodologies are transparent and documented. The IPCC Guidelines do not reference methodology tiers for the waste sector. The good practice guidance does classify waste methodologies as tier 1 (IPCC default) and tier 2 (first order decay or more complex country-specific time-dependent methodologies). Estimation of emissions from the key sources is consistent with the tier 2 methodology for SWDS. It is a country-specific time-dependent methodology.

218. The methodologies used for the key source 6.D Other (sludge spreading and compost production) are noted as country-specific but are closer to tier 1 methodologies. In the case of sludge spreading, an estimate from 1990 is used and is held constant for all subsequent years (p. 127), and in the case of compost production an emission factor obtained from data in 1995 is multiplied by the activity data for all years from 1990 to 1999.

219. The reporting of emissions from this source in the CRF and in the NIR is consistent with the UNFCCC reporting guidelines, noting the issues referred to under completeness above. Data quality has not been assessed by the Party, with no entries in table 7s3 of the CRF. This table should be completed in future inventories.

B. Key sources

1. 6.A Solid waste disposal on land – CH_4

Methodology

220. CRF Summary 3s2 shows the methodology as country-specific . The methodology is documented in the NIR with solid waste comprising two categories: residual waste and directly disposed of waste (p. 118). The directly disposed of waste is later referred to as directly-deposited household waste. The methodologies are outlined in relatively accessible form in the NIR and are time-dependent methods developed in-house. The composition or origin of residual waste is not obvious and requires more explanation. Further comment is provided under activity data. An important omission which needs to be addressed is that there is no estimate of methane recovery.

221. It is noted that the density of CH_4 used to convert volume to mass is 0.72 kg per m^3. This is the density of CH_4 at 0°C and approximately one atmosphere. A lower value should be used within the range 0.64 to 0.67 depending on the temperature. The value used has no impact on the trend, provided that it is constant across all years, but it does overestimate the mass generated and emitted in each year.

Activity data

222. Activity data are described in the NIR. Residual waste is obtained from a dataset dating back to 1950 (p. 120), whereas directly-deposited waste is based on an estimate for 1995 which is then assumed constant for all inventory years.

223. If residual waste is assumed to be that waste remaining after incineration and recycling, based on additional information provided in table 6.A, this would imply waste to SWDS of $8092 \times 9 \times 365 \times 0.41 \times 0.60$ = 6,539,226 tonnes = 6,539.23 Gg.

224. The annual municipal solid waste (MSW) at SWDS is shown in table 6.A as 3,639.5 Gg. This suggests that the data provided in the additional information is not relevant, in that the CH_4 generated is a function of waste deposited in each of the 31 years over which the methodology is applied. In view of the fact that annual waste deposited does not accord with the value derived from the additional information where the quantity is calculated as a residual, further clarification of the activity data is required.

Emission factors

225. The CRF (Summary 3s2) notes the emission factor as country-specific. The NIR provides additional detail on the emission factors in the context of the explanation of the methodology (pp. 119-121). The models do not incorporate a unique emission factor. The emission factors are implied based on the degradable organic carbon (DOC) of wastes disposed of in each of the 31 years for residual waste, and in each of 1-20, 20-100, and >100 years for the directly-deposited household waste. Emission factors are implied from the model results and total waste relevant to each calculation.

2. 6.D Other: sludge spreading and compost production – CH_4

Methodology

226. The NIR provides an explanation of the methodologies used to derive emissions from sludge spreading and compost production. The model for sludge spreading is taken from a study in 1994 which estimated spread sludge for the year 1990 (p. 126).

227. The method used for estimating emissions from compost production is based on research undertaken in 1995 for the emission factor, and quantities of waste estimated in 1998 (p. 127).

Activity data

228. Sludge spreading activity data are based on an estimate for 1990 which is held constant for all subsequent years. The NIR notes that it is proposed to update the sludge spreading data and that in future years it will be included in 6.B Wastewater handling (p. 127).

229. Compost production activity data are derived from a study undertaken in 1998. The NIR notes that an update of the data is proposed. In addition, compost production will in future inventories be reported under 6.A Solid waste disposal on land.

Emission factors

230. Emission factors for sludge spreading are documented in the NIR and are proposed to be updated (p.127).

231. The emission factor for compost production is provided in the NIR. As with activity data, the Party proposes to update the data. The NIR states that the emission factor now used is 1.945 kg CH_4 per tonne of waste. This value appears to be too high given that one tonne of pure C converted to CH_4 will give rise to approximately 1.333 kg. Austria confirmed in its response to the draft of this report that the emission factor used is 1.945 kg CH_4 per tonne of waste.

232. The draft S&A report 2001 stated that a value for DOC was not provided. The latest submission includes a value for DOC that appears to be too high. The Party may have confused DOC with DOC_f. A value of 0.45 for DOC is very high (the IPCC default range across all countries is 0.08 to 0.21). The IPCC default for DOC_f is 0.77 which has been revised in the good practice guidance with a range of 0.50 to 0.60 cited. Austria explained in its response that the model uses values between 0.2 and 0.24 Mg DOC/Mg waste. Further explanation is however required.

233. It is assumed that in future inventories the Party will fulfil the undertakings given in response to the S&A report 2000.

C. Non-key sources

234. 6.B Wastewater handling and 6.C Waste incineration are non-key sources. An important factor is that once sludge spreading is allocated to 6.B Wastewater handling, and compost production is allocated to 6.A Solid waste disposal on land, wastewater handling will become a key source and 6.D Other will no longer be a key source. This outcome highlights the need to undertake and report recalculations for all years.

235. The methodologies, activity data sources and emission factors are outlined in the NIR. Austria has noted that open burning of agricultural waste will be included in agriculture, 4.F.

D. Results from previous reviews

236. Several matters that have been referred to above were raised in the S&A report 2000 and draft S&A report 2001. In particular, non-reporting of N_2O emissions from human sewage, inclusion of open burning of agricultural wastes in incineration rather than agriculture, and sludge spreading under 6.D Other rather than 6.B Wastewater handling. Various references were made to the completeness table of the CRF's not including any entries. The Party responded to most of the matters raised in the S&A report 2000, but did not incorporate accepted changes in the 2001 submission, which resulted in the same matters being raised in the draft S&A report 2001.[6]

237. The Party provided a comprehensive response to the comments in the S&A report 2001 and it is evident that time constraints prevented the Party incorporating the changes into its 1999 inventory (2001 submission). Changes will be made in the next submissions addressing all of the concerns raised in the S&A report 2001. Austria noted in its response to the draft of this report that not all the changes will be addressed in the next submission as it will take more time to implement the necessary improvements.

E. Areas for further improvement

1. Planned or ongoing work by the Party

238. The Party responded to most of the matters raised in the S&A report 2000, and it is assumed that timing prevented these matters being addressed in the 2001 submission, which resulted in the same matters being raised in the draft S&A report 2001. These improvements are confirmed in the response to the draft S&A report 2001 and include:

(a) Allocation of emissions from sludge spreading to wastewater handling;

(b) Allocation of emissions from compost production to solid waste disposal on land;

(c) Allocation of emissions from open burning of agricultural waste to agriculture (4.F);

(d) Derivation of N_2O emissions from human sewage using the IPCC default methodology.

239. It is important that the Party provide full recalculation tables once these emissions have been reallocated, and in the case of N_2O from human sewage, derived. This will ensure that the trends in subsectors are not distorted by changes in emissions allocation.

240. The Party has also noted in the NIR several areas where data and emission factors will be updated.

241. In response to the draft S&A report 2001 the Party has addressed all relevant issues although it is unclear whether methane recovered will be accounted for in future inventories. In respect of issues additional to those referred to above, the following is noted:

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[6] It should be noted that due to review schedules in the year 2001, the S&A report of the 2000 inventory submissions was published when Parties were already in the process of preparing their 2001 inventory submissions, thus leaving no time for Parties to consider any issues raised in the S&A report 2000.

(a) A value for DOC is used and will be included. It is stated to be 200 kg per tonne of waste, which implies a DOC fraction of 0.20. However, the DOC fraction shown in the additional information (table 6.A,C) is 0.45. The relationship between these values needs to be further explained.

(b) N_2O emissions will be reported in the 2002 submission.

(c) Table 9 will be completed in future in order to explain the notation “IE” used in the waste sector tables.

2. Issues identified by the ERT

242. In future inventories it is recommended that the Party ensure that:

(a) The mass of methane value is reviewed (0.72 kg per m^3 is too high).

(b) The DOC value of 0.45 is reviewed – it appears to be too high.

(c) There is no double counting of emissions between the energy sector and waste sector as a result of accounting for waste oil incineration under waste.

(d) More explanation of residual waste is provided.

(e) The value of MSW shown in table 6.A is reviewed and the relevance of the value entered is considered.

(f) Further clarification is provided on accounting for methane recovery. When it is included, recalculations for all years should be presented in order to ensure comparability of sectors over time.

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