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**Report of the individual review of the greenhouse gas inventory of the
European Community submitted in 2006***

* In the symbol for this document, 2006 refers to the year in which the inventory was submitted, and not to the year of publication.

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I. Overview

A. Introduction

1. This report covers the in-country review of the 2006 greenhouse gas (GHG) inventory submission of the European Community (EC), coordinated by the United Nations Framework Convention on Climate Change (UNFCCC) secretariat, in accordance with decision 19/CP.8. The review took place from 2 to 7 July 2007 in Brussels, Belgium, and was conducted by the following team of nominated experts from the roster of experts: generalist – Ms. Helen Plume (New Zealand); energy – Mr. Takeshi Enoki (Japan); industrial processes – Mr. Jos Olivier (Netherlands); agriculture – Mr. Sergio González (Chile); land use, land-use change and forestry (LULUCF) – Mr. Rizaldi Boer (Indonesia); waste – Mr. Seungdo Kim (Korea). Ms. Helen Plume and Mr. Sergio González were the lead reviewers. The review was coordinated by Ms. Astrid Olsson and Mr. Tomoyuki Aizawa (UNFCCC secretariat).

2. In accordance with the “Guidelines for the technical review of greenhouse gas inventories from Parties included in Annex I to the Convention” (hereinafter referred to as the UNFCCC review guidelines), a draft version of this report was communicated to the European Commission, 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. In its 2006 submission, the EC submitted a complete set of common reporting format (CRF) tables for the years 1990–2004 and a national inventory report (NIR). The EC submitted revised emission estimates on 11 January 2008 in response to questions raised by the expert review team (ERT) during the course of the in-country visit. Where needed the ERT also used previous submissions, including the CRF tables for the years 1990–2003. During the review the EC provided the ERT with additional information. These documents are not part of the NIR. The full list of materials used during the review is provided in the annex to this report.

C. Emission profiles and trends

4. In 2004, the most important GHG in the EC was carbon dioxide (CO₂), contributing 82.9 per cent to the total¹ national GHG emissions expressed in CO₂ eq., followed by nitrous oxide (N₂O), 7.9 per cent, and methane (CH₄), 7.6 per cent. Hydrofluorocarbons (HFCs) contributed 1.2 per cent, followed by sulphur hexafluoride (SF₆), 0.2 per cent, and perfluorocarbons (PFCs), 0.1 per cent. The energy sector accounted for 80.0 per cent of the total GHG emissions in 2004 followed by agriculture, 9.3 per cent; industrial processes, 7.9 per cent; waste, 2.7 per cent; and solvent and other product use, 0.2 per cent. Total GHG emissions amounted to 4,219,457.76 Gg CO₂ eq. and decreased by 0.8 per cent from 1990 to 2004. The trends for the different gases and sectors are reasonable. However, more detailed explanations of trends would assist with the assessment of time-series consistency and thus increase the transparency of reporting. The ERT encourages the EC to provide brief explanations in the NIR covering this issue.

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

¹ In this report, the term total emissions refers to the aggregated national GHG emissions expressed in terms of CO₂ eq. excluding LULUCF, unless otherwise specified.

Table 1. Greenhouse gas emissions by gas, 1990–2004

GHG emissions	Gg CO ₂ equivalent								Change BY–2004 (per cent)
	Base year Convention ^a	1990 ^a	1995 ^a	2000	2001	2002	2003	2004 ^a	
CO ₂ (with LULUCF)	3 143 614.99	3 143 614.99	3 032 854.76	3 096 542.00	3 131 816.66	3 117 026.80	3 198 421.28	3 207 779.09	2.0
CO ₂ (without LULUCF)	3 354 306.62	3 354 306.62	3 277 341.09	3 351 746.33	3 417 113.84	3 412 130.36	3 481 120.51	3 498 987.61	4.3
CH ₄	439 544.19	439 544.19	413 074.98	366 987.54	354 925.33	344 760.71	333 605.17	321 912.03	–26.8
N ₂ O	408 738.97	408 738.97	389 068.13	354 393.85	347 124.98	339 615.33	338 737.27	336 008.16	–17.8
HFCs	27 999.94	27 999.94	40 948.61	45 751.84	44 575.94	46 736.31	50 871.24	52 425.71	87.2
PFCs	16 824.70	16 824.70	10 949.62	7 308.14	6 522.32	8 259.50	6 632.86	5 383.52	–68.0
SF ₆	10 954.84	10 954.84	15 394.76	10 707.84	10 122.51	9 258.82	8 945.12	8 974.49	–18.1

Note: BY = base year; LULUCF = Land use, land-use change and forestry.

^a The EC submitted revised estimates for 1990, 1995 and 2004 in the course of the review. These estimates differ from the EC's GHG inventory submitted in 2006.

Table 2. Greenhouse gas emissions by sector, 1990–2004

Sectors	Gg CO ₂ equivalent								Change BY–2004 (per cent)
	Base year Convention ^a	1990 ^a	1995 ^a	2000	2001	2002	2003	2004 ^a	
Energy	3 255 816.75	3 255 816.75	3 176 325.70	3 240 780.63	3 310 459.91	3 304 031.67	3 368 519.60	3 374 138.41	3.6
Industrial processes	377 969.47	377 969.47	375	331 023.60	322 981.78	321 031.77	326 937.14	332 343.68	–12.1
Solvent and other product use	10 229.33	10 229.33	9 093.45	8 923.20	8 561.78	8 531.01	8 214.12	8 199.23	–19.8
Agriculture	434 595.65	434 595.65	413 437.42	413 324.09	404 689.78	399 043.97	394 254.96	392 045.11	–9.8
LULUCF	–205 901.11	–205 901.11	–240 353.41	–250 890.95	–281 598.14	–291 478.65	–278 623.29	–286 974.75	39.4
Waste	174 967.54	174 967.54	168 409.96	138 530.64	129 992.63	124 497.69	117 910.41	112 731.33	–35.6
Other	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total (with LULUCF)	3 932 483.01	4 047 677.63	3 902 290.77	3 881 691.21	3 895 087.73	3 865 657.46	3 937 212.94	3 932 483.01	–2.8
Total (without LULUCF)	4 253 578.74	4 253 578.74	4 142 644.18	4 132 582.16	4 176 685.87	4 157 136.11	4 215 836.23	4 219 457.76	–0.8

Note: BY = base year; LULUCF = Land use, land-use change and forestry; NA = Not applicable.

^a The EC submitted revised estimates for 1990, 1995 and 2004 in the course of the review. These estimates differ from the EC's GHG inventory submitted in 2006.

D. Key categories

6. The EC reported a tier 1 key category analysis, both level and trend assessment, as part of its 2006 submission. The key category analysis performed by the Party and the secretariat² produced similar results, noting that the EC uses a much more disaggregated approach. The EC has included the LULUCF sector in its key category analysis, although the summary table provided in the body of the NIR does not include the LULUCF sector. A key category analysis including LULUCF was provided during the review. A level assessment was carried out for all the years from the base year to 2004 and a trend assessment was performed for 1990 to 2004. The NIR states that the EU-15 key category analysis was carried out to identify those categories for which overviews of member States' methodologies, emission factors (EFs), quality estimates and emission trends are provided in the NIR and to help identify those categories that should receive special attention with regard to quality assurance/quality control (QA/QC) at EC level. The member States use their key category analysis to improve the quality of emission estimates at member State level. The results of the key category analysis are used extensively in the presentation of information in the NIR, but it is less clear that the results are used in the prioritization of resources for inventory improvement. The ERT encourages the EC to use the results of the key category analysis to prioritize its approach to working with member States on inventory improvement. The ERT further recommends that the EC provide a summary key category table including LULUCF in the main body of future NIRs.

E. Main findings

7. The EC has continued to improve its reporting in the NIR and CRF, reflecting the results of previous reviews. The CRF tables are almost completely filled in. There are missing activity data (AD) in CRF table 1.B.2 as well as missing AD and implied emission factors (IEFs) in CRF table 3.A-D, and CRF table 2(II).F is not provided. The NIR meets almost all the requirements of 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). The ERT recommends the EC to continue improving the structure of the sectoral chapters of the NIR to make them fully compliant with the UNFCCC reporting guidelines. Taking into account that the EC's GHG inventory is a compilation of member States' inventories, the EC's GHG inventory information is generally 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 *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Revised 1996 IPCC Guidelines). The EC has strong and effective institutional arrangements for the preparation of its GHG inventory. The ERT recommends that the EC build on these arrangements to further enhance its reporting, working on improving the overall quality of the member States' inventories (relating to AD, EFs and methods) and hence enhancing the quality of the EC inventory by fully complying with the UNFCCC reporting guidelines and the IPCC good practice guidance.

8. Uncertainties are reasonably well covered in the NIR, following the IPCC good practice guidance. However, the ERT recommends that the EC extend its uncertainty analysis to include LULUCF, and make use of the uncertainty analysis to prioritize improvements in the inventory.

² The secretariat identified, for each Party, those source categories that are key categories in terms of their absolute level of emissions, applying the tier 1 level assessment as described in the 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 those 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.

9. The EC QA/QC plan is comprehensive and in line with the IPCC good practice guidance. However, it does not explicitly include specific review procedures for key categories or procedures to be undertaken where significant changes have occurred. The ERT encourages the EC to build such specific procedures into the QA/QC plan.

10. Particular issues relating to the sectors can be found in the relevant sections of this report.

F. Cross-cutting topics

1. Completeness

11. The EC inventory is complete in terms of the time series (1990 to 2004), geographic coverage as determined at member State level, source/sink categories and GHGs (including the reporting of actual and potential emissions of halocarbons and SF₆). The CRF tables have been almost completely filled in. There are missing AD in CRF table 1.B.2 as well as missing AD and IEFs in CRF table 3.A-D, and CRF table 2(II).F is not provided. Some IPCC categories are only partially reported, for example CO₂ emissions from solvents and other product use. The ERT recommends that the EC work with member States to fill all remaining gaps in the inventory. The NIR is generally complete. However, the ERT recommends that the EC continue to improve the structure of the sectoral chapters of the NIR to make them fully compliant with the UNFCCC reporting guidelines. For example, the sections in the sectoral chapters, except for LULUCF, do not follow the recommended structure, and sections are missing on time-series consistency, category-specific verification (if applicable) and category-specific planned improvements (where applicable).

2. Transparency

12. The NIR provides much of the information necessary to assess the inventory, recognizing that the detail on the methods used for estimating emissions and removals are described in detail at the member State level. Some additional information could improve the transparency of the NIR. For example: some more detailed explanation of trends to assist with the assessment of the time-series consistency, and recalculations (where sometimes no explanation is reported at the member State level); information on AD, IEFs, technologies and abatement technologies in the industrial processes sector; better explanation of notation keys; and better explanation of the allocation of emissions between the energy and industrial processes sectors. Improved transparency in the NIR will facilitate future reviews, particularly centralized and desk reviews. The ERT encourages the EC to provide brief explanations in the NIR covering these issues.

3. Recalculations and time-series consistency

13. The ERT noted that the recalculations of the time series from the 1990 to 2003 reported by the EC had been undertaken to take into account reallocation of emissions, inclusion of new categories and changes in methods, AD and EFs at the member State level. Given that the EC inventory is a compilation of the inventories of member States, recalculations occur in all inventory categories. The major changes from 2003 include: CO₂ emissions from metal production, mainly due to the reallocation of German process-related CO₂ emissions from iron and steel production from the category manufacturing industry and construction (in the energy sector) to iron and steel (in the industrial processes sector); CO₂ emissions from the chemical industry; and CH₄ emissions from manure management. The rationale for these recalculations is provided in the NIR, although there are some gaps in the summary information in the NIR on recalculations at member State level. The total effect of these recalculations is a 0.9 per cent increase for 2003 and a 0.4 per cent increase for 1990 excluding LULUCF. When the LULUCF sector is included, these percentages become 1.6 per cent and 0.8 per cent, respectively. These recalculations have resulted in real improvements to the inventory. The recalculations are the result of improvements made by member States, often in response to the UNFCCC

reviews. The ERT recommends that the EC fill the gaps in the explanations of recalculations at member State level as summarized in the NIR.

4. Uncertainties

14. Using a modified tier 1 analysis, the EC has provided an uncertainty analysis for each inventory category and for the inventory as a whole, following the IPCC good practice guidance. The ERT noted that the EC is not explicitly using the results of the uncertainty analysis to prioritize improvements in the inventory (e.g. a tier 2 key category analysis). The EC bases its uncertainty analysis on the uncertainties reported by member States. The combined quantitative approach covers all sectors of the inventory except LULUCF, which is excluded because of significant gaps in member State information, and covers both level and trend. The overall level of uncertainty is estimated to be between 4 and 11 per cent, and the overall trend uncertainty is estimated to be between 1 and 2 per cent. The uncertainty estimates appear to be in line with many country-specific estimates. However, they may be improved by comparison with the weighted average values of uncertainties provided by member States and with specific measurement data, if available. The ERT recommends that the EC extend its overall uncertainty analysis to include LULUCF, and recommends that the EC consider ways to make use of the uncertainty analysis to prioritize improvements in the inventory.

5. Verification and quality assurance/quality control approaches

15. The EC has elaborated and implemented a QA/QC programme in accordance with the IPCC good practice guidance. This includes general QC procedures (tier 1) as well as some category-specific procedures for key categories, for example in the energy sector through Eurostat. The European Commission (DG Environment) is responsible for coordinating QA/QC activities for the EC inventory and the EEA is responsible for the annual implementation of the QA/QC procedures. The programme includes procedures for review by experts who have not been involved with the inventory preparation process, procedures for pre- and post-submission review, and QA procedures including sector-specific workshops to address major problems/follow-up activities to improve inventory quality. Under the EC QA/QC programme, the member States have also implemented QA/QC procedures in order to comply with the IPCC good practice guidance.

16. The EC conducts a series of QC procedures such as emission and IEF checks, time-series checks, trend checks, and minimum/maximum checks for all key categories. When IEF anomalies are identified by the EC inventory compilers, the EC asks member States for clarification. In addition, the EC conducts internal reviews and EU workshops to improve the quality of the EC and member State inventories. The ERT commends the EC on these activities and encourages it to continue its efforts to work with member States to resolve issues identified by the QC checks.

17. The ERT recognizes the importance of the EC's QA/QC processes, given that the inventory is based on the annual inventories of member States and thus the quality of the EC inventory depends on the quality of the member States' inventories, the QA/QC procedures at member State level and the quality of the compilation process of the EC inventory. The ERT concludes that the QA/QC plan is comprehensive and in line with the IPCC good practice guidance, but does not explicitly include specific review procedures for key categories or procedures to be undertaken where significant changes have occurred. The ERT encourages the EC to build such specific procedures into the QA/QC plan.

6. Follow-up to previous reviews

18. The NIR contains information on improvements made to the inventory as a result of previous reviews. These improvements include the reporting of LULUCF CRF tables consistent with decision 13/CP.9; generally providing more detailed descriptions of the methods used, AD, EFs and other relevant parameters in each of the sectors; and providing more detailed information on recalculations. The NIR

also contains a summary of improvements made by member States in response to UNFCCC reviews. The ERT considers this a useful addition to the NIR and encourages the EC to continue to provide this information.

G. Areas for further improvement

1. Identified by the Party

19. The NIR identifies several areas for improvement. The following activities are planned in 2006–2007 at EC level with a view to improving the EC GHG inventory:

- (a) Continue sector-specific QA/QC activities within the EC internal review;
- (b) Test the newly developed CRF Aggregator database in order to ensure full functionality for the 2007 submission;
- (c) Prepare to provide background data in the CRF table for industrial processes (in particular table 2(II).F) and for waste;
- (d) Compare emission estimates for aviation with Eurocontrol flight data;
- (e) Further develop the EC QA/QC activities on the basis of the experience in 2006.

20. In addition, in its response to earlier 2006 review stages, the EC indicated that it is working to improve the consistency of information between the CRF and the NIR, and that it has already prepared one of the missing CRF tables for its next submission.

2. Identified by the ERT

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

- (a) Work more closely with member States on all aspects of inventory improvement, including using the results of the full key category analysis (including LULUCF) to prioritize its approach;
- (b) Include a summary table showing the key category analysis including LULUCF in the NIR;
- (c) Continue to improve the structure of the sector chapters of the NIR to make them fully compliant with Annex I of the UNFCCC reporting guidelines;
- (d) Build on the existing relationships with member States to work on improving the overall quality of the member States' inventories (relating to AD, EFs and methods) and hence enhance the quality of the EC inventory;
- (e) Extend the uncertainty analysis to include LULUCF, and consider ways to use the complete uncertainty analysis to prioritize inventory improvement;
- (f) Work with member States to fill all remaining gaps in the inventory;
- (g) Work with member States to move to higher tier methods in their inventories where this is appropriate according to the IPCC good practice guidance.

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

II. Energy

A. Sector overview

23. In 2004, the energy sector contributed 80.0 per cent of total GHG emissions, excluding LULUCF. Total GHG emissions from the sector increased by 3.6 per cent from 1990 to 2004 (in terms of CO₂ eq., 3,255,816.75Gg in 1990 to 3,374,138.41 Gg in 2004). The most important energy-related gas is CO₂, contributing 97.0 per cent of emissions from the energy sector in 2004. CH₄ accounted for 1.6 per cent of emissions from the energy sector in 2004 and N₂O accounted for 1.4 per cent.

24. From 1990 to 2004, the largest increases in the energy sector were observed for transportation (a 26.1 per cent increase) and energy industries (a 3.3 per cent increase). There were large decreases in manufacturing industries and construction (a 9.5 per cent decrease), other (1.A.5) (a 60.5 per cent decrease) and fugitive emissions from solid fuels (a 63.3 per cent decrease). Emissions from road transportation show a gradual increase throughout the time series, whereas emissions from public electricity and heat production, residential and many other categories fluctuated for a variety of reasons, such as the reunification of Germany, fuel switching in the United Kingdom of Great Britain and Northern Ireland and seasonal temperature variability.

B. Reference and sectoral approaches

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

25. CO₂ emissions from fuel combustion were calculated using the reference and sectoral approaches. The reference approach for CO₂ from fossil fuel combustion for the EC is based on Eurostat energy data. Energy statistics are submitted annually to Eurostat by member States along with the five joint Eurostat/IEA/UNECE questionnaires on solid fuels, oil, natural gas, electricity and heat, and renewables and wastes. On the basis of this information, Eurostat compiles the annual energy balances used by the EC to estimate CO₂ emissions from fossil fuels.

26. For 2004, the difference in CO₂ emission estimates between the reference and sectoral approaches was 0.30 per cent³ (the reference approach being lower). The NIR provides a description of the methodology used to estimate the reference approach. Differences of more than 5 per cent were reported for Belgium, Finland, Greece and Sweden. According to the NIR, the main reasons for diverging energy data and CO₂ emissions are the differences in the treatment of non-energy use of fossil fuels and carbon stored, and the use of country-specific EFs. The ERT commends the progress made with improving the match between the sectoral and reference approaches. The ERT encourages the EC to continue its analysis and improvement work with the countries with the greatest differences such as Belgium, Finland, Greece, and Sweden.

2. Feedstocks and non-energy use of fuels

27. The NIR does not contain a section on how feedstocks and non-energy use of fuels are accounted for in the inventory, as required by the UNFCCC reporting guidelines. Nor do the NIRs of several member States contain such information. To increase transparency and assess the completeness of these categories, the ERT recommends that the EC include this information in the next NIR.

³ The value provided is based on the EC's submission of 2 February 2007 and not the revised estimates submitted during the review for the years 1990, 1995 and 2004. Table summary 2 provides inventory data at an aggregate level and cannot be used for detailed inventory information. Some values in this report are therefore based on the submission of 2 February 2007 instead of the submitted revised estimates. This is clearly indicated in the report.

3. Country-specific issues

28. The ERT noted that because the EC inventory is a compilation of data from 15 member States, which use different methodologies, there is difficulty in reporting information in the CRF in a consistent manner. For example, the allocation of CO₂ emissions from iron and steel production is different for member States, ranging from including almost all emissions in the energy sector to reporting almost all emissions in the industrial processes sector or using a split according to the IPCC good practice guidance, the UNFCCC reporting guidelines and/or based on country-specific information. Sulphur dioxide (SO₂) scrubbing from the use of limestone in Germany is included in energy industries but should be included in limestone and dolomite use. The level of aggregation for other (manufacturing industries and construction) also varies between member States. The ERT encourages the EC to briefly describe these issues in the NIR and to facilitate harmonization of methods and allocation of emissions between member States without compromising the accuracy of the estimates.

29. There is an inconsistency among member States in the categories that are estimated. For example, Finland reports indirect N₂O emissions from emissions of nitrogen oxides (NO_x) in other (energy (1.A.5)) and the Netherlands reports them under other (industrial processes (2.G)), whereas other member States do not estimate these emissions. The EC informed the ERT that as a result of the Dutch review, the Netherlands decided not to report indirect N₂O emissions in other (industrial processes). In addition, some member States report indirect CO₂ emissions from CH₄ and non-methane volatile organic compounds (NMVOC) in oil and natural gas whereas other member States do not estimate these indirect CO₂ emissions at all. To improve the consistency of the EC inventory, the ERT encourages the EC to work with the member States to facilitate the harmonization of categories for which emissions are estimated and to report these emissions in a consistent manner.

C. Key categories

1. Stationary combustion: solid, liquid, gas, other – CO₂

30. During the review, several unusual IEFs and time-series fluctuations in emissions were identified for solid, liquid and gas fuels in public electricity and heat production. During the review, the EC explained the impact on emission trends of: the reunification of Germany, fluctuations in CO₂ IEFs in the Spanish inventory between 1990 and 1993, the growing amount of solid fuel consumption by Spain and the decreasing amount in the United Kingdom, the increased share of blast furnace gas used in Sweden since 1996, the commissioning of a power station in Scotland using sour gas in the early 1990s, and the changing contributions over time of the member States. The ERT encourages the EC to include information on national circumstances in the next NIR that helps explain the trend for public electricity and heat production as this is the largest emitting category in the EC inventory.

31. The trend of the CO₂ IEF for other fuels decreases over time for some categories. For example, the CO₂ IEF for public electricity and heat production decreased from 95.06 t/TJ in 1990 to 82.15 t/TJ in 2004, and the CO₂ IEF for chemicals decreased from 106.13 t/TJ in 1990 to 75.24 t/TJ in 2004.⁴ During the review, the EC explained that IEFs of several member States, such as Germany (public electricity and heat production) and Belgium (chemicals) decreased. The IEF trend for these categories also fluctuates. The ERT encourages the EC to work with the member States to analyse the reasons for this trend.

32. During the review, the EC informed the ERT that member States include different fuels as other fuels. For example, in Finland peat is included as other fuels instead of solid fuels. The ERT encourages the EC to work with member States that allocate fuels differently to facilitate the harmonization of fuel

⁴ The values provided are based on the EC's inventory submission of 2 February 2007. See footnote 3 for further information.

categorization. The ERT also encourages the EC to provide information in the NIR on what is included in other fuels.

2. Road transportation: liquid – N₂O

33. Germany's N₂O IEF for gasoline from road transportation is significantly lower than those of the other member States throughout the time series and also has a different trend. During the review, the EC explained that Germany revised its EFs for N₂O from gasoline-powered cars with catalytic converters in its 2006 inventory submission. Recent measurements indicated that the newer gasoline-powered cars with catalytic converters (Euro II and Euro III technologies) have lower N₂O emissions than the older cars. Therefore, the IEF in Germany decreased when new technologies penetrated the market whereas in those countries using a constant EF for all gasoline cars with catalytic converters the IEF increases with the penetration of the catalytic converter in the vehicle fleet. This issue is expected to be resolved in the next submission when member States will use the COPERT IV model which includes lower EFs for newer gasoline-powered cars. The ERT noted that not all member States use the COPERT model to estimate emissions from road transportation. The ERT encourages the EC to continue to follow-up this issue with the member States that do and do not use the COPERT model.

34. Germany's N₂O IEF for diesel from road transportation is significantly lower than those of the other member States. The ERT was informed that the German EFs are based on the updated version of the: "Handbuch Emissionsfaktoren des Straßenverkehrs 2.1"; UBA Berlin, BUWAL Bern, UBA Wien; August 2004. This handbook is a compilation of published EFs based on measurements. The new EFs are more detailed and are generally lower than those used before. The old EFs are based on "Carbotech 1998: NOREM-Database for non-regulated emissions from motor vehicles; BUWAL Bern". The ERT encourages the EC to further investigate the reasons for these differences and to continue its work with member States to improve the accuracy of the inventory.

3. Fugitive emissions: oil and natural gas – CH₄

35. AD on oil and natural gas fugitive emissions are not reported because member States use different AD for a variety of methodologies including the default IPCC method, CORINAIR and country-specific methods. The ERT encourages the EC to fill in the cells with appropriate values or notation keys.

36. The EC informed the ERT of recent efforts on the part of the EC to group countries according to methodologies used. The ERT commends the EC on these efforts and encourages the EC to continue to work with member States to facilitate harmonization of methodologies in order to improve comparability without compromising accuracy.

D. Non-key categories

1. Stationary combustion: solid – N₂O

37. The N₂O IEF for solid fuels in public electricity and heat production in Greece (15.95 kg/TJ for 2004) is higher than other major emitters (Germany, 3.79 kg/TJ; Italy, 6.46 kg/TJ; United Kingdom, 2.51 kg/TJ) throughout the time series.⁵ During the review, the EC explained that Greece uses the EMEP/CORINAIR approach to estimate these emissions.

⁵ The values provided are based on the EC's inventory submission of 2 February 2007. See footnote 3 for further information.

III. Industrial processes and solvent and other product use

A. Sector overview

38. In 2004, the industrial processes sector accounted for 8.9 per cent of total national GHG emissions (without LULUCF). From 1990 to 2004 emissions from the sector fell by 12.1 per cent, mainly due to decreases of 55.3 per cent in N₂O emissions from chemical industry and decreases in the production of halocarbons and SF₆ (by 80.8 per cent) and in PFC emissions from metal production (by 80.5 per cent). HFC emissions from refrigeration have increased significantly since 1990. Only actual emissions of fluorinated gases (F-gases) are reported; potential emissions are reported at the aggregate level as an unspecified mix of listed HFCs and PFCs, and SF₆. The minor indirect CO₂ emissions from solvent and other product use decreased by 19.8 per cent from 1990 to 2004. CO₂ emissions from cement production and from iron and steel production are the largest categories, accounting for about 25 per cent and 20 per cent, respectively⁶ of the sector total.

39. The CRF tables are filled in completely, except for the sectoral background data table 2(II).F which has not been provided. During the review, the EC stated that this information has been provided in the 2007 inventory submission. Emission estimates are made for all gases. However, the CRFs of individual member States indicate that some non-mandatory subcategories may not have been estimated completely for all 15 member States, in particular for CO₂ from non-combustion uses of lubricants and waxes, indirect CO₂ from NMVOC emissions in solvent and other product use and CO₂ from limestone and dolomite use (e.g. for flue gas desulphurization (2.A.3)). To improve coverage at EC level, and also of non-mandatory categories, the ERT recommends that the EC encourage member States to consider estimating these categories, where applicable, and to provide more complete estimates of other categories where member States report emissions as not estimated ("NE").

40. The ERT commends the EC on the substantial improvements made by using higher tier methods for key categories and plant-specific or country-specific EFs, which are now used for the larger part of the emissions of all key categories, and concludes that the methodology and plant-specific data used for key categories are mostly in line with the IPCC good practice guidance. A significant exception is CO₂ emissions from ammonia production where only 40–45 per cent are estimated using higher tier methods, mainly due to the use of the tier 1 method in Germany, which contributes 32 per cent of the total emissions from ammonia production. The ERT recommends that the EC encourage member States to improve this situation. The ERT also encourages the EC to work with member States to increase the share of higher tier methods used in estimating emissions from the production of aluminium and HCFC-22 (currently each about 70 per cent).⁷

41. The EC has also made significant improvements in its documentation of this sector in the NIR. However, the transparency and comparability of reported emissions, which are often based on plant-specific or country-specific data, could still be improved. The ERT recommends that the EC provide, for each gas, a description of the main activities and the methodologies used in the subcategories other (chemical industry (2.B.5)), other (production of halocarbons and SF₆ (2.E.3)) and other (2.G).

42. EC IEFs are generally missing because some member States have AD missing or reported as either confidential ("C") or included elsewhere ("IE"), or because inconsistent definitions are used by member States for allocating combustion and process emissions of CO₂. Since this hinders assessment of time-series consistency, the ERT recommends improving transparency and comparability at the EC level

⁶ The value provided is based on the EC's inventory submission of 2 February 2007. See footnote 3 for further information.

⁷ The values provided are based on the EC's inventory submission of 2 February 2007. See footnote 3 for further information.

by the EC encouraging member States to provide quantitative data at subcategory level whenever possible. Until these data are available, the ERT encourages the EC to provide its own estimates of total EC-level AD, where possible, and report these in the NIR for information purposes. During the review, the EC noted that providing its own AD estimates along with those of member States could lead to inconsistencies with the national inventories of the member States. The EC will continue to assist its member States to improve the quality and amount of data reported.

43. Moreover, to assess time-series consistency and improve transparency, the ERT encourages the EC to provide information in the NIR time series on shares in total EC production of plants or production technologies with distinctly different EFs and with emission abatement, if available and if confidentiality can be maintained where required. For the industrial processes sector, the separate EEA trend and projections report does not give sufficiently detailed information to provide an understanding of time-series consistency for the emissions. The ERT recommends that the EC provide this in its reporting.

44. Last year sector-specific QA/QC through internal review was introduced for several of the large key categories in the industrial processes sector. The QA/QC system for data received by the inventory compilation team from the member States focuses on detecting, checking and explaining outliers in level (also comparing between member States) and trend in member States' emissions and AD. However, AD and IEFs are not provided for many subcategories in this sector, for example for reasons of confidentiality, so the ERT recommends that the EC verify that category-specific QC has been performed by member States for key categories in this sector. The ERT recommends the EC to provide summary information on this subject in the NIR. For recalculations, in order to improve transparency the ERT recommends that the EC present the changes at relevant subcategory levels, instead of only at sector and member State level. During the review, the EC stated that this information is provided in the 2007 inventory submission.

45. The uncertainty estimates for this sector appear to be in line with many country-specific estimates. The uncertainty estimates for this sector may be improved by comparison with the weighted average values of uncertainties provided by member States and with specific measurement data, if available. The ERT recommends that the EC take a more active role in improving, and where possible harmonizing, the approach taken in member States' inventories, particularly in the industrial processes sector, in which quality assessment is also hindered at EC level by the frequent use of the notation keys confidential ("C"), included elsewhere ("IE") and not estimated ("NE"), and where there is not a uniform approach to AD and allocation of emissions.

B. Key categories

1. Cement production – CO₂

46. The NIR does not provide AD and IEFs at EC level due to the use of different definitions of AD by member States for clinker and cement production. Since this is the largest category in the industrial processes sector, the ERT encourages the EU to work towards harmonizing the reporting of the member States and providing AD and IEF for clinker production at EC level, which will enable comparisons with other Parties. The ERT also recommends that the EC include in the NIR explanations for unexpected AD changes over time, for example the 11 per cent⁸ decrease in 1990–1993, and the determination of the EFs, including the cement kiln dust correction factor where applicable, provided during the review.

⁸ The value provided is based on the EC's inventory submission of 2 February 2007. See footnote 3 for further information.

2. Limestone and dolomite use – CO₂

47. Eight member States report CO₂ from limestone and/or dolomite used in wet flue gas desulphurization of flue gases in power generation. The ERT recommends that the EC encourage other member States that do not mention this category in their NIR to report where this category is included. The ERT further recommends the EC to encourage member States to ensure that all activities are covered, where applicable, with a view to reporting more complete estimates.

3. Ammonia production – CO₂

48. During the review, the 2.9 per cent decrease in the CO₂ IEF between 2002 and 2004 was explained. The ERT recommends including this explanation in the NIR. Currently, 40 to 45 per cent of emissions are estimated using higher tier methods. The ERT was informed that Germany, which uses a tier 1 method and has a 32 per cent share of total emissions in the category, is investigating how to change to a higher tier method.⁹ The ERT recommends that the EC encourage larger emitters to use higher tier methods. The ERT also recommends the EC to allocate emissions from Greece, which are currently included in the energy sector (chemicals (1.A.2.c)), in accordance with the Revised 1996 IPCC Guidelines. Moreover, the ERT recommends that the EC ensure that all the energy-related emissions of Belgium are (re)allocated to the energy sector as recommended in the Revised 1996 IPCC Guidelines.

4. Nitric acid production – N₂O

49. During the review, the EC explained the decrease in N₂O emissions of 20.4 per cent in 2000–2002 and the decrease in the IEF calculated by the ERT for N₂O of 19.5 per cent in 2000–2002.¹⁰ In addition, the large IEF variations for the United Kingdom were explained by the fact that some production data between 1990 and 1994 are unknown and had to be estimated from surrogate parameters, and for Belgium by the use of abatement measures, changes in monitoring methods as well as changes in contributions of individual plants due to plant closures. The ERT recommends that the EC include this information in the NIR, including the trend in the EC IEF, which is calculated excluding member States that report AD as confidential; and provide explanations of changes caused by alterations in the mix of technologies with higher and lower EFs and of changes in the fraction of emissions abated. Furthermore, the ERT recommends the EC to encourage the United Kingdom to improve the emissions split between nitric acid production and adipic acid production, for example using production capacities as proxy, and to encourage member States to provide production indices where AD are reported as confidential (Netherlands and Portugal).

5. Other (chemical industry) – N₂O

50. The ERT observed that the Netherlands reports constant emissions for 1990–2002, not taking into account actual trends in production. These emissions were revised during the member State review. Italy reports N₂O emissions from caprolactam as 0.04 Gg, which is equivalent to using an IEF that is a factor of 10 lower than that of Germany and the Netherlands/Belgium as inferred from national production estimates from industry consultants (e.g. SRIC). Spain does not report N₂O emissions from this activity although industry consultants report production of caprolactam. The ERT recommends that the EC encourage member States to add these activities, where applicable, as current reporting could lead to an underestimate of emissions.

⁹ The values provided are based on the EC's inventory submission of 2 February 2007. See footnote 3 for further information.

¹⁰ The values provided are based on the EC's inventory submission of 2 February 2007. See footnote 3 for further information.

6. Iron and steel production – CO₂

51. The ERT recommends that the EC provide more accurate information on the fraction of CO₂ emissions estimated using higher tier methods, including an assessment of country-specific methods. Although not mandatory, the EC might find it useful, as part of its QA/QC activities, to compare the EC CRF data with that of other Parties with a view to increasing their comparability. In this regard, the ERT recommends that the EC encourage harmonization between the approach taken by member States regarding the allocation of CO₂ emissions between the energy sector and the industrial processes sector, and provide total crude steel production as AD, both at EC and member State level, which could be used to estimate overall IEFs that in turn could give indications of possible double counting or gaps in reporting. During the review the ERT was informed that Luxembourg changed its methodology during its review and is now using a tier 2 method with country-specific factors. The ERT recommends that the EC encourage the use of country-specific EFs in Austria instead of default factors.

7. Aluminium production – PFCs

52. To improve comparability and to assess time-series consistency, the ERT recommends that the EC encourage the United Kingdom to reconsider, if confidentiality can still be maintained where required, separating by-product PFC emissions from emissions from PFC use, which are currently aggregated into a single value for reasons of confidentiality, and Greece to consider reporting AD that are available from other publicly available AD sources (e.g. Eurostat (ProdCom), World Bureau of Metal Statistics (WBMS), Euromines, USGS and UNSD). The ERT encourages the EC to encourage other larger emitters to use higher tier methods (70 per cent of emissions in this category are currently estimated using a higher tier method)¹¹ in accordance with the IPCC good practice guidance. However, the ERT notes that the EC stated that all member States use higher tier methods for recent years in the 2007 inventory submission. The ERT also noted that some member States use a 1/10 or 10:90 ratio for estimating C₂F₆ emissions, whereas the default ratio is only 1/10 for some process types and not for all, and 10:90 is not the correct interpretation of the default ratio. The ERT recommends that the EC work with member States to improve emission estimates in this category.

8. HCFC-22 production – HFC-23

53. In the NIR, the IEF trend of HCFC-22 production and other (2.E.2/3) are not well explained, partly because member States report emissions as confidential (“C”) or included elsewhere (“IE”), but methodology information for production of halocarbons and SF₆ is provided. In line with the IPCC good practice guidance, the ERT recommends that the EC assess and discuss this key subcategory of by-product emissions from production of HCFC-22 (2.E.1) separately in the NIR and provide more specific information on abatement methods applied, if such information is not confidential (e.g. year/fraction applicable and destruction efficiency). Several member States use country-specific or higher tier and country-specific or plant-specific EFs. The ERT recommends that the EC encourage larger emitters to use higher tier methods and separate HFC-23 emissions from HCFC-22 production from other subcategories, if such information is not confidential. Moreover, in order to improve transparency at the EC level the ERT recommends that the EC encourage those member States currently using the notation keys “C” or “IE” for by-product emissions from production of HCFC-22 to consider separating the reporting of their F-gas emissions from emissions due to the use of F-gases and to report them in the appropriate categories (production of halocarbons and SF₆, consumption of halocarbons and SF₆, and metal production) if confidentiality allows.

¹¹ The value provided is based on the EC’s inventory submission of 2 February 2007. See footnote 3 for further information.

9. Consumption of halocarbons and SF₆ – HFCs

54. In commercial and industrial refrigeration the annual leakage rate (“product life factor”) varies by a factor of 100 (from 0.1 per cent to 10 per cent) and several entries are left blank without notation keys, although similar technologies are likely and values are low compared to the IPCC default ranges of 10 to 30 per cent for commercial refrigeration and 7 to 25 per cent for industrial refrigeration. For mobile air-conditioning the product life factor is about 15 per cent, except for three member States which report values of 0.1 per cent or 0 per cent, which are lower than the IPCC default range of 10 to 20 per cent (and 5 to 10 per cent for newer technology) and also lower compared to several other similar countries¹². The ERT recommends that the EC check the present country-specific values with member States and encourage improvements where warranted, as the current approach could lead to an underestimate of emissions. The ERT recommends that the NIR provide an explanation of the differences in the country-specific leakage rates used. Moreover, the ERT recommends that the EC add any missing notation keys at the EC level based on complete use of notation keys by member States. In order to increase transparency in cases where the IEF for large categories is “NA” for reasons of confidentiality, the ERT recommends that the EC include in the NIR the trend in leakage rates (product life factors) per member State for those that do report them.

10. Other (2.G) – CO₂

55. CO₂ emissions from the non-combustion use of lubricants and waxes are explicitly reported by only a few member States, even though the AD for the non-energy use are readily available in the energy statistics (see the reference approach for CO₂). To further improve the coverage of the EC inventory, the ERT recommends that the EC encourage its member States to consider reporting these activities where applicable. In addition, the ERT recommends that the EC indicate how feedstocks and non-energy use of all fuels are accounted for in the inventory, in the energy or industrial processes sector, and encourage its member States to do the same.

C. Non-key categories

1. Other (mineral products) – CO₂

56. The NIR does not explicitly mention CO₂ emissions from glass production in Ireland, Sweden or the United Kingdom. The EC explained during the review that CO₂ emissions from glass production were included in other categories in Sweden and the United Kingdom and that Ireland had not yet estimated these emissions. The ERT notes that this does not comply with the UNFCCC reporting guidelines and recommends that the EC include this information in the NIR and encourage Ireland to estimate this category.

2. Solvent and other product use – CO₂

57. Three member States (Belgium, Germany and United Kingdom) representing 45 to 50 per cent of NMVOC emissions in this sector do not report indirect CO₂ emissions. Moreover, the average ratio of NMVOC to CO₂ of member States’ reporting both emissions suggest an average carbon content of the NMVOC emissions of about 40 to 45 per cent, which is low compared to the default values found in recent EF guidebooks (e.g. 60 per cent).¹³ The ERT recommends that the EC describe in the NIR the assumptions used to estimate the CO₂ emissions, and add NMVOC emissions as AD in table 3.A-D where applicable. With reference to the note to table 3, Sectoral Report, in the appendix to the UNFCCC

¹² The values provided are based on the EC’s inventory submission of 2 February 2007. See footnote 3 for further information.

¹³ The values provided are based on the EC’s inventory submission of 2 February 2007. See footnote 3 for further information.

reporting guidelines, although not mandatory, the EC might find it useful to consider including in the NIR the activities not (completely) considered in the inventory, and the reason for their exclusion when (partly) not reported. The ERT also encourages the EC to work with member States to add these activities where applicable.

IV. Agriculture

A. Sector overview

58. In 2004, sectoral emissions reached 392,045.11 Gg CO₂ eq., accounting for 9.3 per cent of total national GHG emissions (excluding LULUCF). Emissions decreased by 9.8 per cent from 1990 to 2004, mainly due to EC/member State regulations which led to reductions in the number of cattle and in the use of nitrogen. CH₄ and N₂O emissions represented 43.2 and 56.8 per cent, respectively, of sectoral emissions, showing only minor changes in the balance obtained for 1990 (42.1 per cent and 57.9 per cent, respectively).

59. The EC inventory is complete in terms of gases, categories, territories, numbers of member State submissions and use of notation keys. Transparency was significantly improved compared to the last submission as relevant information is included in the NIR. However, supporting information on agricultural driving forces (N regulations, milk production agreements and epidemic animal disease incidence) and explanations of unusual issues/trends should be included or expanded in the next submission. The key category analysis was performed at the subcategory level, providing a better focus on the most important issues.

60. The main improvements since the previous submission are the use of higher tiers for enteric fermentation (mainly non-dairy cattle), the streamlined process of data compilation, the inclusion of more category overview tables on methodological issues and relevant parameters, and graphical trend representations that facilitate comparisons between member States.

61. Some minor issues of inconsistency, incompleteness and/or lack of transparency were found during the review process. During the review, the EC informed the ERT that most of these issues had been resolved in the 2007 inventory. The EC also informed the ERT that the unusual values and trends obtained from member States' inventories that were highlighted during the review are being discussed with member States in order to resolve them.

B. Key categories

1. Enteric fermentation – CH₄

62. In 2004, CH₄ emissions from enteric fermentation were 5,849.69 Gg CH₄, representing 31.3 per cent of sectoral emissions, with cattle and sheep (82.4 and 11.8 per cent,¹⁴ respectively) the main contributors. Eleven member States (representing 70.3 per cent¹⁵ of the EC emissions) use higher tier methods to estimate cattle emissions, while, for sheep, five member States (representing 68.2 per cent¹⁶ of the EC emissions) use higher tier methods. Emissions from the remaining animal species were estimated mainly applying tier 1 methods and default EFs, which is in line with the IPCC good practice guidance.

¹⁴ The values provided are based on the EC's inventory submission of 2 February 2007. See footnote 3 for further information.

¹⁵ The value provided is based on the EC's inventory submission of 2 February 2007. See footnote 3 for further information.

¹⁶ The value provided is based on the EC's inventory submission of 2 February 2007. See footnote 3 for further information.

63. From 1990 to 2004, cattle emissions decreased by 10.7 per cent, due mainly to a 14.3 per cent decrease in animal numbers, although the IEF increased by 4.16 per cent due to increased milk productivity. Sheep emissions decreased by 9.7 per cent in the same period, reflecting the effect of the 10.7 per cent decrease in animal numbers, although the IEF increased by 3.4 per cent.¹⁷ AD come mainly from national statistics agencies, which is in line with the IPCC good practice guidance.

64. Some minor issues that need to be resolved are: (a) no information on how the Dutch cattle population was disaggregated at the EC level into dairy and non-dairy; and (b) a very low IEF for poultry is reported, which is a misleading value as only one member State reports poultry emissions. During the review, the EC clarified these issues. The ERT recommends that the EC include these clarifications in its next NIR.

2. Manure management – CH₄

65. In 2004, this category emitted 2,103.20 Gg CH₄ representing 11.3 per cent of sectoral emissions. The main contributors were cattle and swine (46.0 and 47.2 per cent,¹⁸ respectively). Category emissions decreased by 0.4 per cent from 1990 and the contribution of swine increased by 13.9 per cent¹⁹ from 1990, reflecting the population increase during this period. Twelve member States (representing 60.2 per cent²⁰ of the EC emissions) estimated cattle emissions using higher tiers while eleven member States (representing 78.2 per cent²¹ of the EC emissions) applied higher tier methods for swine. Emissions from the remaining animal species were estimated mainly applying tier 1 and default EFs, which is in line with the IPCC good practice guidance.

66. Cattle emissions decreased by 12.3 per cent from 1990 to 2004, supported by a 14.3 per cent reduction in animal numbers and a 2.3 per cent increase in IEF values, mainly due to changes in animal allocation to animal waste management systems. Swine emissions increased by 13.9 per cent due to IEF increases, mainly in Sweden and Finland. AD come mainly from national statistics agencies, which is in line with the IPCC good practice guidance.²²

3. Agricultural soils – N₂O

67. This category is the largest sectoral contributor to GHG emissions. In 2004, the category emitted 646.20 Gg N₂O, representing 51.1 per cent of sectoral emissions which was only 1 per cent lower than in 1990. The contribution of direct, indirect, and pasture range and paddock manure emissions are 51.3, 34.7 and 13.0 per cent,²³ respectively, of the category emissions, the same percentages as in 1990.

68. From 1990 to 2004 direct emissions decreased by 11.3 per cent as a result of the EC nitrogen regulations. The main subcategory is synthetic fertilizers (50.0 per cent of the category emissions, 3 per cent lower than in 1990). Although a key category for the EC, only three member States

¹⁷ The values provided are based on the EC's inventory submission of 2 February 2007. See footnote 3 for further information.

¹⁸ The values provided are based on the EC's inventory submission of 2 February 2007. See footnote 3 for further information.

¹⁹ The values provided are based on the EC's inventory submission of 2 February 2007. See footnote 3 for further information.

²⁰ The values provided are based on the EC's inventory submission of 2 February 2007. See footnote 3 for further information.

²¹ The values provided are based on the EC's inventory submission of 2 February 2007. See footnote 3 for further information.

²² The values provided are based on the EC's inventory submission of 2 February 2007. See footnote 3 for further information.

²³ The values provided are based on the EC's inventory submission of 2 February 2007. See footnote 3 for further information.

(representing 15 per cent of direct soil emissions (4.D.1)) use higher tier methods, the reason given being that no tier 2 methods are available in the Revised 1996 IPCC Guidelines.²⁴

69. Pasture, range and paddock, and indirect emissions decreased by 9.0 and 13.5 per cent, respectively, between 1990 and 2004, also due to the EC nitrogen regulations. For pasture, range and paddock, four member States (representing 10.2 per cent of the subcategory emissions) use higher tier methods. For indirect emissions, N leaching and runoff is 4.5 times more important than atmospheric deposition but both subcategories are showing a decreasing trend. Eleven member States (representing 55.5 per cent of pasture, range and paddock manure emissions and 79.5 per cent of indirect emissions) apply country-specific methods.²⁵

70. Some minor issues that need to be corrected are: (a) not enough information in the NIR on national or regional nitrogen regulations; (b) AD and IEFs for N-fixing crops and crop residues are reported as "NE" in the CRF although they are reported in the NIR; (c) the United Kingdom IEF for N-leaching and runoff is 1,000,000 times higher than the IPCC default value (25,000 compared to 0.025); and (d) the unusual trends in Sweden of $Frac_{GASM}$ and $Frac_{GASF}$ (there is a need to explain the steep increase of 12.1 per cent from 1995 to 1996 for $Frac_{GASM}$, which continues until 2000, and the increase by 81.6 per cent from 1990 to 1994 followed by a decrease until 1999 for $Frac_{GASF}$).²⁶ During the review, the EC informed the ERT that the issues referred to under (b) and (c) have been clarified in the 2007 submission. In addition, the EC provided an explanation for the trend in Sweden of $Frac_{GASM}$ and $Frac_{GASF}$. The ERT recommends the EC to include these clarifications in the next NIR.

C. Non-key categories

Manure management – N₂O

71. In 2004, emissions in this category were 71.96 Gg N₂O, corresponding to 5.7 per cent of sectoral emissions; the main contributor being solid storage and dry lot (91.7 per cent²⁷ of the category emissions). The majority of the member States applied tier 1 methods along with country-specific N excretion rates, which is in line with the IPCC good practice guidance.

72. Emissions decreased by 11.0 per cent between 1990 and 2004, reflecting the impact of national and/or regional regulations on nitrogen in agriculture. AD were mainly derived from national statistics agencies and supported with published data and expert judgement.

73. Some minor issues that need to be resolved are: (a) Sweden's N excretion rates for dairy and non-dairy cattle are a factor of 1,000 higher (100,041.48 and 39,332.75 kg N/hd/yr, respectively) than the correct values; and (b) buffalo nitrogen excretion rates for 2004 (98.65 kg N/hd/yr) differ from the values of the majority of the previous years (ranging from 90.5 to 93.5)²⁸ During the review, the EC provided the ERT with further information on the issue referred to under (b). In addition, the EC informed the ERT that the error in Swedish N-excretion rates referred to under (a) will be corrected in the 2008 submission. The ERT recommends the EC to include these clarifications in its next NIR.

²⁴ The values provided are based on the EC's inventory submission of 2 February 2007. See footnote 3 for further information.

²⁵ The values provided are based on the EC's inventory submission of 2 February 2007. See footnote 3 for further information.

²⁶ The values provided are based on the EC's inventory submission of 2 February 2007. See footnote 3 for further information.

²⁷ The value provided is based on the EC's inventory submission of 2 February 2007. See footnote 3 for further information.

²⁸ The values provided are based on the EC's inventory submission of 2 February 2007. See footnote 3 for further information.

V. Land use, land-use change and forestry

A. Sector overview

74. The LULUCF sector of the EC is a net carbon sink. The overall sink (including non-CO₂ GHGs) from 1990 to 2004 increased by 38.2 per cent from 205,901.11 Gg of CO₂ eq. to 286,974.75 Gg of CO₂ eq. On average, CO₂ removals from the LULUCF sector increased at a rate of about 2.3 per cent per year, while CH₄ and N₂O emissions decreased at a rate of about 0.3 per cent per year and 2.9 per cent per year, respectively. Among the member States, Denmark, Ireland, the Netherlands, Portugal and the United Kingdom were net emitters in 1990. They all became net sinks by 2004, apart from the Netherlands.

75. The total land area for the EC-15 reported in CRF v1.6 was not consistent. There is a discrepancy of 4,617 kha between the total area reported in 1990 and that reported in 2004. During the review, the EC inventory team clarified that the difference may be due to incorrectly summed areas of land converted to another land use from year to year, and “non-reporting” of the area of some categories by a number of member States (e.g. cropland for Spain). The EC team will make all possible efforts to encourage member States to correct the problem in the next submission. To ensure that changes in land uses can be traced accurately, the use of satellite and GIS technology in the development of the GHG inventory is encouraged.

76. The EC inventory is complete in term of gases, categories, territories, the number of member State submissions (except for Luxembourg’s category split) and the use of notation keys. However, the notation keys not occurring (“NO”) or not estimated (“NE”) may have been used interchangeably with 0 by some member States. The ERT recommends that the EC ensure consistent use of notation keys in this sector.

77. Large differences in IEFs among member States were found in some source/sink subcategories. The ERT recommends that to increase transparency, the EC include in subsequent NIRs additional information including references to supporting documents that explain the large differences. During the review, the EC explained that in its next submission it will make every effort to provide more information to explain the differences in IEFs among member States.

78. A sectoral QA/QC programme is in place, which involves the electronic transfer of member State submissions to a single file, the performance of a series of internal checks using outlier detection and sending the findings to member States for clarification and to finalize consistency checks. Verification by independent reviewers has not been carried out.

79. Sources of uncertainties in carbon removals have been reported. Information on how the estimates of uncertainty are derived were not provided. Estimates of uncertainty at member State level were provided in the NIR, but no uncertainty estimates are provided at the EC level. During the review, the EC inventory team provided the ERT with information about the methods used by member States to estimate uncertainties. The ERT recommends that this information be included in the next NIR. If the methods used are not the same as those in the IPCC *Good Practice Guidance for Land Use, Land-use Change and Forestry*, an explanation of this should also be provided. During the review, the EC inventory team for the agriculture sector presented a method that can be used to undertake uncertainty analysis at EC level, which would potentially be applicable to the LULUCF sector in the future.

80. A programme for the improvement of the LULUCF inventory is in place. A number of workshops and projects have been implemented. A web-based database called AFOLU DATA is under development to store all research outputs related to AD and EFs. During the review, the EC LULUCF inventory team presented the AFOLU DATA website. The website can be accessed by the inventory

team of each member State to assist with inventory improvements. The ERT recommends the EC to further improve the accessibility of this information and to encourage member States to use the information.

B. Key categories

1. Forest land remaining forest land – CO₂

81. The IEFs of living biomass used for forest land remaining forest land in Germany and Italy were much higher than those of Finland and Sweden and this leads to much higher levels of reported carbon removal in Germany and in Italy, even though the forest areas of these two countries are smaller than those in Finland and Sweden. The EC LULUCF inventory team explained that in the first two countries, the area of forest being harvested was limited unlike the other two countries. In addition, in central Europe forests are now growing faster mainly because of past management effects. Most forests are relatively young, that is, they are still in an exponential growth phase and are recovering from past overexploitation. Nitrogen deposition is also a contributing factor. The ERT recommends that the EC provide these explanations in the next NIR submission together with references to supporting data and documentation.²⁹

2. Land converted to forest land – CO₂

82. A minor issue that needs to be clarified is that conversion of land to forest land in Sweden leads to a soil carbon decrease, unlike in other member States (e.g. France, Italy and United Kingdom). Normally, converting land to forest will lead to a soil carbon increase. The ERT recommends that the EC provide an explanation of this issue in its next NIR.³⁰

3. Land converted to cropland – CO₂

83. Conversion of forest and grassland to cropland in France and the United Kingdom caused a decrease in soil carbon. The IEFs used by the two countries are very different. The IEFs for soil carbon used by the United Kingdom for forest land converted to cropland and grassland converted to cropland for 2004 were -1.02 Mg C/ha and -0.76 Mg C/ha, respectively; while for France they were -1.25 Mg C/ha and 1.25 Mg C/ha, respectively. This leads to much higher removals from this category in France. In order to increase transparency, the ERT recommends that the EC provide additional explanations and references to supporting documents to clarify the big differences in the IEFs used by member States.³¹

4. Land converted to grassland – CO₂

84. A minor issue that needs to be clarified is that the IEFs for soil carbon used by France and the United Kingdom for soils in the conversion of forest land to grassland and cropland to grassland as well as settlements converted to grassland are very different, particularly for cropland converted to grassland and settlements converted to grassland. France reported no change in soil carbon from settlements converted to grassland, while the United Kingdom IEF is quite high (1.42 – 1.61 Mg C/ha). No explanation is provided for such differences. In order to increase transparency, the ERT recommends that the EC provide additional explanations and references to supporting documents to clarify the big

²⁹ The values provided are based on the EC's inventory submission of 2 February 2007. See footnote 3 for further information.

³⁰ The values provided are based on the EC's inventory submission of 2 February 2007. See footnote 3 for further information.

³¹ The values provided are based on the EC's inventory submission of 2 February 2007. See footnote 3 for further information.

differences in the IEFs used by member States. In addition, some member States used very different IEFs for the same subcategory. The ERT recommends that the EC provide further explanation of this issue.³²

C. Non-key categories

Land converted to settlement – CO₂

85. In some member States, such as the Netherlands and Sweden, land converted to settlements did not lead to CO₂ emissions, while other countries reported emissions from this category. During the review, the EC explained that it will make all the possible efforts to provide more information on the causes of differences among member States reporting emissions from land converted to settlements.

VI. Waste

A. Sector overview

86. In 2004, GHG emissions from the waste sector were reported to be 112,731.33 Gg CO₂ eq. contributing 2.7 per cent of total national emissions excluding LULUCF. Solid waste disposal on land, wastewater handling, waste incineration and other accounted for 77.5, 17.8, 3.4 and 1.4 per cent, respectively, of total emissions from the waste sector. The GHG emissions decreased steadily by 35.6 per cent between 1990 and 2004. Solid waste disposal on land was responsible for 94.8 per cent of the total reduction in this sector. One major driving force for the reduction in CH₄ emissions from solid waste disposal on land is the European Landfill Directive.

B. Key categories

1. Solid waste disposal on land – CH₄

87. CH₄ emissions from managed solid waste disposal on land represented 67.6 per cent of sectoral emissions in 2004. The emissions decreased by 41.3 per cent between 1990 and 2004.³³ All EU-15 member States except Luxembourg applied the tier 2 methodology or its modified version reflecting country-specific conditions in accordance with the IPCC good practice guidance. During the review, the EC informed the ERT that Luxembourg, during its review, had submitted revised estimates calculated based on a tier 2 methodology. Waste management practices and statistics in member States have evolved historically based on country-specific circumstances such as waste composition, political decisions and statistical systems. For this reason, historical data sets and parameters used for emissions estimation are difficult to harmonize. The EU Waste Statistics Regulation may lead to more harmonized waste data in the future. The ERT acknowledges these planned improvements.

88. CH₄ emissions from unmanaged waste disposal on land represented 7.3 per cent of sectoral emissions in 2004. The emissions decreased by 37.3 per cent between 1990 and 2004.³⁴ Six member States (France, Greece, Ireland, Italy, Portugal and Spain) reported CH₄ emissions from unmanaged solid waste disposal sites in 2004. All six member States applied the tier 2 methodology in line with the IPCC good practice guidance. Little information is available in the NIR on the methodologies used and the key parameters. The ERT recommends that the EC provide more information in future NIR submissions.

³² The values provided are based on the EC's inventory submission of 2 February 2007. See footnote 3 for further information.

³³ The values provided are based on the EC's inventory submission of 2 February 2007. See footnote 3 for further information.

³⁴ The values provided are based on the EC's inventory submission of 2 February 2007. See footnote 3 for further information.

2. Wastewater handling – CH₄

89. CH₄ emissions from domestic and commercial wastewater handling represented 5.6 per cent of sectoral emissions in 2004. The emissions decreased by 29.7 per cent between 1990 and 2004.³⁵ All EU-15 member States except Luxembourg and Sweden reported emissions of CH₄ in this subcategory in accordance with the IPCC good practice guidance. During the review, the EC informed the ERT that Luxembourg had, during its review, submitted CH₄ emission estimates for domestic and commercial wastewater handling. Sweden reported emissions from domestic and commercial wastewater handling as included elsewhere (“IE”) and reported under solid waste disposal on land because of sludge disposal to landfills. Sweden neglected the CH₄ emissions from the wastewater treatment process. Little information was provided in the NIR on the key parameters of the member States. The ERT recommends that the EC improve its explanations of the above-mentioned issues in future NIRs.

3. Wastewater handling – N₂O

90. N₂O emission from domestic and commercial wastewater handling represented 7.6 per cent of sectoral emissions in 2004. The emissions increased by 4.8 per cent between 1990 and 2004.³⁶ All EU-15 member States except Luxembourg reported emissions of N₂O from domestic and commercial wastewater handling in accordance with the IPCC good practice guidance. During the review, the EC informed the ERT that Luxembourg had during its review submitted N₂O emission estimates for domestic and commercial wastewater handling. Some member States adopted country-specific per capita protein consumption factors, which are usually much lower than those of the Food and Agriculture Organization of the United Nations factors adopted by most EU-15 member States. It would be recommendable for the 15 member States to harmonize the methodology used to determine the per capita protein consumption factor. However, the ERT admits that it would be quite difficult to develop a common approach to the selection of per capita protein consumption factors at this time.

C. Non-key categories

1. Waste incineration – CO₂ and CH₄

91. CO₂ emissions from this category represented 3.4 per cent of sectoral emissions in 2004. The emissions decreased by 36.4 per cent between 1990 and 2004. Some member States did not cover all emission activities from this subcategory. Nine member States reported CO₂ emissions from waste incineration in the base year in accordance with the IPCC good practice guidance. Some of these member States (Austria, Finland, Italy and Portugal) reported CH₄ emissions from waste incineration, whereas the others did not. The ERT encourages the EC to work with member States to harmonize the estimation of CH₄ emissions in this category.

2. Wastewater handling – CH₄

92. Eight member States reported CH₄ emissions from industrial wastewater in 2004. Some member States reported these emissions as “NE”, leading to an underestimation of CH₄ emissions from this subcategory. Little information is available on the methodologies used and the key parameter values. The ERT recommends that the EC provide more information in the NIR on the methodologies and IEF values reported by the member States.

³⁵ The values provided are based on the EC’s inventory submission of 2 February 2007. See footnote 3 for further information.

³⁶ The values provided are based on the EC’s inventory submission of 2 February 2007. See footnote 3 for further information.

3. Other – CH₄

93. CH₄ emissions from other accounted for 0.8 per cent of sectoral emissions in 2004. The emissions increased by 182.5 per cent between 1990 and 2004. Ten member States reported CH₄ emissions in the category other. Nine of these member States identified composting as a major source of CH₄ in this category, the exception being Portugal which reported the open burning of industrial solid wastes under this category. Germany and France also reported CH₄ emission from biogas production. The Revised 1996 IPCC guidelines and the IPCC good practice guidance do not provide methodologies and EFs for these activities. Member States applied country-specific methodologies or those available in recently published recognized international scientific literature. The ERT encourages the EC to provide more information in the NIR on the emission data of the member States as well as the methodologies applied.

VII. Conclusions and recommendations

94. The EC has submitted an NIR including a complete set of CRF tables for the years 1990 to 2004. The inventory is complete in terms of geographic coverage as determined at member State level, source/sink categories and GHGs (including the reporting of actual and potential emissions of HFCs and SF₆). There are some minor gaps in the CRF tables and some IPCC categories are only partially reported. The NIR is generally complete, but in places is not fully compliant with the UNFCCC reporting guidelines. Taking into account the fact that the EC's GHG inventory is a compilation of member States' inventories, the EC's GHG inventory information is generally consistent with the Revised 1996 IPCC Guidelines and the IPCC good practice guidance.

95. The EC has strong and effective institutional arrangements for the preparation of its GHG inventory, including the elaboration and implementation of a comprehensive QA/QC programme in accordance with the IPCC good practice guidance.

96. In the course of the review, the ERT formulated a number recommendations relating to improving the completeness and transparency of the EC's inventory information. The key recommendations³⁷ are that the EC:

- Take more of a leadership role regarding recommendations to member States on priority setting for improving the overall quality of the member States' inventories across all sectors (relating to AD, EFs and methods) and hence further improve the quality of the EC inventory. This could be done by enhancing the objectives and tasks of Working Group 1 'Annual Inventories' established under the EC's Climate Change Committee, and by building this into the inventory improvement plan with priorities both at EC and member State level, taking into account the IPCC good practice guidance for the EC inventory at EC level;
- Prepare a tier 2 key category analysis and identify key categories at EC level, using the uncertainty estimates for EC categories and a comparison of EC uncertainty estimates with weighted estimates of uncertainties reported by member States;
- Describe how and where CO₂ emissions from non-energy and feedstock use of fuels are reported in the inventory;
- Describe for key categories where emissions are (partly) reported as confidential, the category-specific QC that has been performed by member States;

³⁷ For a complete list of recommendations, the relevant sections of this report should be consulted.

- Provide the information recommended by the ERT to improve transparency and enable assessment of time-series consistency;
- Describe why outliers in IEF values reported by the 15 member States are consistent with values used by other, apparently similar, member States;
- Work with member States to fill all remaining gaps in the EC inventory, including providing comparable quantitative AD in the industrial processes sector and encouraging member States to improve the geographic coverage at EC level of non-mandatory categories;
- Increase transparency in future NIRs by providing additional information with supporting references on the methods used for uncertainty analysis and their comparison with the IPCC good practice guidance. In addition, further develop methodology for combining uncertainty estimates at EC level.

Annex**Documents and information used during the review****A. Reference documents**

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

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

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

UNFCCC. Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories. FCCC/SBSTA/2004/8. Available at <<http://unfccc.int/resource/docs/2004/sbsta/08.pdf>>.

UNFCCC secretariat. Status report for the European Community. 2006. Available at <<http://unfccc.int/resource/docs/2006/asr/ec.pdf>>.

UNFCCC secretariat. Synthesis and assessment report on the greenhouse gas inventories submitted in 2006. FCCC/WEB/SAI/2006. Available at <http://unfccc.int/resource/docs/webdocs/sai/sa_2006.pdf>.

UNFCCC secretariat. The European Community: Report of the individual review of the greenhouse gas inventory submitted in the year 2005. FCCC/WEB/IRI/2005/EC. Available at <<http://unfccc.int/resource/docs/2005/arr/ec.pdf>>.

B. Additional information provided by the Party

Responses to questions during the review were received from Ms. Erasmia Kitou (EC) and Mr. Bernd Guele (EEA/ETC ACC), including additional material on the methodology and assumptions used.

CEC Report from The Commission: Progress Towards Achieving the Kyoto Objectives (required under Decision 280/2004/EC of the European Parliament and of the Council concerning a mechanism for monitoring Community greenhouse gas emissions and for implementing the Kyoto Protocol), 27.10.2006. COM(2006) 658 final.

European Environment Agency (EEA), Greenhouse gas emission trends and projections in Europe 2006. European Environment Agency, 2006, EEA Report No 9/2006, ISBN 92-9167-885-6.

Quality Management System, European Community Greenhouse Gas Inventory. European Environment Agency, European Topic Centre on Air and Climate Change.
