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**Report of the individual review of the annual submission of Finland
submitted in 2009***

* In the symbol for this document, 2009 refers to the year in which the inventory was submitted, and not to the year of publication.

CONTENTS

	<i>Paragraphs</i>	<i>Page</i>
I. OVERVIEW	1–35	4
A. Introduction	1–2	4
B. Emission profiles and trends.....	3–4	4
C. Annual submission and other sources of information	5–7	6
D. Completeness of inventory	8	6
E. Main findings.....	9–16	6
F. A description of the institutional arrangements for inventory preparation, including the legal and procedural arrangements for inventory planning, preparation and management.....	17–29	7
G. Follow-up to previous reviews	30–31	10
H. Areas for further improvement	33–35	10
II. ENERGY	36–52	11
A. Sector overview	36–38	11
B. Reference and sectoral approaches.....	39–49	12
C. Key categories	50–51	14
D. Non-key categories.....	52	14
III. INDUSTRIAL PROCESSES AND SOLVENT AND OTHER PRODUCT USE.....	53–61	15
A. Sector overview	53–56	15
B. Key categories	57–59	15
C. Non-key categories.....	60–61	16
IV. AGRICULTURE	62–70	17
A. Sector overview	62–64	17
B. Key categories	65–69	17
C. Non-key categories.....	70	18
V. LAND USE, LAND-USE CHANGE AND FORESTRY	71–78	18
A. Sector overview	71–73	18
B. Key categories	74–78	19
	<i>Paragraphs</i>	<i>Page</i>

VI.	WASTE.....	79–87	20
	A. Sector overview.....	79–82	20
	B. Key categories.....	83	21
	C. Non-key categories	84–87	21
VII.	SUPPLEMENTARY INFORMATION REQUIRED UNDER ARTICLE 7, PARAGRAPH 1, OF THE KYOTO PROTOCOL	88–96	22
	A. Information on Kyoto Protocol units	88–93	22
	B. Changes to the national system	94	23
	C. Changes to the national registry	95–96	23
VIII.	CONCLUSIONS AND RECOMMENDATIONS.....	97–104	23
IX.	QUESTIONS OF IMPLEMENTATION.....	105	24

Annexes

I.	Documents and information used during the review	25
II.	Acronyms and abbreviations	26

I. Overview

A. Introduction

1. This report covers the centralized review of the 2009 annual submission of Finland, coordinated by the UNFCCC secretariat, in accordance with decision 22/CMP.1. The review took place from 14 to 19 September 2009 in Bonn, Germany, and was conducted by the following team of nominated experts from the UNFCCC roster of experts: generalists – Mr. Domenico Gaudioso (Italy) and Mr. Dennis Rudov (Belarus); energy – Mr. Leif Hockstad (United States of America) and Mr. Ole-Kenneth Nielsen (Denmark); industrial processes – Mr. Stanford Mwakasonda (South Africa) and Mr. Dušan Vácha (Czech Republic); agriculture – Mr. Donald Kamdonyo (Malawi) and Mr. Chang Liang (Canada); land use, land-use change and forestry (LULUCF) – Ms. Oksana Butrym (Ukraine), Mr. Walter Oyhançabal (Uruguay) and Mr. Richard Volz (Switzerland); and waste – Ms. Violeta Hristova (Bulgaria) and Mr. Jose Ramon Villarin (Philippines). Mr. Hockstad and Mr. Mwakasonda were the lead reviewers. The review was coordinated by Ms. Astrid Olsson and Mr. Sabin Guendehou (UNFCCC secretariat).

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

B. Emission profiles and trends

3. In 2007, the main greenhouse gas (GHG) in Finland was carbon dioxide (CO₂), accounting for 84.4 per cent of total GHG emissions¹ expressed in CO₂ eq, followed by nitrous oxide (N₂O) (8.9 per cent) and methane (CH₄) (5.8 per cent). Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF₆) collectively accounted for 1.2 per cent of the overall GHG emissions in the country. The energy sector accounted for 81.2 per cent of the total GHG emissions, followed by industrial processes (8.5 per cent), agriculture (7.1 per cent), waste (3.1 per cent) and solvent and other product use (0.1 per cent). Total GHG emissions amounted to 78,345.34 Gg CO₂ eq and increased by 10.6 per cent between the base year² and 2007.

4. Tables 1 and 2 show total GHG emissions by gas and by sector, respectively. Table 1 shows emissions from the sectors/categories listed in Annex A to the Kyoto Protocol and excludes emissions and removals from the LULUCF sector.

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

² “Base year” refers to the base year under the Kyoto Protocol, which is 1990 for CO₂, CH₄ and N₂O, and 1995 for HFCs, PFCs and SF₆. The base year emissions include emissions from Annex A sources only.

Table 1. Total greenhouse gas emissions by gas, 1990–2007^a

Greenhouse gas	Gg CO ₂ eq							Change base year–2007 (%)
	Base year ^b	1990	1995	2000	2005	2006	2007	
CO ₂	56 612.61	56 612.61	57 870.08	56 688.16	56 347.14	67 705.09	66 103.44	16.8
CH ₄	6 405.01	6 303.31	6 099.06	5 430.85	4 506.77	4 572.22	4 443.12	–29.5
N ₂ O	7 937.05	7 851.85	7 154.32	6 849.41	6 949.03	6 853.83	6 863.88	–12.6
HFCs	29.33	0.02	29.33	501.73	863.80	747.66	903.92	2 982.0
PFCs	0.14	0.07	0.14	22.46	9.88	15.43	8.40	5 897.1
SF ₆	68.53	94.38	68.53	51.49	19.56	40.44	22.59	–67.0

^a “Total greenhouse gas emissions” includes emissions from the sectors/categories listed in Annex A to the Kyoto Protocol and excludes emissions/removals from the land use, land-use change and forestry sector.

^b “Base year” refers to the base year under the Kyoto Protocol, which is 1990 for CO₂, CH₄ and N₂O, and 1995 for HFCs, PFCs and SF₆. The base year emissions include emissions from Annex A sources only.

Table 2. Greenhouse gas emissions by sector, 1990–2007

Sector	Gg CO ₂ eq							Change base year–2007 (%)
	Base year ^a	1990	1995	2000	2005	2006	2007	
Energy	54 577.71	54 577.71	56 252.88	54 634.86	54 329.13	65 636.94	63 610.99	16.6
Industrial processes	5 000.15	4 996.62	4 567.45	5 494.33	6 199.17	6 091.29	6 675.93	33.5
Solvent and other product use	178.37	178.37	142.77	124.71	106.39	100.18	97.07	–45.6
Agriculture	7 125.73	7 125.73	6 324.76	5 968.93	5 602.78	5 587.93	5 529.75	–22.4
LULUCF	NA	–17 772.94	–16 556.29	–18 417.98	–28 305.91	–32 207.39	–25 265.63	NA
Waste	3 983.81	3 983.81	3 933.59	3 321.27	2 458.70	2 518.33	2 431.60	–39.0
Other	NA	NA	NA	NA	NA	NA	NA	NA
Total (with LULUCF)	NA	53 089.30	54 665.17	51 126.12	40 390.26	47 727.29	53 079.71	NA
Total (without LULUCF)	70 865.77	70 862.24	71 221.46	69 544.10	68 696.17	79 934.67	78 345.34	10.6

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

^a “Base year” refers to the base year under the Kyoto Protocol, which is 1990 for CO₂, CH₄ and N₂O, and 1995 for HFCs, PFCs and SF₆. The base year emissions include emissions from Annex A sources only.

C. Annual submission and other sources of information

5. The 2009 annual inventory submission was submitted on 8 April 2009; it contains a complete set of common reporting format (CRF) tables for the period 1990–2007, and a national inventory report (NIR). Finland also submitted information required under Article 7, paragraph 1, of the Kyoto Protocol, including accounting of Kyoto Protocol units and information on changes in the national registry. The standard electronic format (SEF) tables were also submitted on 8 April 2009. The annual submission was submitted in accordance with decision 15/CMP.1. The Party indicated that the 2009 submission is also its voluntary submission under the Kyoto Protocol.

6. In addition, the expert review team (ERT) used the Standard Independent Assessment Report (SIAR), Parts I and II, to review information on the accounting of Kyoto Protocol units (including the SEF tables and their comparison report) and on the national registry.³

7. Where necessary, the ERT also used the previous year's submission during the review. During the review, Finland provided the ERT with additional information. The documents concerned are not part of the annual submission. The full list of materials used during the review is provided in annex I to this report.

D. Completeness of inventory

8. The inventory covers all source and sink categories for the period 1990–2007, and is complete in terms of years and geographical coverage. Finland has provided all CRF tables for the years 1990–2007. The ERT commends Finland for this achievement.

E. Main findings

9. The inventory is in line with the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Revised 1996 IPCC Guidelines), the Intergovernmental Panel on Climate Change (IPCC) *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC good practice guidance) and the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF). The Finnish inventory submission is of a high quality and shows significant improvements in the structure of the NIR, its transparency and time-series consistency.

10. Finland has demonstrated sufficient capacity to comply with the “Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories” (hereinafter referred to as the UNFCCC reporting guidelines), for example by providing timely answers to the additional questions raised by the ERT during the review.

11. Finland has submitted, in part, on a voluntary basis supplementary information required under Article 7, paragraph 1, of the Kyoto Protocol in accordance with Part I of the annex to decision 15/CMP.1. The Party did not submit on a voluntary basis information on activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol and information on the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol.

³ The SIAR, Parts I and II, is prepared by an independent assessor in line with decision 16/CP.10 (paragraphs 5(a), 6(c) and 6(k)), under the auspices of the international transaction log (ITL) administrator using procedures agreed in the Registry System Administrators Forum. Part I is a completeness check of the submitted information relating to the accounting of Kyoto Protocol units (including the SEF tables and their comparison report) and to national registries. Part II contains a substantive assessment of the submitted information and identifies any potential problem regarding information on the accounting of Kyoto Protocol units and the national registry.

The SIAR is not publicly available.

12. Finland has reported information on its accounting of Kyoto Protocol units in accordance with section I.E of the annex to decision 15/CMP.1, and used the SEF tables as required by decision 14/CMP.1.
13. The Party reported that there has been no change in its national system since its previous annual submission. The national system continues to perform its required functions as set out in the annex to decision 19/CMP.1
14. The national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1, and continues to adhere to the technical standards for data exchange between registry systems in accordance with relevant decisions of the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol (CMP). However, the ERT reiterates the findings in the SIAR concerning reporting on discrepancies, conformance of the national registry with message flows defined in the technical standards for data exchange, and availability of public information referred to in paragraphs 46 and 47 of the annex to decision 13/CMP.1, which needs to be improved.
15. The ERT encourages Finland to explore the possibility of structuring its reporting, in its next annual submission, following the annotated outline of the NIR, and the guidance contained therein, that can be found on the UNFCCC website.⁴
16. In the course of the review, the ERT formulated a number of recommendations relating to uncertainties (see para. 23 below), quality assurance/quality control (QA/QC) (see para. 27 below) and the national registry (see paras. 89, 91, 95 below).

F. A description of the institutional arrangements for inventory preparation, including the legal and procedural arrangements for inventory planning, preparation and management

1. Overview

17. The ERT concluded that the national system of Finland continued to perform its required functions.
18. The NIR describes the national system and institutional arrangements for the preparation of the inventory. The Statistics Finland has overall responsibility for the national inventory. Separate agreements are made with several other institutes (expert organizations) for the development of the inventory at sectoral level. These include: the Finnish Environment Institute (responsible for fluorinated gases (F-gases), non-methane volatile organic compounds (NMVOCs), waste sector); MTT Agrifood Research Finland (responsible for agriculture, LULUCF), Finavia (responsible for mobile sources: transport and off-road machinery); VTT Technical Research Centre of Finland (responsible for mobile sources); and the Finnish Forest Research Institute (responsible for LULUCF). The national system is designed and operated to ensure the transparency, consistency, comparability, completeness, accuracy and timeliness of GHG emission inventories. The quality requirements are fulfilled by consistently implementing the inventory quality management procedures. Statistics Finland is the general authority for the official statistics of Finland and is independently responsible for GHG emission inventory preparation, reporting and submission under the Convention and the Kyoto Protocol. In implementing its role as the national authority for the GHG inventory, Statistics Finland follows the Statistics Finland Act and the Statistics Act. Finland reported that the Finnish Forest Research Institute and MTT Agrifood Research Finland are the organizations responsible for reporting activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol.

⁴ <http://unfccc.int/files/national_reports/annex_i_ghg_inventories/reporting_requirements/application/pdf/annotate_nir_outline.pdf>.

2. Inventory planning

19. Statistics Finland, in its role as national authority for the GHG inventory, is responsible for coordinating quality management measures at the national level. It compiles and approves the inventory and submits it to the UNFCCC secretariat and the European Commission. Statistics Finland bears the responsibility for the archiving system, which includes all inventory-related information: activity data (AD), emission factors (EFs) and other parameters, methods, the quality manual and the submissions of annual inventories (comprising CRF tables and the NIR). Expert organizations contributing to the sectoral calculation archive the primary data used, the internal documentation of calculations and the sectoral CRF tables.

20. The main source of data for the inventory is the VAHTI database. It contains information based on the environmental permits, including data on fuel use, industrial production and emissions, as well as waste and wastewater generation and treatment data. Another data source is the European Union emissions trading scheme (EU ETS) data on Finnish installations, obtained from the Energy Market Authority. The EU ETS data are used for comparison with the fuel consumption and CO₂ emissions from specific installations in the energy sector and as prime source of AD and CO₂ emissions for installations in the industrial processes sector.

21. Finland has elaborated and implemented a QA/QC plan as an integrated part of its national system, in accordance with the IPCC good practice guidance and decision 19/CMP.1. This includes general QC procedures (tier 1) as well as category-specific procedures (tier 2) for key categories and for those individual categories in which significant methodological and/or data revisions have occurred. The QA/QC procedures are in place and QC reports are prepared by all the expert organizations. The ERT commends Finland for its achievements and encourages the Party to continue further elaboration of its QA/QC activities by, for example, including summary results of the checks performed in the NIR.

3. Inventory preparation

Key categories

22. Finland has reported a key category tier 2 analysis, both level and trend assessment, as part of its 2009 submission and has also applied a qualitative approach in determining its key categories. The key category analysis performed by the Party and that performed by the secretariat⁵ produced different results owing to different tiers applied. Finland has included the LULUCF sector in its key category analysis, which was performed in accordance with the IPCC good practice guidance and the IPCC good practice guidance for LULUCF. The Party uses the key category analysis as a driving factor for the preparation of the inventory and to prioritize future development and improvement of the inventory.

Uncertainties

23. Finland reported in its NIR that IPCC tier 1 and tier 2 uncertainty analysis have been performed; the results of these analysis are presented in the annex to the NIR, both at a summary level and at the individual category level. The uncertainty estimates are included in the key category analysis and used for category-specific QC checks. The estimate of overall uncertainty of the inventory is within ± 23 per cent, which is 3 per cent higher than in the 2008 submission. The ERT reiterates the

⁵ The secretariat identified, for each Party, the categories that are key categories in terms of their absolute level of emissions, applying the tier 1 level assessment as described in the IPCC good practice guidance for LULUCF. Key categories according to the tier 1 trend assessment were also identified for Parties that provided a full set of CRF tables for the base year or period. 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.

recommendation from the previous review that Finland include a summary of the changes in the uncertainty estimates in the next annual submission. Sector-specific descriptions of uncertainties were provided, although the basis for such estimates was not always identified. The ERT encourages Finland to provide this information in its next annual submission. In response to the draft report, Finland indicated that it will provide a summary of the changes in the uncertainty estimates in its 2010 annual submission.

Recalculations and time-series consistency

24. Recalculations have been performed and reported in accordance with the IPCC good practice guidance. The ERT noted that the recalculations take into account the following: in energy, revision of AD to ensure consistency between energy statistics and the GHG inventory, correction of errors in input data, correction of average carbon content in NMVOCs in oil refining, based on the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the 2006 IPCC Guidelines); in industrial processes, removal of double-counting in steel production, correction of the calculation method for a hydrogen producing company, correction of average carbon content in NMVOCs in chemical production, metal production and road paving with asphalt, in accordance with the 2006 IPCC Guidelines; in agriculture, correction of errors in AD, addition of emissions from field burning of agricultural residues; in LULUCF, correction of bugs found in the programs used to estimate land areas and tree biomass, update of land area estimates, use of new EFs for peat extraction; in waste, re-estimation of solid waste amounts and availability of more accurate AD for wastewater handling.

25. The major recalculations are reported in the LULUCF sector for 2006 and indicate a decrease in removals of 1,236.45 Gg CO₂ eq, or 3.7 per cent.

26. The total effect of the recalculations was a decrease in total GHG emissions in the base year (0.12 per cent) and in 2006 (0.44 per cent). The rationale for these recalculations is provided in the NIR and in CRF table 8(b). For further information on recalculations, the relevant sector chapters of this report should be consulted (see paras. 37, 53, 62, 72, 85 below).

Verification and quality assurance/quality control approaches

27. The NIR includes the QA/QC plan and provides a description of QA/QC activities and verification procedures following the tier 1 approach and the tier 2 approach (for key categories) of the IPCC good practice guidance. The quality management system is an integrated part of the national system. As a result of the implementation of the QA/QC plan, recalculations due to data corrections have been undertaken. During the review week, the Party informed the ERT that the 2009 inventory submission has been audited, and that bilateral quality meetings were held in January and February 2009 between the inventory unit (the compiler) and the expert organizations that produce the inventory estimates and descriptions. In addition, Finland reported planned sector-specific tier 2 QA audits; these are extensive QA assessments which will focus on specific issues or important factors in one specific sector at a time. The ERT encourages the Party to implement this plan and report on it in its next annual submission.

Transparency

28. The NIR, together with the information provided during the review, provides much of the information necessary to assess the inventory. Finland has completed CRF table 9(a) and provided information on the use of notation keys. The overall sector-specific transparency is good and the report is written in a clear manner that enables easy understanding of the methodologies used. EFs sources, data collection procedures and rationale for recalculations are well explained. The NIR shows some aggregations in reporting HFC and SF₆ emissions in industrial processes. These emissions are reported under the category other (consumption of halocarbons and SF₆) because of confidentiality issues. A satisfactory explanation is provided in the NIR. The ERT commends Finland for the improvements

made regarding transparency since its last submission. However, some additional information on AD and EFs in the energy sector (see paras. 36, 37 and 39 below) would increase the transparency. The ERT encourages Finland to continue to improve transparency in its next annual submission.

4. Inventory management

29. Finland has a centralized archiving system at Statistics Finland, which includes the archiving of disaggregated EFs, AD and documentation on how these factors and data have been generated and aggregated for the preparation of the inventory. The archived information also includes internal documentation on QA/QC procedures, external and internal reviews, and documentation on annual key categories and key category identification and on planned inventory improvements. Expert organizations contributing to the sectoral calculation archive the primary data used and other information (see para. 19 above).

G. Follow-up to previous reviews

30. The ERT notes that Finland has improved the transparency of its inventory since the previous submission by including separate chapters for each source/sink category, including for all key categories, as recommended by the previous review. Finland included in its NIR a list of the implemented changes by sector and category in response to the previous year's review recommendations. The ERT commends this action; however, it noted that the following recommendations from previous reviews have not yet been implemented:

- (a) Include a summary of the changes in the uncertainty estimates;
- (b) Include an explanation of the net calorific values used for the entire time-series;
- (c) Continue to verify CO₂ emissions from iron and steel production to the extent possible.

31. In response to the draft report, Finland indicated that it will add some explanatory text on the net calorific values used for the entire time series in the NIR of future submissions.

32. The ERT encourages the Party to implement the remaining recommendations from the previous review and the recommendations formulated by the ERT during the current review.

H. Areas for further improvement

1. Identified by the Party

33. The 2009 NIR identifies several areas for improvement. Finland indicated that it is working to improve:

- (a) Estimates of emissions from transport by separating gasoil for non-road use from heating gasoil in its transport models and estimates of emissions from leisure boats;
- (b) Estimates of emissions from manure management and agricultural soils by exploring the possibility of regularly updating the methods of distributing different manure management systems, and by considering the possibility of using a new N₂O model;
- (c) Methodology for estimating carbon stock changes in cropland and grassland, and the distribution of cultivated organic soils into different crop types;
- (d) Inclusion in the inventory of N₂O emissions from disturbance associated with land-use conversion to cropland;

- (e) Methodology for identifying transitions between land-use categories and to adhere to the minimum area of 0.5 ha for forest to improve time-series consistency;
- (f) Methodology of estimating carbon stock changes in living biomass for forest land; the same methodology is to be used for all biomass calculations;
- (g) Definition of organic soil for forest land (the national forestry inventory definition for peatlands is currently used), and consolidated with the definition of organic soils in agriculture;
- (h) Estimate of emissions from solid waste disposal on land by considering the need for new composition data for mixed construction and demolition waste;
- (i) AD in the VAHTI system for wastewater handling.

2. Identified by the expert review team

34. The ERT identifies the following cross-cutting issues for improvement:
- (a) Include a summary of the changes in the uncertainty estimates and provide information on the basis for the uncertainty estimates;
 - (b) Include the results of QA activities and completed QC checklists in the next annual submission;
 - (c) Improve reporting on discrepancies between the national registry and the international transaction log (ITL) and actions taken to correct problems that caused a discrepancy to occur and to prevent it from reoccurring;
 - (d) Improve the conformance of the national registry with the message flows defined in the technical standards for data exchange, and report on these improvements in the next annual submission;
 - (e) Enhance the availability of public information referred to in paragraphs 45 to 48 of the annex to decision 13/CMP.1, and report, in the next annual submission, on any changes to that public information;
 - (f) Report in the next annual submission the plan to change the Greta registry with the registry developed by the European Commission and provide full explanation of how the new software is able to fully perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1, and how it continues to adhere to the technical standards for data exchange between registry systems in accordance with relevant CMP decisions.
35. Recommended improvements relating to specific categories are presented in the relevant sector chapters of this report.

II. Energy

A. Sector overview

36. The energy sector is the main sector in the GHG inventory of Finland. In 2007, emissions from the energy sector amounted to 63,610.99 CO₂ eq, or 81.2 per cent of total GHG emissions. Since 1990, emissions have increased by 16.6 per cent. The key driver for the rise in emissions is the growth of emissions from energy industries, driven by the change in shares of imported electricity across the time series, and from transport, primarily driven by road transportation. Emissions from energy industries

grew by 60.5 per cent and emissions from transport grew by 15.3 per cent. Within the sector, 48.4 per cent of the emissions were from energy industries, followed by 23.2 per cent from transport, 17.9 per cent from manufacturing industries and construction and 8.1 per cent from other sectors. Other stationary and mobile sources accounted for 2.1 per cent and fugitive emissions from oil and natural gas accounted for 0.3 per cent. Fugitive emissions from solid fuels were reported as not occurring (“NO”).

37. A single table is provided in the energy chapter on the EFs used by Finland. In response to the draft report, Finland stated that EFs are thought to be constant over time. The ERT recommends that Finland include this statement in the section of the NIR where the EFs are provided.

38. Finland provided quantitative information on the energy sector recalculations in table 10.1-1 of the recalculations chapter. Finland has provided a full explanation of uncertainties in the energy categories; it has also provided information on QA/QC efforts, including on the verification of emission estimates by comparing with emissions reported under the EU ETS

B. Reference and sectoral approaches

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

39. Finland has calculated CO₂ emissions from fossil fuel combustion using the reference approach and the sectoral approach for all years in the time series. In 2007, CO₂ emissions estimated using the sectoral approach were 0.4 per cent higher than those estimated using the reference approach. The early years of the time series exhibit the greatest differences. The Party has provided limited information on this in the NIR, and has provided only overall CO₂ emission comparisons for the time-series, and not percentage differences as noted in the CRF tables. Previous review reports have encouraged Finland to continue its efforts to better explain these differences, and the ERT reiterates that recommendation. In response to the draft report, Finland stated that it has developed a preliminary list of possible errors in the energy balance data for its internal use, and that it will add some text about this in the next NIR. Finland will also include a figure showing annual differences between the reference approach and the sectoral approach.

40. In the 2009 submission, an annex that was included in previous submissions providing the national energy balances used in the reference approach calculation was removed. This greatly reduces the transparency of the comparison between the reference and the sectoral approaches, and the ERT recommends that Finland include the annex again in future submissions. In response to the draft report, Finland indicated that it will include the annex in its future inventories.

2. International bunker fuels

41. Finland reported emissions from international bunker fuels on the basis of fuel sales using national EFs derived from the national calculation system. Previous review reports recommended that Finland clarify that the correct fuel heating values were being used in the calculations, and the Party has included information on its investigation in the NIR of the 2009 submission. The information provided is generally transparent, although transparency could be increased by the inclusion of separate fuel consumption values in appendix 3b of the NIR, which provides details of consumption of international bunker fuels by fuel type.

3. Feedstocks and non-energy use of fuels

42. Finland reported emissions from feedstocks and non-energy use of fossil fuels under other (energy (1.A.5.a)). It applies IPCC default storage factors as well as emissive factors based on expert judgement, as recommended in previous review reports, and plant-specific data on feedstock use to the feedstock fuel types. The information presented in the NIR is generally transparent with regard to the

methodological approach and the reporting of the emissions. The ERT commends the improvements and encourages Finland to continue its efforts to increase the transparency of its calculations.

4. Country-specific issues

43. The ERT noted that Finland included peat under other fuels in the CRF tables. In response to previous review recommendations, Finland has provided a detailed explanation for this reporting decision in the 2009 NIR. The ERT commends Finland for providing additional transparency in the NIR on the logic for the reporting of this fuel in the CRF tables.

44. In the 2009 submission, Finland reported for the first time a category entitled “CO₂ transfer” under other (manufacturing industries and construction), from pulp and paper plants that capture and transfer CO₂ from combustion processes. The CO₂ is used in the production of precipitated calcium carbonate (PCC). In Finland’s methodology the PCC, which is used as a coating and filling material in paper, is assumed to store the CO₂ long term, for example when landfilled. Emissions from exported PCC are not reported as these do not take place within the national territory of Finland. The method is based on PCC production, by which the total CO₂ necessary for the chemical process is calculated, and the CO₂ consumed by the process is subtracted from the total CO₂ emissions from fuel combustion reported under pulp, paper and print in the energy sector CRF tables. Finland provided limited information on the methodology in the NIR, and the ERT noted that the information provided is not sufficiently transparent to be fully reviewed. The ERT recommends that in the next annual submission the description should be improved and clarified by providing further information on the process and storage of CO₂ by the process, and by providing specific information on the data used in the calculation method provided in the NIR, and on how the information provided in the NIR is reported in the CRF tables. Given the complexity and country-specific nature of the category, the ERT would further encourage Finland to include such information in an annex, to allow future ERTs to better review this country-specific category.

45. Information exchanged during the review improved the ERT’s understanding of this country-specific method and Finland agreed to present additional information in the next NIR. In addition, the ERT recommends that Finland investigate available information on the characteristics of the CO₂ capture for the PCC process. While the ERT notes that the methodology for this country-specific category appears sound, further information should be provided in the NIR and the reporting of CO₂ emissions should be improved. As both CO₂ from fossil fuel combustion and CO₂ emissions from biomass occur in the pulp, paper and print industry, the ERT recommends that Finland report the CO₂ captured in the PCC process more transparently in the NIR following the principles of the Revised 1996 IPCC Guidelines and the IPCC good practice guidance, separating out CO₂ from fossil fuels and CO₂ from biomass fuels, to increase the transparency on the trends occurring within the pulp, paper and print subsector of the energy sector and the overall trends of CO₂ emissions reported in the CRF tables.

46. In its response to the draft report Finland noted that the Revised 1996 IPCC Guidelines and the IPCC good practice guidance do not provide any guidance on carbon dioxide capture and storage (CCS). The 2006 IPCC Guidelines provide some guidance on CCS, and although PCC production is not specifically mentioned, Finland considers that the principles of CCS in these guidelines can be applied to PCC production. Finland noted that according to the 2006 IPCC Guidelines, once captured, there is no differentiated treatment between biogenic carbon and fossil carbon.⁶ Finland explained that its approach avoids double counting of overall CO₂ emissions in the inventory, as the biogenic CO₂ emissions are reported in the LULUCF sector. It further explained that the capture and storage of CO₂ from fossil and biogenic sources in the pulp, paper and print category are correctly reported in the inventory and that the deduction of the capture and storage from the energy sector in the inventory correctly reflects the reduction in CO₂ concentrations in the atmosphere.

⁶ 2006 IPCC Guidelines. Volume 2 (Energy), footnote 1 to table 5.4: p.5.19.

47. In response to questions raised during the review, Finland explained that EU ETS data are used, and only kilns combusting fuel oil are capturing CO₂ emissions for the PCC process, although in the CRF tables 75.1 per cent of energy consumption in the pulp, paper and print subcategory was from biomass in 2007. This response does not explain the subtraction across the entire time-series for years prior to the EU ETS data collection. The ERT, therefore, recommended that Finland not subtract CO₂ emissions from the energy sector unless enough detailed information, preferably unit-level data on kilns where capture is occurring, is provided in the NIR to transparently justify that only fossil fuel CO₂ combustion emissions are being captured and used in the PCC process. In its response to the draft report Finland explained that in line with the principles of the 2006 IPCC Guidelines and as described in paragraph 46 above, there is no need to distinguish between fossil and biogenic CO₂.

48. In addition, the ERT recommended during the review that Finland improve justification of its assumptions across the entire time series. In response, during the review process, Finland provided some additional information on data sources and methods used for the calculation of CO₂ transfer to PCC. The ERT identified that Finland has been using plant-specific data (which are confidential) from the Finnish Forest Industries Federation for the time series since 1990.

49. Finland indicated that the production data have been cross-checked with the EU ETS data for the years 2005, 2006 and 2007 and that the difference is small. The ERT appreciates the additional clarification provided by Finland. The ERT further recommends that Finland include this information as already planned by the Party, as well as additional information and as specifically detailed data as possible, in its next annual submission. Finland should also expand upon its explanation on the small differences between the production data and EU ETS data for available years.

C. Key categories

1. Stationary combustion: solid fuels – CO₂

50. Finland calculated CO₂ emissions from fuel combustion using country-specific carbon contents. The CO₂ EFs appear fairly constant over the time-series. In response to questions raised during the review on the use of these country-specific CO₂ EFs, Finland indicated that it could use data collected through the EU ETS for future calculations. This response seems to acknowledge some problems with the currently used country-specific EFs; reliance on EU ETS data may be sufficient for future inventory years, but the issue of how to address time-series consistency for years prior to EU ETS will need to be resolved. The ERT encourages Finland to consider this issue, and provide more details in the next submission, preferably in the QA/QC section of the energy chapter, on how it will make use of data collected under the EU ETS.

2. Transport: liquid fuels – N₂O

51. Finland calculated fuel consumption and emissions from transport using the LIPASTO models developed by VTT. The sub-models used by Finland include: ILMI (civil aviation), LIISA (road transportation), RAILI (railways), and MEERI (domestic navigation). The NIR provides information on the models and the general methodologies in the energy chapter, but little information is provided on fuel consumption and EFs used. Links are provided in the NIR to external websites where additional information is provided. Given the extensive use of models for transport, the ERT encourages Finland to provide, in an additional annex, more information on fuel consumption and EFs for transport activities with significant trends, in order to improve transparency.

D. Non-key categories

Other sectors – CO₂

52. Finland reported indirect CO₂ emissions from the oxidation of fugitive CH₄ and NMVOCs under the category other (fugitive emissions from oil natural gas and other sources) based on guidance contained in the 2006 IPCC Guidelines. The ERT noted that Finland cited studies from the Netherlands and the United States of America on the fossil carbon content fraction of NMVOCs. The ERT encourages Finland to further clarify any assumptions that are derived from these studies as used in the calculations.

III. Industrial processes and solvent and other product use

A. Sector overview

53. In 2007, emissions from the industrial processes sector amounted to 6,675.93 Gg CO₂ eq, or 8.5 per cent of total GHG emissions and emissions from the solvent and other product use sector amounted to 97.07 Gg CO₂ eq, or 0.1 per cent of total GHG emissions. Since the base year (1990 for CO₂, CH₄ and N₂O, and 1995 for HFCs, PFCs and SF₆), emissions have increased by 33.5 per cent in the industrial processes sector, and decreased by 45.6 per cent in the solvent and other product use sector. The key driver for the rise in emissions in the industrial processes sector is emissions of HFCs, which have gone up from 29.33 Gg CO₂ eq in 1995 to 903.92 Gg CO₂ eq in 2007 (2981.9 per cent). Emissions of PFCs increased from 0.14 Gg CO₂ eq to 8.40 Gg CO₂ eq in the same period (5900.0 per cent). Within the industrial processes sector, 37.0 per cent of the emissions were from metal production, followed by 30.0 per cent from chemical industry, 19.0 per cent from mineral products and 14.0 per cent from consumption of halocarbons and SF₆.

54. The Finnish inventory in the industrial processes and solvent and other product use sector is complete, incorporating emission estimates for all categories. The reporting is transparent, giving clear explanations regarding sources of data and factors used. The ERT noted that time-series consistency was observed and that the NIR provided category-specific explanations on time-series consistency.

55. Finland reported recalculations of three categories in the industrial processes sector, including cement production, steel production and ethylene and hydrogen production. Finland explained in the NIR that the recalculations were due to improving time-series consistency in emissions from cement production, new information received on ethylene production, an improved methodology for hydrogen production, and revised average carbon content in NMVOCs in steel production and road paving with asphalt in accordance with the 2006 IPCC Guidelines. The ERT noted that the recalculations contributed to improving the accuracy of reported emissions, and encourages Finland to continue with the effort to improve its inventory.

56. Finland provided good category-specific explanations of uncertainties consistently across the industrial processes sector. Uncertainty estimates were provided, although the basis for such estimates was not identified, whether expert judgement or otherwise. The ERT recommends that the Party provide the basis for the uncertainty estimates in the next annual submission. In response to the draft report, Finland indicated that the basis for the uncertainty estimates will be included in the next annual submission. Finland provided a well-documented account of category-specific verification and QA/QC.

B. Key categories

1. Nitric acid production – N₂O

57. The ERT identified from the NIR that plant-specific EFs were calculated based on the measurements at individual plants. The ERT noted, as also indicated in previous reviews, that the decrease in the N₂O IEF in the period 1990–2007 was 20.1 per cent (0.008 t/t in 2007). Finland explained in the NIR that the decreasing trend is due to changes in the production process and the closing down of old plants. The ERT, while noting the Party's indication that the plant-specific EFs are confidential,

reiterates the recommendation from the previous review that Finland, in future inventory submissions, improve transparency on the trends for EFs and relevant data calculations where possible.

2. Iron and steel production – CO₂

58. Finland reported in the NIR that the method of calculating CO₂ emissions from the iron and steel industry is country-specific, and that both fuel-based emissions and process emissions are calculated using the ILMARI calculation system, which was specifically designed for calculating national energy-based emissions. The Party indicated in the NIR that the VAHTI system, a database with detailed (boiler/process level) data, is used as data source in calculating CO₂ emissions, whereby emissions are calculated by plant operators using carbon inputs (fuel inputs and reducing materials) and reported separately by installations. Finland reported in its NIR that the VAHTI system was not complete and that some corrections were made in estimating total CO₂ emissions. It was also reported that plant-specific CO₂ EFs have been used; the ERT noted that the CO₂ EF values used in the calculation from 1990–2007 were provided. However, all values of the CO₂ IEF (0.48–0.68 t/t) are among the highest values of reporting Parties (0.005–1.73 t/t). The ERT reiterates the recommendations from the previous ERT that Finland continue to verify CO₂ emissions from iron and steel production to the extent possible.

3. Refrigeration and air conditioning equipment – HFCs

59. Finland reported in the NIR that data on refrigerant imports for 2007 were obtained through a survey conducted from February to August 2008. The Party used the IPCC tier 2 and tier 1a and 1b methods to calculate emissions. Both potential and actual emissions are reported. Given the observed large inter-annual changes in emission estimates: 1990–1996 (ranging between –7.1 per cent and 4,090.7 per cent), 2001/2002 (–29.7 per cent) and 2005/2006 (–15.2 per cent), and the indication in the NIR that some of the major importers of refrigerants in Finland did not respond to the survey, the ERT recommends that Finland investigate further ways of collecting AD for F-gases in order to improve the accuracy and completeness of this category. The ERT further recommends that Finland investigate the possibility of disaggregating emission data for all refrigeration and air conditioning subcategories (domestic, commercial, industrial, mobile, etc.). In response to the draft report, Finland indicated that it is not considering changing its way of collecting AD for the category in question and that it has already investigated the possibility of disaggregating emission data, and found that this is not feasible.

C. Non-key categories

1. Soda ash use – CO₂

60. The NIR indicates that Finland checks the nature of soda ash users using industrial statistics and websites to ascertain the absence of CO₂ emissions from their activities. The ERT observed that the NIR does not provide a clear indication of whether all soda ash users included in the industrial statistics have websites where they indicate the nature of their soda ash use, in order for one to ascertain whether such soda ash use results into CO₂ emissions or not. The ERT recommends that Finland provide a clear explanation in the next NIR on the completeness of the check using industrial statistics and websites.

2. Semiconductor manufacture – HFC-23

61. The ERT noted the use of the notation key not estimated (“NE”) in the CRF tables for semiconductor manufacture HFC-23 emissions. Finland indicated during the review that this notation key was an error and that it should have been “NO” instead. The ERT recommends that Finland correct this error in its next annual submission.

IV. Agriculture

A. Sector overview

62. In 2007, emissions from the agriculture sector amounted to 5,529.75 Gg CO₂ eq, or 7.1 per cent of total GHG emissions. Since 1990, emissions have decreased by 22.4 per cent. The key driver for the fall in emissions is a decrease in the population of dairy cattle (by 39.5 per cent) and non-dairy cattle (by 27.5 per cent) and reduced use of mineral fertilizers (by 35.0 per cent). Within the sector, 57.7 per cent of the emissions were from agricultural soils, followed by 28.2 per cent from enteric fermentation and 14.1 per cent from manure management. Finland reported that field burning of crop residues occurs on a small scale and is becoming increasingly rare. In 2007 the Party has reported 0.82 Gg CO₂ eq from this category, representing less than one per cent of the total emissions from the sector. The Party is commended for reporting emissions from this category, which in the previous submission had been reported as “NE”, “NO”.

63. Based on the recommendations from the previous review, Finland has made minor recalculations in agriculture (correction of errors in AD, addition of emissions from field burning of agricultural residues) and the Party is commended for this. The impact of recalculations is an increase in emissions estimates in 1990 of 0.2 per cent and in 2006 of 0.4 per cent.

64. The transparency of the NIR has greatly improved following previous review recommendations. Explanations are clear and detailed. Figures are specifically referred to or explained in the text. AD are generally consistent except for missing data on goats in 1991 and broilers from 1991–1994 which were extrapolated. Finland implemented most of the recommendations from the previous review, and the ERT recommends that Finland implement the remaining recommendations given in previous reviews, including the revision of indirect soil N₂O emissions and N₂O emissions from pasture, range and paddock manure. In response to the draft report, Finland indicated that an overview of the changed method of calculating N₂O emissions will be included in the NIR of its next annual submission.

B. Key categories

1. Enteric fermentation – CH₄

65. Finland has a significantly high number of fur-farming animals (more than 3.4 million). Based on the recommendation from the previous review, the Party has for the first time reported CH₄ emissions from the fur-farming livestock (minks, raccoons, foxes and fitches). However, a Norwegian EF (0.1 kg/head/year) has been used. The ERT encourages Finland to develop country-specific EFs for the fur animals, if possible. In response to the draft report, Finland indicated that it does not consider this issue as a priority in improving its inventory due to the minor importance of these emissions.

2. Manure management – N₂O

66. As indicated in the previous review, values of the N₂O IEF for solid storage and dry lot (0.0202–0.0203 kg N₂O-N/kg N) have been among the highest of reporting Parties for several years (0.0054–0.2012 kg N₂O-N/kg N), and higher than the IPCC default value (0.020 kg N₂O-N/kg N). Finland indicated that there was an error in time-series transfer to the CRF Reporter, which will be corrected. The ERT recommends that the Party corrects this error in its next annual submission. In response to the draft report, Finland indicated that the error in data transfer will be corrected in its next annual submission.

67. The ERT noted that nitrogen excretion (N_{ex}) rates for various animals have not been revised for some years. The country-specific value on N_{ex} for goats (17 kg/head/year) has not changed since 1998 and the same rates are being used for reindeer because of the lack of national values. However, the Party indicated that these rates will be evaluated annually in cooperation with animal nutrition experts.

The ERT encourages the Party to implement this plan for its next annual submission. In response to the draft report, Finland confirmed that most of the N_{ex} rates will be updated in the next annual submission.

3. Direct soil emissions – N_2O

68. The previous review identified that Finland estimated and reported direct N_2O soil emissions from sewage sludge applied to fields under other (agricultural soils), which is not in line with the Revised 1996 IPCC Guidelines. All direct soil emissions should be reported under direct soil emissions. The Party has addressed this issue and emissions are now correctly reported under other direct emissions. Finland is commended for this correction.

4. Indirect soil emissions – N_2O

69. As already indicated in the previous review report, Finland uses the IPCC default method, together with a country-specific fraction of nitrogen (N) input to soils that is lost through leaching and run-off ($Frac_{LEACH}$), to estimate indirect N_2O emissions from soils. However, the Party reported in the NIR that it subtracts $Frac_{GASF}$ and $Frac_{GASM}$ from the nitrogen inputs before applying the $Frac_{LEACH}$ value of 0.15 (kg N/kg of fertilizer or manure nitrogen). This is not in line with the IPCC good practice guidance, which advises that $Frac_{LEACH}$ should be applied to total synthetic fertilizer and animal manures unadjusted for volatilization of NO_X and ammonia. The ERT reiterates the previous year's review recommendation that Finland revise this emission estimation in its next annual submission. In response to the draft report, Finland clarified that, as indicated in the NIR, it will provide revised estimates in the 2010 submission.

C. Non-key categories

Manure management – CH_4

70. Finland estimated CH_4 emissions from this category using a tier 2 method and country-specific EFs for all animal categories. The previous review identified that all the percentages of manure and all the CH_4 conversion factors allocated to the different animal waste management systems in CRF table 4.B were incorrect. This ERT noted that Finland has corrected these errors in the 2009 submission. The ERT commends Finland for resolving these issues and encourages the Party to ensure that proper QC procedures are implemented in order to avoid errors of this nature in the future.

V. Land use, land-use change and forestry

A. Sector overview

71. In 2007, net removals from the LULUCF sector amounted to 25,265.63 Gg CO_2 eq. Since 1990, net removals have increased by 42.2 per cent. The key driver for the rise in removals is the increase in carbon stock in living biomass in forest land remaining forest land and a minor decrease in emissions from cropland. Within the sector, 32,811.86 Gg CO_2 eq removals were from forest land remaining forest land, followed by 1,219.67 Gg CO_2 eq from other (harvested wood products (HWP)). The other land-use categories are net sources. Cropland accounted for 3,329.25 Gg CO_2 eq, grassland accounted for 4,057.14 Gg CO_2 eq and wetlands accounted for 1,379.5 Gg CO_2 eq. For settlements and other land, emissions and removals are reported as included elsewhere, "NA" or "NE".

72. Finland provided AD and parameters used for all categories and reported estimates of emissions and removals for all categories for the time-series 1990–2007 except for settlements, other land and N_2O emissions from disturbance associated with land-use conversion to cropland (tables 5.E, 5.F and 5(III)). Uncertainty estimates and details of QC procedures were provided for all land-use categories.

73. Recalculations are well-documented and planned improvement described. The effect of the recalculations is a reduction in removals of 669.32 Gg CO_2 eq (–3.6 per cent) in 1990 and 1236.45 Gg

CO₂ eq (-3.7 per cent) in 2006 for the whole sector. Main changes arise from updated area estimates in the category grassland and new country-specific EFs for peat extraction on wetlands. The Finnish land-use data do not quantify the changes in land area between the different land-use categories, and emissions and removals are reported under the subcategories of land remaining under the same land use category. Finland reports that the method to estimate converted areas is under development and will be ready for the 2010 inventory submission. The ERT notes this planned improvement of the Finnish land-use system and recommends that Finland provide in its next annual submission detailed information on land conversion, including the information needed for reporting on activities under Article 3, paragraph 3, of the Kyoto Protocol and on forest management as an elected activity under Article 3, paragraph 4.

B. Key categories

1. Forest land remaining forest land – CO₂

74. Forest land, constituting 72.5 per cent of the total land area of Finland, is a net sink offsetting 41.9 per cent of the total GHG emissions in 2007. The CO₂ uptake by tree growth per area increased by 28.5 per cent from 1990 to 2007. Finland applies a tier 2 approach based on method 1 of the IPCC good practice guidance for LULUCF. Country-specific data are derived from national forest inventories to calculate changes in carbon stocks in living biomass and dead organic matter. The Party uses a model with country-specific data and coefficients to estimate changes in carbon stocks in soils. The Party recalculated estimates for the whole time-series of the category owing to the availability of new forest inventory data and correction of bugs found in the programs used for area and biomass estimation. The recalculations led to a slight increase in removals of 145.00 Gg CO₂ eq in 1990 (0.6 per cent) and a reduction in removals of 152.70 Gg CO₂ eq in 2006 (0.4 per cent).

75. The ERT identified that the uncertainty associated with estimates in the category is relatively high; for example, the following standard errors are reported: change in carbon stocks in living biomass (21.7 per cent), change in carbon stocks in mineral soils (92 per cent) and change in carbon stocks in organic soils (78 per cent). Finland reported that it plans to reduce uncertainty and to improve the estimation of carbon stock changes in living biomass by applying country-specific biomass models. In addition, the Party plans to improve the time-series consistency of forest area; in previous national forest inventories Finland has used a different minimum land area in the forest definition for the southern part of the country. The ERT welcomes the efforts to reduce uncertainty and recommends that Finland improve time-series consistency by applying a single and consistent forest definition, especially with regard to reporting on activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol.

2. Cropland remaining cropland – CO₂

76. Cropland remaining cropland was a net source of GHG emissions, accounting for 6,796.99 Gg CO₂ eq in 1990 and 3,080.60 Gg CO₂ eq in 2007. Finland reported carbon stock changes in mineral and organic soils. For the first time, it has reported carbon stock changes in living biomass of perennial crops, indicating a very minor removal of 2.82 Gg CO₂. The carbon stock changes in mineral soils and in organic soils are estimated separately by applying a method close to tier 1 of the IPCC good practice guidance for LULUCF and country-specific EFs, respectively. The ERT noted that the carbon stock changes in mineral soils show large fluctuations. Finland explained that the fluctuations were caused by insufficient AD. The Party assumes that the area of cropland remaining cropland in the current submission is not identical with the area of cropland remaining cropland in the inventory from 20 years ago. Finland indicated its plan to provide revised emissions with new AD in its next inventory submission. The ERT recommends that Finland implement this plan and provide information on conversions to and from perennial cropland, in order to improve transparency in reporting carbon stock changes in living biomass of perennial cropland. In response to the draft report, Finland indicated that the recommended conversion class changes will be carried out for its next annual submission.

3. Grassland remaining grassland – CO₂

77. Grassland remaining grassland was a sink accounting for 2,131.21 Gg CO₂ eq in 1990 and a source accounting for 4,057.14 Gg CO₂ eq in 2007. Estimates are reported for carbon stock changes in mineral and organic soils, and indicate that mineral soils have changed from a sink in 1990 to a source after 1998. Finland reported that the variation between years results from a lack of accurate estimates of the area of grassland remaining grassland; the area of grassland in the current inventory year is different from that of 20 years ago, which results in unrealistic changes in carbon stocks. The Party indicated that it will provide revised emissions with new AD in the next annual submission and will add estimates of emissions from land converted to grassland. The ERT recommends that Finland implement this plan in order to improve accuracy and completeness in the category. It also recommends that Finland report a consistent time-series, including conversions of land to grassland, in its next annual submission. In response to the draft report, Finland indicated that the recommended changes will be carried out for its next annual submission.

4. Harvested wood products – CO₂

78. HWP were a sink of 945.64 Gg CO₂ eq in 1990 and 1,219.67 Gg CO₂ eq in 2007. Finland uses a tier 2 approach and reports large fluctuations from year to year, and except for 1991, HWP were a sink in all years. The Party explained the fluctuations as an effect of the fluctuations in the construction markets. The estimations are based on inventories of the building stock carried out every five years. The inventories are interpolated using annual data on apparent consumption of solid wood products and paper downloaded from the FAO database and a first order decay model of HWP. Finland estimates the uncertainty of its HWP estimates as about 25 per cent.

VI. Waste

A. Sector overview

79. In 2007, emissions from the waste sector amounted to 2,431.60 Gg CO₂ eq, or 3.1 per cent of total GHG emissions. Since 1990, emissions have decreased by 39.0 per cent. The key driver for the fall in emissions is the implementation of the Waste Act, which requires increased recycling and recovery of waste as material or energy. Within the sector, 84.7 per cent of the emissions were from solid waste disposal on land, followed by 9.6 per cent from wastewater handling and 5.6 per cent from composting. NMVOCs emissions from solid waste disposal sites and wastewater handling as well as NMVOCs, CH₄ and N₂O emissions from composting are also estimated in the Finnish inventory.

80. The reporting in the waste sector is in general transparent and complete. All CRF tables including estimates of all gases and categories have been provided for the whole time-series. Finland applied QA/QC tier 1 and tier 2 procedures to EFs, AD and emissions estimates. Quantitative uncertainty estimates are provided based on expert judgments. Recalculations have been reported for emissions from wastewater, which improved the accuracy of inventory report. Finland has implemented all ERT recommendations from the previous review.

81. In line with the IPCC good practice guidance, Finland reported emissions from waste incineration under the energy sector because all combustion is for energy production.

82. Some areas of further improvement reported by Finland in the NIR include the collection of AD on a new composition of mixed construction and demolition waste, and planned recalculations in wastewater handling based on outcomes of the verification of AD in the VAHTI system. The ERT encourages Finland to implement these planned improvements.

B. Key categories

Solid waste disposal on land – CH₄

83. Finland applied the first order decay model to estimate CH₄ emissions, which complies with the IPCC good practice guidance. It used a combination of country-specific emission parameters including CH₄ correction factor, degradable organic carbon (DOC), oxidation factor and fraction of DOC dissimilated, together with IPCC good practice guidance default values on the fraction of CH₄ in landfill gas. The AD used in the calculation are taken from the VAHTI system and include information on all landfills in Finland excluding Åland which is estimated according to population. Data on landfill gas recovery are obtained from the Finnish Biogas Plant Register. Finland used DOC (for some type of waste) and k values from the 2006 IPCC Guidelines and perform recalculations which have resulted in an increase in estimated total emissions for the whole time-series (e.g. an increase of 0.01 per cent in 1990 and 0.03 per cent in 2006). The ERT encourages Finland to ensure the consistency between the AD from the VAHTI system and the AD estimated based on population. In response to the draft report, Finland indicated that it believes that there is no inconsistency with AD in this respect.

C. Non-key categories

1. Wastewater handling – CH₄ and N₂O

84. A national methodology that corresponds to the methodology given in the Revised 1996 IPCC Guidelines is used to estimate CH₄ emissions. Finland has used the method based on the maximum CH₄ producing capacity and the weighted average CH₄ conversion factor as provided in the IPCC good practice guidance for all subcategories except uncollected domestic wastewater (septic tanks). For septic tanks Finland use the check method presented in the IPCC good practice guidance. Noting that the check method gives only a rough estimate, the ERT encourages Finland to estimate emissions from septic tanks using the same method it uses for the other subcategories. In response to the draft report, Finland indicated that there is no reason to change the method as the septic tanks used are quite small (about 3m³) and have a short retention time.

85. N₂O emissions are generated from the N input of fish farming and from domestic and industrial wastewater discharged into waterways. To calculate N₂O emissions Finland uses default EFs from the Revised 1996 IPCC Guidelines. N₂O emissions from human sewage are estimated based on population data and measured values of N input. The ERT encourages Finland to assess whether country-specific data are available to be used. In response to the draft report, Finland indicated that owing to the minor importance of the emissions, development of country-specific data is not feasible.

86. Recalculations have been made and reported for N₂O emissions from industrial wastewater and uncollected domestic wastewater only in 2006 for more accurate AD on added industrial load in VAHTI system and information on protein consumption are collected. It resulted in an increase in emissions of 0.0009 per cent.

2. Composting – CH₄ and N₂O

87. Estimates include emissions from municipal solid waste, municipal and industrial sludge and industrial solid waste (construction and demolition waste). Emissions from composting have been calculated using the method given in the 2006 IPCC Guidelines.

VII. Supplementary information required under Article 7, paragraph 1, of the Kyoto Protocol

A. Information on Kyoto Protocol units

1. Standard electronic format and reports from the national registry

88. Finland has reported information on its accounting of Kyoto Protocol units in the required SEF tables, as required by decisions 15/CMP.1 and 14/CMP.1. The ERT took note of the findings and recommendations included in the SIAR on the SEF tables and their comparison report.⁷ The SIAR was forwarded to the ERT prior to the review, pursuant to decision 16/CP.10. The ERT reiterated the main findings contained in the SIAR.

89. Information on the accounting of Kyoto Protocol units has been prepared and reported in accordance with section I.E of the annex to decision 15/CMP.1, and reported in accordance with decision 14/CMP.1 using the SEF tables. This information is consistent with that contained in the national registry and with the records of the ITL and the Clean Development Mechanism registry, and meets the requirements set out in paragraph 88(a) to (j) of the annex to decision 22/CMP.1. The transactions of Kyoto Protocol units initiated by the national registry are in accordance with the requirements of the annex to decision 5/CMP.1 and the annex to decision 13/CMP.1. No non-replacement has occurred. The national registry has adequate procedures in place to minimize discrepancies.

90. The ERT took note of the SIAR and its findings that the Party did not report on discrepancies even though they did occur. The ERT reiterates the recommendation in the SIAR that Finland should improve its reporting on discrepancies and actions taken to correct problems that caused a discrepancy to occur and to prevent it from reoccurring, in accordance with paragraphs 12 and 17 of the annex to decision 15/CMP.1.

2. National registry

91. The ERT took note of the SIAR and its findings that the reported information on the national registry is complete and has been submitted in accordance with the annex to decision 15/CMP.1. The ERT further noted from the SIAR and its findings that the national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1, and continues to adhere to the technical standards for data exchange between registry systems in accordance with decisions 16/CP.10 and 12/CMP.1. The national registry also has adequate security, data safeguard and disaster recovery measures in place and its operational performance is adequate.

92. The ERT took note of the SIAR and its findings that Finland should improve the conformance of its national registry with the message flows defined in the technical standards for data exchange, and report on these improvements in its next annual submission and Finland should also enhance the availability of public information referred to in paragraphs 46 and 47 of the annex to decision 13/CMP.1, and report, in its next annual submission, on any changes to that public information.

3. Calculation of commitment period reserve

93. Finland has reported its commitment period reserve in its 2009 annual submission. The Party reported that its commitment period reserve has not changed since the initial report review (319,515,790 t CO₂ eq), as it is based on the assigned amount and not the most recently reviewed inventory. The ERT agrees with this figure.

⁷ The SEF tables comparison report is prepared by the ITL administrator and provides information on the outcome of the comparison of data contained in the Party's SEF tables with corresponding records contained in the ITL.

B. Changes to the national system

94. Finland reported no change in its national system since the previous annual submission. The ERT concluded that the Party's national system continues to be in accordance with the requirements of national systems outlined in decision 19/CMP.1.

C. Changes to the national registry

95. Finland reported some changes in its national registry since the previous annual submission. The change reported by Finland was regarding the update of its Greta registry software. Testing of the registry with the ITL and the community ITL was completed successfully, and the ITL administrator authorized the registry of Finland to commence live operation with the production environment of the ITL. Finland reported that the registry has been operational since the connection. The ERT concluded that the national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1, and continues to adhere to the technical standards for data exchange between registry systems in accordance with relevant CMP decisions.

96. In its 2009 annual submission, Finland indicated its plan to replace the Greta registry during 2009 with the registry software developed by the European Commission. The ERT recommends that Finland report in its next annual submission this planned change in its national registry in accordance with section I.G of the annex to decision 15/CMP.1, and provide a full explanation of how such new software is able to fully perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1, and how it continues to adhere to the technical standards for data exchange between registry systems in accordance with relevant CMP decisions.

VIII. Conclusions and recommendations

97. Finland made its annual submission on 8 April 2009. The Party indicated that the 2009 annual submission is a voluntary submission under the Kyoto Protocol. The annual submission contains the GHG inventory (CRF tables and NIR) and supplementary information under Article 7, paragraph 1, of the Kyoto Protocol (information on Kyoto Protocol units and changes to the national registry). This is in line with decision 15/CMP.1.

98. The ERT concludes that the inventory submission of Finland has been prepared and reported in accordance with the UNFCCC reporting guidelines. The inventory submission is complete and the Party has submitted a complete set of CRF tables for the years 1990–2007 and an NIR; these are complete in terms of geographical coverage, years and sectors, as well as in terms of categories and gases.

99. The submission on a voluntary basis of information required under Article 7, paragraph 1, of the Kyoto Protocol has been prepared and reported in accordance with decision 15/CMP.1. Finland did not report on a voluntary basis information on activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, and information on minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol.

100. The Party's inventory is in line with the UNFCCC reporting guidelines, the Revised 1996 IPCC Guidelines, the IPCC good practice guidance and the IPCC good practice guidance for LULUCF.

101. The information on Kyoto Protocol units has been reported in accordance with section I.E of the annex to decision 15/CMP.1, and used the required reporting format tables as required by decision 14/CMP.1.

102. The national system continues to perform its required functions as set out in the annex to decision 19/CMP.1.

103. The national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1, and continues to adhere to the technical standards for data exchange between registry systems in accordance with relevant CMP decisions.

104. In the course of the review, the ERT formulated a number of recommendations⁸ relating to Finland's information presented in its annual submission. The key recommendations are that Finland:

- (a) Include a summary of the changes in the uncertainty estimates and provide information on the basis for the uncertainty estimates;
- (b) Include the results of QA activities and completed QC checklists in the next annual submission;
- (c) Improve reporting on discrepancies between the national registry and the ITL and actions taken to correct problems that caused a discrepancy to occur and to prevent it from reoccurring;
- (d) Improve the conformance of the national registry with the message flows defined in the technical standards for data exchange, and report on these improvements in the next annual submission;
- (e) Enhance the availability of public information referred to in paragraphs 45 to 48 of the annex to decision 13/CMP.1, and report, in the next annual submission, on any changes to that public information;
- (f) Report in the next annual submission the plan to change the Greta registry with the registry developed by the European Commission and provide full explanation of how the new software is able to fully perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1, and how it continues to adhere to the technical standards for data exchange between registry systems in accordance with relevant CMP decisions.

IX. Questions of implementation

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

⁸ For a complete list of recommendations, the relevant chapters of this report should be consulted.

Annex I

Documents and information used during the review

A. Reference documents

Intergovernmental Panel on Climate Change. 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Available at <<http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html>>.

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

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

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

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

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

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

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

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

Status report for Finland 2009. Available at <<http://unfccc.int/resource/docs/2009/asr/fin.pdf>>.

Synthesis and assessment report on the greenhouse gas inventories submitted in 2009. Available at <<http://unfccc.int/resource/webdocs/sai/2009.pdf>>.

FCCC/ARR/2008/FIN. Report of the individual review of the greenhouse gas inventory of Finland submitted in 2007 and 2008. Available at <<http://unfccc.int/resource/docs/2009/art/fin.pdf>>.

UNFCCC. Standard independent assessment report, Parts I and II. Unpublished document.

B. Additional information provided by the Party

Responses to questions during the review were received from Ms. Riitta Pipatti (Statistics Finland, Greenhouse Gas Inventory Unit), including additional material on the methodology and assumptions used.

Annex II**Acronyms and abbreviations**

AD	activity data	LULUCF	land use, land-use change and forestry
CH ₄	methane	m ³	cubic metre
CO ₂	carbon dioxide	MCF	methane conversion factors
CO ₂ eq	carbon dioxide equivalent	Mg	megagram (1 Mg = 1 tonne)
CRF	common reporting format	Mt	million tonnes
CMP	Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol	Mtoe	millions of tonnes of oil equivalent
DOC	degradable organic carbon	N	nitrogen
EF	emission factor	NA	not applicable
ERT	expert review team	NE	not estimated
EU ETS	European Union emissions trading scheme	N _{ex}	nitrogen excretion
FAO	Food and Agriculture Organization of the United Nations	NH ₃	ammonia
F-gas	fluorinated gas	NMVOC	non-methane volatile organic compounds
GHG	greenhouse gas; unless indicated otherwise, GHG emissions are the sum of CO ₂ , CH ₄ , N ₂ O, HFCs, PFCs and SF ₆ without GHG emissions and removals from LULUCF	NO	not occurring
GJ	gigajoule (1 GJ = 10 ⁹ joule)	NO _x	nitrogen oxides
HFCs	hydrofluorocarbons	N ₂ O	nitrous oxide
HWP	harvested wood products	NIR	national inventory report
IEF	implied emission factor	PCC	Precipitated Calcium Carbonate
IPCC	Intergovernmental Panel on Climate Change	PFCs	perfluorocarbons
ITL	international transaction log	PJ	petajoule (1 PJ = 10 ¹⁵ joule)
kg	kilogram (1 kg = 1 thousand grams)	QA/QC	quality assurance/quality control
kgoe	kilograms of oil equivalent	SEF	standard electronic format
		SF ₆	sulphur hexafluoride
		SIAR	Standard Independent Assessment Report
		Tg	teragram (1 Tg = 1 million tonnes)
		TJ	terajoule (1 TJ = 10 ¹² joule)
		UNFCCC	United Nations Framework Convention on Climate Change
