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Report of the review of the initial report of Finland

According to decision 13/CMP.1, each Annex I Party with a commitment inscribed in Annex B to the Kyoto Protocol shall submit to the secretariat, prior to 1 January 2007 or one year after the entry into force of the Kyoto Protocol for that Party, whichever is later, a report (the 'initial report') to facilitate the calculation of the Party's assigned amount pursuant to Article 3, paragraphs 7 and 8, of the Kyoto Protocol, and to demonstrate its capacity to account for emissions and the assigned amount. This report reflects the results of the review of the initial report of Finland conducted by an expert review team in accordance with Article 8 of the Kyoto Protocol.

CONTENTS

	<i>Paragraphs</i>	<i>Page</i>
I. INTRODUCTION AND SUMMARY	1–9	3
A. Introduction	1–2	3
B. Summary.....	3–9	3
II. TECHNICAL ASSESSMENT OF THE ELEMENTS REVIEWED..	10–112	7
A. National system for the estimation of anthropogenic GHG emissions by sources and sinks	10–19	7
B. Greenhouse gas inventory	20–91	9
C. Calculation of the assigned amount.....	92–95	20
D. Calculation of the commitment period reserve	96–98	21
E. National registry	99–108	21
F. Land use, land-use change and forestry parameters and election of activities	109–112	23
III. CONCLUSIONS AND RECOMMENDATIONS	113–121	24
A. Conclusions	113–118	24
B. Recommendations	119–120	24
C. Questions of implementation.....	121	25

Annexes

I. Documents and information used during the review.....	26
II. Acronyms and abbreviations	29

I. Introduction and summary

A. Introduction

1. This report covers the in-country review of the initial report of Finland, coordinated by the United Nations Framework Convention on Climate Change (UNFCCC) secretariat, in accordance with the guidelines for review under Article 8 of the Kyoto Protocol (decision 22/CMP.1). The review took place from 28 May to 2 June 2007 in Helsinki, Finland, and was conducted by the following team of nominated experts from the roster of experts: generalist – Mr. Manfred Ritter (Austria); energy – Mr. Tomas Gustafsson (Sweden); industrial processes – Mr. William Kojo Agyemang-Bonsu (Ghana); agriculture – Mr. Donald Kamdonyo (Malawi); land use, land-use change and forestry (LULUCF) – Mr. Mikhail Gytarsky (Russian Federation); waste – Mr. Ayite-Lo Ajavon (Togo). Mr. William Kojo Agyemang-Bonsu and Mr. Mikhail Gytarsky were the lead reviewers. In addition, the expert review team (ERT) reviewed the national system, the national registry, and the calculations of the Party's assigned amount and commitment period reserve, and took note of the LULUCF parameters and the elected Article 3, paragraph 4, activities. The review was coordinated by Ms. Astrid Olsson (UNFCCC secretariat). Ms. Maria Socorro Manguiat (UNFCCC secretariat) participated in the review as an observer.

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. Summary

1. Timeliness

3. Decision 13/CMP.1 requests Parties to submit the initial report prior to 1 January 2007 or one year after the entry into force of the Kyoto Protocol for that Party, whichever is later. The initial report was submitted on 22 December 2006, which is in compliance with decision 13/CMP.1. With the initial report Finland submitted a revised greenhouse gas (GHG) inventory compared to its original 2006 GHG inventory submission of 6 April 2006. Prior to the in-country visit Finland resubmitted a GHG inventory on 23 May 2007, which was used as the basis for the review by the ERT. The Party submitted revised emission estimates on 3 July 2007 in response to questions raised by the ERT during the course of the in-country visit.

2. Completeness

4. Table 1 below provides information on the mandatory elements that have been included in the initial report and the revised values for the assigned amount and the commitment period reserve provided by the Party as a result of the review process. These revised values are based on revisions of emission estimates for CO₂ in the energy sector and the industrial processes sector (see paragraphs 46, 48 and 59), which resulted in a revision of the total of GHG emissions, including base year emissions, from 71,141,639 tonnes carbon dioxide (CO₂) equivalent, as reported originally by the Party to 71,003,509 tonnes CO₂ eq. (see paragraphs 94 and 95).

Table 1. Summary of the reporting on mandatory elements in the initial report

Item	Provided	Value/year/comment
Complete GHG inventory from the base year 1990 to the most recent year available 2004	Yes	1990–2004
Base year for HFCs, PFCs and SF ₆	Yes	1995
Agreement under Article 4	Yes	100%
LULUCF parameters	Yes	Minimum tree crown cover: 10% Minimum land area: 0.5 ha Minimum tree height: 5 m
Election of and accounting period for Article 3, paragraphs 3 and 4, activities	Yes	Finland elected forest management under Article 3, paragraph 4, of the Kyoto Protocol. Finland has decided to account for each activity under Article 3, paragraphs 3 and 4, for the entire commitment period.
Calculation of the assigned amount in accordance with Article 3, paragraphs 7 and 8	Yes	355 708 195 tonnes CO ₂ eq.
Calculation of the assigned amount in accordance with Article 3, paragraphs 7 and 8, revised estimate		355 017 545 tonnes CO ₂ eq.
Calculation of the commitment period reserve	Yes	320 137 376 tonnes CO ₂ eq.
Calculation of the commitment period reserve, revised estimate		319 515 791 tonnes CO ₂ eq.
Description of national system in accordance with the guidelines for national systems under Article 5, paragraph 1	Yes	
Description of national registry in accordance with the requirements contained in the annex to decision 13/CMP.1, the annex to decision 5/CMP.1 and the technical standards for data exchange between registry systems adopted by the CMP	Yes	

5. The information in the initial report covers all elements as required by decision 13/CMP.1, section I of decision 15/CMP.1, and the relevant decisions of the Conference of the Parties serving as the Meeting of the Parties (CMP).

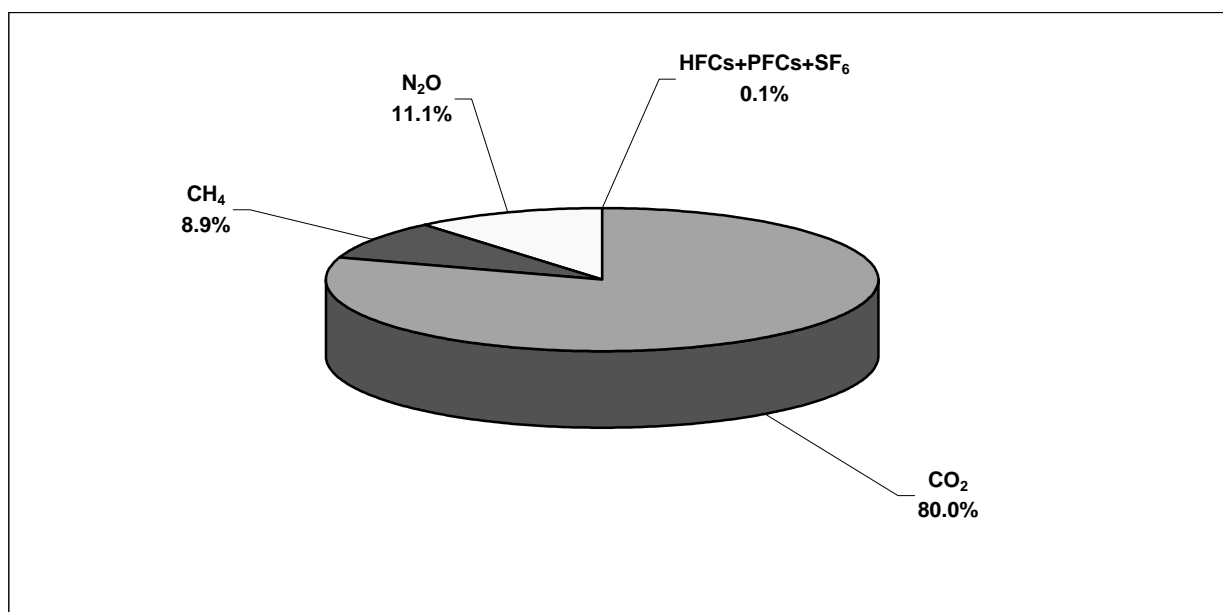
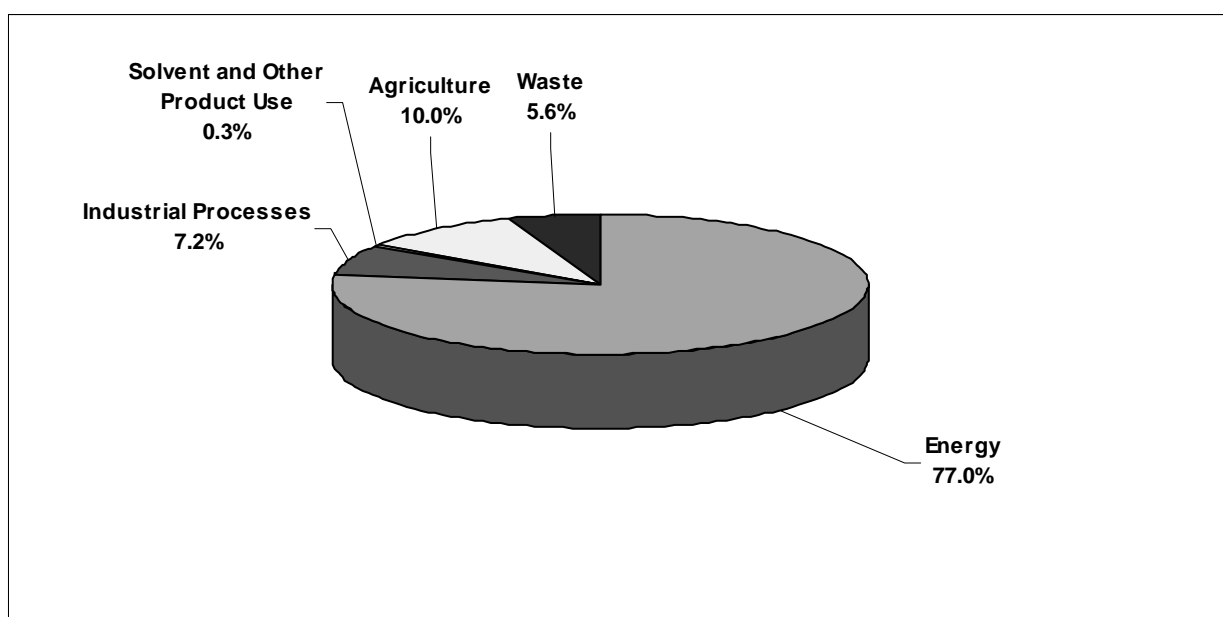
3. Transparency

6. The initial report is transparent. The national inventory report (NIR), in addition to the initial report, provides much of the information required to assess the inventory. However, information provided in the NIR is sometimes unclear about the data sources used and the procedures for cross-checking and correcting the data. The level of detail in the documentation and the trend explanations differ between sectors. The ERT recommends Finland to include further detailed documentation in the NIR and to further describe the way that cross-checking and correction of the data are carried out.

4. Emission profile in the base year, trends and emission reduction target

7. In the base year (1990 for CO₂, CH₄ and N₂O, and 1995 for HFCs, PFCs and SF₆), the most important GHG in Finland was CO₂, contributing 80.0 per cent to total¹ national GHG emissions expressed in CO₂ eq., followed by nitrous oxide (N₂O), 11.1 per cent, and methane (CH₄), 8.9 per cent (see figure 1). Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF₆) taken together contributed 0.1 per cent of the overall GHG emissions in the base year. The energy sector accounted for 77.0 per cent of the total GHG emissions in the base year followed by agriculture (10.0 per cent), industrial processes (7.2 per cent), waste (5.6 per cent) and solvent and other product use (0.3 per cent), see figure 2. Total GHG emissions (excluding LULUCF) amounted to 71,003.51 Gg CO₂ eq. and increased by 13.9 per cent from the base year to 80,895.56 Gg in 2004.

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.

Figure 1. Shares of gases in total GHG emissions, base year**Figure 2. Shares of sectors in total GHG emissions, base year**

8. Tables 2 and 3 show the GHG emissions by gas and by sector, respectively.

9. Finland's quantified emission limitation is 92 per cent of the base year as included in Annex B to the Kyoto Protocol. As Finland is part of the European Community, whose member States will meet their reduction commitment jointly in accordance with Article 4 of the Kyoto Protocol, Finland's quantified emission limitation is 100 per cent. Finland's assigned amount is calculated based on the Party's Article 4 commitment.

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

GHG emissions (without LULUCF)	Gg CO ₂ eq.								Change BY–2004 (%)
	Base year ^a	1990	1995	2000	2001	2002	2003	2004 ^a	
CO ₂	56 767.66	56 767.66	58 210.01	57 209.15	62 327.03	64 833.90	72 739.58	68 605.07	20.9
CH ₄	6 286.42	6 286.42	6 074.00	5 382.01	5 258.94	5 061.51	4 867.74	4 698.88	–25.3
N ₂ O	7 851.43	7 851.43	7 154.86	6 848.79	6 759.35	6 813.33	6 920.89	6 861.13	–12.6
HFCs	29.33	0.02	29.33	501.73	656.87	463.44	652.07	695.07	2 269.9
PFCs	0.14	0.07	0.14	22.46	20.06	13.37	14.85	12.23	8 635.0
SF ₆	68.53	94.38	68.53	51.49	55.03	51.31	41.71	23.18	–66.2

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

^a Finland submitted revised estimates for the base year and 2004 in the course of the initial review on 3 July 2007. These estimates differ from Party's GHG inventory submitted in 2006.

Table 3. Greenhouse gas emissions by sector, 1990–2004

Sectors	Gg CO ₂ eq.								Change BY–2004 (%)
	Base year ^a	1990	1995	2000	2001	2002	2003	2004 ^a	
Energy	54 655.61	54 655.61	56 564.78	55 101.48	60 350.42	63 002.57	70 667.93	66 382.45	21.5
Industrial processes	5 077.60	5 074.07	4 601.59	5 553.91	5 595.94	5 358.47	5 957.08	6 154.94	21.2
Solvent and other product use	178.37	178.37	142.77	124.71	122.00	111.08	104.46	105.10	–41.1
Agriculture	7 113.82	7 113.82	6 317.66	5 960.84	5 846.34	5 818.38	5 736.31	5 614.53	–21.1
LULUCF	NA	–21 389.50	–15 381.02	–16 293.19	–19 059.76	–18 867.91	–17 848.08	–18 485.82	NA
Waste	3 978.11	3 978.11	3 910.07	3 274.69	3 162.58	2 946.36	2 771.05	2 638.54	–33.7
Other	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total (with LULUCF)	NA	49 610.5	56 155.9	53 722.4	56 017.5	58 368.9	67 388.8	62 409.7	NA
Total (without LULUCF)	71 003.51	70 999.98	71 536.88	70 015.62	75 077.28	77 236.86	85 236.83	80 895.56	13.9

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

^a Finland submitted revised estimates for the base year and 2004 in the course of the initial review on 3 July 2007. These estimates differ from Party's GHG inventory submitted in 2006.

II. Technical assessment of the elements reviewed

A. National system for the estimation of anthropogenic GHG emissions by sources and sinks

10. Finland's national system is prepared in accordance with the guidelines for national systems under Article 5, paragraph 1, of the Kyoto Protocol (decision 19/CMP.1) and can perform the general and specific functions required.

11. Table 4 shows which of the specific functions of the national system are included and described in the initial report.

Table 4. Summary of reporting on the specific functions of the national system

Reporting element	Provided	Comments
Inventory planning		
Designated single national entity*	Yes	See section II.A.1
Defined/allocated specific responsibilities for inventory development process*	Yes	See section II.A.1
Established process for approving the inventory*	Yes	See section II.A.1
Quality assurance/quality control plan*	Yes	See section II.A.2
Ways to improve inventory quality	Yes	See section II.B.3
Inventory preparation		
Key category analysis*	Yes	See section II.B.1
Estimates prepared in line with IPCC guidelines and IPCC good practice guidance*	Yes	See section II.B.2
Sufficient activity data and emission factor collected to support methodology*	Yes	See section II.B
Quantitative uncertainty analysis*	Yes	See section II.B.2
Recalculations*	Yes	See section II.B.2
General QC (tier 1) procedures implemented*	Yes	See section II.A.2
Source/sink category-specific QC (tier 2) procedures implemented	Yes	See section II.A.2
Basic review by experts not involved in inventory	Yes	See section II.A.2
Extensive review for key categories	Yes	See section II.A.2
Periodic internal review of inventory preparation	Yes	See section II.A.2
Inventory management		
Archive inventory information*	Yes	See section II.A.3
Archive at single location	No	See section II.A.3
Provide ERT with access to archived information*	Yes	See section II.A.3
Respond to requests for clarifying inventory information during review process*	Yes	See section II.A.1

* Mandatory elements of the national system.

1. Institutional, legal and procedural arrangements

12. During the in-country visit, Finland explained the institutional arrangements, as part of the national system, for the preparation of the inventory. By Government resolution, Statistics Finland is the designated single national entity with overall responsibility for the national inventory. Statistics Finland's responsibilities as the single national entity for the GHG inventory are detailed in the agreement between Statistics Finland and the Ministry of the Environment. These responsibilities include the preparation, submission and quality management of Finland's GHG inventory as well as the final approval and submission of the GHG inventory to the UNFCCC. As the national entity for the GHG inventory, Statistics Finland applies the Statistics Finland Act and subsequent Statistics Acts.

An advisory board has been set up to facilitate coordination with other core institutions and to ensure sufficient resources and capacity for timely performance.

13. Other core institutions involved in the preparation of the GHG inventory are the Finnish Environment Institute (SYKE), the Finnish Forest Research Institute (Metla), Agrifood Research Finland (MTT), the Technical Research Centre of Finland (VTT) and Finavia. The specific responsibilities of these and other organizations are defined in agreements between Statistics Finland and the expert organizations. During the in-country visit, Finland supplied a copy of these agreements to the ERT. These define and allocate specific responsibilities in the inventory development process between the expert organizations. The ERT recommends Finland to expand the summary of these agreements (e.g. the main responsibilities) in the NIR.

14. In Finland there is an established process for the official consideration and approval of the inventory, including recalculations, prior to its submission and for responding to any issues raised by the inventory review. The responsible organization is Statistics Finland. The national system demonstrated its functionality during the review and the Party responded to all requests for further information during the review in a very cooperative, comprehensive and timely manner. However, a summary of the corrections and changes made in the inventory and of the revised assigned amount and commitment period reserve calculations were submitted by Finland shortly before the in-country review. Finland explained during the review that due to time and resource constraints some quality checks were only made after the submission, thus leading to corrections and a subsequent resubmission. The ERT recognizes that while there is a functioning QA/QC system in place, there is still room for improvement. The ERT recommends Finland to improve its time and resource management in order to be able to complete all the required quality checks on time.

2. Quality assurance/quality control

15. Finland has elaborated and implemented a quality assurance/quality control (QA/QC) plan in accordance with the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC good practice guidance). 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.

16. QA/QC procedures are in place and QC reports are prepared by all six core institutions. However, a strengthening of these procedures and a further elaboration of the QC reports is still needed. The ERT recommends a further strengthening of the QA/QC procedures at the relevant institutions, and a further elaboration of the QC reports, for example, by including summary results of the checks performed in the NIR and links to the underlying checklists.

17. There are descriptions of general and category-specific QA/QC procedures in the NIR and in the initial report. The NIR describes the overall quality objectives. During the in-country review, Finland presented an updated and extended overall improvement plan that includes a timetable and sets out responsibilities. The ERT recommends Finland to include this improvement plan in the next NIR.

18. During the in-country visit, Finland explained that systems audits have not yet been performed but that it has explored the possibility of certifying the inventory system, although a decision on this has not been taken yet.

3. Inventory management

19. Finland does not have a centralized archiving system. The respective institutes that contribute to the inventory are responsible for archiving the data they collect and the estimates they calculate with any associated methodology documentation and internal documentation on QA/QC. Statistics Finland archives its own work, documentation on QA/QC procedures and planned inventory improvements,

external and internal review reports, annual key category analyses data, and the main results from the respective institutes. During the review, the ERT noted that Finland was able to provide the archived documents requested by the ERT, including confidential data, according to national procedures. All the relevant input and output files are archived at Statistics Finland. There is a well developed system for archiving submissions and the data sources used (passive archiving). However, the archiving of the working files (active archiving) is the responsibility of the sectoral experts and differs widely between the sectors. The ERT encourages Finland to improve the archiving of the working files and their links to e-mail correspondence in order to facilitate tracking of the information flow.

B. Greenhouse gas inventory

20. In conjunction with its initial report, Finland has submitted a complete set of common reporting format (CRF) tables for the years 1990–2004 and an NIR. Prior to the in-country visit, Finland submitted a revised GHG inventory on 23 May 2007 which was used as the basis for the review by the ERT. The Party submitted revised emission estimates on 3 July 2007 in response to questions raised by the ERT during the course of the in-country visit. Where needed the ERT also used previous years' submissions, including the CRF tables for the years 1990–2003.

21. During the review, Finland provided the ERT with additional information sources. These documents are not part of the initial report submission but are in many cases referenced in the NIR. The full list of materials used during the review is provided in the annex to this report.

1. Key categories

22. Finland reported a tier 2 key category analysis, both level and trend assessment, and also applied a qualitative approach in determining its key categories as a part of its initial report submission. The LULUCF sector was included in the key category analysis. The key category analyses performed by the Party and the secretariat² produced different results, mainly because of the tier 2 approach used by Finland to identify its key categories. Finland provided a transparent description of its key category analysis in the NIR.

2. Cross-cutting topics

23. 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 *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 good practice guidance for LULUCF). However, the ERT identified some cases where the methods and EFs used are not fully in line with this guidance. These cases are identified below in the respective sectoral sections of this report. The ERT also acknowledges that these problems were corrected during the review. The ERT recommends Finland to reflect these improvements and changes in its next inventory submission.

24. The inventory is compiled in accordance with Article 7, paragraph 1, and decision 15/CMP.1.

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* (hereinafter referred to as the IPCC good practice guidance for LULUCF) for the base year as well as the latest inventory year. Key categories according to the tier 1 trend assessment were also identified. 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.

Completeness

25. The inventory submitted is complete in terms of geographical coverage, years and sectors, and complete in terms of categories and gases. Some minor categories are reported as “not occurring” (“NO”), or “not estimated” (“NE”) because emissions are assumed to be negligible (e.g. field burning of agricultural residues).

Transparency

26. The transparency of the CRF and the NIR has been improved since previous submissions. However, the level of detail of the documentation and the level of transparency still differ between the sectors. The ERT encourages Finland to further improve transparency in all sectors by ensuring a minimum level of documentation detail in all sectors, for example, by developing internal reporting guidelines. These guidelines could include recommendations on the extent to which trend explanations need to be provided in the sectors.

Consistency

27. The inventory and the time series provided in the NIR and the CRF are consistent, as defined in the UNFCCC reporting guidelines and in accordance with the IPCC good practice guidance.

Comparability

28. The inventory and the time series provided are both comparable with those of the other Parties, as defined in the UNFCCC reporting guidelines. The allocation of the categories follows the split in the revised 1996 IPCC Guidelines and the IPCC good practice guidance.

Accuracy

29. The inventory is accurate, as defined in the UNFCCC reporting guidelines, providing estimates of uncertainty and addressing uncertainty through the application of tier 1 and 2 methods from the IPCC good practice guidance. Emissions are neither systematically overestimated nor underestimated and uncertainties are reduced as far as practicable. During the in-country review, the ERT identified a few categories where the methods or EFs used were not fully in accordance with the IPCC good practice guidance and might lead to overestimation of emissions in the base year or underestimation of emissions in the most recent year (e.g. feedstocks and non-energy use of fuels and iron and steel production). The ERT recommended Finland to revise its estimates for these categories. After the in-country review, in accordance with the recommendations of the ERT, Finland provided revised estimates for these categories for both the base year and 2004. Further details are provided in the sectoral sections below.

Recalculations

30. The national system can ensure that recalculations of previously submitted estimates of GHG emissions by sources and removals by sinks are prepared in accordance with the IPCC good practice guidance.

31. The ERT noted that a number of recalculations had been made since the last inventory submission to take account of methodological improvements, better activity data (AD) and more accurate emission factors (EFs). In the energy sector, point-source data had been revised after thorough checking for inconsistencies in the AD. Non-CO₂ EFs had been updated and indirect N₂O emissions from atmospheric deposition of nitrogen (N) from nitrogen oxides (NO_x) have been included. Emissions from peat production previously reported as fugitive emissions in the energy sector have been reallocated to wetlands in the LULUCF sector. Indirect CO₂ emissions from fugitive emissions from fuels have been calculated from non-methane volatile organic compounds (NMVOC) emissions for the first time.

A number of further recalculations were performed in order to take account of the recommendations from previous reviews and the findings of internal checks.

Uncertainties

32. The Party has provided an uncertainty analysis for each category and for the inventory in total, following the IPCC good practice guidance. Finland performed a tier 1 and a tier 2 uncertainty assessment and included the LULUCF sector in its uncertainty estimates. The results of the uncertainty analyses, level of aggregation used, correlations considered and methodological approaches used are transparently reported in the NIR. The NIR discusses planned improvements and uncertainty analysis within each category and the uncertainties are considered when prioritizing improvements to the inventory.

3. Areas for further improvement identified by the Party

33. The inventory improvement plan in the NIR identifies the following areas for improvement: (1) direct use of emissions trading data for inventory verification; (2) verification of the F-gas (fluorinated gas) emission trend; (3) methodological developments for calculating CH₄ emissions from enteric fermentation from cattle; (4) improvement of data collection for agricultural soils; (5) inclusion of N₂O emissions from disturbance associated with land-use conversion to cropland; (6) implementation of a new method to estimate carbon stock change in living biomass; (7) separation of emission and removal estimates for land remaining in the same land category and land converted to other land categories; and (8) review of the waste composition data for municipal solid waste (MSW). During the in-country visit, Finland explained its further plans for improving the overall QA/QC system.

4. Areas for further improvement identified by the ERT

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

- (a) Improve the performance of the overall QA/QC system by further considering the resource implications for QA/QC for the different institutions involved in preparing the inventory; the use of internal audits for the sectors and systems audits in the QA/QC system; and further improvements to the systematic approach to quality checks;
- (b) The CRF and the NIR: further improve the completeness and consistency of the documentation provided in the NIR and consider an updated system for version management for the CRF and the NIR.

35. Recommended improvements relating to specific categories are presented in the relevant sector sections of this report.

5. Energy

Sector overview

36. The energy sector is the largest contributor to GHG emissions in Finland, and accounted for 77.0 per cent of the total national GHG emissions (excluding LULUCF) in the base year. In the base year, fuel combustion contributed 54,417.38 Gg CO₂ eq. and fugitive emissions contributed 238.23 Gg CO₂ eq. to the total national GHG emissions. The largest category within the energy sector in the base year was public electricity and heat production, which accounted for 23.3 per cent of the total national GHG emissions. The GHG emissions from public electricity and heat production increased by 79.1 per cent between 1990 and 2004. From 1990 to 2004, GHG emissions in the energy sector increased by 21.5 per cent.

37. All categories as well as all years and gases are covered in the energy sector. In addition, the proper notation keys have been applied where needed. Finland derives most of the underlying AD for the

energy sector from the compliance monitoring data system (VAHTI system) and the national energy statistics. The energy balances are used to ensure that all fuels are accounted for, especially liquid fuels. The data collection is comprehensive and of good quality. EFs are mostly country-specific.

38. The energy sector in the Finnish NIR is generally transparent. However, for several categories insufficient information is provided to fully explain emission trends and inter-annual variations. This is particularly the case for emissions from mobile combustion, where models are largely used and the underlying drivers for the emission trends are not included in the NIR but described on external web pages. For the next inventory submission, the ERT recommends Finland to include more qualitative and quantitative analyses of changes in the underlying AD and the shares of different technology types in stationary and mobile combustion. In order to keep the NIR from expanding too much, it is recommended that extensive category-specific information is placed in annexes properly linked to the relevant category section in the energy sector.

39. Finland has performed many recalculations in its 2006 submission compared to its 2005 submission. The recalculations in the energy sector have been properly addressed in the NIR, in particular the inclusion of national EFs for stationary combustion. However, given that the NIR does not contain all the information necessary to fully understand the emission trends, the complete impact of the recalculations cannot be assessed based on the information provided in the NIR. During the in-country visit, the ERT was provided with additional information which justified the recalculations, for example, the reasons for reporting on corrections of heavy fuel oil under other (1.A.5.a). The ERT recommends that Finland include this information in the next NIR.

40. The NIR gives general descriptions of category-specific QC procedures and verifications. The ERT recommends that Finland formalize the documentation of QC-procedures, for example, in manuals for applying AD from the largest emitting plants and by checking the data for large industries, especially the iron and steel industry.

Reference and sectoral approaches

41. Finland has calculated CO₂ emissions from fossil fuel combustion using the reference and the sectoral approaches for all years in the time series. For the base year, there is a difference of 2.92 per cent in CO₂ emission estimates between the two approaches. The difference is briefly explained in the NIR, but is not shown in CRF table 1.A(b). The Party responded that the explanations in the CRF had partly vanished. The Party further noted in the NIR that recalculations of the reference approach have been carried out in the 2006 submission and that further studies are ongoing, which focus on the year 2004. The ERT welcomes the Party's effort to further explore the rationales behind the remaining differences and recommends it consider 1990 as well. The ERT further recommends Finland to include an explanation of the differences between the two approaches in CRF table 1.A(c).

International bunker fuels

42. Finland uses AD on fuel sales to estimate emissions from international bunkers. EFs for CO₂ emissions are national and for non-CO₂ emissions are based on average EFs calculated using the national calculation system of air traffic emissions (ILMI model). Emissions from international bunkers are separated from domestic navigation and aviation in accordance with the IPCC good practice guidance.

43. The ERT noticed several differences in international bunker data between the CRF and those reported to the IEA, for example, a systematic difference of about 3 per cent for jet kerosene, with lower figures in the CRF. Finland responded that the AD come from the same source. The ERT encourages Finland to double check the estimates included in the CRF, particularly the NCVs applied.

44. The ERT noticed discrepancies between table 1.C and table 1.A(b) for jet kerosene (international aviation), gas/diesel oil and residual fuel oil (international marine bunkers) for all years. The Party is

encouraged to use the same, most up-to-date data in both CRF tables 1.C and 1.A(b) in its future reporting.

Feedstocks and non-energy use of fuels

45. In previous submissions, emissions from feedstocks and non-energy use of fuels were calculated assuming that all non-stored carbon is combusted. In its 2006 submission Finland estimated emissions from feedstocks and non-energy use of fuels based on plant-specific information and reported the emissions under corresponding categories in the CRF. In addition, smaller amounts of feedstocks and lubricants are judged, by the national experts, to be released as CO₂, CH₄ and N₂O and reported under other – non-specified emissions of fuels from non-energy use (1.A.5.a). Remaining amounts are reported as stored carbon. The ERT commends Finland for its efforts to establish national emission estimates for feedstocks and non-energy use of fuels instead of using the IPCC default values.

46. During the in-country review, Finland indicated that based on expert judgment, approximately 141 Gg CO₂ in the base year (and small amounts of CH₄ and N₂O emissions) totally or partly from burned feedstock may also be accounted for as fugitive emissions from oil and natural gas flaring. The ERT noted that this could be a potential double-counting of emissions and requested Finland to provide underlying information to support the expert judgement or to exclude the emissions from feedstock burning from the estimates for this category. In response to the ERT request, Finland provided revised estimates for other – non-specified emissions of fuels from non-energy use for the base year, which changed from 349.44 Gg CO₂ eq. to 209.16 Gg CO₂ eq. This also affected the estimates of other – indirect N₂O from NO_x emissions in 1990, which changed from 438.32 Gg CO₂ eq. to 437.88 Gg CO₂ eq. The ERT agreed with the revised estimates and recommended Finland to include them in the next inventory submission.

Key categories

Stationary combustion: solid – CO₂

47. All the values for the CO₂ implied emission factors (IEFs) for solid fuels for iron and steel (145.34–162.86 t/TJ) are higher than the IPCC default range (94.60–106.70 t/TJ) and are among the highest of reporting Parties (4.51–247.98 t/TJ). The Party responded that the majority of the AD are from blast furnace gas with plant-specific EFs (155–265 t/TJ). Judging from the production data for crude steel presented in the Finnish NIR (page 92) the ERT believes that the CO₂ emissions in iron and steel show a similar overall trend but differences in inter-annual changes; for example, in 1999/2000 emissions increased by 8.0 per cent but production only increased by 3.5 per cent. The ERT recommends Finland to explain the drivers behind the large variance in CO₂ IEFs and, if possible, relate it to the production data.

48. During the in-country review, Finland indicated that the emissions derived from iron and steel are mainly based on detailed data on burned gases (blast furnace gas, coke oven gas, etc.) instead of, for example, carbon mass balances. Finland reports emissions in both the energy sector and the industrial processes sector in accordance with the Revised 1996 IPCC Guidelines. Finland is encouraged to include more information on the underlying calculations and the methods used to ensure that no omissions or double counting of emissions occur, for example, by including comparisons with mass-balances, and so on. In addition, during the in-country review it was discovered that there was a possible underestimation of CO₂ emissions from the second largest plant of about 4 Gg CO₂ in 1990. Finland responded by providing revised estimates that only affected iron and steel production in the industrial processes sector (2.C) (see paragraph 59).

Non-key categoriesFuel combustion: gas – CO₂

49. Finland applies a national EF for CO₂ from natural gas (55.04 t/TJ) that is lower than the IPCC default value (56.10 t/TJ). During the in-country visit, Finland provided the ERT with its underlying calculations on its national CO₂ EF for natural gas. The ERT judged that they provide a good understanding of the EF estimate, but encourages Finland in its next NIR to further document the size of the underlying components of the EF using relevant references.

Fugitive emissions: oil and natural gas – CO₂

50. From 1990 to 2004 CO₂ emissions from venting and flaring decreased by 49.6 per cent. The trend shows some large inter-annual changes. The trend for the CO₂ IEFs is strongly decreasing (12,444 kg/kt in 1990 to 4,794 kg/kt in 2004). According to the NIR, the estimates of CO₂ emissions from flaring were derived directly from data received from the industry, and inter-annual changes resulted from production difficulties and output changes. During the in-country visit, Finland double-checked the data from the plants and no obvious mistake was detected. The ERT recommends Finland to provide data on production and outputs that confirm the trend and inter-annual changes in CO₂ emissions. The ERT further recommends Finland to provide the rationale behind the decline in the CO₂ trend in the next NIR.

6. Industrial processes and solvent and other product useSector overview

51. In the Kyoto Protocol base year (which is 1990 for CO₂, CH₄ and SF₆, and 1995 for F-gases), the total national GHG emissions from the industrial processes sector amounted to 5,077.60 Gg CO₂ eq., accounting for 7.2 per cent of total national GHG emissions. Metal production accounted for 36.8 per cent of the emissions from the sector followed by chemical industry emissions (35.3 per cent), mineral products (25.8 per cent), consumption of halocarbons and SF₆ (1.9 per cent) and other production (0.3 per cent). CO₂ accounted for 65.3 per cent of the total sectoral emissions, followed by N₂O (32.6 per cent), F-gases (1.9 per cent) and CH₄ (0.2 per cent).

52. In the base year total national GHG emissions from solvent and other product use amounted to 178.37 Gg CO₂ eq., accounting for 0.3 per cent of total national GHG emissions. CO₂ accounted for 65.2 per cent of the total solvent and other product use emissions, and N₂O for 34.8 per cent.

53. The inventory of the industrial processes and solvent and other product use sectors is complete. Finland performed recalculations for CO₂ emissions from industrial processes (the chemical industry, metal production and other production) and solvent and other product use as a result of the inclusion of indirect CO₂ emissions from NMVOC. Finland performed uncertainty estimates and used these in the key category analysis. The Party has implemented QA/QC procedures for the categories under this sector.

54. The Party's inventory for the industrial processes and solvent and other product use sectors is largely transparent. However, better documentation in the areas of the choice of methods and EFs, for example, nitric acid production, would further improve transparency. Finland estimates both actual and potential emissions for the F-gases.

Key categoriesNitric acid production – N₂O

55. Finland uses plant-specific AD and EFs to estimate the N₂O emissions. The EFs (7.6 kg/t, 9.5 kg/t and 9.2 kg/t) are based on plant-specific measurements. All nitric acid plants in Finland are medium

pressure plants and the EFs used are high compared to the IPCC default range (6.0–7.5 kg/t). In order to enhance transparency, the ERT recommends that Finland explore the reasons for the high EFs and document its findings in the next submission.

Electrical equipment – SF₆

56. The trend for SF₆ emissions from 1990 to 1995 displays considerable year-to-year variation. The Party provided no information on the drivers behind the trend for SF₆ emissions. During the in-country visit, Finland provided documentation to the ERT that explains the trend. Finland explained that it uses the tier 3c method to calculate SF₆ emissions from electrical equipment. The calculations are based on annual sales of SF₆ to manufacturers, users, service companies and contractors; as well as the net increase in total nameplate capacity or charge and the amount of SF₆ destroyed. The nameplate capacity depends predominantly on the capacity growth rate which is determined by the quantities of electrical equipment installed, which showed considerable annual variations in the period 1978 to 1998. The peak in emissions in 1995 is a reflection of increased capacity installations and associated high levels of emissions. The ERT recommends that Finland provide this detailed information in the next NIR, explaining the decreasing trend in SF₆ emissions from 1990 to 1994 and the sudden increase in 1995, in particular since 1995 is the base year for the F-gases.

Non-key categories

Limestone and dolomite use – CO₂

57. The Party indicates in the NIR that some plants may exist and that emissions from some of these plants are not included in the national total. For the sake of completeness of reporting, the ERT recommends that Finland collect the AD and estimate the associated emissions for the next inventory submission.

Other (chemical industry) – CO₂

58. Finland reports CO₂ emissions from hydrogen production in the category other (chemical industry). During the review, Finland indicated that it had discovered an error in the equation it had used for estimating the amount of hydrogen produced given in the current NIR. This error did not influence the calculation of the emissions, as they are calculated based on the feedstocks used. The ERT recognizes that the Revised 1996 IPCC guidelines and the IPCC good practice guidance do not provide any default EF(s) for this activity. However, as Finland has chosen to report the emissions from this category, the ERT encourages Finland to do it in a transparent manner by providing information on the underlying chemical reactions, choice of methods, AD and EFs.

Iron and steel production – CO₂

59. Finland reports emissions from iron and steel production in the energy sector (combustion-related emissions) and the industrial processes sector (process-related emissions), which is in accordance with the Revised 1996 IPCC Guidelines. During the in-country review, the ERT noted a potential underestimation of CO₂ emissions from the second largest plant in the base year. In response to the ERT's request, Finland provided revised base year estimates, which increased from 1,858.69 Gg CO₂ to 1,861.29 Gg CO₂. The ERT agreed with the revised estimates and recommended Finland to include them in the next inventory submission (see paragraph 48).

7. Agriculture

Sector overview

60. The agriculture sector contributed 10.0 per cent of total GHG emissions in the base year. These emissions decreased by about 21.1 per cent over the period 1990–2004 because Finland's membership of

the European Community resulted in changes to its economic structure, an increase in the average farm size, a decrease in the number of farms and a decrease in all livestock numbers except horses. The decrease in the use of N fertilizers and improved manure management have also reduced emissions. These changes in AD resulted in some time-series fluctuations.

61. The sub-chapter on time-series consistency in the NIR only covered enteric fermentation. Nor is there a detailed explanation of the development of national EFs. In order to improve the transparency of reporting in the NIR, the ERT encourages Finland to document time-series consistency and country-specific EFs in its next inventory submission.

62. Recalculations were carried out for all the key categories, mainly to update AD (on animal numbers), EFs and N excretion rates.

63. QA/QC procedures were undertaken for the sector and the Party has developed and elaborated a well documented QA/QC plan for which it should be commended.

64. Uncertainties have been estimated using the Monte Carlo simulation method for all the key categories. The lowest levels of uncertainty were for CH₄ from enteric fermentation of domestic livestock (–20 to +30 per cent) and the highest for N₂O emissions from agriculture soils (–60 to +170 per cent). The agriculture sector has some of the highest uncertainties in the inventory especially for EFs. This is in line with other reporting Parties.

65. The Party has planned several improvements in the sector such as an examination of specific N excretion rates for reindeer, swine and poultry, a revision of animal waste management systems (AWMS) types and further enhancement of AD collection, particularly in the areas of cultivated organic soils and agricultural land properties.

66. The Party has undertaken a single livestock characterization and has used this data across all categories, which is in line with the IPCC good practice guidance. It has improved its use of notation keys, which had been a concern in previous reviews.

Key categories

Enteric fermentation – CH₄

67. An enhanced characterization was carried out for cattle, which is a significant key emitter in the sector, and tier 1 methods were used for all other animals. Similarly, national EFs were used for cattle, and IPCC default factors were used for swine, horses and goats. This is in line with the IPCC good practice guidance.

Manure management – N₂O

68. Finland used IPCC methods and national data on N excretion rates and AWMS types. The N₂O emission estimates have been recalculated to take account of updated and more accurate livestock population numbers and N excretion rates, which is consistent with the IPCC good practice guidance. The ERT notes the Party's plans to further improve the collection of AD and parameters (see paragraph 65 above), and welcomes the Party's efforts to improve its emissions estimates.

Agricultural soils – N₂O

69. Finland used the IPCC tier 1b methodology and both country-specific and default EFs to estimate direct and indirect N₂O emissions from agricultural soils. Fractions of N volatilized as NH₃ and NO_x from synthetic fertilisers (Frac_{GASF}) equal to 0.6 per cent and from manure (Frac_{GASM}) equal to 33 per cent have been used, based on national knowledge. Country-specific EFs were applied to cultivated organic soils, while default EFs were used for other soil types. The use of country-specific EFs was appropriately documented in the NIR and supported by relevant scientific research and

publications. The ERT evaluated these values and found their use appropriate for the inventory. Based on soil analysis data, Finland assumed that 50 per cent of cultivated organic soil was producing cereals and 50 per cent was grassland. However, such a subdivision may inadequately represent the distribution of land uses over the area of cultivated organic soils. Noting the plans of the Party to improve AD collection (see paragraph 65 above), the ERT encourages Finland to develop appropriate methodologies, to estimate areas of cultivated organic soils for cropland and grassland, and to report these in its next inventory submission.

Non-key categories

Manure management – CH₄

70. Tier 2 methods and national EFs were used for cattle, and tier 1 methods and default EFs were used for all other animals. This is in line with the IPCC good practice guidance. The ERT further noted that Finland used a methane conversion factor (MCF) of 10 per cent for slurry in a cool climate from the Revised 1996 IPCC Guidelines instead of the revised value of 39 per cent from the IPCC good practice guidance, referring to the use of this value in Sweden. In response to the ERT's question, Finland clarified that the selected MCF value is considered more accurate for the conditions of the country and that relevant reference to it has been provided in the NIR.

Field burning of agricultural residues – CH₄ and N₂O

71. CH₄ and N₂O emissions from field burning of agricultural residues are reported as not occurring ("NO") in the CRF tables. However, the NIR states that field burning of agricultural residues does occur occasionally but that data are not available. Although the emissions may be negligible, the Party is encouraged to try to collect such data or to report the estimates as not estimated ("NE").

8. Land use, land-use change and forestry

Sector overview

72. In the base year, the LULUCF sector was a net sink of 21,389.50 Gg CO₂ eq., and accounted for 30.1 per cent of total national GHG emissions, the removal being 13.6 per cent higher than in 2004. The amount of removals increased by 68.9 per cent in 1991, decreased by 57.4 per cent from 1991 to 1995, increased by 48.9 per cent in 1996 and decreased again by 19.3 per cent from 1996 to 2004. Finland explained that the fluctuations were caused by varying harvests linked to fluctuating wood prices on international markets.

73. The ERT noted that the NIR does not include consistent land representation as outlined in the IPCC good practice guidance for LULUCF. Additional information on land areas included in the GHG inventory estimation was provided to the ERT during the review. In order to improve the completeness of the reporting, the ERT encourages Finland to include information on consistent land representation within national borders in its next inventory submission.

74. In its 2006 submission, Finland reports CO₂ removals for forest land remaining forest land and grassland remaining grassland as well as CO₂ and non-CO₂ emissions from biomass burning and nitrogen fertilization of forest land, cultivation and liming of cropland, and peat extraction from and drainage of wetlands. Settlements are reported as included elsewhere and not estimated ("IE", "NA"), and other land is reported as not applicable and not estimated ("NA", "NE"). These categories are optional for the LULUCF sector. The areas of land were estimated on the basis of data from the National Land Survey (NLS), the National Forest Inventory (NFI) and the Ministry of Agriculture and Forestry, the VAHTI database and a survey by Statistics Finland.

75. Finland has established an enhanced inter-agency system that allows for the consistent improvement of AD and GHG calculations in the LULUCF sector. The tier 2 level and trend key

category analyses performed by the Party identified the categories forest land remaining forest land, cropland remaining cropland, grassland remaining grassland and land converted to wetlands as key categories. To estimate emissions and removals from key categories, Finland uses a combination of tier 1, tier 2 and tier 3 methods as outlined in the IPCC good practice guidance for LULUCF. During the review, the ERT noted that reporting is provided only for land remaining in the same category. In order to improve the completeness of the reporting, the ERT encourages Finland to separate reporting on emissions and removals from land remaining in the same category from land converted to other land uses in its future inventory submissions.

76. The non-CO₂ emissions from controlled biomass burning and wetland drainage were recalculated after the implementation of consistent improvements to the GHG inventory system. The recalculations increased emissions by 0.04 per cent. The ERT noted that Finland carried out QA/QC procedures and tier 2 uncertainty assessments, which were appropriately documented in the NIR.

Key categories

Forest land remaining forest land – CO₂

77. Forest land remaining forest land is the major contributor to the sectoral profile. In the base year, net CO₂ removals by forest land were 27,793.46 Gg, equivalent to 39.1 per cent of total national GHG emissions. Finland used tier 2 methods to estimate carbon stock change in biomass and a tier 3 method (the YASSO model) to calculate carbon stock change in dead organic matter and soils. The emissions from biomass burning were calculated using a tier 2 method. The ERT noted that the total area of forest land was not provided in the NIR but, according to information provided during the review, it was included in the 2007 submission. The ERT further noted that different parameters were used to estimate removals by and emissions from the same forest biomass pool. In order to improve transparency in the reporting, the ERT encourages Finland to further document in the next submission the area of forest land as well as supporting AD and parameters.

Cropland remaining cropland – CO₂

78. In the base year, cropland remaining cropland was the major contributor to CO₂ emissions in the LULUCF sector, emitting 7,416.30 Gg or 10.4 per cent of the national total. Finland used tier 1 methods to calculate emissions from mineral soils and liming in this category. Emissions from organic soils were estimated using a tier 2 method based on national AD and the parameters documented in the NIR. The ERT noted that the tier 1 method contained in the IPCC good practice guidance for LULUCF may not be fully applicable to the intensively managed mineral soils in the country and encourages Finland to re-evaluate its applicability to croplands. The ERT further encourages Finland to change its estimation method if it is found to be not applicable.

Grassland remaining grassland – CO₂

79. CO₂ removals by grassland remaining grassland constituted 1,647.96 Gg, offsetting 2.3 per cent of national emissions in the base year. For this category Finland estimated changes in soil carbon stocks using national data from the NFI, a tier 1 method and default parameters. The ERT noted that the tier 1 method contained in the IPCC good practice guidance for LULUCF may not be fully applicable for estimating removals by grasslands in Finland and encourages the Party to re-evaluate its applicability to this category. The ERT further encourages Finland to change its estimation method if it is found to be not applicable.

Land converted to wetlands – CO₂

80. Land converted to wetlands had minor levels of CO₂ emissions of 585.26 Gg, making up 0.8 per cent of total national emissions, in the base year. Finland reports emissions from peat extraction under this category. National data on peat production areas and country-specific EFs were used to make

the estimates. The method applied corresponds to the IPCC good practice for LULUCF tier 2 method. The ERT noted the efforts made by Finland to enhance reporting on peat extraction under this category in the NIR and CRF.

Non-key categories

Direct N₂O emissions from N fertilization of forest land – N₂O

81. Direct N₂O emissions from nitrogen fertilization are minor, 26.8 Gg of CO₂ eq. or 0.04 per cent of total national emissions in the base year. Finland reports only N fertilization of forest land remaining forest land under this category because it is unable to divide the AD by N inputs between land remaining forest land and land converted to forest land. The estimates were made using the IPCC default method and default parameters.

Non-CO₂ emissions from drainage of soils and wetlands – CH₄

82. CH₄ emissions from the drainage of soils and wetlands amounted to 6.2 Gg of CO₂ eq., which was less than 0.01 per cent of total national emissions in the base year. Emissions were reported only for drainage of wetlands for peat extraction. The estimations were made using a tier 2 method. The ERT noted that wetland drainage was not documented in the NIR and encourages Finland to document calculations from this category in the next inventory submission.

Non-CO₂ emissions from drainage of soils and wetlands – N₂O

83. N₂O emissions from drainage of soils and wetlands amounted to 7.75 Gg CO₂ eq. (0.01 per cent of the base year national total). These emissions were due to peat extraction and were estimated using default methods, national AD and country-specific EFs.

Biomass burning – CH₄

84. CH₄ emissions from biomass burning were 8.7 Gg CO₂ eq., almost 0.01 per cent of total national emissions, in the base year. The emission estimates were made using a tier 2 method, country-specific data and default parameters.

Biomass burning – N₂O

85. N₂O emissions from biomass burning were 0.9 Gg CO₂ eq., 0.001 per cent of total national emissions, in the base year. The N₂O emission estimates were made using tier 2 methods, country-specific data and default parameters.

9. Waste

Sector overview

86. In the base year GHG emissions from the waste sector accounted for 3,978.11 Gg CO₂ eq., which corresponded to 5.6 per cent of the total national GHG emissions. Solid waste disposal on land accounted for 91.5 per cent of sectoral emissions. In addition, the waste sector includes CH₄ emissions from municipal and industrial wastewater handling, N₂O emissions generated from nitrogen input from fish as well as domestic and industrial discharge into waterways, NMVOC emissions from solid waste disposal sites and wastewater handling, and, for the first time, CH₄ and N₂O emissions from composting.

87. The inventory includes information on key categories, methods, data sources, the EFs used, uncertainty estimates and QA/QC procedures. It also contains most of the relevant information required for replication of the inventory. The methodologies for estimating GHG emissions are consistent with the Revised 1996 IPCC Guidelines and the IPCC good practice guidance. The transparency of the reporting has improved compared with previous inventory submissions, for example, by including some

of the references requested in the 2005 review report. Both the NIR and the CRF are consistent with the UNFCCC reporting guidelines. Recalculations have been made for all the reported categories for the entire time series because of revisions to AD.

Key categories

Solid waste disposal on land – CH₄

88. Finland has used a first-order decay (FOD) method with a slightly modified equation 5.1, which complies with the IPCC good practice guidance. Recalculations linked to more accurate AD, changes in classification of industrial waste and reallocation of waste between waste categories have led to a decrease in CH₄ emissions from solid waste disposal on land of 1.1 per cent compared to the 2005 GHG submission. In response to the 2005 review report, Finland has included references to documents that provide supporting AD for the base year in the NIR. The ERT appreciates this effort, but recommends Finland to include a short description, as previously discussed in the 2005 review report, of how the data have been derived, especially as the referenced documents are in Finnish.

Non-key categories

Waste incineration – CO₂, N₂O and CH₄

89. The NIR states that CO₂, CH₄ and N₂O emissions from waste incineration are reported in the energy sector. However, no explanation is provided of why these emissions are reported in the energy sector. The ERT recommends that this be included in the next NIR.

Composting – N₂O and CH₄

90. In response to the 2005 review report, Finland has reported emissions of CH₄ and N₂O from composting for the first time. The category includes emissions from composting of biowaste (municipal solid waste, municipal and industrial sludge and industrial solid waste including construction and demolition waste).

91. Finland uses a method analogous to that included in recently published recognized international scientific literature. The ERT welcomes this effort by Finland and recommends that Finland continue reporting these emissions in its future inventory submissions.

C. Calculation of the assigned amount

92. The assigned amount pursuant to Article 3, paragraphs 7 and 8, is calculated in accordance with the annex to decision 13/CMP.1.

93. Finland's base year is 1990 and the Party has chosen 1995 as the base year for HFCs, PFCs and SF₆. Finland's quantified emission limitation is 92 per cent of the base year as included in Annex B to the Kyoto Protocol. As Finland is part of the European Community, whose member States will meet their reduction commitment jointly in accordance with Article 4 of the Kyoto Protocol, Finland's quantified emission limitation is 100 per cent. Finland's assigned amount is calculated based on the Party's Article 4 commitment.

94. Based on Finland's base year emissions, 71,141.64 Gg CO₂ eq. as reported in the submission of 23 May 2007, and its Kyoto Protocol target (100 per cent), the Party calculates its assigned amount to be 355,708,195 tonnes CO₂ eq.

95. In response to the inventory issues identified during the review, the Party submitted revised estimates of its base year inventory (71,003,509 tonnes CO₂ eq.), which resulted in a recalculation of the assigned amount. Based on the revised estimates, the Party calculates its assigned amount to be 355,017,545 tonnes CO₂ eq. The ERT agrees with this figure.

D. Calculation of the commitment period reserve

96. The calculation of the required level of the commitment period reserve is in accordance with paragraph 6 of the annex to decision 11/CMP.1.
97. Based on its calculated assigned amount, 355,708,195 tonnes CO₂ eq., Finland calculates its commitment period reserve to be 320,137,376 tonnes CO₂ eq.
98. In response to the inventory issues identified during the review, the Party submitted revised estimates of its base year inventory, which resulted in a recalculation of the commitment period reserve. Based on the revised estimates, the Party calculates its commitment period reserve to be 319,515,790 tonnes CO₂ eq. The ERT agrees with this figure.

E. National registry

99. Finland has provided all information on the national registry system required by the reporting guidelines under Article 7, paragraphs 1 and 2, of the Kyoto Protocol (decision 15/CMP.1). The information provided is transparent and in accordance with the requirements of these reporting guidelines. However, the ERT noted that even though the registry administrator is named in the initial report as Mr. Jukka Moisanen of the Energy Market Authority, Mr Moisanen is currently not responsible for the registry system. The ERT was informed that Mr. Jouko Hepola in the Energy Market Authority is responsible for the registry. The ERT recommends that Finland update the name of registry administrator in its next inventory report under the Kyoto Protocol.
100. During the initial review, the ERT was provided with additional and updated information on the national registry of Finland, which included the division of duties between the three institutions and the staff working on the registry. The Energy Market Authority is the registry administrator and also responsible for the internal reporting system and database management. The company WM-data is responsible for hosting the registry production servers (network connectivity and VPN devices) and providing data communication services to the production environment. Innofactor Ltd. is responsible for application-level management, including core software, localization and environment and registry test/preproduction servers. The ERT recommends the Party to provide this information in its next inventory report under the Kyoto Protocol.
101. Table 5 summarizes the information on the mandatory reporting elements of the national registry system, as stipulated by decision 15/CMP.1, which describes how its national system performs the functions defined in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1.
102. During the in-country visit, the ERT was informed that the internal operational test of the registry for network connectivity was expected to be completed in June 2007. The initialization process was expected to be completed by September 2007 and the registry to be fully operational by December 2007. Information on the registry is publicly available on the Internet at: <http://www.paastokaupparekisteri.fi>.
103. The ERT was also informed about the procedures and security measures adopted to minimize discrepancies, terminate transactions and correct problems, and minimize operator error. These procedures and security measures include procedures to allow public access to the registry and a hardware architecture made up of three application servers and a database cluster that enable continuous availability and fast recovery in the event of a disaster.
104. The ERT acknowledged the efforts made by Finland to put in place adequate procedures and security measures, including strong authentication methods for the operators and traders who will use the registry. The ERT gained the overall impression that Finland attached importance, and allocated adequate resources, including human resources, to the development, operation and maintenance of the registry.

Table 5. Summary of information on the national registry system

Reporting element	Provided in the initial report	Comments
Registry administrator		
Name and contact information	Yes	Updated during the in-country review ^a
Cooperation with other Parties in a consolidated system		
Names of other Parties with which Finland cooperates, or clarification that no such cooperation exists.	Yes	No such cooperation exists. ^b
Database structure and capacity of the national registry		
Description of the database structure	Yes	Covered in the Independent Assessment Report (IAR) ^c
Description of the capacity of the national registry	Yes	
Conformity with data exchange standards (DES)		
Description of how the national registry conforms to the technical DES between registry systems	Yes	
Procedures for minimizing and handling of discrepancies		
Description of the procedures employed in the national registry to minimize discrepancies in the transaction of Kyoto Protocol units	Yes	
Description of the steps taken to terminate transactions where a discrepancy is notified and to correct problems in the event of a failure to terminate the transaction	Yes	
Prevention of unauthorized manipulations and operator error		
An overview of security measures employed in the national registry to prevent unauthorized manipulations and to prevent operator error	Yes	Covered in the IAR
An overview of how these measures are kept up to date	Yes	
User interface of the national registry		
A list of the information publicly accessible by means of the user interface to the national registry	Yes	Covered in the IAR
The Internet address of the interface to Finland's national registry	Yes	< http://www.paastokaupparekisteri.fi >
Integrity of data storage and recovery		
A description of measures taken to safeguard, maintain and recover data in order to ensure the integrity of data storage and the recovery of registry services in the event of a disaster	Yes	Covered in the IAR
Test results		
The results of any test procedures that might be available or developed with the aim of testing the performance, procedures and security measures of the national registry undertaken pursuant to the provisions of decision 19/CP.7 relating to the technical standards for data exchange between registry systems.	Yes	Covered in the IAR

^a The registry administrator, according to the information provided to the ERT during the in-country visit, is Mr. Jouko Hepola.

^b Finland states in its initial report "The Finnish national registry is currently linked to the other operational EU member states' national registries by way of the European Community CITL (Community Independent Transaction Log)."

^c Pursuant to decision 16/CP.10, once registry systems become operational, the administrator of the international transaction log (ITL) is requested to facilitate an interactive exercise, including with experts from Parties to the Kyoto Protocol not included in Annex I to the Convention, demonstrating the functioning of the ITL with other registry systems. The results of this exercise will be included in an independent assessment report (IAR). They will be also included in its annual report to the Conference of the Parties serving as the Meeting of the Parties to the Kyoto Protocol.

105. The ERT took note of the results of the technical assessment of the national registry, including the results of standardized testing, as reported in the independent assessment report that was forwarded to the ERT by the administrator of the international transaction log, pursuant to decision 16/CP.10, on 16 November, 2007. The IAR identified some minor issues concerning documentation, and the Party informed the ERT that it will rectify these issues before the registry is fully operational with the ITL, and not later than the end of 2007.

106. The ERT reiterated the main findings of this report, including that the registry has sufficiently fulfilled its obligations regarding conformity with the data exchange standards (DES). These obligations

include having adequate transaction procedures, adequate security measures to prevent and resolve unauthorized manipulations and adequate measures for data storage and registry recovery.

107. The IAR identified some minor limitations in the state of registry readiness, including the following: the evidence provided in support of the incident management process lacked examples of tracking and procedure documents; the evidence provided in support of the change management process is limited in regard to operational changes such as temporary unavailability of the registry system; the description explaining the implementation of time management is limited and lacks evidence of use; the documentation provided to explain the test plan was more a statement of criteria and not a full test plan which could be executed in order to produce the test results.

108. Based on the results of the technical assessment, as reported in the independent assessment report, the ERT concluded that Finland's national registry is sufficiently compliant with the registry requirements as defined by decisions 13/CMP.1 and 5/CMP.1, noting that registries do not have obligations regarding operational performance or public availability of information prior to the operational phase.

F. Land use, land-use change and forestry: parameters and election of activities

109. Table 6 shows the Party's choice of parameters for forest definition as well as its election of Article 3, paragraphs 3 and 4, activities in accordance with decision 16/CMP.1.

Table 6. Selection of LULUCF parameters

Parameters for forest definition		
Minimum tree cover	10%	
Minimum land area	0.5 ha	
Minimum tree height	5 m	
Elections for Article 3, paragraphs 3 and 4, activities		
Article 3, paragraph 3, activities	Election	Accounting period
Afforestation and reforestation	Mandatory	Commitment period
Deforestation	Mandatory	Commitment period
Article 3, paragraph 4, activities		
Forest land management	Elected	Commitment period
Cropland management	Not elected	Not applicable
Grazing land management	Not elected	Not applicable
Revegetation	Not elected	Not applicable

110. The parameters chosen for the definition of forest are within the agreed values in decision 16/CMP.1 and are consistent with what Finland has reported to the Food and Agriculture Organization of the United Nations (FAO). During the review, the ERT was informed that Finland has reported data to the FAO using a minimum area of 0.5 ha for northern Finland and 0.25 ha for southern Finland. The choice of 0.5 ha is consistent with the FAO reporting to the extent possible. For the purposes of reporting under the Kyoto Protocol, the areas reported using 0.25 ha will be converted to 0.5 ha. The ERT encourages Finland to maintain consistency in its representation of the minimum land area that will be used for its Kyoto Protocol reporting since 1990.

111. Temporarily un-stocked forest areas are included in the definition of forest in the initial report. Furthermore, Finland includes a 20-metre minimum forest width in the definition of forest, which is consistent with its current reporting to the FAO as a part of its national forest data.

112. The ERT noted that the initial report does not indicate that selected forest management activities have occurred since 1990 and are human-induced. In response to the ERT's question, Finland pointed out that all forests in the country are managed and, therefore, any changes are human-induced. The use of a combination of the IPCC good practice guidance for LULUCF reporting method 1 and data from periodic National Forest Inventories (NFIs) will allow Finland to meet the reporting requirements on consistent representation of units of land subject to forest management activities that occurred in 1990 and have occurred since.

III. Conclusions and recommendations

A. Conclusions

113. The ERT concluded that the information provided by Finland in the NIR and the CRF is complete and submitted in accordance with the relevant provisions of paragraphs 5, 6, 7 and 8 of the annex to decision 13/CMP.1, section I of the annex to decision 15/CMP.1, and the relevant decisions of the CMP.

114. The national system of Finland has been developed in accordance with the guidelines for national systems (decision 19/CMP.1) and can fulfil the requirements of the Kyoto Protocol as well as other obligations regarding its national GHG inventory preparation. The initial report describes all the mandatory elements of the national system.

115. Finland has submitted a complete set of CRF tables for the years 1990–2004 and an NIR which is complete in terms of geographical coverage, years and sectors, and complete in terms of categories and gases. During the in-country review, the Party and the ERT agreed on changes to be made to some categories in the energy and industrial processes sectors, and there was no need for adjustments. The GHG inventory for the base year in the NIR and the CRF is compiled in accordance with Article 7, paragraph 1, and decision 15/CMP.1.

116. In response to the inventory issues identified during the review, Finland submitted revised estimates of its base year inventory estimate of 71,003,509 tonnes CO₂ eq. and recalculated its assigned amount to be 355,017,545 tonnes CO₂ eq. Based on the revised estimates, Finland further calculated its commitment period reserve to be 319,515,790 tonnes CO₂ eq. The ERT agrees with these figures.

117. Finland's choice of parameters to define forest (minimum tree cover: 10 per cent; minimum land area: 0.5 ha; minimum tree height: 5 metres) is in accordance with decision 16/CMP.1. Finland has elected to account for forest management under Article 3, paragraph 4, of the Kyoto Protocol. Finland has also elected commitment period accounting for its Article 3, paragraphs 3 and 4, activities.

118. Based on the results of the in-country review visit and the technical assessment, as reported in the independent assessment report, the ERT concluded that Finland's national registry is sufficiently compliant with the registry requirements as defined by decisions 13/CMP.1 and 5/CMP.1.

B. Recommendations

119. In the course of the review, the ERT formulated a number of recommendations relating to the completeness and transparency of the information presented in Finland's initial report. The key recommendations³ are that Finland should:

³ For a complete list of recommendations, the relevant sections of this report should be consulted.

- Provide an annex to the NIR containing a summary of agreements on the responsibilities between the designated national entity (Statistics Finland) and the other national institutions involved in preparation of the inventory;
- Present more detailed documentation of its inventory estimates as well as its cross-checks and corrections of AD and emission estimates as part of the QA/QC system in the NIR;
- Improve archiving of the inventory calculations and other working files prepared at the category level to facilitate information exchange;
- Provide consistent land representation within its national borders as a part of its national system for inventory preparation under Article 5, paragraph 1, of the Kyoto Protocol;
- Rectify minor issues concerning documentation identified in the IAR before the national registry is fully operational with the ITL, and not later than the end of 2007.

120. The ERT further recommends the following cross-cutting areas for improvement:

- (a) Enhancement of the overall QA/QC system through strengthening cooperation between the institutions involved in preparing the inventory, inter alia, by the use of internal audits and quality checks for particular sectors and improving the systematic approach to the QA/QC system as a whole; and
- (b) Further elaboration of the completeness and overall consistency of the documentation in the NIR and the CRF, for example, by developing internal reporting guidelines on the level of detail to be provided, and for recording AD, emission trends and the parameters used at the sectoral level.

C. Questions of implementation

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

Annex I

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/>>.

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B. Additional information provided by the Party

Responses to questions during the review were received from Ms. Riita Pipatti, Ms. Pia Forsell, Mr. Kari Grönfors, Ms. Tuija Lapveteläinen, Ms. Leena Raittinen, Mr. Kai Skoglund, Mr. Teemu Oinonen (Statistics Finland) and Ms. Kristiina Regina and Ms. Paula Perala (MTT), Ms. Tarja Tuomainen and Mr. Timo Kareinen (METLA), including additional material on the methodology and assumptions used.

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Annex II**Acronyms and abbreviations**

AD	activity data
CH ₄	methane
CO ₂	carbon dioxide
CO ₂ eq.	carbon dioxide equivalent
CRF	common reporting format
EC	European Community
EF	emission factor
ERT	expert review team
EU	European Union
F-gas	fluorinated gas
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
GJ	gigajoule (1 GJ = 10 ⁹ joule)
HFCs	hydrofluorocarbons
IEA	International Energy Agency
IPCC	Intergovernmental Panel on Climate Change
kg	kilogram (1 kg = 1 thousand grams)
LULUCF	land use, land-use change and forestry
m ³	cubic metre
Mg	megagram (1 Mg = 1 tonne)
NA	not applicable
N ₂ O	nitrous oxide
NIR	national inventory report
PFCs	perfluorocarbons
QA/QC	quality assurance/quality control
SF ₆	sulphur hexafluoride
SO ₂	sulphur dioxide
TJ	terajoule (1 TJ = 10 ¹² joule)
UNFCCC	United Nations Framework Convention on Climate Change
