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Report of the individual review of the annual submission of Estonia 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. Executive summary

1. This report covers the in-country review of the 2009 annual submission of Estonia, coordinated by the UNFCCC secretariat, in accordance with decision 22/CMP.1. The review took place from 28 September to 4 October 2009 in Tallinn, Estonia, and was conducted by the following team of nominated experts from the UNFCCC roster of experts: generalist – Mr. Mario Contaldi (Italy); energy – Mr. Joost Huurman (Netherlands); industrial processes – Ms. Natalya Parasyuk (Ukraine); agriculture – Mr. Mahmoud Medany (Egypt); land use, land-use change and forestry (LULUCF) – Ms. Kathryn Bickel (United States of America); and waste – Ms. Tatiana Tugui (Republic of Moldova). Mr. Contaldi and Ms. Tugui were the lead reviewers. The review was coordinated by Ms. Ruta Bubniene (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 Estonia, which provided comments that were considered and incorporated, as appropriate, into this final version of the report.

3. In 2007, the main greenhouse gas (GHG) in Estonia was carbon dioxide (CO_2), accounting for 86.7 per cent of total GHG emissions[1] expressed in CO_2 eq, followed by methane (CH_4) (7.8 per cent) and nitrous oxide (N_2O) (4.8 per cent). Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6) collectively accounted for 0.7 per cent of the overall GHG emissions in the country. The energy sector accounted for 86.7 per cent of the total GHG emissions, followed by agriculture (6.1 per cent), industrial processes (4.1 per cent) and waste (3.2 per cent). Emissions from solvent and other product use have been reported as not applicable ("NA"). Total GHG emissions amounted to 22,018.68 Gg CO_2 eq and decreased by 47.5 per cent between the base year[2] and 2007. The trends for the different gases and sectors seem reasonable given Estonia's national circumstances and economic development.

4. Tables 1 and 2 show GHG emissions by gas and by sector, respectively. Table 1 includes emissions from Annex A sources only and excludes emissions and removals from the LULUCF sector.

5. The inventory is generally in line with the Intergovernmental Panel on Climate Change (IPCC) *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC good practice guidance), the IPCC *Good Practice Guidance for Land Use, Land-use Change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF) and the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Revised 1996 IPCC Guidelines). The completeness and transparency of the reporting could be improved.

6. Estonia's 2009 inventory submission covers most sectors and categories, but the expert review team (ERT) identified a need for further improvements in the following areas: identification of the land areas subject to afforestation, reforestation and deforestation; use of higher-tier methods to estimate emissions from key categories (such as CH_4 emissions from manure management); improvement of inventory completeness for all sectors (see paras. 53, 86, 87, 98, 113, 118 and 136 below); and improvement of the transparency (see paras. 119, 137 and 139 below) of the annual submission in general.

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

[2] "Base year" refers to the base year under the Kyoto Protocol, which is 1990 for CO_2, CH_4 and N_2O, and 1995 for HFCs, PFCs and SF_6. 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 1990–2007 (%)
	Base year[b]	1990	1995	2000	2005	2006	2007	
CO_2	37 283.48	37 283.48	18 165.83	15 555.63	16 847.86	16 341.13	19 093.24	–48.8
CH_4	2 726.35	2 726.35	1 675.95	1 713.77	1 721.35	1 723.09	1 724.31	–36.8
N_2O	1 925.60	1 925.60	992.92	1 036.16	948.31	974.74	1 055.36	–45.2
HFCs	25.70	NA, NO	25.70	70.79	118.70	139.53	144.73	463.2
PFCs	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	0.07	0.06	NA
SF_6	3.22	NA,NO	3.22	2.73	1.08	1.15	0.97	–70.0

Abbreviations: NA = not applicable, NO = not occurring.

[a] Total greenhouse gas emissions includes emissions from Annex A sources only (excludes emissions/removals from the LULUCF sector).

[b] "Base year" refers to the base year under the Kyoto Protocol, which is 1990 for CO_2, CH_4 and N_2O, and 1995 for HFCs, PFCs and SF_6. 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 1990–2007 (%)
	Base year[a]	1990	1995	2000	2005	2006	2007	
Energy	37 285.23	37 285.23	18 154.77	15 569.73	17 016.16	16 482.27	19 087.28	–48.8
Industrial processes	974.51	945.59	597.46	656.65	665.21	720.39	901.17	–7.5
Solvent and other product use	NA	NA	NA	NA	NA	NA	NA	NA
Agriculture	3 032.75	3 032.75	1 467.78	1 297.99	1 255.28	1 274.40	1 333.09	–56.0
LULUCF	NA	–6 368.09	–7 113.77	–1 459.02	–7 560.49	–8 934.11	–7 903.05	NA
Waste	671.87	671.87	643.60	854.73	700.65	702.66	697.14	3.8
Other	NA	NA	NA	NA	NA	NA	NA	NA
Total (with LULUCF)	NA	35 567.34	13 749.85	16 920.08	12 076.80	10 245.60	14 115.63	NA
Total (without LULUCF)	41 964.35	41 935.43	20 863.62	18 379.09	19 637.29	19 179.71	22 018.68	–47.5

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 CO_2, CH_4 and N_2O, and 1995 for HFCs, PFCs and SF_6. The base year emissions include emissions from Annex A sources only.

7. By supplying the additional information requested by the ERT during the in-country review, Estonia 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).

8. The Party 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 has not submitted on a voluntary basis information on activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, or information on the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol.

9. Estonia 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 standard electronic format (SEF) tables as required by decision 14/CMP.1.

10. The national system continues to perform its required functions as set out in the annex to decision 19/CMP.1; however, the ERT identified the following issues that will need to be addressed by the Party: the improvement of its archiving system; the further implementation of quality assurance/quality control (QA/QC) procedures and the strengthening of the continuity of the national system and of capacities to identify land-use areas subject to activities under Article 3, paragraph 3, of the Kyoto Protocol (see paras. 117 and 118 below).

11. 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 Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol (CMP) decisions.

12. In the course of the review, the ERT formulated a number of recommendations relating to the completeness and transparency of the annual submission, in relation to the energy (see paras. 51 and 53–56 below), industrial processes (see paras. 86 and 95), agriculture (see paras. 98–99, 104, 106 and 108–109 below), LULUCF (see paras. 113, 118–123, 125–126, 128–129 and 131) and waste (see paras. 137–139, 141, 143–147 and 150 below) sectors. In addition, the ERT encourages Estonia to explore the possibility of structuring its reporting, in its next annual submission, following the annotated outline of the national inventory report (NIR), and the guidance contained therein, that can be found on the UNFCCC website.[3]

II. Overview

A. Annual submission and other sources of information

13. The 2009 annual inventory submission was submitted on 15 April 2009; it contains a complete set of common reporting format (CRF) tables for the period 1990–2007, and an NIR. The Party also submitted information required under Article 7, paragraph 1, of the Kyoto Protocol, including: information on accounting of Kyoto Protocol units, and information on changes in the national system and in the national registry. The SEF tables were also submitted on 15 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.

[3] <http://unfccc.int/files/national_reports/annex_i_ghg_inventories/reporting_requirements/application/pdf/annotated_nir_outline.pdf>.

14. In response to questions raised by the ERT during the in-country review regarding the completeness of the Party's inventory and potential underestimations of its emissions, on 2 November 2009 Estonia submitted explanations and revised emission estimates (see para. 19 below). The revised estimates were noted by the ERT, and the review report refers to the estimates, which were originally reported in the 2009 submission. Where necessary, the ERT also used the previous years' submissions during the review.

15. In addition, the 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.[4]

16. During the review, Estonia provided the ERT with additional information. The documents concerned are not part of the annual submission but are in many cases referenced in the NIR. The full list of materials used during the review is provided in annex I to this report.

Completeness of the inventory

17. The inventory covers most source and sink categories for the period from the base year to 2007. It is complete in terms of years and geographic coverage, as required by the Revised 1996 IPCC Guidelines.

18. The ERT noted several improvements in the completeness of Estonia's inventory since the previous annual submission. In its 2009 submission, Estonia has reported actual emissions of fluorinated gases (F-gases) for the period from 1995 (the base year for F-gases) to 2007, which the ERT considers to be a remarkable achievement. Estonia has also reported emissions from several other categories for the first time in its 2009 submission, such as CH_4 and N_2O emissions from some categories under field burning of agricultural residues, and CO_2 emissions from organic soils under cropland remaining cropland and grassland remaining grassland. Furthermore, the estimates of emissions from the industrial processes and agriculture sectors have been improved and reported more completely, in comparison with in the Party's previous inventory submission. However, some categories were still missing from the inventory: for example, emissions from glass production, solvent and other product use, and iron and steel production; direct and indirect N_2O emissions from organic soils; and emissions from industrial, domestic and commercial wastewater have been reported as not estimated ("NE").

19. During the review, Estonia provided explanations or revised estimates for the following emissions, which were reported as "NE", not applicable ("NA") or not occurring ("NO") in the inventory but which may actually occur in the country: CO_2, CH_4 and N_2O emissions from other fuels, under public electricity and heat production (see para. 49 below); CO_2, CH_4 and N_2O emissions from the category other (manufacturing industries and construction) (see para. 53 below); CH_4 and N_2O emissions from biogas from wastewater treatment plants and landfill gas (see para. 49 below); CO_2 emissions from glass production and CO_2, CH_4 and N_2O emissions from iron and steel production (see para. 86 below); CO_2 emissions from limestone and dolomite use and CO_2 emissions from soda ash production and use (see para. 87 below); emissions from solvent and other product use (see para. 88 below); CH_4 and N_2O emissions from dry beans and CH_4 and N_2O emissions from the category other (field burning of

[4] The SIAR, Parts I and II, is prepared by an independent assessor in line with decision 16/CP.10 (paras. 5 (a), 6 (c) and 6 (k)), under the auspices of the international transaction log 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.

agricultural residues) (see para. 98 below); and emissions and removals from biomass for specific land-use transitions, such as cropland converted to forest land (see para. 115 below).

20. Estonia also provided explanations for its apparent underestimation of the following emissions: CH_4 and N_2O emissions from the use of oil shale and oil shale gas (see paras. 77 and 79 below); CH_4 and N_2O emissions from semi-coke use (see para. 51 below); CO_2, CH_4 and N_2O emissions from combustion of natural gas for energy use at the country's ammonia production plant (see para. 52 below); CO_2 emissions from gasoline used in road transportation, CH_4 and N_2O emissions from liquefied petroleum gas (LPG) and CH_4 emissions from coal and coke (see para. 4759 below); CO_2, CH_4 and N_2O emissions from fuel used in fishing (see para. 74 below); CO_2, CH_4 and N_2O emissions from fuel used by the navy or air force (see para. 7668 below); CO_2 emissions from ammonia production (see para. 95 below); CH_4 emissions from management of cattle manure (see para. 106 below); CH_4 and N_2O emissions from wastewater handling (see para. 146 below); and CH_4 and N_2O emissions from industrial wastewater, and domestic and commercial wastewater (see para. 136 below).

21. The ERT recommends that Estonia improve the completeness of its inventory by its next annual submission, especially by estimating emissions from those categories in which emissions are known to occur in the country and for which methodologies to estimate emissions are available in the IPCC good practice guidance and the Revised 1996 IPCC Guidelines. The ERT encourages the Party to explore approaches available in the scientific literature, to estimate emissions for categories that do not have methodologies prescribed in the Revised 1996 IPCC Guidelines or the IPCC good practice guidance, with a view to enhancing further, to the extent possible, the completeness and accuracy of its inventory. The ERT also recommends that the Party, when reporting data on emissions for a given category for the first time, ensure that these data are provided for the entire time series and that the rationale for the choice of methods, emission factors (EFs) and other parameters is clearly explained in the NIR.

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

1. Overview

22. The ERT concluded that the national system continued to perform its required functions.

23. During the in-country review, Estonia explained the institutional arrangements for the preparation of the inventory. The Ministry of the Environment (MoE) has overall responsibility for the preparation and management of the national GHG inventory, while the Estonian Environment Information Centre (EEIC), directly supervised by MoE, compiles the inventory. Other organizations (Tallinn Technical University (TTU) and Estonian Environmental Research Centre) are also involved in the preparation of the inventory which are commissioned through tender procedures for work in relation to the different inventory sectors. The Party further described the changes in the institutional arrangements since the previous annual submission, in particular that the responsibility for compiling the inventory for the waste sector will probably be shifted to the Estonian Environmental Research Centre and that additional expertise is expected in the EEIC for the compilation of the LULUCF inventory.

2. Inventory planning

24. Estonia's national system has generally been prepared in accordance with the requirements of national systems under Article 5, paragraph 1, of the Kyoto Protocol (decision 19/CMP.1). The ERT found that the responsibility for preparing the inventory is distributed among a few institutions and experts, some of them involved through a tender procedure. The relatively short duration of the contracts (one year) creates uncertainty if improvements identified by the Party and the ERT to be made to the inventory estimates are not implemented in a systematic way.

25. Estonia has elected to report on activities under Article 3, paragraph 3, of the Kyoto Protocol on the basis of accounting performed at the end of the commitment period. However, information on afforestation, deforestation and reforestation should be reported in the Party's next annual submission in 2010. The ERT has strong concerns about the readiness of Estonia's national system to carry out the necessary work to meet these reporting requirements. There is a need to develop institutional relationships and initiate the development of the required data on land areas.

26. The ERT noted that the inventory benefits, in terms of its quality, from the established good inter-institutional relationships between the inventory compiler and data providers from the governmental institutions and private industry, resulting, for example, in the availability of detailed data directly from operators and in access to confidential data. The availability of detailed background data should allow for the implementation of higher-tier methods for estimating emissions from key categories and is a positive aspect of Estonia's national system. However, such higher-tier methods have not yet been implemented for all key categories; therefore, the ERT recommends that the Party use those valuable sources of data to improve the estimation methods used.

3. Inventory preparation

Key categories

27. Estonia has reported a key category tier 1 analysis, both level and trend assessment, as part of its 2009 submission. The key category analysis performed by the Party and that performed by the secretariat[5] produced similar results. Estonia 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.

28. The ERT found that the Party does not use the results of its key category analysis as a driving factor for setting priorities for improving the quality of its inventory, particularly with regard to the prioritization of resources and the selection of methodologies. Therefore, the ERT encourages Estonia to use the results of its key category analysis to streamline planned improvements of the inventory.

Uncertainties

29. Estonia has provided a tier 1 uncertainty analysis in its 2009 annual submission. The information provided on uncertainties is in line with the UNFCCC reporting guidelines and the IPCC good practice guidance. Information on the uncertainty of each category has been reported in the relevant chapters of the Party's NIR. Uncertainty estimates are provided in the inventory including and excluding LULUCF. Combined GHG inventory uncertainty in 2007 was 8.2 per cent, which is higher than that estimated in the 2008 submission for 2006 (6.5 per cent). Estonia does not use the results of its uncertainty analysis to prioritize improvements to the inventory. Therefore, the ERT encourages Estonia to do so.

Recalculations and time-series consistency

30. Recalculations have been performed and reported in accordance with the IPCC good practice guidance. The ERT noted that recalculations of the time series 1990–2006 have been undertaken to take into account changes in the energy, industrial processes and LULUCF sectors, leading to the improvement of the inventory. The total effect of these recalculations on the estimates for 2006 was a

[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.

1.6 per cent increase in the estimate of total emissions excluding LULUCF, and a 33.5 per cent decrease in the estimate of total emissions including LULUCF.

31. The major changes, referred to in paragraph 30 above, include: the inclusion of estimates for emissions of F-gases (see para. 85 below) and for emissions/removals from a number of LULUCF categories (see para. 121 below) for the first time. However, the rationale for these recalculations has been only partially explained in the NIR and the CRF table 8 (b), although it was explained by the Estonian experts during the in-country review. The ERT recommends that Estonia provide explanations for the recalculations in its next annual submission.

Verification and quality assurance/quality control approaches

32. Estonia has elaborated and updated its QA/QC plan during 2009 within the framework of the twinning project "Improving the Quality of Estonia's National Greenhouse Gas Inventory". The QA/QC plan was provided to the ERT during the in-country review. During the review, the ERT also had an opportunity to discuss the current practice and planned improvements to the QA/QC procedures with the Party's QA expert.

33. Estonia has elaborated an improved QA/QC plan in accordance with the IPCC good practice guidance. This updated plan includes: general QC procedures (tier 1); source/sink category-specific procedures (tier 2) for key categories and where significant changes in data have occurred; the identification of the QA/QC coordinator; and procedures for the review of the inventory by staff who have not been involved in the preparation process, and procedures for the post-submission review.

34. During the review the ERT found that AD for many categories (including the key categories) fluctuated throughout the time series, which may indicate possible input or calculation errors. According to the IPCC good practice guidance, it is good practice to compare emissions from each category with emissions previously reported for the same category or against historical trends and reference calculations. The ERT noted that Estonia did not follow this provision of the IPCC good practice guidance when estimating emissions using highly volatile data, in particular for the following categories: direct N_2O emissions from agricultural soils, emissions from solid waste disposal on land and waste incineration, and emissions from consumption of gas and liquid fuel from the subcategory commercial/institutional. The ERT recommends that Estonia allocate sufficient effort and resources to improving the time-series consistency of its key categories and provide more comprehensive explanations for the fluctuation throughout the time series of some of its emission estimates, in the relevant sectoral chapters of its NIR.

Transparency

35. The Party's NIR provides much of the information necessary to assess the inventory. Additional information is necessary to improve the transparency of the NIR, such as explanations for any large variations in trends in AD (e.g. regarding direct N_2O emissions from agricultural soils, CH_4 and N_2O emissions from solid waste disposal on land and waste incineration, and consumption of gas and liquid from the subcategory commercial/institutional). Also, the consistency of the information in the NIR with that in the CRF tables could be improved, by reporting more consistently the methods and EFs used in the energy sector and the AD used in the industrial processes sector. The ERT recommends that Estonia improve the consistency of the information presented in the CRF tables with that in the NIR, provide references for the EFs used and explain in the NIR trends in AD that were previously not reported.

4. Inventory management

36. Estonia has an archive at a central location – EEIC. EEIC, the inventory compiler, keeps records and stores information related to the inventory, including AD, EFs and methodologies, in electronic

format on its servers. The information is backed up daily. 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 planned inventory improvements. The sectoral inventory experts keep relevant information available in hard copy and in electronic format, including information on disaggregated EFs and AD, and documentation on how these factors and data have been generated and aggregated for the preparation of the inventory.

37. Estonia was able to provide the archived documents requested during the review; however, the ERT found that the centralized archiving system is not well structured and stores insufficient information on methods, EFs and sources of information. The ERT recommends that Estonia improve its centralized archiving system, with the aim of ensuring the quality of its inventory for the entire commitment period by storing the background data, documentation on methods, EFs, AD and calculation sheets at the central location.

C. Follow-up to previous reviews

38. Estonia has significantly improved its inventory in the 2009 annual submission by following some recommendations of previous ERTs, particularly in relation to estimating emissions of F-gases, reporting on more LULUCF categories and revising the AD used in the industrial processes sector.

39. However, there are still some pending issues with regard to recommendations made in previous review reports that have not been implemented, in particular that Estonia:

(a) Improve the description of its methodologies for estimating emissions, especially with regard to country-specific methods;

(b) Provide detailed explanations and analyses of the key drivers for the emission trends, by sector and by gas, in particular explaining the fluctuating trend in fuel consumption from residential and manufacturing industries and construction;

(c) Improve the completeness of its inventory by, among other things, providing emission estimates for categories in the LULUCF and solvent and other product use sectors, for military fuel use and for field burning of agricultural residues;

(d) Ensure the time-series consistency and provide sufficient explanation of the fluctuations of the background data, such as data on animal populations, and of its emission estimates where highly volatile data are used in the calculations, by improving its statistical database.

D. Areas for further improvement

1. Identified by the Party

40. The 2009 NIR identifies several areas for improvement at category-specific level, and reports Estonia's intention to implement the recommendations stemming from the twinning project referred to in paragraph 32 above. This project focused on all sectors of the inventory with the exception of F-gases, which were covered by another project implemented together with experts from Germany.

41. During the review, the ERT was informed that this project has nearly been completed, in cooperation with the twinning partner Finland. The results of the project, namely a needs assessment and recommendations with regard to improvements for each sector and the revision of the QA/QC plan, were made available to the ERT. Estonia indicated that it is working to improve its emission estimates following the recommendations of this project, which include:

(a) The strengthening of the implementation of the newly prepared QA/QC plan;

(b) The estimation of emissions from glass production and steel production and from other minor sources in the production of construction material, having sought the relevant information;

(c) The completion of its reporting of the parameters under Article 3, paragraph 3, of the Kyoto Protocol, and of the relevant categories in the LULUCF sector;

(d) The development of country-specific EFs for some key categories, such as CH_4 emissions from manure management.

2. Identified by the expert review team

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

(a) The strengthening of the national system and of the sustainability of institutional arrangements, with the aim of building capacity and ensuring the quality of the inventory for the entire commitment period;

(b) The development of the archiving system by classifying the background data, documentation on methods, EFs, AD and calculation sheets at the central location;

(c) The strengthening of the implementation of the QA/QC plan and verification procedures;

(d) The upgrading of the tier 1 methods used to estimate emissions from key categories to a higher tier, and the development and use of country-specific EFs to estimate emissions from key categories (e.g. for CH_4 and N_2O emissions from manure management);

(e) The allocation of efforts to identify land areas subject to afforestation, reforestation and deforestation, in order to facilitate the meeting of reporting requirements under Article 3, paragraph 3, of the Kyoto Protocol.

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

III. Energy

A. Sector overview

44. The energy sector is the main sector in the GHG inventory of Estonia. In 2007, emissions from the energy sector amounted to 19,087.28 Gg CO_2 eq, or 86.7 per cent of total GHG emissions. Since the base year, emissions have decreased by 48.8 per cent. The key driver for the fall in emissions is the transition from a planned to a market economy. In contrast, from 2006 to 2007 the sectoral emissions increased by 15.8 per cent. The most important drivers for this increase were the increases in electricity production and cement production, with a corresponding growth in fuel use and emissions.

45. Within the sector, 75.8 per cent of the emissions were from energy industries, followed by 13.7 per cent from transport, 5.2 per cent from manufacturing industries and construction, and 2.5 per cent from other sectors. Fugitive emissions from oil and natural gas accounted for 2.7 per cent of the sectoral emissions. CO_2 was the most important GHG in this sector, contributing 96.1 per cent of the total energy-related emissions, while CH_4 and N_2O contributed 3.4 per cent and 0.6 per cent of the sectoral emissions, respectively.

46. Solid fuel, mostly oil shale, is the most important fuel type in Estonia, contributing 56.8 per cent of the emissions from fuel combustion in the energy sector. Liquid fuels, gaseous fuels and biomass contributed 19.3, 14.0 and 9.9 per cent, respectively, of the emissions from fuel combustion. No other fuels have been reported on in the CRF tables.

47. In several cases Estonia used IPCC default EFs to calculate emissions from key categories, including: CO_2 emissions from coal in the subcategory other (manufacturing industries and construction); CO_2 emissions from diesel oil, residual fuel oil and other kerosene combustion under public electricity and heat production; CO_2 emissions from natural gas combustion under public electricity and heat production; CO_2 emissions from natural gas in the subcategory commercial/institutional; CO_2 emissions from gasoline in the subcategory road transportation; and CO_2 emissions from gasoline in the subcategory other transportation. Since these are all key categories and it is good practice to estimate key categories using a higher-tier method taking into account the national circumstances, the ERT recommends that Estonia develop and use country-specific EFs or provide an explanation as to why the default EFs better suit the national circumstances of Estonia.

48. Emissions stemming from national military services have been included in different categories: emissions from stationary sources have been reported under commercial/institutional, while emissions from road vehicles have been reported under road transportation. It is not clear whether emissions from the navy and air force were estimated. The ERT encourages Estonia to analyse the fuel use by the military and improve the inventory accordingly, by reallocating emissions from fuel use in military services to the category other (1.A.5) and describing in more detail the rationale behind the above-mentioned split of emissions.

1. Completeness

49. Emissions from the energy sector have been reported for all years of the time series and for all geographical locations. The CRF tables include emission estimates of most categories, gases and fuel use from the energy sector, as recommended by the Revised 1996 IPCC Guidelines. Estonia has not used the notation key "NE". However, the ERT noted the omission of emissions of CH_4 and N_2O from: the combustion of shale oil gas and oil shale (for gaseous and solid fuels under public electricity and heat production); the use of waste fuels under public electricity and heat production; the use of biogas from wastewater treatment plants; and the use of landfill gas.

50. During the review, Estonia noted that currently only emissions from solid fuels are reported under public electricity and heat production Estonia also noted that, in its 2009 inventory submission, biogas was included in the reference approach but not in the sectoral approach, and that it intends to include CH_4 and N_2O emissions from biogas in the sectoral approach under public electricity and heat production in its next annual submission. The ERT commends Estonia on these planned improvements.

51. In addition, the ERT noted that CH_4 and N_2O emissions from the use of semi-coke in petroleum refining were "NE" owing to a lack of EFs. During the review, Estonia informed the ERT of its intention to use CH_4 (1 kg CH_4/TJ) and N_2O (1.5 kg N_2O/TJ) EFs for coke oven coke for its calculations of CH_4 and N_2O emissions from oil shale semi-coke combustion. In addition, Estonia noted its intention to develop country-specific CH_4 and N_2O EFs for oil shale semi-coke. The ERT recommends that Estonia develop such country-specific EFs and include them in its inventory.

52. Estonia did not take into account the amount of natural gas used (and the corresponding CO_2, CH_4 and N_2O emissions) in the production of ammonia for combustion purposes, and has reported all fuel use as feedstock. During the review, Estonia provided the ERT with new information and expressed its intention to revise the AD and calculate and include estimates of these emissions in its next annual submission. The ERT commends Estonia for this intention.

53. The ERT recommends that Estonia assess the quantity and rational for natural gas used and report the corresponding emissions in its next annual submission in the energy sector. The ERT noted cases where activities and emissions that do occur in the country have been reported as "NO". For example, Estonia has reported other fuel use and emissions from the category other (manufacturing industries and construction) as "NO". However, during the review the ERT received information on the use of oil shale fusses and waste oil in the cement industry. Estonia noted its intention to estimate emissions from combustion of waste oils (used as fuel in the cement industry) and allocate these emissions to the category referred to above. The ERT recommends that Estonia collect data on this fuel use, calculate the corresponding emissions, and report them in its next annual submission.

2. Transparency

54. The ERT noted a lack of explanations for the emission trends in the energy sector, in the Party's NIR. The emissions from many categories in this sector fluctuate throughout the time series, for example CO_2 emissions from natural gas use under commercial/institutional. The ERT recommends that Estonia explain the main sectoral emission trends and the drivers behind them in its next annual submission.

55. The notation keys have not been used consistently for all categories in the energy sector; for example, CO_2 emissions from other fuels from non-ferrous metals have been reported as "NA", whereas the AD have been reported as "NO". In addition, not all EFs used have been included in the NIR, and background data on country-specific EFs have not been elaborated in detail in the NIR. The ERT recommends that Estonia improve its use of the notation keys and provide more explanation of the country-specific EFs, in its next annual submission.

56. The ERT noted inconsistencies between the CRF tables and the NIR. The EFs used in the estimation of CH_4 and N_2O emissions from liquid fuels for other transportation (5.18 kg/TJ for CH_4 and 0.6 kg/TJ for N_2O) reported in the CRF tables are different from those reported in the NIR (0.5 kg/TJ for CH_4 and 2 kg/TJ for N_2O). As the Party explained during the review, the EFs reported in the NIR are the correct ones. The ERT recommends that Estonia revise the emission estimates using the correct EFs in its next annual submission.

57. The ERT welcomes the provision, during the review, of the calculation sheets for emissions from the energy sector but notes their lack of transparency and vulnerability to errors. The ERT encourages Estonia to improve these calculation sheets, specifically in terms of their security, archiving and transparency. The ERT was notified of ongoing improvements and commends Estonia for its efforts.

3. Recalculations and time-series consistency

58. The ERT noted that Estonia had undertaken several recalculations in the energy sector for the period from the base year to 2006. These recalculations occurred owing to: the yearly update of energy statistics; the introduction of a new CO_2 EF for oil shale gas; a methodological change in the calculation of CO_2 emissions from shale oil production; and the removal of CH_4 emissions from surface mining. These recalculations resulted in an increase of the estimate of the sectoral emissions by 1.0 per cent (from 16.310.97 Gg CO_2 eq to 16,482.27 Gg CO_2 eq for 2006 and by 1.5 per cent (from 36.742.15 Gg CO_2 eq to 37.285.23 Gg CO_2 eq for 1990.

59. During the review, Estonia noted its intention to recalculate CO_2 emissions from gasoline using the Lithuanian gasoline CO_2 EF (73 kg CO_2/TJ); to calculate CH_4 and N_2O emissions from LPG using the default EF for CH_4 (1 kg CH_4/TJ) and for N_2O (0.1 kg N_2O/TJ) from the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the 2006 IPCC Guidelines); and to recalculate CH_4 emissions from coke and coal in residential using the correct EFs (the CH_4 EF for coal being 300 kg CH_4/TJ and for coke being 200 kg CH_4/TJ), in its next annual submission. The ERT

commends Estonia on this intention and encourages the Party to provide sufficient explanations for these recalculations in its next annual submission.

4. Uncertainties

60. Estonia applied different uncertainty estimation methods for the AD for CO_2 emissions from all categories and for AD for the other gases. For CO_2, a country-specific uncertainty value was used and for the other gases an IPCC default value. The uncertainty analysis is not used to prioritize improvements to the quality of the emission estimates in the energy sector. The ERT encourages Estonia use a country-specific value for the uncertainty of all gases and use the results of its uncertainty analysis to prioritize improvements to the energy sector of its inventory.

5. Verification and quality assurance/quality control approaches

61. During the review, the ERT learned that data from the European Union emissions trading scheme (EU ETS) are not yet being used for verification purposes. Since EU ETS covers the majority of the installations in the energy sector, the ERT encourages Estonia to use the EU ETS data to verify its CO_2 emission estimates. Estonia may wish to ensure that not only the inventory compilers but also the staff involved from Statistics Estonia have access to these data, in order to facilitate the QC of the data.

62. During the review, the ERT noted that there was no formalized cooperation between the different sectoral experts. It is advisable to share knowledge on the development of AD and emission estimates in order to ensure completeness and consistency in trends, especially between the energy and industrial processes sectors and the energy and waste sectors.

B. Reference and sectoral approaches

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

63. The difference in the estimate of CO_2 emissions calculated using the reference and the sectoral approaches is 0.82 per cent in 2007. In previous years, the difference was less than 2.0 per cent. However, at the level of the individual fuels there are major differences. The ERT encourages Estonia to include explanations for these differences, for example the substantial conversion from solid to liquid fuels in the oil shale industry, in its next annual submission.

64. There are some minor differences between the data reported to the International Energy Agency and those reported in the CRF tables. The ERT recommends that Estonia analyse the reasons for these differences and report them in its next annual submission.

65. The EF and net calorific value (NCV) for semi-coke (which has been reported as coke oven coke) used in the reference approach are different from those used in the sectoral approach. The EF used in the sectoral approach takes into account the amount of carbon remaining in the ash, thus it is not good practice to use it in the reference approach. The ERT recommends that Estonia use the country-specific NCV and calculate a country-specific EF for semi-coke, based on its carbon content, for use in the reference approach.

2. International bunker fuels

66. The Party's NIR does not include the methodology used to distinguish between domestic and international fuel use. The only explanation given in the NIR is that AD from Statistics Estonia were used. During the review, Estonia explained that the sample survey carried out annually by Statistics Estonia specifically requests respondents to distinguish between fuel used for domestic and international purposes. The ERT recommends that Estonia elaborate on this explanation in its next annual submission.

67. The fuel used by deep-sea fishing vessels has been reported as international bunker fuel. However, it is good practice to report it under agriculture/forestry/fisheries and include it in the national GHG emission total. The ERT recommends that Estonia reallocate the fuel used and the relevant emissions, in its next annual submission.

68. During the review the ERT noted that fuel used for fishing and military vessels might have been included under CO_2 emissions from navigation. Estonia informed the ERT of its intention to analyse whether emissions from fuel used by the navy/air force may have been partly included under international bunkers and to revise the relevant emission estimates in its next annual submission, if data are available. The ERT commends Estonia on its intention to analyse the fuel use in this category and reallocate the emissions accordingly.

3. Feedstocks and non-energy use of fuels

69. Estonia has reported natural gas used as feedstock for ammonia production. The reported amount, however, was actually the total amount of natural gas used for ammonia production and not just that used as feedstock. Estonia applied the IPCC default carbon storage factor (0.33), whereas a carbon storage factor equal to zero would be more appropriate since there is no carbon stored permanently in the products. The ERT recommends that Estonia report the revised amount of natural gas used as feedstock and use the appropriate carbon storage factor in its next annual submission.

70. In the reference approach, carbon storage from peat has been reported, but it has not been included under feedstocks. Also, oil shale has been reported as feedstock. The ERT recommends that Estonia provide an explanation for its reporting of peat and oil shale as feedstock in its next annual submission.

4. Country-specific issues

71. Oil shale is the most important fuel in Estonia. Since this fuel is relatively uncommon among the reporting Parties, the ERT recommends that Estonia include a more comprehensive specification of oil shale use, its characteristics and the calculation of emissions from it in its next annual submission.

C. Key categories

1. Stationary combustion: solid fuels – CO_2

72. CO_2 emissions from solid fuels under public electricity and heat production increased by 25.0 per cent in the period 2006–2007. The NIR does not provide an explanation for this increase. During the review, Estonia explained that this increase was caused by an increase in the production and export of electricity. The ERT recommends that Estonia include a description of the significant drivers for this trend in its next annual submission.

73. Estonia has reported fuel use for and CO_2 emissions from shale oil production under petroleum refining. Since the feedstock, oil shale, is a solid fuel, these emissions should be reported under the category other energy industries. The calculation of these emissions has not been transparently documented in the NIR. Noting that the production of shale oil from oil shale is a unique process, the ERT recommends that Estonia provide a more detailed description of its methodology for calculating the emissions from this process in its next annual submission.

2. Stationary combustion: liquid fuels – CO_2, CH_4 and N_2O

74. The ERT noted that CO_2, CH_4 and N_2O emissions[6] from fuel used in fishing seem to have been partly included under international bunkers, and thus excluded from the national emission total. The ERT recommends that Estonia analyses whether a proportion of the fuel used for fishing (in particular, for deep-sea fishing in the ocean) has been included under international bunkers, and revise the corresponding emissions and report them under agriculture/forestry/fisheries, if appropriate. During the review, Estonia noted its intention to carry out such as analysis and, if data are available, report the relevant emissions in its next annual submission. The ERT recommends that Estonia better document in its NIR the statistical data for fishing and for international bunkers, and report the relevant emissions accordingly.

3. Stationary combustion: gaseous fuels – CO_2

75. Estonia's CO_2 EF (67.23 t/TJ) for combustion of gaseous fuels under public electricity and heat production is the highest among all of the reporting Parties (54.62–67.23 t/TJ). This is, as explained by the Party, due to the inclusion of oil shale gas as fuel in this category. Since oil shale gas is a gas converted from solid fuel, the ERT recommends that Estonia reallocate and report this fuel and the relevant emissions under solid fuels in its next annual submission.

4. Navigation: liquid fuels – CO_2

76. The Party's NIR does not provide sufficient explanation of the separation of fuel used for domestic and international transport. The ERT recommends that Estonia include a more detailed explanation of this in its next annual submission. The trend in the fuel used for navigation fluctuates, especially in the early 1990s. During the review, Estonia explained that there was an error in the AD and that it intends to revise these data in its next annual submission.

D. Non-key categories

1. Stationary combustion: solid fuels – CH_4 and N_2O

77. CH_4 and N_2O emissions from oil shale use were not estimated and insufficient background documentation has been provided to support this. During the review, Estonia informed the ERT that the N_2O emissions from pulverized combustion of oil shale were almost negligible because of the high combustion temperature, and that those from the circulating fluidized bed combustion (CFBC) device were measured to be 0–2 ppm (or 0–1.46 kg N_2O/TJ). Estonia intends to use an N_2O EF equal to an average value of 0.82 kg N_2O/TJ for the oil shale used in the CFBC device and report this and the corresponding emissions in its next annual submission. The ERT commends Estonia's efforts and encourages the Party to follow up on its intention to report these emissions and to provide sufficient documentation on the EF used, in its next annual submission.

78. In addition, Estonia explained during the review that CH_4 is emitted in small quantities from fuel combustion owing to the incomplete combustion of hydrocarbons in the fuel. The level of the CH_4 emissions depends on the temperature in the boiler. On the basis of the emission measurements performed by the Eesti Power Plant, it was concluded that the combustion temperature is very high and that the rate of CH_4 emission is near zero.[7] The ERT recommends that Estonia provide additional background documentation on this methodological choice in its next annual submission.

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[6] Not all emissions under this category are identified as key categories, particularly CH_4 and N_2O emissions. However, since the calculation procedures for and issues related to this category are discussed as a whole, the individual gases are not assessed in separate sections.

[7] TTU. 2004. *Emission measurements of the Eesti Power Plant*. Report No 00402. (In Estonian).

2. Stationary combustion: gaseous fuels – CH_4 and N_2O

79. CH_4 and N_2O emissions from use of oil shale gas were reported as "NE" owing to the lack of EFs. During the review, the ERT learned of Estonia's intention to use the CH_4 (1 kg CH_4/TJ) and N_2O (0.1 kg N_2O/TJ) EFs for coke oven gas to calculate CH_4 and N_2O emissions from combustion of oil shale gas, and that it intends to develop country-specific EFs in the future. The ERT recommends that Estonia develop these country-specific EFs and calculate CH_4 and N_2O emissions from use of oil shale gas for its next annual submission.

3. Other transportation: liquid fuels – CO_2, CH_4 and N_2O

80. The ERT noted that Estonia has included the fuel used by off-road vehicles used in agriculture, and the corresponding emissions, under the category other transportation (1.A.3.e). According to the Revised 1996 IPCC Guidelines, these emissions should be reported under the agriculture/forestry/fisheries (1.A.4. c) sector. Therefore, the ERT recommends that Estonia reallocate these emissions within the energy sector.

4. Fugitive emissions from solid fuels: coal mining and handling – CH_4

81. In all of its inventories until the 2009 annual submission, Estonia reported CH_4 emissions from surface mining and underground mining of oil shale, which amounted to 262.08 Gg CO_2 eq in 2006. In its 2009 annual submission, the NIR reports that, according to the judgment of an expert from TTU, no CH_4 emissions occur from the mining of oil shale, since oil shale is located very close to the surface and all CH_4 has already been emitted. No documentation of the research or reasoning behind this assumption has been provided. As a consequence, Estonia has removed these emissions from its inventory. The ERT, taking into account the fact that all other forms of surface mining by other Parties are reported to emit CH_4 emissions, recommends that Estonia provide sufficient documentation to prove the non-occurrence of these emissions, or estimate the emissions and include them in its next annual submission.

5. Fugitive emissions from oil, natural gas and other sources – CH_4

82. Estonia has reported emissions from oil production under this category. During the review, the ERT noted that the production reported under this category was the production of shale oil from oil shale. Since the emissions from that process have already been included under fuel combustion in petroleum refining, including these emissions under this category leads to double-counting. The ERT recommends that Estonia remove CH_4 emissions from shale oil production from oil shale under this category and that it report oil production as "NO" in its next annual submission.

E. Areas for further improvement

Identified by the Party

83. Estonia is planning to introduce a model to calculate CO_2 emissions from road transportation (the COPERT IV model). The ERT noted that, as CO_2 emissions from road transportation is a key category, it is good practice to use country-specific EFs derived from the carbon content of the fuel used in the country. Also, Estonia is planning to use information on take-off and landing cycles to estimate CH_4 and N_2O emissions from domestic aviation.

IV. Industrial processes and solvent and other product use

A. Sector overview

84. In 2007, emissions from the industrial processes sector amounted to 901.17 Gg CO_2 eq, or 4.1 per cent of total GHG emissions. Emissions from solvent and other product use have been reported as

"NA" for the entire time series. Since the base year, emissions have decreased by 7.5 per cent in the industrial processes sector. The key driver for this fall in emissions is the decrease in cement and ammonia production, owing to the transition from a planned to a market economy. Within the industrial processes sector, 70.0 per cent of the emissions were from mineral products, followed by 16.2 per cent from consumption of halocarbons and SF_6, and 13.8 per cent from chemical industry.

85. The main difference between Estonia's 2008 and 2009 inventory submissions, in relation to the industrial processes sector, is the inclusion of emission estimates for F-gases, calculated using the bottom-up approach. The estimates were a result of a twinning project entitled "Enhancing the capacity to reduce the emissions of fluorinated GHG in Estonia" (twinning partner Germany), which was carried out in Estonia in the period 2007–2008. The ERT commends Estonia for the inclusion of these estimates and recommends that the Party continue to estimate these emissions in its next annual submission.

Completeness

86. The CRF tables include estimates of most gases and categories of emissions from the industrial processes sector, as recommended by the Revised 1996 IPCC Guidelines. Categories and gases reported as "NE" by Estonia include: CO_2 emissions from glass production; and CO_2, CH_4 and N_2O emissions from iron and steel production. The NIR mentions that the occurrence of glass, iron and steel production in the country was under investigation. During the review, Estonia noted that no production of iron and steel has been identified in the country. One glass-producing company has been identified and data collection has started. Estonia also noted its intention to present the results of these investigations in its next annual inventory submission. The ERT recommends that Estonia include estimates of emissions in its next annual submission from categories for which methodologies are available in the Revised 1996 IPCC Guidelines and the IPCC good practice guidance.

87. Several activities that have been reported as "NO" or "NA" by the Party apparently do occur in the country. The ERT was informed during the review that CO_2 emissions from limestone and dolomite use, soda ash production and soda ash use, and N_2O and non-methane volatile organic compound emissions from solvent and other product use were also under investigation. The investigation of these categories was recommended by the twinning project entitled "Improving the Quality of Estonia's National Greenhouse Gas Inventory", which was carried out in Estonia in 2009. Two companies (besides cement, lime and glass production companies, which have been reported on under the relevant categories) were found, one producing bricks and the other building materials. Data collection has already started in cooperation with MoE. Estonia also investigated soda ash use but could not find any new uses of soda ash (other than for glass production, data on which has been presented under glass production). Estonia is planning to report some relevant preliminary information on these activities in its 2010 annual submission. The ERT recommends that Estonia include the corresponding emission estimates in its next annual submission for categories for which estimation methods are available in the Revised 1996 IPCC Guidelines or the IPCC good practice guidance.

88. Emissions from solvent and other product use have been reported as "NA". During the review, with regard to the occurrence of these emissions, Estonia noted that a thorough investigation is planned for 2010, the preliminary results of which are to be reported in the Party's next annual submission. The ERT encourages Estonia to continue with this investigation and report its results in the next annual submission.

B. Key categories

1. Cement production – CO_2

89. Estonia has only one cement production plant – AS Kunda Nordic Cement. A country-specific method was used to calculate CO_2 emissions from cement production, which is in line with the IPCC

tier 2 methodology. The ERT was informed during the review that, following the recommendations of the twinning project mentioned in paragraph 32, Estonia is planning to calculate emissions from cement production using a cement kiln dust (CKD) correction factor, as recommended in the tier 2 method of the IPCC good practice guidance. AD on clinker and on CKD, as well as EFs, are received directly from the aforementioned plant, but no CKD correction factor. In general, the amount of CKD produced can be estimated as equivalent to around 1.5–2.0 per cent of the weight of the clinker produced. Use of a CKD correction factor may lead to an increase in the estimate of emissions.

90. The ERT welcomes the efforts of Estonia to obtain more accurate data from the plant and report the corresponding emissions in its next inventory submission. The ERT recommends that Estonia provide a more detailed description of the technological process of cement production, as well as the data, EFs and CKD correction factor used, in its next annual submission, in order to improve the transparency of its reporting.

2. Consumption of halocarbons and SF_6

91. A first assessment of the consumption of F-gases in Estonia has been made, based on the results of the twinning project between the Estonian and German Ministries of the Environment. As part of this project, all possible consumption of F-gases was investigated.

92. The estimations of F-gas consumption were based on the bottom-up approach and a detailed analysis of each individual category has been provided. As reported in the NIR, the main sources of data were the manufacturers and traders of goods containing F-gases, domestic and international suppliers of F-gases on the Estonian market, consumers of such goods in the industrial and service sectors, and traders of F-gases. Using these AD, emissions were estimated using tier 2a and 3 methods with mostly country-specific EFs. The ERT welcomes the efforts made by the Party to improve its inventory by including these emissions and encourages Estonia to continue using the bottom-up approach to estimate consumption of F-gases.

C. Non-key categories

1. Lime production – CO_2

93. CO_2 emissions from lime production were calculated using a tier 1 method, AD from industrial statistics and a default EF. During the review, Estonia indicated its intention to estimate these emissions using a plant-specific EF, owing to the availability of more precise information from the existing production plant. The ERT welcomes this intention and recommends that Estonia provide a more detailed description of the AD and EF used in its next annual submission.

2. Ammonia production – CO_2

94. CO_2 emissions from production were calculated using both tier 1a and tier 1b methods, plant-specific data on production and EFs based on the technology used in the ammonia producing plant. However, a proportion of the Party's CO_2 emissions was subtracted from the emissions from production owing to the sale of CO_2 emissions and their use for carbamide (urea) production. According to the Revised 1996 IPCC Guidelines, all emissions should be included in the inventory. The ERT reiterates the recommendation from the previous review that Estonia include the total gross amount of CO_2 from production of ammonia in this category.

95. During the review, the ERT was informed that Estonia is planning to use a tier1a method to calculate emissions from production using plant-specific data as well as to calculate CO_2 emissions for sale and those used for carbamide production. After the in-country visit, Estonia informed the ERT that data have been already collected directly from the producing plant. The ERT welcomes the efforts made

by the Party to improve its inventory and encourages Estonia to continue with these improvements. Also, the ERT recommends that Estonia provide a more detailed description of the AD and EFs used, in its next inventory submission, in order to improve the transparency of its reporting.

V. Agriculture

A. Sector overview

96. In 2007, emissions from the agriculture sector amounted to 1,333.09 Gg CO_2 eq, or 6.1 per cent of total GHG emissions. Since the base year, emissions have decreased by 56.0 per cent. The key driver for the fall in emissions is the decrease in the populations of non-dairy cattle (by 67.1 per cent), dairy cattle (by 63.3 per cent) and swine (by 55.9 per cent) compared with the respective populations in the base year. The use of synthetic fertilizers also fell, by 61.3 per cent in comparison with that in the base year. Within the sector, 53.5 per cent of the emissions were from agricultural soils, followed by 32.6 per cent from enteric fermentation, 13.5 per cent from manure management and 0.4 per cent from field burning of agricultural residues.

97. The ERT learned during the review that the Statistics Estonia collected data on animal waste management systems (AWMS) in 2001, and that the next round of questionnaires for collection of these data will be sent out in 2010. The ERT welcomes the development of country-specific data on manure management and encourages Estonia to develop country-specific EFs based on the results received from the censuses for 2001 and 2010, and extrapolate the data for the remaining period, reflecting the gradual shift from the Eastern European manure management module to the Western European module, in consultation with the relevant experts.

1. Completeness

98. The CRF tables include estimates of all gases and categories of emissions from the agriculture sector, for all years of the inventory time series and for all geographical locations, as recommended by the Revised 1996 IPCC Guidelines. The notation key "NE" has been used to report the following emissions: direct CH_4 emissions from agricultural soils; indirect CH_4 emissions from agricultural soils; CH_4 emissions from field burning of agricultural residues; and N_2O emissions from dry beans and other (non-specified) crops. Estonia estimated emissions of CH_4 and N_2O for some categories under field burning of agricultural residues for the first time in its 2009 inventory submission. During the review, Estonia noted its intention to estimate CH_4 and N_2O emissions from dry beans and from other (non-specified) crops under field burning of agricultural residues and provide these estimates in its next annual submission. The ERT recommends that Estonia follow up on this intention.

2. Recalculations and time-series consistency

99. Recalculations have been performed and reported generally in accordance with the IPCC good practice guidance without providing sufficient explanations for these recalculations. The ERT recommends that Estonia provide more information in its next annual submission on the reasons for these recalculations and for the differences in AD and in the methodologies for collecting data in subsequent submissions with regard to the agriculture sector.

100. The ERT noted that recalculations of the time series 1990–2006 have been undertaken to take into account improvements in AD in the agriculture sector, including: the change of the structure of the cattle and swine populations by subcategories for 1990–1998; and the update of the data on milk produced per cow, the fat content of the milk and the percentage of cows that gave birth. These updated AD were used to estimate CH_4 emissions from enteric fermentation and manure management. The recalculations resulted in a 6.0 per cent decrease in the estimate of emissions from the agriculture sector

for the base year, and a 6.1 per cent increase in the estimate of these emissions for 2006, when compared with the Party's previous annual submission.

101. The Eastern European manure management system module was replaced by the Western European manure management system module to estimate CH_4 and N_2O emissions from manure management for 2003–2006. This recalculation resulted in a 59.5 per cent decrease in the estimate of CH_4 emissions and a 50.0 per cent decrease in the estimate of N_2O emissions both from manure management for 2006, compared with the Party's previous inventory submission. The rationale for these recalculations has not been provided in CRF table 8(b). The ERT recommends that Estonia justify its choice of method, in its next annual submission, and take into consideration the gradual shift from one manure management system to the other.

102. N_2O emissions from: animal manure applied to agricultural soils, nitrogen (N)-fixing crops, crop residues left on agricultural fields, atmospheric deposition, and N leaching and run-off were recalculated for the entire time series (1990–2006), resulting in no significant differences between the recalculated estimates and the estimates in the Party's previous annual submission. The rationale for these recalculations has not been provided in either the NIR or CRF table 8(b). The ERT recommends that Estonia report the reasons for these recalculations in its next annual submission.

3. Uncertainties

103. Estonia estimated the combined uncertainty of the emissions from the agriculture sector. Estonia did not calculate uncertainties for all of the AD used. The recalculations performed did not improve the certainty of the estimates in this sector. The ERT recommends that Estonia develop uncertainty estimates for all parameters, AD and EFs used to estimate emissions from this sector, for its next annual submission.

B. Key categories

Direct soil emissions – N_2O

104. The ERT noted the significant inter-annual variability of the AD reported by Estonia for this category. The Party has not provided sufficient explanation of the rationale for such trends, in its NIR: the explanation for the extreme fluctuation in N_2O emissions from N-fixing crops from the base year to 2007 (a 3,019.7 per cent increase compared with the base year, and a 71.7 per cent increase compared with 2006) is insufficient; and no explanation has been provided for the fluctuation in N_2O emissions from the cultivation of organic soils from the base year to 2007 (significant increase in 1991 and 1992, and significant reduction in 1995, 1996 and 2002). During the review, Estonia provided some explanations for the fluctuations in these data. The ERT recommends that Estonia report the reasons for these fluctuations in AD in its next annual submission, in order to improve the transparency of the reporting.

C. Non-key categories

Manure management – CH_4 and N_2O

105. Estonia reported the EF for CH_4 from manure management in table 4.22 of the NIR as 10.35 kg CH_4/head/year for dairy cattle for 2007, which is inconsistent with that reported in the CRF tables (9.76 kg CH_4/head/year). During the review, Estonia acknowledged this inconsistency and expressed its intention to correct it in its next annual submission.

106. Estonia recalculated its estimates of CH_4 emissions from manure management from cattle for 1990–2006. These recalculations resulted in a 40.5 per cent decrease in the estimate of CH_4 emissions from manure management for cattle, as presented in table 4.29 of the NIR, although transparent

supporting references for the choice of methodology for these recalculations have not been provided in the NIR. During the review, Estonia noted its intention to provide all information in support of these recalculations in its next annual submission. The ERT recommends that Estonia improve the description of these recalculations in its next annual submission.

107. The ERT noted inconsistencies between the total N excretion rate (N_{ex}) reported for some types of AWMS and that reported per population of the individual classes of animal in the CRF tables. For example, the total N_{ex} per AWMS for mature non-dairy cattle was lower by 440,208 kg/year than the N_{ex} calculated by multiplying N excretion by population size; the total N_{ex} from AWMS for sheep was lower than the N_{ex} calculated by multiplying N excretion by population size by 289,600 kg/year. The ERT recommends that Estonia improve the QA/QC of the emission estimates in this category in order to minimize the inconsistencies, and correct these inconsistencies in its next annual submission.

108. Estonia recalculated and has reported revised estimates of N_2O emissions from manure management of cattle for 1990–2006. The recalculations resulted in a 50.0 per cent decrease in the estimate of N_2O emissions from liquid manure management for 2006 (figure 4.25 and table 4.43 of the NIR), although transparent supporting references for the choice of methodology for these recalculations have not been provided in the NIR. The ERT recommends that Estonia provide more information on its estimation of emissions from this category.

D. Areas for further improvement

Identified by the expert review team

109. The ERT encourages Estonia to work towards developing country-specific EFs for the key categories in the agriculture sector, as most of the AD required (animal weight, weight gain, digestibility of feed, and feeding situation) could be obtained from local sources (e.g. Estonian Cattle Growers' Association, and interviews with the growers). The ERT recommends that Estonia check the AD and provide explanations for the inter-annual fluctuations of CH_4 and N_2O emissions from enteric fermentation, direct and indirect N_2O emissions from soil, and emissions from field burning of agricultural residues.

VI. Land use, land-use change and forestry

A. Sector overview

110. In 2007, net removals from the LULUCF sector amounted to 7,903.05Gg CO_2 eq. Since the base year, net removals have increased by 24.0 per cent. The key drivers for the increase are the underlying trends in the changes in the area of forest land over the time series. As noted in paragraph 122 below, the time series for the area of forest land is inconsistent, and the trends observed in the data may not reflect actual trends. Within the sector, 87.1 per cent of the net removals were due to net removals from forest land. The rest of the removals were from land converted to other land (570.82 Gg CO_2 eq), land converted to grassland (1,138.75 Gg CO_2 eq) and wetlands remaining wetlands (14.67 Gg CO_2 eq). The net removals from these categories were offset by the emissions reported from grassland remaining grassland (97.49 Gg CO_2 eq).

1. Completeness

111. The CRF tables include estimates of emissions/removals from several LULUCF categories, as recommended by the Revised 1996 IPCC Guidelines and elaborated in the IPCC good practice guidance for LULUCF. Estonia has made progress in terms of the completeness of its inventory since its last annual submission by adding estimates of: carbon stock changes in mineral soils on grassland converted to cropland and cropland converted to grassland; CO_2 emissions from organic soils on cropland remaining

cropland and grassland remaining grassland; carbon stock changes in living biomass on cropland remaining cropland (fruit trees); and non-CO_2 emissions from wetlands (peat extraction).

112. Reported as "NE" by Estonia in its 2009 annual submission include: carbon stock changes in mineral soils on cropland remaining cropland and grassland remaining grassland; N_2O emissions from soil oxidation when land is converted to cropland; and CO_2 emissions from liming across all land-use categories. Estonia also reported as "NE" emissions and removals from land converted to wetlands, land converted to settlements, and land converted to other land, and estimates have only been partially reported for land converted to cropland and land converted to grassland; thus, emissions from forest land converted to all other land-uses (deforestation) have not been included in the Party's inventory. Emissions and removals from land converted to forest land are not reported separately; therefore, it was not possible to discern carbon stock changes owing to afforestation and reforestation.

113. Estonia's reporting of the time series for mineral soils on land converted to cropland and land converted to grassland is incomplete. Estimates for 1990–1993 have been provided for mineral soils on land converted to cropland and for 1994–2007 for mineral soils on land converted to grassland. The ERT recommends that Estonia use its key category analysis to prioritize the development of estimation methodologies at subcategory level for the LULUCF sector, taking into account future reporting requirements under Article 3, paragraph 3, of the Kyoto Protocol.

114. The IPCC tier 1 default assumption of no change in carbon stocks was used for the following: carbon stock changes in dead organic matter (DOM) and mineral soils on forest land remaining forest land; and carbon stock changes in biomass and DOM on land converted to cropland and land converted to grassland. The ERT notes that moving to a tier 2 approach to estimate emissions/removals from these key categories would require the estimation of the change in these carbon stocks in the future.

115. The Party's ability to produce high-quality estimates in the LULUCF sector is inherently tied to the underlying data available on land use and land-use change for nearly all LULUCF categories. The ERT noted that Estonia's approach to compiling data on land areas was consistent with approach 1 in the IPCC good practice guidance for LULUCF. Because multiple data sets are compiled from different sources, it is critical when using approach 1 to reconcile data from various sources into a consistent land-classification system, aligned with the definitions of land categories provided in the IPCC good practice guidance. The Party's NIR does not explain how this process was undertaken. During the review, the ERT learned that Estonia's LULUCF expert had made some judgments on how to reconcile Estonia's databases, but this was without the involvement of experts who were familiar with the areas of forest land or the statistical databases from which the data on land area were derived. In addition, this expert judgment has not been completely documented in the NIR.

116. The ERT also learned more about Estonia's National Forest Inventory (NFI) during the review, and noted that, since 1999, Estonia has undertaken a complete sampling of the national land areas, covering all major land classifications on a periodic basis. The ERT also noted that Estonia plans to receive from Finland, as part of their twinning project, data on the area of land in Estonia that has been deforested. Estonia plans to use these data to estimate emissions and removals from deforestation in Estonia, for its next annual submission.

117. During the review, Estonia noted that it is continuing to develop all of the data sets required to report on afforestation, reforestation and deforestation, and that these activities will be reported on in its next annual submission. Estonia informed the ERT that information on the spatial assessment unit for determining the area of accounting for afforestation and reforestation has been collected by the Centre for Forest Protection and Silviculture, and that data on areas of deforestation have been developed within the framework of the twinning project referred to in paragraph 32 above, in collaboration with Finnish

specialists. The ERT noted Estonia's intention to report on the afforestation, reforestation and deforestation activities in the country in its next annual submission.

118. The ERT recommends that Estonia explore using the data from its NFI to develop a comprehensive estimation of its land use and land-use changes for the purpose of its reporting to the UNFCCC, keeping in mind the need to develop data on land use and land-use changes for its reporting on activities under Article 3, paragraph 3, of the Kyoto Protocol.

2. Transparency

119. The reporting on the LULUCF sector is in general transparent; however, the ERT recommends that Estonia report on the methodologies used to estimate emissions from the LULUCF sector in more detail, including documentation of the sources of AD, the choice of EFs, and providing disaggregated estimates (e.g. showing estimates by forest type). In addition, explanations for trends should be included in the Party's future inventory submissions.

120. The ERT noted that the sign convention for emissions (+) and removals (–) has not been applied consistently across the figures in the Party's NIR, and recommends that Estonia use a more consistent approach in its next annual submission.

3. Recalculations and time-series consistency

121. The ERT noted that recalculations since the previous annual submission have been reported by Estonia for forest land remaining forest land for the period from 1990 to 2006. To estimate CO_2 emissions from organic soils on forest land for the 2009 annual submission, Estonia used the IPCC default EF for boreal climate zones. This IPCC default factor was lower than the country-specific factor used in the previous submissions, resulting in a lower estimate of CO_2 emissions and, thus, increased net removals from forest land remaining forest land for the entire time series. The ERT notes that, according to the climate zone map published in the 2006 IPCC Guidelines, Estonia appears to fall within a cold temperate climate zone. The Party's choice to apply a new EF has not been documented in its NIR. The ERT recommends that Estonia evaluate and justify its choice of EF in its next annual submission.

122. The ERT noted several cases of an inconsistent time series of data being used by Estonia, owing to the difficulties faced by the Party in compiling and reconciling the data on land areas. Specifically, the ERT learned, during the review, that Estonia's previous system for collecting data on forest land covered only publicly owned forest land. However, since 1999, a new, more comprehensive NFI has been undertaken. For the purpose of estimating emissions and removals from forest land categories, Estonia combined the two different data sets into a single time series. As a result, estimates for before 1999 reflect emissions and removals from public forests only, while those for 2000–2007 reflect emissions and removals from both public and privately owned forest land. The ERT recommends that the Estonian inventory compiler cooperate with the NFI experts to develop an extrapolation approach in order to ensure time-series consistency by estimating areas of forest land for 1990–1998 using the new NFI data and to ensure time-series consistency.

B. Key categories

1. Forest land remaining forest land: biomass – CO_2

123. An IPCC tier 1 approach, consistent with the IPCC good practice guidance for LULUCF, was applied to estimate CO_2 emissions from biomass, using a combination of country-specific data and the IPCC default parameters. It was clarified during the review that Estonia considers all forest land in the country to be managed. The ERT noted that, since the initial review in 2007, Estonia has moved from using country-specific values for wood density and biomass expansion factors to using the IPCC default

parameters for these variables, in response to questions raised regarding the reliability of the country-specific data. Estonia has continued to use country-specific values for biomass increment, compiled from publicly available NFI data. An extrapolation of the increment data was undertaken. The ERT recommends that Estonia provide more detail on the source of the data and approach for this extrapolation, and encourages Estonia to involve forestry experts in the review and development of country-specific increment data. The ERT also recommends that Estonia state in its NIR that all its forests are considered to be managed and provide supporting evidence for this assumption.

124. Estonia estimated annual removals from biomass using country-specific data on harvest volumes from two data sources: documentation on forest harvests for 1990–2007 and NFI for 1999–2007. Data on harvest volumes used to estimate emissions and removals from biomass for 1990–1998 were derived by increasing the annual harvest volumes from the documentation on forest harvests by 20 per cent (i.e. by multiplying the harvest volumes by 1.2). An explanation of this extrapolation has not been provided in the Party's NIR. However, during the review Estonia described the approach taken. The ERT encourages Estonia to have forestry experts assess this extrapolation approach and provide justification for it in its next annual submission.

125. The time series for this category showed a sharp decrease in removals in 1999 and 2000. Estonia explained during the review that this trend coincided with the country's land reform, which resulted in a significant increase in the rate of harvests in the country. The ERT recommends that the Party include this explanation in its next annual submission.

2. Land converted to grassland – CO_2

126. A tier 1 approach was used to estimate carbon stock changes in mineral soils on cropland converted to grassland. However, Estonia did not report data for the entire time series. A lack of transparency made it difficult to evaluate the application of the estimation methodology for this category, and the incomplete time series was an indication of the potential constraints of Estonia's land use and land-use change tracking system. The ERT recommends that Estonia include a justification in its next NIR for this choice of the tier 1 approach in its next annual submission.

127. The decision to classify abandoned cropland as grassland should be further investigated by Estonia. It is common for abandoned agricultural lands to revert back to forest through natural regeneration. Thus, this land could have been misclassified, meaning that it should instead be classified as forest land.

C. Non-key categories

1. Cropland remaining cropland – CO_2

128. A tier 1 approach was used to estimate CO_2 emissions from organic soils on cropland remaining cropland. Estonia chose to use the IPCC default EF for organic soils on cropland in a cold temperate climate. The ERT recommends that the Party include the justification for this choice of EF, in its next annual submission.

129. A tier 1 approach was used to estimate carbon stock changes in living biomass on cropland remaining cropland (fruit trees). Estonia applied the default loss rate to the loss in the area of fruit trees. However, according to the IPCC good practice guidance for LULUCF, loss rates should be applied to harvest cycles only when complete tree removal and replanting occurs (not a land-use change). The ERT recommends that Estonia consult relevant experts to determine what percentage of fruit trees is replanted each year, apply a loss co-efficient to that portion of the land area each year, and report emissions/removals accordingly in its next annual submission.

2. Grassland converted to cropland – CO_2

130. A tier 1 approach was used to estimate carbon stock changes in mineral soils on grassland converted to cropland. However, Estonia did not report data for the entire time series. A lack of transparency made it difficult to evaluate the application of the estimation methodology, and the incomplete time series was an indication of the potential constraints of Estonia's land use and land-use change tracking system. Once land has been classified as land converted to cropland, it should be tracked in that category for 20 years or until it is converted to another use. However, in the case of Estonia, it appears that estimates were made by the Party only for the amount of land that was converted to cropland in a given year, and not thereafter.

3. Other land – CO_2

131. Carbon removals from other land were estimated by Estonia; however, according to the IPCC good practice guidance for LULUCF, no emissions/removals should be estimated for this category. The ERT recommends that Estonia consider whether the land in this category has been classified appropriately, in accordance with the IPCC good practice guidance for LULUCF.

4. Non-carbon dioxide emissions from drainage of soils and wetlands – N_2O and CH_4

132. The ERT notes that Estonia implemented a tier 1 method to estimate N_2O and CH_4 emissions from peat extraction. This is an optional category and the methodology is included in an appendix to the IPCC good practice guidance. The ERT commends Estonia for the improvement of the completeness of the inventory.

5. Biomass burning – CO_2, CH_4 and N_2O

133. A tier 1 approach was used to estimate CO_2, CH_4 and N_2O emissions from biomass burning owing to wildfires on forest land. The ERT recommends that Estonia include more details in its NIR on the coverage and accuracy of the data source for this category and that it explore sources of data for other types of burning, such as prescribed burning. The ERT notes that Estonia could report CO_2 emissions from wildfires as a biomass loss co-efficient in the tier 1 estimate of carbon stock changes in forest land.

VII. Waste

A. Sector overview

134. In 2007, emissions from the waste sector amounted to 697.14 Gg CO_2 eq, or 3.2 per cent of total GHG emissions. Since the base year, emissions have increased by 3.8 per cent. The key driver for the rise in emissions is the increase in the population's consumption. Within the sector, 74.1 per cent of the emissions were from solid waste disposal on land, followed by 19.8 per cent from the category other, 5.5 per cent from wastewater handling and 0.6 per cent from waste incineration.

1. Completeness

135. Estonia has reported emissions from solid waste disposal on land, waste incineration, human sludge, and biological treatment of waste. Emissions from sludge application in agriculture have been reported in the CRF tables under the agriculture sector and in the NIR under the waste sector. The Revised 1996 IPCC Guidelines recommends that emissions from sewage sludge application be reported under the agriculture sector and the ERT recommends that Estonia describe this category in the NIR under the agriculture sector.

136. CH_4 emissions from domestic and commercial wastewater have been reported as "NE" owing to the lack of AD. During the review, Estonia informed the ERT of its intention to gather AD and report

emissions from industrial wastewater and domestic/commercial wastewater in its next annual submission. The ERT commends Estonia for its intention.

137. Estonia has reported emissions from waste incineration under the waste sector, although energy is recovered during this process. It is good practice to report these emissions under the energy sector and to include a description in the NIR of the estimation methodology used. This misallocation of emissions apparently appeared due to the lack of communication among the sectoral experts and a lack of QA. The ERT recommends that Estonia strengthen its QA to ensure consistent intersectoral reporting and reallocate emissions from waste incineration with energy recovery to the energy sector in its next annual submission.

138. Since 2005, Estonia has reported an increase in the CH_4 recovered from landfills, which is then used for energy purposes. No information on the CH_4 recovery facilities or any relevant explanation of trends has been provided in the NIR. The ERT recommends that Estonia provide this information and explanation in its next annual submission.

2. Transparency

139. To improve the transparency of the NIR, the ERT recommends that Estonia provide, in its next annual submission, more information on its waste management policy, existing practices and technologies of waste recovery, and waste disposal facilities. The ERT reiterates the recommendation made in previous reviews that Estonia provide further information on and detailed descriptions of the background data and references, AD, EFs, and methodologies and assumptions used, in its next annual submission.

3. Recalculations and time-series consistency

140. Estonia has provided recalculated estimates of CH_4 emissions from solid waste disposal on land for the complete time series, without providing any explanations for these recalculations in the NIR or the CRF tables. In response to the question raised by the ERT during the review, Estonia informed the ERT that the FORECAST function of the Excel software was used to calculate the quantities of waste generated in the period 1940–1990. The formula recalculates all previous values when a new value for the most recent year is added. As the value for 2007 was added for the 2009 submission, the data for 1940–1990 were recalculated. This recalculation led to an artificial reduction in the rate of waste generation in 1940–1990, owing to the declining trend in the amount of waste disposed on land.

141. The model used for these recalculations also resulted in an annual waste generation rate of 415 kg/person for 1940, which is apparently the highest rate of waste generation among the reporting Parties with similar economic and geographic conditions, and, thus, would appear to be incorrect. Relevant methodological studies[8] recommend a waste generation rate of 200 kg/person/year. The ERT recommends that the Party make an effort to revise the waste generation rate for the entire time series in order to reflect actual economic growth and consumption patterns in Estonia since 1940. This revision will lead to a decrease in the estimate of CH_4 emissions for the whole time series.

4. Uncertainties

142. Estonia has reported in its NIR uncertainties for the emissions estimated, for each individual category under the waste sector, using the IPCC good practice guidance. During the review, Estonia presented a total uncertainty of 1.15 per cent for the waste sector, which is the lowest of the reporting Parties. The ERT notes that AD and EFs in the waste sector usually have higher uncertainties than those in the other sectors and, therefore, encourages Estonia to revise its uncertainty analysis and provide explanations for its low uncertainty estimates.

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[8] Gulyaev N. 1966. *Municipal waste removing in cities*. Moscow: Literature for construction. p.16, table 6.

B. Key categories

Solid waste disposal on land – CH_4

143. CH_4 emissions from solid waste disposal on land contributed 2.3 per cent of the total GHG emissions in 2007. During the period 1990–2007, CH_4 emissions from landfills decreased overall by 13.9 per cent, with small increases in emissions occurring in some years. No explanation for these trends has been provided in the NIR. During the review, Estonia explained that the driver for the decreasing trend in these emissions is the increasing amounts of landfill gas recovered and waste recycled. The ERT recommends that Estonia include this explanation of the emission trend in its next annual submission.

144. Estonia derived the degradable organic carbon (DOC) value for the 1940–2000 period from an analysis of waste composition from the Netherlands. This may not reflect the actual economic and geographic conditions in Estonia during that period. During the review, the Party explained that a study on the composition of municipal waste in Estonia was performed during the 2000–2008 period, which will be used to update the DOC value. The ERT recommends that the Party verify and revise the DOC value using available data from the neighbouring Baltic countries or from recognized international scientific literature which better reflect the patterns of consumption in Estonia.

145. A CH_4 correction factor of 1 was used for the period 1940–2007, which implies that all landfills have been managed since 1940. As this assumption seems unlikely for the beginning of the time series, the ERT recommends that Estonia make an effort to revise the landfill parameters for the entire time series, reflecting the actual patterns in consumption in Estonia since 1940.

C. Non-key categories

1. Wastewater handling – CH_4 and N_2O

146. CH_4 and N_2O emissions from wastewater handling have been reported as "NE". The CRF tables state that it was not possible to estimate these emissions owing to a lack of AD, but no information on the wastewater handling system used has been provided in the Party's NIR. The ERT noted that Estonia reported these emissions in its 2007 submission and that no explanation has been provided for their exclusion from the inventory in the 2009 submission. During the review, Estonia informed the ERT of its intention to include information on its wastewater handling system and the wastewater treatment plants located in the country, and the relevant emission estimates, in its next annual submission. The ERT recommends that Estonia follow up on this intention.

147. During the review, the ERT learned that at least two wastewater treatment plants in Estonia (in Tallinn and Narva) were equipped with methane tanks and that the recovered CH_4 was used for energy purposes. It was also mentioned during the review that, during its collection and treatment, wastewater may be accidentally or deliberately managed under anaerobic conditions. Even if Estonia uses aerobic systems, CH_4 emissions could still occur from anaerobic processes. In order to improve transparency, information on the wastewater streams and treatment should be included by the Party in its NIR, in accordance with the IPCC good practice guidance. The ERT recommends that Estonia investigate the technologies used at its wastewater treatment plants, in order to ascertain the share of anaerobically treated wastewater, and estimate and include the corresponding emissions in its next annual submission.

148. To estimate N_2O emissions from human sewage, Estonia used data on protein consumption from the Food and Agriculture Organization of the United Nations for 1990–2004. Before 2004, these emissions declined slightly, owing to the country's decreasing population; however, since 2004 the emissions have slightly increased again, owing to the increase in protein consumption. The ERT encourages Estonia to investigate the country's protein consumption and document its findings in its next annual submission.

2. Waste incineration – CO_2

149. Estonia has reported AD on waste incineration with energy recovery and open burning under the waste sector, although it is good practice to include emissions from waste incineration with energy recovery under the energy sector and provide a relevant description under the waste sector. The NIR does not report on Estonia's waste incineration facilities, provide an explanation of the trends in waste incineration, or contain information on the treatment of hospital waste, which in many countries is incinerated.

150. During the review, Estonia explained that waste was used in co-combustion with fossil fuels for cement production, and in a small incinerator for the treatment of hazardous waste. It is not clear whether emissions from the incineration of hazardous waste have been included in the inventory, which could mean a potential underestimation of emissions. The ERT recommends that Estonia include in its NIR relevant information on its waste incineration facilities and on the composition of its incinerated waste streams, and that the Party refer to the corresponding section under the energy sector when explaining the allocation of the emissions from waste incineration under the waste sector.

VIII. 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

151. Estonia 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.[9] The SIAR was forwarded to the ERT prior to the review, pursuant to decision 16/CP.10. The ERT reiterated the main findings and recommendations contained in the SIAR.

152. 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)–(d) and (f)–(j) of the annex to decision 22/CMP.1.

153. The transactions of Kyoto Protocol units initiated by the national registry were in accordance with the requirements of the annex to decision 5/CMP.1 and the annex to decision 13/CMP.1. No discrepancy has been identified by the international transaction log (ITL) and no non-replacement has occurred. The national registry has adequate procedures in place to minimize discrepancies.

2. National registry

154. The ERT took note of the SIAR and its finding 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 15/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 reported information on the national registry is complete and has been submitted in accordance with the annex to decision 15/CMP.1. The national registry also has

[9] 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.

adequate security, data safeguard and disaster recovery measures in place and its operational performance is adequate.

155. However, the SIAR identified that the information on the legal entities required under paragraph 48 of the annex to decision 13/CMP.1 was missing. During the review, Estonia demonstrated the accessibility of all of the public information referred to in paragraphs 45–48 of the annex to decision 13/CMP.1, and showed that this information is available on the website of the national registry,[10] also in English. The ERT commends Estonia for demonstrating the availability and accessibility of this information. In addition, the Party provided access to information from its national registry that substantiated or clarified the information reported in its annual submission, and the ERT commends Estonia for giving it an opportunity to visit the location of the national registry. The ERT recommends that Estonia report in more detail on the aforementioned publicly available information, and encourages the Party to report on any changes to the list of public information accessible through the user interface of its registry, in its next annual submission.

3. Calculation of the commitment period reserve

156. Estonia has reported its commitment period reserve in its 2009 annual submission. The Party reported its commitment period reserve to be 110,093,385 t CO_2 eq based on the national emissions in its most recently reviewed inventory (22,018.68 Gg CO_2 eq). The ERT agrees with this figure.

B. Changes to the national system

157. Estonia has reported in its NIR changes in its national system compared with the previous annual submission. However, the reported changes are related not to the institutional, legal or administrative arrangements but rather to the improvement of the estimates in the Party's inventory. During the review, the ERT learned about several planned changes to the national system, in particular that the sectoral teams performing the calculations for the inventory will change as from the next annual submission, and also that the strengthening of the implementation of the improved QA/QC plan will mean a change to the rules and responsibilities of the experts involved.

158. The ERT noted that short-term contracts create uncertainty with regard to the maintenance and improvement of the quality of the inventory. The ERT recommends that Estonia ensure the longer-term involvement of experts with the required competences in the preparation of its inventory, with the aim of building capacity and ensuring the quality of the inventory for the entire commitment period.

159. 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. The ERT recommends that the Party, in its next annual submission, report any change(s) in its national system in accordance with section I.F of the annex to decision 15/CMP.1.

C. Changes to the national registry

160. Estonia reported no change in its national registry compared with the previous annual submission. The ERT concluded that the Party's 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.

[10] <http://khgregister.envir.ee>.

IX. Conclusions and recommendations

161. Estonia made its annual submission on 15 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 submitted, in part, on voluntary basis (information on the Kyoto Protocol units and information on changes to the national system and to the national registry). This is in line with decision 15/CMP.1.

162. The ERT concludes that the inventory submission of Estonia has been prepared and reported in accordance with the UNFCCC reporting guidelines. Estonia has submitted a complete set of CRF tables for the years 1990–2007 and an NIR; these are complete in terms of geographic coverage, years and sectors, and generally complete in terms of categories and gases. Some of the categories, particularly in the industrial processes, the LULUCF, and the waste sectors have been reported as "NE".

163. The Party's inventory is generally in line with the Revised 1996 IPCC Guidelines, the IPCC good practice guidance and the IPCC good practice guidance for LULUCF; however the completeness and transparency of the inventory could be further improved. The ERT noted that Estonia had made significant improvements to its inventory compared with the previous annual submission, namely by estimating actual emissions of F-gases and improving the completeness of the reporting on the LULUCF sector, and it commends the Party for these improvements.

164. 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. Estonia 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.

165. The Party 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 required reporting format tables as required by decision 14/CMP.1.

166. The national system continues to perform its required functions as set out in the annex to decision 19/CMP.1; however, the ERT identified that the following issues will need to be addressed by the Party: improvement of its archiving system; strengthening the implementation of QA/QC procedures; and strengthening of the continuity of the national system and of capacities to identify land-use areas subject to activities under Article 3, paragraph 3, of the Kyoto Protocol.

167. 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.

168. In the course of the review, the ERT formulated a number of recommendations[11] relating to the completeness of the inventory and the transparency of the annual submission. The key recommendations are that the Party:

(a) Strengthen the national system and sustainability of the institutional arrangements, with the aim of building capacity and ensuring the quality of the inventory for the entire commitment period;

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

(b) Develop its archiving system by classifying the background data, documentation on methods, EFs, AD and calculation sheets at the central location;

(c) Strengthen implementation of the QA/QC plan and verification procedures;

(d) Upgrade the tier 1 methods used to estimate emissions from key categories to higher-tier methods, and develop and apply country-specific EFs to estimate emissions from key categories (e.g. for CH_4 and N_2O emissions from manure management);

(e) Make efforts to identify the land areas subject to afforestation, reforestation and deforestation;

(f) Ensure the inclusion, in its next annual submission, of emission estimates for categories which are currently reported as "NE" and for which methods for estimating emissions are available in the Revised 1996 IPCC Guidelines and/or in the IPCC good practice guidance, and, where emissions cannot be estimated for any category, then the Party is to provide sufficient explanation for this in its NIR.

X. Questions of implementation

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

Annex I

Documents and information used during the review

A. Reference documents

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

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

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"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>.

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B. Additional information provided by the Party

Responses to questions during the review were received from Ms. Reet Pruul (Ministry of the Environment); Ms. Eve Tamme, Ms. Jelena Svintsova and Ms. Getlyn Makke (Climate and Ozone Bureau, Estonian Environment Information Centre); Ms. Inge Roos, Ms. Olga Gavrilova and Ms. Tiina Randla (Tallinn Technical University); and Ms. Kristina Kaar and Ms. Kristiina Nikkel (Estonian Environmental Research Centre), including additional material on the methodology and assumptions used.

Annex II

Acronyms and abbreviations

AD	activity data
AWMS	animal waste management system
CFBC	circulating fluidized bed combustion
CH_4	methane
CKD	cement kiln dust
CO_2	carbon dioxide
CO_2 eq	carbon dioxide equivalent
CRF	common reporting format
CMP	Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol
DOC	degradable organic carbon
DOM	dead organic matter
EF	emission factor
ERT	expert review team
EU ETS	European Union emissions trading scheme
F-gas	fluorinated gas
GHG	greenhouse gas; unless indicated otherwise, GHG emissions are the sum of CO_2, CH_4, N_2O, HFCs, PFCs and SF_6, without GHG emissions and removals from LULUCF
HFCs	hydrofluorocarbons
IPCC	Intergovernmental Panel on Climate Change
ITL	international transaction log
LPG	liquefied petroleum gas
LULUCF	land use, land-use change and forestry
N	nitrogen
NA	not applicable
NCV	net calorific value
NE	not estimated
N_{ex}	nitrogen excretion
	ammonia
NO	not occurring
N_2O	nitrous oxide
NIR	national inventory report
PFCs	perfluorocarbons
QA/QC	quality assurance/quality control
SEF	standard electronic format
SF_6	sulphur hexafluoride
SIAR	Standard Independent Assessment Report
TJ	terajoule (1 TJ = 10^{12} joule)
UNFCCC	United Nations Framework Convention on Climate Change

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