Advance Version

COMPLIANCE COMMITTEE **CC/ERT/ARR/2013/3**
25 February 2013

Report of the individual review of the annual submission of Estonia submitted in 2012

Note by the secretariat

The report of the individual review of the annual submission of Estonia submitted in 2012 was published on 25 February 2013. For purposes of rule 10, paragraph 2, of the rules of procedure of the Compliance Committee (annex to decision 4/CMP.2, as amended by decision 4/CMP.4), the report is considered received by the secretariat on the same date. This report, FCCC/ARR/2012/EST, contained in the annex to this note, is being forwarded to the Compliance Committee in accordance with section VI, paragraph 3, of the annex to decision 27/CMP.1.

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Report of the individual review of the annual submission of Estonia submitted in 2012*

* In the symbol for this document, 2012 refers to the year in which the inventory was submitted, and not to the year of publication.

Contents

I. Introduction and summary

1. This report covers the in-country review of the 2012 annual submission of Estonia, coordinated by the UNFCCC secretariat, in accordance with decision 22/CMP.1. The review took place from 10 September to 15 September 2012 in Tallinn, Estonia, and was conducted by the following team of nominated experts from the UNFCCC roster of experts: generalist – Mr. Bernd Gugele (European Union (EU)); energy – Mr. Hongwei Yang (China); industrial processes – Ms. Maria Jose Lopez (Belgium); agriculture – Mr. Donald Kamdonyo (Malawi); land use, land-use change and forestry (LULUCF) – Mr. Giacomo Grassi (EU); and waste – Ms. Violeta Hristova (Bulgaria). Mr. Gugele and Mr. Yang 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) (hereinafter referred to as the Article 8 review guidelines), 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 2010, the main greenhouse gas (GHG) in Estonia was carbon dioxide (CO_2), accounting for 88.7 per cent of total GHG emissions [1] expressed in carbon dioxide equivalent (CO_2 eq), followed by methane (CH_4) (5.4 per cent) and nitrous oxide (N_2O) (5.1 per cent). Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6) collectively accounted for 0.8 per cent of the overall GHG emissions in the country. The energy sector accounted for 88.5 per cent of total GHG emissions, followed by the agriculture sector (6.4 per cent), the waste sector (2.6 per cent), the industrial processes sector (2.4 per cent) and the solvent and other product use sector (0.1 per cent). The LULUCF sector was a net sink and reduced total GHG emissions including LULUCF by 18.3 per cent in 2010. Total GHG emissions amounted to 20,541.61 Gg CO_2 eq and decreased by 49.6 per cent between the base year[2] and 2010. The trends for the different gases and sectors are reasonable.

4. Tables 1 and 2 show GHG emissions from Annex A sources, emissions and removals from the LULUCF sector under the Convention and emissions and removals from activities under Article 3, paragraph 3, and, if any, Article 3, paragraph 4, of the Kyoto Protocol (KP-LULUCF), by gas and by sector and activity, respectively. In table 1, CO_2, CH_4 and N_2O emissions included in the rows under Annex A sources do not include emissions and removals from the LULUCF sector.

5. Tables 3–5 provide information on the most important emissions and removals and accounting parameters that will be included in the compilation and accounting database.

[1] In this report, the term "total GHG emissions" refers to the aggregated national GHG emissions expressed in terms of carbon dioxide equivalent (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

Greenhouse gas emissions from Annex A sources and emissions/removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, by gas, base year to 2010[a]

			Gg CO_2 eq								*Change*
		Green house gas	*Base year*[a]	*1990*	*1995*	*2000*	*2005*	*2008*	*2009*	*2010*	*Base year–2010(%)*
Annex A sources		CO_2	36 620.25	36 620.25	17 957.05	15 149.62	16 435.96	17 382.10	14 184.98	18 218.70	–50.2
		CH_4	1 856.11	1 856.11	1 070.79	1 088.27	1 100.56	1 110.28	1 082.64	1 110.81	–40.2
		N_2O	2 244.83	2 244.83	1 065.30	917.98	924.22	1 106.24	1 016.65	1 053.95	–53.0
		HFCs	25.37	0.00	25.37	69.80	118.78	131.89	139.14	156.33	516.3
		PFCs	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA
		SF_6	3.22	NA, NE, NO	3.22	2.74	1.08	1.35	1.44	1.81	–43.8
KP-LULUCF	Article 3.3[b]	CO_2						817.95	252.78	253.11	
		CH_4						0.47	0.53	0.59	
		N_2O						0.08	0.10	0.11	
	Article 3.4[c]	CO_2	NA					NA	NA	NA	NA
		CH_4	NA					NA	NA	NA	NA
		N_2O	NA					NA	NA	NA	NA

Abbreviations: KP-LULUCF = land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, NA = not applicable.

[a] "Base year" for Annex A sources 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" for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol is 1990.

[b] Activities under Article 3, paragraph 3, of the Kyoto Protocol, namely afforestation and reforestation, and deforestation. Only the inventory years of the commitment period must be reported.

[c] Elected activities under Article 3, paragraph 4, of the Kyoto Protocol, including forest management, cropland management, grazing land management and revegetation. For cropland management, grazing land management and revegetation, the base year and the inventory years of the commitment period must be reported.

Table 2
Greenhouse gas emissions by sector and activity, base year[a] to 2010

			Gg CO_2 eq								*Change*
		Sector	*Base year[a]*	*1990*	*1995*	*2000*	*2005*	*2008*	*2009*	*2010*	*Base year–2010 (%)*
Annex A		Energy	35 942.49	35 942.49	17 572.35	14 778.46	16 037.45	16 770.10	14 157.38	18 185.24	–49.4
		Industrial processes	1 076.51	1 047.92	675.28	705.08	807.42	1 051.52	451.98	497.57	–53.8
		Solvent and other product use	20.77	20.77	26.02	26.76	26.16	22.21	18.19	17.65	–15.1
		Agriculture	3 328.99	3 328.99	1 557.08	1 251.46	1 225.37	1 382.04	1 283.88	1 308.77	–60.7
		Waste	381.02	381.02	291.00	466.66	484.19	506.04	513.43	532.39	39.7
		LULUCF	–9 348.84	–9 348.84	–9 557.42	4 132.12	–9 090.55	–6 140.14	–7 127.25	–3 757.75	–59.8
		Total (with LULUCF)	**NA**	**31 372.35**	**10 564.31**	**21 360.53**	**9 490.04**	**13 591.75**	**9 297.61**	**16 783.86**	**NA**
		Total (without LULUCF)	**40 749.78**	**40 721.19**	**20 121.73**	**17 228.41**	**18 580.59**	**19 731.90**	**16 424.85**	**20 541.61**	**–49.6**
		Other[b]	NA	NA	NA	NA	NA	NA	NA	NA	NA
KP-LULUCF	Article 3.3[c]	Afforestation and reforestation						–170.58	–184.02	–197.50	
		Deforestation						989.08	437.42	451.31	
		Total (3.3)						**818.50**	**253.40**	**253.81**	
	Article 3.4[d]	Forest management						NA	NA	NA	
		Cropland management	NA					NA	NA	NA	NA
		Grazing land management	NA					NA	NA	NA	NA
		Revegetation	NA					NA	NA	NA	NA
		Total (3.4)	**NA**					**NA**	**NA**	**NA**	**NA**

Abbreviations: LULUCF = land use, land-use change and forestry, KP-LULUCF = LULUCF emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, NA = not applicable.

[a] "Base year" for Annex A sources 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" for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol is 1990.

[b] Emissions/removals reported in the sector other (sector 7) are not included in Annex A to the Kyoto Protocol and are therefore not included in national totals.

[c] Activities under Article 3, paragraph 3, of the Kyoto Protocol, namely afforestation and reforestation, and deforestation. Only the inventory years of the commitment period must be reported.

[d] Elected activities under Article 3, paragraph 4, of the Kyoto Protocol, including forest management, cropland management, grazing land management and revegetation. For cropland management, grazing land management and revegetation, the base year and the inventory years of the commitment period must be reported.

Table 3

Information to be included in the compilation and accounting database in t CO_2 eq for the year 2010, including the commitment period reserve

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Commitment period reserve	102 583 811	102 708 051		102 708 051
Annex A emissions for current inventory year				
CO_2	18 218 704			18 218 704
CH_4	1 050 610	1 110 811		1 110 811
N_2O	1 089 307	1 053 954		1 053 954
HFCs	156 330			156 330
PFCs	NA, NE, NO			NA, NE, NO
SF_6	1 811			1 811
Total Annex A sources	**20 516 762**	**20 541 610**		**20 541 610**
Activities under Article 3, paragraph 3, for current inventory year				
3.3 Afforestation and reforestation on non-harvested land for current year of commitment period as reported	–346 719	–197 503		–197 503
3.3 Afforestation and reforestation on harvested land for current year of commitment period as reported	NA, NO			NA, NO
3.3 Deforestation for current year of commitment period as reported	299 659	451 310		451 310
Activities under Article 3, paragraph 4, for current inventory year[c]				
3.4 Forest management for current year of commitment period				
3.4 Cropland management for current year of commitment period				
3.4 Cropland management for base year				
3.4 Grazing land management for current year of commitment period				
3.4 Grazing land management for base year				
3.4 Revegetation for current year of commitment period				
3.4 Revegetation in base year				

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

[a] "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).

[b] "Final" includes revised estimates as per CRF tables submission (version 2.2), provided by the Party on 14 September, 2012.

[c] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

Table 4
Information to be included in the compilation and accounting database in t CO_2 eq for the year 2009

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Annex A emissions for 2009				
CO_2	14 184 984			14 184.98
CH_4	1 015 131	1 082 635		1 082 635
N_2O	1 050 372	1 016 651		1 016 651
HFCs	139 144			139 144
PFCs	NA, NE, NO			NA, NE, NO
SF_6	1 440			1 440
Total Annex A sources	**16 391 072**	**16 424 855**		**16 424 855**
Activities under Article 3, paragraph 3, for 2009				
3.3 Afforestation and reforestation on non-harvested land for 2009 as reported	–324 822	–184 019		–184 019
3.3 Afforestation and reforestation on harvested land for 2009 as reported	NA, NO			NA, NO
3.3 Deforestation for 2009 as reported	292 944	437 419		437 419
Activities under Article 3, paragraph 4, for 2009[c]				
3.4 Forest management for 2009				
3.4 Cropland management for 2009				
3.4 Cropland management for base year				
3.4 Grazing land management for 2009				
3.4 Grazing land management for base year				
3.4 Revegetation for 2009				
3.4 Revegetation in base year				

Abbreviations: NA = not applicable, NE = not estimated, NO = not occurring.
[a] "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).
[b] "Final" includes revised estimates, if any, and/or adjustments, if any.
[c] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

Table 5
Information to be included in the compilation and accounting database in t CO_2 eq for the year 2008

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Annex A emissions for 2008				
CO_2	17 382 102			17 382 102
CH_4	1 042 571	1 110 277		1 110 277
N_2O	1 147 066	1 106 243		1 106 243
HFCs	131 887			131 887
PFCs	38			38
SF_6	1 350			1 350
Total Annex A sources	**19 705 015**	**19 731 898**		**19 731 898**
Activities under Article 3, paragraph 3, for 2008				
3.3 Afforestation and reforestation on non-harvested land for 2008 as reported	–303 034	–170 581		–170 581
3.3 Afforestation and reforestation on harvested land for 2008 as reported	NA, NO			NA, NO
3.3 Deforestation for 2008 as reported	869 523	989 084		989 084
Activities under Article 3, paragraph 4, for 2008[c]				
3.4 Forest management for 2008				
3.4 Cropland management for 2008				
3.4 Cropland management for base year				
3.4 Grazing land management for 2008				
3.4 Grazing land management for base year				
3.4 Revegetation for 2008				
3.4 Revegetation in base year				

Abbreviations: NA = not applicable, NO = not occurring.
[a] "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).
[b] "Final" includes revised estimates, if any, and/or adjustments, if any.
[c] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

II. Technical assessment of the annual submission

A. Overview

1. Annual submission and other sources of information

6. The 2012 annual inventory submission was submitted on 13 April 2012; it contains a complete set of common reporting format (CRF) tables for the period 1990–2010 and a national inventory report (NIR). Estonia also submitted information required under Article 7, paragraph 1, of the Kyoto Protocol, including information on: activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, accounting of Kyoto Protocol units, changes in the national system and in the national registry, and the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol. The standard electronic format (SEF) tables were submitted on 13 April 2012. The annual submission was submitted in accordance with decision 15/CMP.1.

7. Estonia officially submitted revised emission estimates on 15 September 2012 in response to questions raised by the expert review team (ERT) during the course of the review week.[3]

8. The ERT also used previous years' submissions during the review, where needed. 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]

9. 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 inventory

10. The inventory is complete in terms of years and geographical coverage and covers all mandatory[5] source and sink categories for the period 1990–2010 except for estimates of carbon stock changes and emissions and removals from mineral soils for all land uses (except forest land converted to settlements (see para. 91 below)). In addition, the following non-mandatory categories have not been estimated: CH_4 from poultry due to lack of an emission factor (EF); biogenic CH_4 from waste incineration due to lack of activity data (AD); N_2O from wastewater due to lack of AD; and potential emissions of SF_6. The ERT recommends that Estonia estimate mandatory pools and related emissions and removals in

[3] The values used in this report are based on the values contained in the submission of 15 September, 2012.

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

[5] Mandatory source and sink categories under the Kyoto Protocol are all source and sink categories for which the Intergovernmental Panel on Climate Change (IPCC) *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*, the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* and the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry* provide methodologies and/or emission factors to estimate GHG emissions.

its next annual submission. In addition, the ERT encourages Estonia to estimate emissions from non-mandatory categories in future submissions (e.g. by using methods/EFs used by other Parties which have similar conditions to those in Estonia).

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

Overview

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

12. The Party explained in the NIR that no changes of the national system have been made since the previous annual submission.

Inventory planning

13. During the in-country visit, Estonia explained the national system for the preparation of the inventory. The single national entity with overall responsibility for the Estonian GHG inventory is the Ministry of Environment (MoE). The inventory is produced by a collaboration between the MoE, Estonian Environmental Research Centre (EERC), Estonian Environment Information Centre (EEIC) and the Tallinn University of Technology (TUT). The main responsibilities of MoE include: (a) coordinating the overall inventory preparation process; (b) approving the inventory before official submission to the UNFCCC; (c) reporting the GHG inventory to the UNFCCC, including the NIR and CRF tables; (d) concluding the formal agreements with the inventory compilers (TUT, EERC).

14. The main responsibilities of EERC include: (a) compiling the NIR based on the input received from the inventory compilers; (b) coordinating the implementation of the quality assurance/quality control (QA/QC) plan; (c) coordinating the inventory process; (d) maintaining the overall archiving system; (e) preparing the emission estimates for the industrial processes, solvent and other product use and waste sectors. TUT prepares the emission estimates for the energy and agriculture sectors. The main task of EEIC is the preparation of the emission estimates for the LULUCF sector and the provision of input data for other sectors.

15. During the review week Estonia informed the ERT that MoE concludes contracts for the inventory work with EERC and TUT. MoE has concluded one-year contracts for the coordination of the inventory work with EERC for the years 2012 and 2013. In addition, three-year contracts are in place with EERC for the compilation of the industrial processes, solvent and other product use and waste sectors for the years 2011–2013. One-year contracts with TUT were in place for the preparation of the energy and the agriculture sectors for 2012. One-year contract with EEIC is signed for the preparation of the GHG inventory for the energy and agriculture sectors for the 2013 annual submission. EERC subcontracted an expert from TUT for the preparation of GHG inventory for the agriculture sector for 2013 annual submission. As EEIC is a government institution its inventory-related work is regulated in a statute and does not require separate contracts by law.

16. During the review week Estonia informed the ERT about plans to change the national system towards a centralized system where the main responsibilities are taken over by EERC. It is anticipated that, in 2013, the EERC will take over the preparation of the inventory for the energy sector from TUT. From the 2014 annual submission onwards, MoE is planning to have only one combined contract with EERC for all the tasks (coordination, QA/QC and all sectors excluding LULUCF). The objective is to sign one legally binding overall long-term contract (at least three years). The purpose is to use

synergies at EERC and to create a strong and competent institution for inventory preparation. However, EERC will also be in the position to provide for contracts to external institution, if needed.

17. In response to questions raised by the ERT on the preparation of the energy sector for the 2013 annual submission, Estonia informed the ERT that the energy expert at EERC, which is taking over the preparation of the energy sector in 2013, has been involved in the following inventory-related activities in the past: (a) additional QA procedures of key categories in the energy sector in the 2012 inventory; (b) evaluating the implications of the implementation of the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the 2006 IPCC Guidelines) for the energy sector; (c) comparing European Union emissions trading scheme (EU ETS) and GHG inventory data; (d) reviewing the documentation related to the energy sector prepared by the energy expert from TUT. In addition, Estonia confirmed that it plans to involve the TUT energy expert in the inventory preparation of the energy sector for a transition period and that financial resources are planned for this activity. The ERT appreciates that the Party has shared its plans with the ERT. The ERT strongly recommends that Estonia allocate the necessary resources in order to ensure a smooth transition period, in particular ensuring that the TUT energy expert will allocate enough time to support the preparation and quality checking of the 2013 energy sector.

18. In response to a question raised by the ERT during the review regarding the annual resources used by Estonia for the preparation of the GHG inventory, the Party indicated that almost five person-years are dedicated to the annual preparation of the GHG inventory. The ERT noted from the discussion during the review that the possibilities for sectoral experts backing up each other are very limited. In terms of capacity-building and training of the experts the Party informed the ERT that there are two experts from Estonia on the UNFCCC roster of experts for the review process: the waste expert and the agriculture expert. The agriculture expert participated in a review of annual submissions in 2012. The ERT encourages Estonia to provide for adequate resources to the inventory team in order to make sure that appropriate back-up arrangements can be taken. The ERT also encourages Estonia to nominate further experts to the roster of experts for the review process, noting that participating in the review training and in the review process will strengthen the QA/QC capacity of its inventory team.

19. The ERT noted that Statistics Estonia is not considered as a part of the national system, although important input data (e.g. energy balance data) are taken from this institution. In response to questions raised during the review, Estonia explained that no specific contractual arrangements are in place between MoE and Statistics Estonia because it is a government agency and, therefore, is obliged by law to provide data to other government institutions. The ERT recommends that Estonia explore the possibility of strengthening the links between the GHG inventory compilers and Statistics Estonia, which would facilitate the preparation of the inventory for the energy sector. This might include the definition of quality criteria of the energy balance data provided by Statistics Estonia, or the involvement of Statistics Estonia in the quality checking of the GHG inventory.

Inventory preparation

Key categories

20. Estonia has reported a key category tier 2 analysis, both level and trend assessment, as part of its 2012 submission. The key category analysis performed by the Party and that

performed by the secretariat[6] produced different results because Estonia performed a tier 2 analysis while the secretariat performed a tier 1 analysis. Estonia has included the LULUCF sector in its key category analysis, which was performed in accordance with the Intergovernmental Panel on Climate Change (IPCC) *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC good practice guidance) and the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF).

21. In its response to questions raised by the ERT, Estonia explained that it uses the results of the key category analysis to prioritize the development and improvement of the inventory. Estonia mentioned a project launched in order to obtain country-specific EFs for the energy sector. However, the ERT noted that this project was launched only in 2012, although it was clear from the key category analysis of the previous year's submission that these improvements could have been made earlier. In addition, the key category analysis shows that public electricity and heat production – solid fuels is by far the most important key category, mainly because of the magnitude of the category but also due to high uncertainty estimates. During the review week Estonia acknowledged that the high uncertainty estimates are likely to be an artifact as they are based on an outdated study.[7] The ERT recommends that Estonia revise the uncertainty assessment and use the key category analysis to prioritize improvements of its inventory.

22. Estonia has identified key categories for activities under Article 3, paragraph 3 of the Kyoto Protocol, for 2008–2010.

Uncertainties

23. Estonia has provided a tier 1 uncertainty analysis in its 2012 annual submission both including and excluding LULUCF. The level uncertainties for total GHG emissions in 2010 are 24.3 per cent without LULUCF and 31.0 per cent with LULUCF. The trend uncertainties are 2.6 per cent without LULUCF and 7.8 per cent with LULUCF. The ERT noted that the level uncertainties are one of the highest of all Parties. The main reason for the large level uncertainty is an uncertainty of 38.9 per cent of the CO_2 EF of solid fuels. This uncertainty estimate is based on the Metrosert study (see para. 21 above). However, the ERT considers that these uncertainty estimates are outdated as they are too high, which was also acknowledged by Estonia. Therefore, the ERT encourages Estonia to update the uncertainty estimates in order that they reflect the use of improved EFs/AD and in particular to revise the uncertainty estimates for solid fuels from public electricity and heat production.

24. Estonia did not include explanations for the differences in the uncertainty estimates when the results are compared with previous annual submissions. In response to questions raised during the review Estonia provided detailed information on the changes of the uncertainty estimates. The ERT commends the Party for having removed errors and for having improved the uncertainty estimates. However, the ERT reiterates the recommendation of the previous review report that Estonia include explanations for such

[6] 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.

[7] AS Metrosert. 2007. *Uncertainty estimation of CO_2 emission in the Estonian national Greenhouse gas Inventory, 2004*, April 2007, Tallinn, Estonia.

changes in the uncertainty estimates in its next annual submission. The ERT commends Estonia for having included uncertainty estimates for the KP-LULUCF activities in the 2012 NIR for the first time, in response to a recommendation in the previous review report.

25. The ERT noted that the selected uncertainty values for each category are not always well explained or justified. The ERT reiterates the recommendation of the previous review report that, in its next annual submission, Estonia improve the justification of the uncertainty values used.

Recalculations and time-series consistency

26. Recalculations have been performed and reported in accordance with the IPCC good practice guidance. The ERT noted that recalculations reported by the Party of the time series 1990 to 2009 have been undertaken. The total effect of the recalculations in estimated total GHG emissions including LULUCF was a 2.3 per cent increase (excluding LULUCF – a 0.9 per cent decrease) for 1990 and a 3.7 per cent decrease (excluding LULUCF – a 1.6 per cent decrease) for 2009. The most significant changes (in absolute terms) in the estimates for 2009 are decreases in fugitive CH_4 emissions from oil and natural gas and from solid waste disposal on land and decreases in CO_2 emissions from forest land.

27. Fugitive CH_4 emissions from oil and natural gas were revised because a double-counting of emissions was removed and the EF of CH_4 from natural gas distribution was revised. Emission estimates of solid waste disposal on land were revised due to updated waste generation rates for the period 1940–1990 and reclassification of types of solid waste disposal sites, as well as due to a revision of waste composition data for the years 1940–1999.

28. The recalculations of forest land were mainly due to: revised AD (area estimates); revised parameters (e.g. combustion efficiency value and quantity of fuel burnt in forest fires); more accurate root–shoot ratios and biomass expansion factor (BEF) values; and the availability of new data on areas of drained organic forest.

29. In general, the rationale for the recalculations is explained transparently in the NIR and in CRF table 8(b). However, the ERT noted that in the energy sector (see para. 52 below) the explanations provided by the Party were not fully transparent. Estonia's estimates are consistent throughout the time series. The ERT recommends that Estonia provide transparent explanations for all recalculations in its next annual submission.

Verification and quality assurance/quality control approaches

30. Estonia has an elaborated QA/QC plan in accordance with the IPCC good practice guidance, including tier 1 and some tier 2 category-specific QC procedures. The Climate Department of EERC is responsible for the implementation of the QA/QC plan. QA procedures are performed by an independent expert from TUT. The NIR presents a description of the quality objectives and the QA/QC procedures and responsibilities.

31. In response to a recommendation in the previous review report, Estonia implemented additional QA procedures for key categories before the 2012 annual submission. In addition, data from the EU ETS have been used for verification purposes of the 2012 inventory by MoE. The ERT commends the Party for these improvements and recommends that the Party perform these checks on an annual basis.

32. During the review, Estonia provided the ERT with the QC reports prepared by the inventory compilers and with the QA reports prepared by the independent experts. The ERT found that, in general, the quality checks are documented very well. However, limited documentation is available for the overall checks made by the QA/QC coordinator and of

cross-checks with the EU ETS data. Therefore, the ERT recommends that Estonia improve the documentation of these QA/QC checks.

33. The QA/QC plan provides for a ministerial and public review of the annual submission but does not include any peer reviews or other verification activities. During the review week Estonia informed the ERT that the review team obtains feedback from specific ministries (e.g. Ministry of Agriculture) but that the public review has not been very effective in providing feedback. Therefore, the ERT encourages Estonia to strengthen its QA procedures, for example by: (a) being more proactive during the public review (e.g. by directly approaching relevant institutions such as business associations, university institutes, and so on); (b) involving Statistics Estonia in the QC of the inventory; (c) providing for peer reviews of the inventory.

Transparency

34. Estonia has increased the overall transparency of the NIR as part of its inventory improvement plan and in response to previous review reports. However, the ERT identified several areas where the CRF tables and the NIR still lack transparency. Therefore, the ERT encourages Estonia to continue to improve the transparency of the information provided in its next annual submission. In particular, the ERT recommends that Estonia provide clearer information on the energy sector (see paras. 42, 43, 48, 52, 56 and 57 below), the industrial processes sector (see para. 75 below), the agriculture sector (see paras. 79 and 82 below), the LULUCF sector (see paras. 93 and 95 below) and the waste sector (see paras. 111 and 113 below), as well as information on the activities under Article 3, paragraph 3, of the Kyoto Protocol (see para. 123 below).

Inventory management

35. Estonia has a centralized archiving system, which includes the archiving of disaggregated EFs and AD, and documentation on how these factors and data have been generated and aggregated for the preparation of the inventory. The archived information also includes internal documentation on QA/QC procedures, external and internal reviews, and documentation on annual key categories and key category identification and planned inventory improvements. The archive is kept by EERC. However, the ERT noted that the archive does not include all information (e.g. XML files provided by the inventory compilers to the producers of the CRF tables. This information is stored on an electronic file transfer (ftp) site also managed by EERC and used to facilitate the exchange of data. During the review, the Party provided the ERT with the requested additional archived information. The ERT recommends that Estonia make sure that all relevant materials (also relevant material from the ftp site) are stored in the archive.

3. Follow-up to previous reviews

36. Estonia has made many improvements in its 2012 annual submission by implementing the recommendations formulated in the previous review report. The implemented recommendations formulated in the 2011 review report are listed in table 10.8 of the NIR. The improvements include: the revision of the uncertainty estimates and calculation of KP-LULUCF uncertainty estimates; the implementation of additional QA checks for key categories and the use of EU ETS data for QA/QC checks; the completeness of the energy reference approach; the inclusion of the national energy balance data in an annex of the NIR; the revision of the natural gas EF; the completeness and transparency of the reporting of fluorinated gases (F-gases); the provision of estimates of the carbon stock changes in living biomass for cropland remaining cropland and in forest land converted to settlements.

37. The Party has not yet implemented some of the recommendations from the previous review report, including: the development of country-specific EFs for gasoline, diesel and gas oil; the reporting of mandatory pools under the LULUCF sector; the transparent reporting of land identification; the development of country-specific EFs and other parameters for certain LULUCF categories; the reduction of inter-annual fluctuations in carbon stock changes in living biomass; and the reporting of bovine cattle in the young cattle subcategory.

4. Areas for further improvement identified by the expert review team

38. During the review, the ERT identified several issues for improvement. These are listed in table 6 below.

39. Recommended improvements relating to specific categories are presented in the relevant sector chapters of this report and in table 6 below.

B. Energy

1. Sector overview

40. The energy sector is the main sector in the GHG inventory of Estonia. In 2010, emissions from the energy sector amounted to 18,185.24 Gg CO_2 eq, or 88.5 per cent of total GHG emissions. Since 1990, emissions have decreased by 49.4 per cent. The key drivers for the fall in emissions are the economic structural changes in line with the transition from a planned economy to a market economy, which resulted in a decline in emissions from the categories energy industries, manufacturing industries and construction, transport, other sectors and fugitive emissions. Within the energy sector, 80.5 per cent of the emissions were from energy industries, followed by 12.4 per cent from transport, 3.6 per cent from other sectors, 2.8 per cent from manufacturing industries and construction, and 0.5 per cent from fugitive emissions from oil and natural gas. The category other accounted for 0.2 per cent of total emissions from the energy sector. Fugitive emissions from solid fuels are reported as not occurring ("NO").

41. Estonia has made recalculations for the energy sector between the 2011 and 2012 submissions mostly in response to the 2011 annual review report and following changes in AD and EFs. The impact of these recalculations on the energy sector is a decrease in emissions of 0.4 per cent for 2009 and a decrease in emissions of 1.1 per cent for the base year. The main recalculations took place in the following categories:

(a) Fugitive emissions from oil and natural gas;

(b) Energy industries;

(c) Other sectors.

42. The ERT commends Estonia for making improvements in the transparency of its reporting of the energy sector, as recommended by previous review reports. Compared with the previous submission, in the 2012 NIR, Estonia has included more figures on trends and explanations on the driving forces behind the emissions trends of all key categories. Also, the national energy balance was provided as an annex to the NIR. More explanations were provided on the choice of AD and EFs for emission estimates of a few categories where fuel is imported or/and exported. Additional background information from Statistics Estonia on the activities of international and domestic aviation and navigation was provided to the ERT during the review, which justifies the allocation of these emissions between international and domestic aviation. In response to questions raised during the review regarding some inconsistencies between national statistics and the International Energy

Agency (IEA) statistics (most of them related to import/export of fuels), Estonia informed the ERT about its intention to review all export data of gas/diesel oil, other kerosene, gasoline and jet kerosene and make revisions if necessary in its next annual submission. The ERT recommends that Estonia improve the consistency between data reported to the IEA and data gathered at Statistics Estonia, and provide relevant information in the NIR to improve transparency in its next annual submission.

43. The NIR for the energy sector is generally transparent with a few exceptions, such as estimates of the CH_4 EF for natural gas distribution (see para. 57 below), background information on CH_4 and N_2O emission estimates from road transportation using the COPERT IV model (see para. 56 below). The ERT recommends that Estonia improve the transparency of its reporting and provide more explanations on these matters in the NIR of the next annual submission.

44. Emissions from the energy sector have been reported for all years of the time series and are complete in terms of geographical coverage, and the time series is consistent. The CRF tables include emission estimates for all categories, gases and fuel uses from the energy sector, as recommended by the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Revised 1996 IPCC Guidelines). The ERT commends Estonia for having corrected some gaps that were identified in previous review reports with regard to the methodology used for the reference approach and a few categories, by adopting methodologies in line with the Revised 1996 IPCC Guidelines and the IPCC good practice guidance.

45. Emissions from oil shale in the category public electricity and heat production, which accounts for 80.5 per cent of the total emissions of the sector, are estimated using detailed plant-specific information. A tier 3 approach based on the COPERT IV model is applied for emission estimates of CH_4 and N_2O from road transportation, which accounts for most of the emissions from transport. Such prioritizing is in accordance with the IPCC good practice guidance. Emissions from the remaining categories are estimated using tier 1 or tier 2 methods. During the review, Estonia informed the ERT that it has a plan for the improvement of the prioritization of key categories. The ERT encourages Estonia to continue its efforts towards the use of higher-tier methods and country-specific EFs for the key categories to improve accuracy.

2. Reference and sectoral approaches

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

46. CO_2 emissions from fuel combustion were calculated using both the reference approach and the sectoral approach. For 2010, CO_2 emission estimates calculated using the reference approach are 2.52 per cent higher than those calculated by the sectoral approach. An explanation for the difference between the two approaches was provided in CRF table 1.A(c). Main reasons for this difference include: (1) the reallocation of fuels from solid fuel to liquid and gas fuels when using the most primary energy source oil shale for power generation and heating (which generate shale oil and oil shale gas from oil shale); (2) the differences in import and export data, including those for shale oil, gasoline, diesel and natural gas.

47. The ERT commends Estonia for the improvements made to the emission estimates in the reference approach by including the emissions from lubricants and bitumen and carbon stored in peat. The ERT noted that figures for apparent energy consumption (excluding non-energy use and feedstocks) were not provided in CRF table 1.A(c) and instead the notation key not applicable ("NA") was used, which resulted in a 100 per cent difference for energy consumption data between the reference and sectoral approaches. The

ERT recommends that Estonia improve the completeness of its reporting by providing the relevant figures in its next annual submission.

International bunker fuels

48. Following the recommendation in the previous review report, Estonia provided the time series for the number of landing and take-off cycles for both domestic and international flights, as well as additional information from Statistics Estonia on jet kerosene fuel consumption data for international and domestic aviation, and on residual fuel oil and diesel oil for marine bunkers. The ERT recommends that Estonia improve the transparency of its reporting by including in the next annual submission information on data sources and a description of the methodologies used.

Feedstocks and non-energy use of fuels

49. Estonia reported feedstocks and non-energy use of fuels from oil shale, natural gas, lubricants and bitumen. The ERT commends Estonia for having improved the methodology used to estimate carbon stored from non-energy consumption of natural gas, bitumen and lubricants which was not reported in line with Revised 1996 IPCC Guidelines in previous annual submissions. AD on lubricants and bitumen consumption are based on IEA statistics, while data on natural gas use for non-energy use and oil shale semi-coke stored in the oil shale waste dumps are based on national energy statistics or plant-specific information. The ERT encourages Estonia to make further efforts in obtaining consumption data on lubricants and bitumen from national statistics authorities and to use these data in the next annual submission.

3. Key categories

Stationary combustion: solid fuels – CO_2

50. Oil shale is the dominant energy source in Estonia, and it accounted for 65 per cent of the national total primary energy supply in 2010. In response to a recommendation in the previous review report, Estonia provided an up-to-date carbon balance for all three individual shale oil production plants (Kiviõli Oil Shale Processing and Chemicals Plant Ltd, Viru Chemistry Group(VKG) Ltd and Narva Oil Plant AS at the Eesti Power Plant) based on each specific thermal processing operation. Additional information on an oil shale carbon balance check was provided as an annex to the NIR. Emission estimates for the current approach are based on oil shale carbon balance at the plant level, so the ERT recommends that Estonia continue to compare the carbon balance with emission estimates in future annual submissions.

51. Noting that the accuracy of the present emission estimates has been improved considerably by using plant-specific data in the carbon balance, and considering also the dominant role of this key category in the national total GHG emissions and overall outdated uncertainty estimates, the ERT encourages Estonia to update the uncertainty estimates for this category in future annual submissions.

52. Recalculations have been conducted for the entire time series to reflect the updates in methodology and changes in AD and EFs, including the change in the use of the net calorific values for oil shale obtained from national statistical data to the use of plant-specific data. However, the reasons for the recalculations are not transparently explained in the NIR. The ERT recommends that Estonia provide relevant explanations in its next annual submission.

Stationary combustion: gaseous fuels – CO_2

53. Estonia adopted the CO_2 EF of natural gas (54.98 t CO_2/TJ) from the Russian Federation and recalculated the entire time series to reflect the change of CO_2 EF (previously the CO_2 EF from Finland was used (54.76 t CO_2/TJ)), as all natural gas in Estonia is imported from the Russian Federation). However, the ERT noted that the EF is inconsistent with the EF used in the 2011 annual submission of the Russian Federation (which is 55.26 t CO_2/TJ).

54. In response to the questions raised by the ERT during the review, Estonia explained that it calculated the CO_2 EF by using the carbon content of natural gas from the Russian Federation (15.07 t C/TJ) multiplied by the default oxidation rate value for natural gas (99.5 per cent) from the Revised 1996 IPCC Guidelines, which explains why the Estonian EF is lower than Russian EF (where oxidation rate of 100 per cent is applied). The ERT noted that Estonia incorrectly referenced the carbon content of natural gas to the Russian country-specific values (as contained in table 3.13 of the NIR of the Russian Federation). The ERT recommends that Estonia correct the source reference and provide the above explanations about the application of the carbon content and oxidation factor values in the NIR in its next annual submission**.**

Road transportation: liquid fuels – CO_2

55. Estonia applied the CO_2 EF for gasoline from Lithuania (72.97 t/TJ) without justification instead of developing its own country-specific EF. In response to a question raised by the ERT during the review Estonia explained that developing a country-specific CO_2 EF for gasoline is resource-intensive work and needs gasoline import data from countries that are not available in the electronic database of Statistics Estonia. During the review, Estonia informed the ERT that it calculated the country-specific EF of gasoline for one year (2009) and found it very close to the Lithuanian EF. However, because CO_2 emissions from gasoline is a key category, the ERT recommends that, to improve the accuracy of its reporting, Estonia extend this effort and develop a county-specific CO_2 EF for gasoline for the entire time series by using a weighted average of country-specific EFs from the main import countries.

4. Non-key categories

Road transportation: liquid fuels – CH_4 and N_2O

56. Estonia estimated CH_4 and N_2O emissions from road transportation based on a tier 3 approach (COPERT IV model). In response to recommendations in the previous review reports, Estonia provided a general description of the model and AD and EFs used as input to the model. During the review, in response to questions raised by the ERT, Estonia provided additional background information on the model framework, input/output data and QA/QC procedures such as common statistical quality checks related to the assessment of trends before using the AD. The ERT noted some large inter-annual fluctuations and noted that there are no explanations for the trends in the N_2O implied emission factor (IEF) for gasoline (e.g. it increased by 43.8 per cent between 1993 and 1994, decreased by 23.9 per cent between 1997 and 1998, increased by 47.2 per cent between 2000 and 2001, decreased by 54.1 per cent between 2002 and 2003, and decreased by 37.8 per cent between 2005 and 2006). The ERT recommends that Estonia strengthen its QA/QC procedures, for example by conducting model calibrations, and that Estonia provide the necessary explanations on emissions trends in the NIR to improve transparency.

Fugitive emissions: natural gas – CH_4

57. Estonia reported fugitive CH_4 emissions from industrial, residential and commercial consumption of natural gas under the sub-category natural gas: distribution, whereas in previous submissions, these emissions had been reported under the subcategory natural gas: other leakage, and confirmed that there is no natural gas transmission in Estonia.

58. Between the 2011 (266.09 t/PJ) and 2012 (165.02 t/PJ) annual submissions the CH_4 EF for natural gas distribution (category 1.B.2.b.iv) declined by 38.0 per cent for 2009. In the 2012 annual submission, Estonia reports a constant value of 165.02 t/PJ for the entire time series, referring to default EFs from the Revised 1996 IPCC Guidelines but without providing further explanations. The ERT noted that the CH_4 EF (266.09 kg/PJ) reported as leakage in the 2011 annual 2011 submission for 2009 is the mid-value in the range of weighted average of IPCC default EFs (mid-value of EFs for leakage at industrial plants and power stations (279.5 t/PJ) and mid-value of EFs for leakage in the residential and commercial sectors (139.5 t/PJ)). In response to questions raised by the ERT during the review, Estonia explained that it had decided to use the Finnish CH_4 EF for natural gas distribution (165.02 kg/PJ) for the whole time series, arguing that natural gas distribution networks in Estonia meet all the EU requirements. as do those in Finland. The ERT noted that the Finnish EF is based on measurements and varies from year to year, and therefore recommends that Estonia investigate the rationale of a constant EF and refer correctly to the source of the EF in the NIR of the next annual submission.

C. Industrial processes and solvent and other product use

1. Sector overview

59. In 2010, emissions from the industrial processes sector amounted to 497.57 Gg CO_2 eq, or 2.4 per cent of total GHG emissions, and emissions from the solvent and other product use sector amounted to 17.65 Gg CO_2 eq, or 0.1 per cent of total GHG emissions. Since the base year, emissions have decreased by 53.8 per cent in the industrial processes sector, and decreased by 15.1 per cent in the solvent and other product use sector. The key drivers for the fall in emissions in the industrial processes sector are: the transition from a planned economy to a market economy after 1991, which led to an overall decrease in emissions from the industrial processes sector between 1991 and 1993; the closure of the single Estonian ammonia factory in 2009; and the global economic recession 2008–2009, which led to a decrease of emissions by 66.1 per cent between 2008 and 2009.

60. Within the industrial processes sector, 62.4 per cent of the emissions were from cement production, followed by 29.0 per cent from the use of halocarbons in refrigeration and air-conditioning equipment, 3.6 per cent from lime production and 2.3 per cent from other mineral products (container glass production and bricks and tiles production). The consumption of halocarbons in foam blowing accounted for 1.5 per cent. The remaining 1.2 per cent were from consumption of halocarbons and SF_6 (electrical equipment, aerosols, fire extinguishers) and soda ash use.

61. Estonia has made recalculations for the industrial processes sector between the 2011 and 2012 submissions following changes in AD (more detailed and additional AD was provided by companies, depending on the categories, but mainly in response to the recommendations in the 2011 annual review report). The main recalculations took place in the following categories:

(a) Domestic refrigeration (refrigeration and air conditioning equipment). The leakage rate of domestic refrigerators was reviewed using data from the Estonian Association for Recycling of Electrical and Electronic Equipment because it was very high

in previous submissions (2 per cent) compared with the default product life factor provided in the IPCC good practice guidance (which ranges between 0.1 and 0.5 per cent), and the whole time series of emissions from stocks were recalculated accordingly;

(b) Transport refrigeration (refrigeration and air conditioning equipment). More detailed AD for 2009 on refrigerated vehicles were collected from companies and the emission estimates were updated accordingly;

(c) Mobile air-conditioning (refrigeration and air conditioning equipment). More detailed data on ship air-conditioning were provided by companies and the Ministry of Defence from 2006 to 2009 and estimates were recalculated accordingly;

(d) Foam blowing. More detailed AD for 2009 on spray and injection of polyurethane foam, and fire protecting systems were collected from companies and the emission estimates were updated accordingly;

(e) Other (mineral products). Production AD for bricks and tiles collected from the plants were used and the time series recalculated due to additional data from two new plants.

62. The impact of these recalculations on the industrial processes sector is a decrease in emissions of 1.52 Gg CO_2 eq in 2009. The recalculations are transparently explained in the NIR.

63. Estonia has made recalculations for the solvent and other product use sector between the 2011 and 2012 submissions following changes in AD in the databases of Statistics Estonia. Every year Statistics Estonia provides initial data and the common practice is to correct annually statistical data for previous years. Non-methane volatile organic compounds and indirect CO_2 emissions from paint application were corrected for the years 2001–2002, 2004, 2009, from degreasing and dry cleaning for the year 2006 and from other product use for the year 2009. The impact of these recalculations on the solvent and other product use sector is an increase in emissions of 0.89 Gg CO_2 eq for 2009.

64. The ERT noted that the Estonian inventory for the industrial processes sector is complete and that the AD, EFs, background parameters and the methods used are generally transparently described in the NIR, with the exception of those for emissions from the use of F-gases (see para. 75 below).

65. Estonia estimated CO_2 emissions from cement and lime production using plant-specific data, because in the past these had been key categories. IPCC default EFs were used for the other mineral products subcategories.

66. The ERT further noted that Estonia implemented all the recommendations for improvements in the industrial processes and solvent and other product use sectors provided in the previous review report, which improved the completeness and accuracy of the inventory. The ERT commends Estonia for the efforts it has made, particularly regarding the review of the leakage rate of household refrigerators and the recalculation of the emissions using a new country-specific product life factor for the whole time series, as well as the refinement of AD and EFs and the provision of more detailed information in the NIR. The ERT also commends Estonia for the efforts made regarding the estimation of emissions from categories that were previously reported as not estimated ("NE"), such as N_2O emissions from aerosol cans in the solvents and other product use sector.

67. Estonia fully implemented the encouragements provided in the previous review report, except for those relating to the estimation of potential emissions of F-gases (see para. 74 below) and the ERT noted that a detailed comparison of the country-specific methods used in all consumption of halocarbons and SF_6 subcategories with those from the IPCC good practice guidance is still missing in the NIR (see para. 75 below).

68. The general QA/QC approach of the Party for the industrial processes sector is appropriate. However, the ERT noted that QA/QC activities could be improved in this sector by, for example, including peer reviews of the models and all inventory estimates by external industrial experts not involved in the compilation of the inventory.

2. Non-key categories

Limestone and dolomite use – CO_2

69. Estonia reported CO_2 emissions from limestone and dolomite use as included elsewhere ("IE"). Following the 2006 IPCC Guidelines, Estonia allocates CO_2 emissions from the use of limestone and dolomite to the industrial category where the raw materials are consumed (e.g. under the category other (mineral products). Under this category Estonia includes the emissions from glass production, bricks and tiles production and lightweight gravel production. During the review, Estonia explained that it had undertaken a cross-check of limestone consumption for one year, based on AD provided by the plants for the inventory against the total national limestone consumption obtained from Statistics Estonia. The cross-check showed that the inventory emission estimates for limestone use were conservative (total AD reported in the inventory were higher than total national limestone consumption obtained from statistics).

70. The ERT welcomes this cross-checking approach and considers it could be an integral part of the QA/QC system. The ERT encourages Estonia to cross-check limestone and dolomite use on an annual basis from the next annual submission (e.g. by comparing the sum of specific limestone and dolomite uses included in the inventory with apparent consumption obtained from statistical data on production, imports and exports). The ERT also encourages Estonia to document the results of such comparisons, including explanations for any discrepancies in the NIR of its next annual submission.

Other (mineral products) – CO_2

71. The ERT noted that the same raw materials as those used for cement and lime production are also used for glass production and ceramics productions (bricks and tiles and lightweight gravel) and these emissions are reported under other (mineral products) using IPCC default EFs. The ERT notes that, because the number of plants concerned is small, Estonia may wish to consider developing country-specific EFs and using tier 2 or higher methods to estimate emissions in order to increase accuracy of the estimates.

Soda ash use – CO_2

72. Following the recommendation of the previous review report Estonia has reported, for the first time, emissions under this category from the use of soda ash in the electrolyte neutralization process, which started in 2003 in the country. The ERT encourages Estonia to enhance the accuracy of the inventory by monitoring and cross-checking the total soda ash use on an annual basis (e.g. by comparing the sum of specific soda ash uses included in the inventory with the apparent consumption estimated from national or international statistical data on production, imports and exports) and by documenting the results of such comparison in its next annual submission.

Consumption of halocarbons and SF_6 – HFCs and SF_6

73. Basic research[8] was undertaken in 2008 to collect AD and country-specific EFs and to establish a complete inventory and reporting system for F-gases for the year 2006. Based on the established methodologies, Estonia has annually updated AD and, in some cases, the basic parameters (e.g. the EF for foam blowing). In the 2012 annual submission, Estonia has recalculated data in order to refine some parameters (e.g. leakage rate of domestic refrigerators) and has completed the time-series using the same methodology. However, the ERT noted that many basic parameters elaborated for the 2006 reporting year are being used annually. In order to increase the accuracy of the estimates, the ERT encourages Estonia to continue its research efforts in order to revise and improve the basic parameters in the future and especially those which are very likely to evolve (e.g. replacement of F-gases due to legislation), which are based on assumptions or which were roughly estimated.

74. Estonia reported potential emissions of HFCs, PFCs and SF_6 as "NO" or "NE". In order to increase the transparency and comparability of the reporting, as well as to check actual estimates, the ERT reiterates the encouragement of the previous review report that Estonia provide estimates for the potential emissions of these gases.

75. Emissions from the use of F-gases were calculated using tier 2a and tier 3 methods from the 2006 IPCC Guidelines and mainly country-specific EFs. Information on the comparison of the EFs used by the Party with the EFs recommended in the 2006 IPCC Guidelines was provided. Further, Estonia explained that the methodology of 2006 IPCC Guidelines has been chosen considering its suitability for the national circumstances and the possibilities to collect data. In order to enhance the transparency and comparability of the reporting, the ERT reiterates the recommendation of the previous review report that Estonia continue its efforts by providing, in its next annual submission, a more detail justification for the use of the methodologies described in the 2006 IPCC Guidelines.

Solvent and other product use –N_2O

76. Estonia estimated N_2O emissions from aerosol cans for the period 2007–2010 for the first time in the 2012 annual submission and provided information on the data and methodology applied. The ERT commends Estonia for these improvements which enhance the completeness of the reporting for the solvents and other product use sector.

D. Agriculture

1. Sector overview

77. In 2010, emissions from the agriculture sector amounted to 1,308.77 Gg CO_2 eq, or 6.4 per cent of total GHG emissions. Since 1990, emissions have decreased by 60.7 per cent. The key drivers for the fall in emissions are a decrease in the livestock population and a decrease in the amount of synthetic fertilizer and manure applied to soils. Within the sector, 54.4 per cent of the emissions were from agricultural soils, followed by 34.1 per cent from enteric fermentation, and 11.5 per cent from manure management. N_2O accounted for 62.1 per cent and CH_4 accounted for 37.9 per cent.

78. Estonia has made recalculations for the agriculture sector between the 2011 and 2012 submissions in response to the 2011 annual review report. The impact of these recalculations on the agriculture sector is an increase in emissions of 1.1 per cent for 2009. The main recalculations took place in the following categories:

[8] EE2005/IB/EN/01. "Enhancing the capacity to reduce the emissions of fluorinated greenhouse gases in Estonia" The Twinning Project between the Estonian Ministry of Environment and the German Ministry for the Environment, Nature Conservation and Nuclear Safety.

(a) Enteric fermentation;

(b) Manure management;

(c) Agricultural soils.

79. The inventory is complete in terms of categories and gases with estimates reported for all years of the time series. Improvements were made in emissions from enteric fermentation by updating the data for feed digestibility, daily weight gain and classification of the feeding situation for dairy cattle. For manure management, improvements were made through the development and use of a country-specific manure management system. However, the ERT noted that not all CRF tables and data are fully explained and referred to in the NIR and recommends that Estonia include this information in its next annual submission to improve transparency.

2. Key categories

Enteric fermentation – CH_4

80. Estonia has used the tier 2 method and country-specific parameters for the estimation of emissions from cattle and swine, and tier 1 methods and IPCC default parameters for the estimation of emissions from all other animals, such as sheep and goats, that are not a significant animal type in this key category. This is in line with the IPCC good practice guidance.

81. For fur-bearing animals, Estonia has used an EF from Norway since no IPCC default value is available, but did not justify the use of the Norwegian factor in its NIR. The ERT encourages Estonia to examine the possibility of developing country-specific EFs for fur-bearing animals.

82. The ERT noted that the NIR does not provide sufficient information on the characteristics of non-dairy cattle, such as animal weights, or on the CH_4 conversion factors and the data sources used for calculations of the CH_4 emission estimates. In response to questions raised by the ERT during the review, Estonia elaborated on these characteristics. The ERT recommends that Estonia increase the transparency of its reporting by including this information in its next annual submission.

83. Estonia reported calves under the subcategory young cattle and reported bovine cattle (aged 1 to 2 years) under the subcategory mature, which is not in accordance with the IPCC good practice guidance. The calves were not excluded from the enteric fermentation calculations for the period when they are milk-fed. The ERT considers that this may lead to an overestimate of CH_4 emissions from enteric fermentation for the entire time series. The ERT reiterates the recommendations from the 2010 and 2011 review reports that Estonia report bovine cattle in the young cattle subcategory, because they are growing animals, and estimate CH_4 emissions from calves by applying a CH_4 conversion rate of zero for the period when they are milk-fed.

Manure management – CH_4 and N_2O

84. Estonia used the tier 2 method and country-specific EFs for cattle and swine, but used the tier 1 method and default EFs for other livestock that are not a significant animal type in this key category. This is in line with the IPCC good practice guidance. The Party has developed and reported for the first time in the 2012 annual submission its own manure management system which disaggregates manure management practices more accurately using country-specific data collected by Statistics Estonia. The ERT commends Estonia for moving from a tier 1 to a tier 2 approach for this category.

Agricultural soils – N_2O

85. Tier 1a and tier 1b methods and default EFs were used to estimate N_2O emissions from this key category. The ERT noted that, in the calculation of N_2O emissions from atmospheric deposition of nitrogen after application of sewage sludge to soils, Estonia inappropriately used the default IPCC good practice guidance value for the fraction of nitrogen that volatilizes as ammonia (NH_3) and nitrogen oxides (NO_X) from synthetic fertilizers (0.1; $Frac_{GASF}$) instead of the default value for the fraction of nitrogen that volatilizes as NH_3 and NO_X from animal manure (0.2; $Frac_{GASM}$). The use of $Frac_{GASF}$ instead of $Frag_{GASM}$ is not in line with the provisions of the IPCC good practice guidance. The ERT considers that the incorrect application of $Frac_{GASF}$ leads to an underestimation of N_2O emissions from agricultural soils.

86. In response to a question raised by the ERT during the review, Estonia provided during the review week a revised estimate of N_2O emissions. The impact of the revision is a decrease in N_2O emissions from crop residues of 59.1 per cent for 2010 (from 0.17 Gg N_2O to 0.07 Gg). The ERT agreed with the revised estimates.

87. For the estimation of direct and indirect N_2O emissions from sewage sludge application to soils (i.e. for the categories sewage sludge, atmospheric deposition and nitrogen leaching and run-off), Estonia included sewage sludge from both 'recycling/reclamation of organic substances which are not used as solvents, including composting and other biological transformation process' and 'land treatment resulting in a benefit to agriculture or ecological improvement'. However, the ERT noted that the N_2O emissions from recycling/reclamation were also included in the waste sector, which has therefore resulted in a double counting of emissions.

88. In response to the questions raised by the ERT during the review, Estonia provided revised N_2O emissions that excluded the amount of composted sewage sludge which is reported under the waste sector. The impact of the revisions is a decrease in emissions of 77.8 per cent for 2010 (from 0.0081 to 0.0018 Gg) from the category other (direct soil emissions). The ERT agreed with the revised estimates.

89. In response to a question raised by the ERT during the review, Estonia revised the indirect N_2O emissions from agricultural soils. The amount of sludge reported under other (direct soil emissions) was revised by excluding the amount of sewage sludge treated biologically. For the year 2010 the recalculations resulted in a decrease in N_2O emissions of 0.3 per cent (from 0.1242 to 0.1238 Gg) for atmospheric deposition and a decrease in N_2O emissions from nitrogen leaching and run-off of 0.7 per cent (from 0.6372 to 0.6330 Gg). The ERT agreed with the revised estimates.

E. Land use, land-use change and forestry

1. Sector overview

90. In 2010, net removals from the LULUCF sector amounted to 3,757.75 Gg CO_2 eq. Since 1990, net removals have decreased by 59.8 per cent. The key driver for the decrease in removals is the increased harvest rate in forest land remaining forest land. Within the sector, in 2010 4,013.08 Gg CO_2 eq of net removals were from forest land, followed by 160.75 Gg CO_2 eq of net removals from grassland. Cropland was a net source of 103.20 Gg CO_2 eq.

91. The ERT noted that the LULUCF sector is not complete, because carbon stock changes in mineral soils and emission and removals from mineral soils are reported as "NE" for all land uses, except forest land converted to settlements. In the 2012 annual submission, Estonia provided for the first time estimates of the carbon stock changes in

living biomass for cropland remaining cropland and for forests converted to settlements. Estonia did not report emissions and removals from forest land converted to wetlands, land converted to settlements (except forest land converted to settlements) and land converted to other land. The ERT commends the Party for the improvements made to the completeness of its inventory, but reiterates the recommendation of the previous review reports that Estonia further improve the completeness of the LULUCF estimates.

92. Estonia reports planned improvements for estimating carbon stock changes in cultivated mineral soils, but at the same time highlights a lack of resources for conducting the work. The ERT notes that the IPCC tier 1 methodology provides a cost-effective approach for estimating emissions and removals in mineral soils in cropland, grassland and any land-use change. The ERT strongly recommends that Estonia begin to implement the IPCC tier 1 method for mineral soils, giving priority to emissions and removals from land-use changes.

93. Estonia uses data from the national forest inventory (NFI) to estimate the areas of land categories and land-use changes. The NFI covers the whole country. To gather NFI data, prior to 1999 Estonia used stand-wise forest inventories. Since 1999 Estonia has been using systematic sampling with a 5km x 5km quadrangle grid, and is measuring one fifth of the permanent sampling plots each year. All permanent plots are measured once every five years. In 2009, Estonia started an additional field study within the framework of the NFI to specifically assess land uses, land-use changes over the past 20 years (and the year of change) and estimate soil types (mineral/organic). In case of doubt, older maps and aerial photographs are used as supporting material to determine more accurately land-use changes in time. The field study is on-going, and the data collected so far have been used while estimating emissions and removals from LULUCF in the 2011 annual submission. The ERT reiterates a recommendation from the previous review report that the Party provide more information on the detailed methods used to identify the exact year when the land-use changes occurred on each sampling plot.

94. The tier 2 approach of the IPCC good practice guidance for LULUCF has been applied to estimate the carbon stock changes associated with aboveground biomass, dead wood and biomass burning for the whole time series, combined with specific tier 1 parameters (e.g. BEF, root–shoot ratio). Carbon stock changes in organic soils have been estimated using the IPCC default method. The ERT reiterates the recommendation of the previous review report that Estonia develop country-specific EFs and parameters where possible or, as an interim measure, use the EFs applied by the neighbouring countries with similar forest conditions. For consistency reasons, the ERT also recommends that Estonia revise the estimates of BEFs, EFs and area of drained organic soils, following the revisions made and reported under the KP-LULUCF activities in the submission of revised estimates made during the review week (see para. 127 below).

95. The ERT considers that the reporting in the LULUCF sector is generally transparent. However, the ERT reiterates the recommendation from the previous review report that Estonia provide more detailed information on the methodology used to estimate the carbon stock changes in any land converted to other land in the NIR.

96. The Party has made recalculations for the LULUCF sector between the 2011 and 2012 submissions, mainly affecting CO_2 emissions from forest land and grassland. These were performed mainly due to: updates in the land use and land-use change matrix; updates of specific parameters (e.g. BEF, root–shoot ratio, combustion factors); the specification of a portion of drained organic forest soil within all organic soils which was defined using data from the latest NFI (in previous submissions, all organic forest soils were regarded as drained); the inclusion of new estimates of carbon stock changes in orchards. The impact of these recalculations on the LULUCF sector is a 1.2 per cent increase in removals for 2009.

2. Key categories

Forest land remaining forest land – CO_2

97. Estonia considers that all forest is managed forest and estimates annually the change in the carbon stock in living biomass by using the stock change method with default parameters (except wood density) from the IPCC good practice guidance for LULUCF. The ERT identified that the carbon stock change method has been incorrectly applied, because first the sum of the carbon stocks across all areas at times t1 and t2 was calculated and then the difference in carbon stocks was calculated. This resulted in errors when the area at times t1 and t2 was not the same. As set out in the IPCC good practice guidance for LULUCF (chapter 4.2.3.2), it is good practice to calculate the carbon stock change as follows: for each given area, the carbon stock change should first be calculated as a difference of carbon stocks between times t1 and t2 and these stock changes should then be summed for all areas. The ERT recommends that Estonia apply the revised calculation for estimating the carbon stock changes in living biomass in the next annual submission.

98. The carbon stock changes in living biomass fluctuate considerably between 1990 and 2010, from gains of –2,565.43 Gg C in 1994 to losses of 1,493.84 Gg C in 2001. In its NIR, Estonia reports that the significant change in the harvest volumes and the extensive impact of wildfires (e.g. in 2006) affect the emission estimates. However, the ERT noted that the level of harvest volumes and wildfires cannot explain the large inter-annual fluctuations in the most recent years and concluded that the relatively low NFI sampling frequency in each year is very likely to be the main reason for these fluctuations. The ERT reiterates the strong recommendation of the previous review reports that Estonia explore ways to reduce the inter-annual fluctuations, for example by using the NFI data set for a specific year and that for the five previous years to compare the data of the same sampling plots.

99. A high level of removals was reported in recent years for carbon stock changes of dead organic matter (up to –1,163.05 Gg C in 2004), along with a high inter-annual variability. During the review, the Party explained that in 2001, 2002 and 2005 large scale storms damaged the forests, leading to large accumulations of dead wood. The ERT noted that the accumulation of dead wood due to the storms could not sufficiently explain the high inter-annual variability. Similarly to the carbon stock changes in living biomass (see para. 98 above), the ERT noted that the inter-annual variability of dead organic matter may be the result of the relatively low NFI sampling frequency in each year The ERT therefore recommends that Estonia explore ways to reduce these inter-annual fluctuations and provide quantitative information on the impact of storms in its next annual submission.

100. Estonia applied the IPCC tier 1 approach for forest mineral soil, which assumes no change in carbon stock. Although this is a valid assumption in the absence of major changes in harvest intensity, in the last 20 years Estonia experienced significant variations in harvest, with the highest harvest levels corresponding to net emissions from living biomass. Therefore, the ERT considers that the tier 1 approach may not be fully appropriate for Estonia. During the review Estonia informed the ERT about planned improvements for estimating carbon stocks and turnover in forest soils through implementation of a project titled “Carbon stock and turnover in Estonian forest soils“ in collaboration with the University of Tartu. The ERT commends Estonia for these planned efforts and encourages Estonia to focus its efforts on the estimation of the impact of high harvest levels on forest soil emissions.

Land converted to forest land – CO_2

101. Estonia reports removals of 640.19 Gg C for the living biomass of land converted to forest land, with input data using the carbon stock values reported by the NFI. During the

review, the ERT noted that Estonia erroneously used the carbon stocks instead of the carbon stock changes to estimate removals, resulting in a significant overestimation of the removals. Also, the ERT noted that the correct use of the carbon stock changes from the NFI to estimate removals resulted in high and unexplainable inter-annual variations. The ERT considers that this variability is probably related to the limited number of plots which each year are classified as land converted to forest land, leading to high variability of total carbon stocks from one year to another. Therefore, the ERT recommends that, for the category land converted to forest land, Estonia use the same method applied for afforestation and reforestation (i.e. the biomass increment is estimated not as a difference in total carbon stocks between successive years, but rather using the mean increment per area unit of a certain age of the existing trees (as reported in table 11.2 of the NIR)).

Grassland remaining grassland – CO_2

102. The ERT noted that the removals for living biomass reported by Estonia for the category grassland remaining grassland are very high (reaching –3,351.11 Gg CO_2 eq in 2004) and vary considerably among years. The ERT considers that this is probably related to the method to estimate carbon stock changes in living biomass and recommends that Estonia revise the calculation method and estimate the biomass increment as indicated in paragraph 101 above.

3. Non-key categories

Cropland remaining cropland – CO_2

103. The ERT commends Estonia for having provided, for the first time, estimates of the carbon stock changes in perennial woody crops for the category cropland remaining cropland.

104. Estonia uses the default EF for cold temperate zone from the IPCC good practice guidance for LULUCF (1.0 t C/ha per year) for estimating emissions from cultivated organic soils. This value is much lower compared with that used by neighbouring countries with similar conditions which implemented tier 2 methods, and it is also considerably lower than the tier 1 value included in the 2006 IPCC Guidelines (5.0 t C/ha per year). The ERT reiterates the recommendation from the previous review report that Estonia develop a country-specific EF and parameters where possible. As an interim measure, the ERT recommends that Estonia use the EF for cultivated organic soil developed by neighbouring countries with similar conditions that use tier 2 methods, such as the EF used by Sweden.

CO_2 emissions from agricultural lime application – CO_2

105. The ERT noted that emissions from liming vary considerably among years, and are nearly zero in some years. The ERT encourages Estonia to double-check the input data for estimating emissions for liming or to provide justifications for this variability in its next annual submission.

F. Waste

1. Sector overview

106. In 2010, emissions from the waste sector amounted to 532.39 Gg CO_2 eq, or 2.6 per cent of total national GHG emissions. Since 1990, emissions have increased by 39.7 per cent. The key drivers for the rise in emissions are changes in the composition of disposed waste, changes in the management practices at solid waste disposal sites and an increase in the amount of waste composted. Within the sector, 60.6 per cent of GHG

emissions were from solid waste disposal on land, followed by 26.0 per cent from biological treatment (composting) of waste and 13.4 per cent from wastewater handling. The remaining 0.01 per cent was from waste incineration.

107. Estonia recalculated solid waste disposal on land between the 2011 and 2012 submissions in response to the 2011 annual review report. The main reasons for the recalculations are: a revision of the waste generation rate for the entire time series in order to reflect the actual economic growth and consumption patterns in Estonia in the period 1950–1990, using methodological studies;[9] the more accurate distribution of solid waste disposal sites to managed and unmanaged sites; and the use of country-specific waste composition data instead of data from an analysis of waste composition from the Netherlands which had been used in the previous annual submission. The impact of these recalculations is a decrease in GHG emissions from the sector by 44.8 per cent for 2009 in the 2012 annual submission compared with the GHG emissions from the sector reported in the 2011 annual submission.

108. The ERT noted that the distribution of managed and unmanaged solid waste disposal sites is not in line with the Revised 1996 IPCC Guidelines. During the review, Estonia informed the ERT that the Pääsküla landfill site in Tallinn was identified as managed solid waste disposal site starting from 1995. However, in the distribution of managed and unmanaged solid waste disposal sites Pääsküla landfill site is not reported as a managed solid waste disposal site and the methane correction factor (MCF) for uncategorized solid waste disposal sites (0.6) is used. In response to the ERT advice during the review week to reclassify solid waste disposal sites Estonia provided revised estimates for the distribution of managed and unmanaged solid waste disposal sites, using expert judgement, for the entire time series.

109. The distribution of managed and unmanaged solid waste disposal sites for the period 1995–2008 was adjusted based on waste generation rate (kg/capita/year) based on available data on the quantity of waste deposited on the Pääsküla landfill site in Tallinn and population data for Tallinn in the years 2001 and 2002. The impact of this revision of estimates is an increase in CH_4 emissions of 22.9 per cent for 2010 (from 12.50 Gg to 15.36 Gg) compared with the original 2012 annual submission. Nevertheless, the ERT encourages Estonia to make further efforts to investigate the historical data of solid waste landfilled by collecting the data from solid waste disposal sites, instead of using expert judgement, to make the estimates more accurate.

110. Estonia has made a number of recalculations in the category wastewater handling in the 2012 annual submission compared with the 2011 annual submission. CH_4 emissions from industrial wastewater handling were recalculated for the year 2009, due to updated AD of production and wastewater output provided by Statistics Estonia. N_2O emissions from human sewage were recalculated for the whole time series due to an update in protein consumption using data from the Food and Agriculture Organization of the United Nations (FAO). The impact of these recalculations is a decrease in N_2O emissions from human sewage of 9.2 per cent for 2009 in the 2012 annual submission compared with the 2011 annual submission.

111. The information provided in the NIR and CRF tables is generally transparent and complete. Following recommendations from previous review reports, Estonia reports additional information on CH_4 recovery practices on landfill sites, the composition and amount of organic waste, and the methods and parameters used to estimate CH_4 and N_2O emissions from biogas flaring. Nevertheless, some AD are not provided in the NIR (see para. 113 below). The ERT encourages Estonia to improve the transparency of its reporting by describing these parameters in its next annual submission.

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

112. Category-specific QA/QC procedures have been implemented in the waste sector. Nevertheless, the explanations for some of the notation keys used are not presented correctly in CRF table 9(a) (i.e. Estonia explained that "NE" is reported for CH_4 emissions from biogenic waste incineration due to lack of AD although, actually, the AD are available but the methodology for estimation of these emissions is not available in IPCC good practice guidance). In addition, the ERT identified discrepancies between the data in the CRF tables and the NIR (e.g. in solid waste disposal on land the amount of degradable organic carbon (DOC) and the fraction of DOC in municipal solid waste used were swapped). The ERT encourages Estonia to enhance QA/QC procedures for the preparation of its next annual submission.

2. Key categories

Solid waste disposal on land – CH_4

113. The IPCC first order decay method was used to estimate emissions of CH_4 from this category. Estonia uses the default CH_4 generation rate constant (k) and a default DOC value for different waste types from the 2006 IPCC Guidelines without providing a justification that these parameters better suit the national circumstances of Estonia than those from the Revised 1996 IPCC Guidelines. Other parameters used, such as the methane correction factor, the fraction of DOC dissimilated, the oxidation factor and the fraction of CH_4 in landfill gas are the default values as in the IPCC good practice guidance. The ERT noted that information about the quantity of waste deposition on land for the entire time series is not presented in the NIR. The ERT recommends that Estonia improve the transparency of its reporting by providing more detailed information about the choice of waste deposition data, the CH_4 generation rate constant and the DOC content, and justify the use of parameters from the 2006 IPCC Guidelines in the next annual submission.

114. In 2010, 1.63 Gg CH_4 are reported as recovered and deducted from the total CH_4 emissions. However, CH_4 generated at solid waste disposal sites that is recovered and burned in a flare is not reported as recovery, which is not in line with the IPCC good practice guidance. The ERT recommends that Estonia report CH_4 recovered and burned in a flare properly, as CH_4 recovered, as required by the IPCC good practice guidance.

Wastewater handling – N_2O

115. The methodology from the 2006 IPCC Guidelines was used to estimate N_2O emissions from domestic and commercial wastewater (without human sewage) without an explanation of why this is better suited to the national conditions in Estonia than those in the Revised 1996 IPCC Guidelines. These estimates of N_2O emission (in accordance with the 2006 IPCC Guidelines) include N_2O emissions from human sewage. The ERT noted that Estonia reported N_2O emissions from human sewage separately, in the subcategory N_2O emissions from human sewage, as required by the Revised 1996 IPCC Guidelines, which leads to double counting of N_2O emissions from wastewater (as these emissions are reported under both, domestic and commercial (without human sewage) and under subcategory N_2O emissions from human sewage). The ERT therefore recommends that Estonia report N_2O emissions from human sewage separately from the subcategory domestic and commercial (without human sewage) to avoid double counting of emissions.

3. Non-key categories

Waste incineration, CO_2 and N_2O

116. Estonia has reported emissions from waste incineration with energy recovery under the energy sector, which is in line with the IPCC good practice guidance. However, the

ERT noted that the CO_2 and N_2O emissions from the incineration of biogenic and non-biogenic waste for non-energy use are reported under biogenic waste incineration. Therefore CO_2 emissions from non-biogenic waste incineration for the period 1990 to 2005 are not included in total GHG emission as all waste was considered as biogenic. In accordance with the Revised 1996 IPCC guidelines the fossil based emissions should be considered as net carbon emissions. Therefore GHG emissions for 1990–2005 are underestimated. The ERT recommends that Estonia report emissions from biogenic and non-biogenic waste separately and include CO_2 from non-biogenic waste incineration in the total CO_2 emissions in its next annual submission.

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

1. Information on activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol

Overview

117. Estonia reported activities under Article 3, paragraph 3, of the Kyoto Protocol and did not elect any activities under Article 3, paragraph 4, of the Kyoto Protocol. The forest definition chosen by Estonia is a minimum land area of 0.5 ha, a minimum tree crown cover of 30 per cent and a minimum tree height of 2 m. Estonia has chosen to account for the KP-LULUCF activities at the end of commitment period.

118. The information related to the KP-LULUCF activities provided by Estonia followed the requirements of paragraphs 5 to 9 of the annex to decision 15/CMP.1. During the review the ERT focussed the attention on its concerns related to: (i) the Party's capacity to identify areas of land and areas of land-use change (see paras. 122 and 123 below) and (ii) the Party's lack of demonstration that carbon pools that were not accounted are not net sources (see para. 124 below);.

119. Afforestation and reforestation areas have been obtained by the inventory team from Statistics Estonia. The ERT notes that data from Statistics Estonia represents unequivocally "direct-human induced" afforestation and reforestation (i.e. only plantations are included), and these data represent about one third of the total area reported under land converted to forest (which includes also large areas of natural forest expansion on agricultural lands).

120. The forest definition used by Statistics Estonia (minimum land area of 0.1 ha) is different from that used by the NFI (minimum land area of 0.5 ha). As also noted by previous review reports, this discrepancy suggests that the area of afforestation and reforestation may be overestimated. According to NFI estimates, the difference in area due to different forest definitions applied by Statistics Estonia and the NFI constitutes only 0.35 per cent of the total forest area of Estonia. The ERT considers that, since this figure has been obtained for the total forest area, the real difference related to different forest definitions during the detection of small and scattered events such as afforestation and reforestation may be higher. Therefore, the ERT recommends that, in its next annual submission, Estonia assess the impact of the application of different forest definitions specifically for afforested and reforested lands, and use the results to correct the areas of afforestation and reforestation obtained using the Statistics Estonia data.

121. Deforestation areas have been defined using data from field studies (started in 2009 within the framework of the NFI) and using aerial photographs as supporting material if necessary, and by applying the same principles and definitions as those used to identify afforestation and reforestation. During the review, Estonia provided maps with NFI sample plots identifying land-use changes and a manual with instructions showing how to document the field samples.

122. The ERT noted that the frequency of NFI sample plots does not allow for the detection of annual deforestation events (typically small and rare) with high statistical confidence (i.e. on average, every year only about 1–3 plots of new deforestation events are sampled over the whole country). The ERT considers that this may introduce a significant statistical inaccuracy in the annual estimates of emissions from deforestation. In order to increase the confidence that deforested areas during the commitment period are not underestimated, the ERT strongly recommends that Estonia analyse other possible sources of information (land-use statistics, harvesting permits, land cadastre) to complement the NFI data, and include the results of this analysis in the next annual submission.

123. Overall, the additional information on land identification provided by Estonia during the review increased the confidence of the ERT on the capacity of the Party to identify areas of land and areas of land-use change. However, the ERT strongly recommends that Estonia improve the transparency of information provided in the NIR specifically on: (i) how afforested and reforested areas are identified by Statistics Estonia; (ii) how deforestation areas are detected in practice (areas identified, year of change); and (iii) how each plot is classified as deforested and then translated into deforestation area.

124. With regard to the completeness of the reporting of carbon pools, the ERT noted that no estimates for the litter, dead wood and mineral soil pools were reported for afforestation and reforestation activities, and that no evidence showing that these pools are not net sources was provided in the NIR. While it can be reasonably assumed that litter and dead wood are not net sources during the first years after forest planting, the ERT considers that the same assumption may not be valid for the mineral soil pool. Indeed, a significant number of Parties report emissions in mineral soil under afforestation and reforestation (at least straight after planting). In response to a question raised during the review, Estonia provided estimates for mineral soils under afforestation and reforestation, using the EFs reported by a neighbouring country with similar conditions (Sweden) for different types of lands converted to forest. This revision resulted in mineral soils under afforestation and reforestation being a source of 0.15 Mg C/ha/year. The ERT commends Estonia for this effort, and recommends that Estonia develop country-specific EFs for all carbon pools reported.

125. The Party has made recalculations for the KP-LULUCF activities between the 2011 and 2012 submissions. These have been made due to: updated area data for afforestation and reforestation (now only including plantations) and deforestation (using NFI data); revised BEF and root–shoot ratio parameters for afforestation and reforestation; biomass burning on afforestation and reforestation areas estimated for the first time; emissions from deforestation from mineral soils and litter pools estimated for the first time using EFs from Sweden. The impact of these recalculations on each KP-LULUCF activity for 2009 is as follows: (a) an increase in removals due to afforestation and reforestation of 137.37 Gg CO_2 eq; (b) a decrease in emissions due to deforestation, mainly due to updated area of deforestation, of 130.44 Gg CO_2 eq.

Activities under Article 3, paragraph 3, of the Kyoto Protocol

Afforestation and reforestation – CO_2

126. For estimating the carbon stock changes in living biomass on afforestation and reforestation areas, Estonia used the values of biomass mean increment per unit area of a certain age of forest (derived from NFI data), combined with tier 1 parameters (BEF, root–shoot ratio, wood density). During the review, the ERT noted that the value of BEF was higher (2.5) compared with the default value (1.3). Estonia explained that this value was taken from the upper part of the range provided by the IPCC good practice guidance for LULUCF (BEF of 1.3 for temperate conifers, with a range of 1.15–4.2; whereas the higher

values are typical for young forests). The ERT noted that the 2006 IPCC Guidelines (table 4.5 in Vol. 4) provide BEFs as a function of growing stock, climate and species. The 2006 IPCC Guidelines suggest that a BEF of 2.5 is applicable for very young forests only. The ERT recommends that Estonia use a lower BEF value which is more appropriate for the growing stocks of afforestation and reforestation areas in Estonia.

127. When estimating emissions from organic soils, Estonia used the NFI information on the share of drained organic soil area over the total area of forest organic soils. However, the ERT noted that this information is valid for forest remaining forest, while for land-use changes from/to forest it is more appropriate to assume (in the absence of more specific information) that all the area of organic soils is drained. Furthermore, the ERT noted that for calculating emissions from organic soils Estonia used the EF from the IPCC good practice guidance for LULUCF for afforestation and reforestation areas, whereas the EF from Sweden is used for deforestation areas. In order to ensure consistency throughout the KP-LULUCF sector, the ERT recommends that Estonia use the EFs from Sweden for afforestation and reforestation as well as for deforestation.

128. In the revised estimates for afforestation and reforestation provided during the review week, including emissions from mineral soils (see para. 124 above), Estonia also included the following improvements: (i) a BEF of 1.58 is used (based on mean growing stock of afforested and reforested area and the BEF values included in the 2006 IPCC Guidelines); (ii) the emissions from organic soils are estimated assuming that all the area is drained, and using the EF from Sweden. Overall, the revised estimates for afforestation and reforestation indicate total removals for the period 2008–2010 equal to 552.10 Gg CO_2 eq, as compared with removals of 974.57 Gg CO_2 eq in the original 2012 annual submission. The ERT commends Estonia for these improvements made. At the same time, the ERT recommends that Estonia in its next annual submission: (i) use the country-specific shares of different growing stocks and species to estimate more accurate BEFs; and (ii) develop species-specific values of biomass mean increment per unit area of a certain age of forest.

Deforestation – CO_2

129. In its 2012 annual submission, Estonia estimated emissions from litter, mineral soils and organic soils in deforested areas using the EFs from Sweden. While the ERT recommends that Estonia develop country-specific EFs for key categories whenever possible, the use of EFs from Sweden may be considered acceptable as an interim solution. The ERT noted that EFs were erroneously applied as factors for carbon stock, instead of factors for carbon stock change, and recommends that Estonia correct this mistake in its next annual submission. Furthermore, the ERT recommends that Estonia, as an interim solution, use the weighted average value EFs from Sweden, according to area of land-use changes (forest land converted to other land uses) existing in Estonia.

130. As part of the revised estimates made during the review, Estonia implemented the recommendations of the ERT regarding EFs of litter, mineral soils and organic soils in deforested areas (see para. 129). Overall, the revised estimates for deforestation provided during the review indicate total emissions for the period 2008–2010 equal to 1,877.81 Gg CO_2 eq, as compared with 1,462.13 Gg CO_2 eq reported in the original 2012 annual submission. The ERT commends Estonia for the improvements made in estimating emissions from deforestation and recommends that Estonia include all these emissions and removals in its next annual submission.

2. Information on Kyoto Protocol units

Standard electronic format and reports from the national registry

131. 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 included in the SIAR on the SEF tables and the SEF comparison report.[10] The SIAR was forwarded to the ERT prior to the review, pursuant to decision 16/CP.10.

132. Information on the accounting of Kyoto Protocol units has been prepared and reported in accordance with decision 15/CMP.1, annex, chapter I.E, 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 international transaction log (ITL) and the clean development mechanism registry and meets the requirements referred to in decision 22/CMP.1, annex, paragraph 88(a–j). No discrepancy has been identified by the ITL and no non-replacement has occurred. The national registry has adequate procedures in place to minimize discrepancies.

National registry

133. 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 finding that the national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1, and continues to adhere to the technical standards for data exchange between registry systems in accordance with decisions 16/CP.10 and 12/CMP.1. The national registry also has adequate security, data safeguard and disaster recovery measures in place and its operational performance is adequate.

Calculation of the commitment period reserve

134. Estonia has reported its commitment period reserve in its 2012 annual submission. In the NIR the Party reported its commitment period reserve to be 102,583,811 t CO_2 eq based on the national emissions in its most recently reviewed inventory (20,516,762.21 t CO_2 eq). During the review the Party submitted revised GHG emission estimates for 2010 and also revised its commitment period reserve to be 102,708,051 t CO_2 eq based on the revised GHG emissions of 20,541,610.2 t CO_2. The ERT agrees with these figures.

3. Changes to the national system

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

4. Changes to the national registry

136. Estonia reported that there are changes in its national registry since the previous annual submission. The Party described the changes in its NIR; they are related to security arrangements, the list of publicly available information and the internet address. In addition, during the review week the Party explained the changes due to the migration of the national registries to the EU registry. The ERT concluded that, taking into account the confirmed

[10] The SEF comparison report is prepared by the international transaction log (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.

changes in the national registry, 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.

5. Minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol

137. Estonia reported two changes in its reporting of the minimization of adverse impacts in accordance with Article 3, paragraph 14, since the previous annual submission: (a) the inclusion of information regarding fast start financing; (b) the update of information regarding the inclusion of aviation. In addition, Estonia reported on measures to promote renewable energy (i.e. the exchange of best practices in renewable energy production between regional and international development initiatives) and co-operation projects with developing countries (i.e. co-financing project "Global Climate Change Alliance- Climate Change Adaptation in the Renewable Natural Resources Sector in Bhutan"). The ERT concluded that, taking into account the changes in the reporting, the information provided is complete and transparent.

III. Conclusions and recommendations

A. Conclusions

138. Estonia made its annual submission on 13 April 2012. The annual submission contains the GHG inventory (comprising CRF tables and an NIR) and supplementary information under Article 7, paragraph 1, of the Kyoto Protocol (information on: activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, Kyoto Protocol units, changes to the national system and the national registry, and minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol. This is in line with decision 15/CMP.1.

139. The ERT concludes that the inventory submission of Estonia has been prepared and reported in accordance 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. The inventory submission is complete and the Party has submitted a complete set of CRF tables for the years 1990–2010 and an NIR; these are complete in terms of geographical coverage, years and sectors, as well as generally complete in terms of categories and gases. Some mandatory pools under the LULUCF sector were reported as "NE".

140. The submission of information required under Article 7, paragraph 1, of the Kyoto Protocol has been prepared and reported in accordance with decision 15/CMP.1.

141. 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. Some pools under the LULUCF sector were reported as "NE", thus the reporting is not fully in line with the IPCC good practice guidance for LULUCF. The ERT commends Estonia for the improvements made compared with previous annual submissions, in particular for: the revision of natural gas EF; more complete and more accurate reporting of F-gases; the provision of estimates of the carbon stock changes in living biomass for cropland remaining cropland and in forests converted to settlements; the use of tier 2 methods instead of tier 1 method for emissions of cattle and swine from manure management.

142. The Party has made recalculations for the inventory between the 2011 and 2012 submissions in response to the 2011 annual review report and following changes in AD and EFs. The impact of these recalculations on the national totals is a decrease in emissions of 3.7 per cent including LULUCF and of 1.6 per cent excluding LULUCF for 2009. The main recalculations took place in the following sectors/categories:

(a) CH_4 emissions from oil and natural gas;

(b) CH_4 emissions from solid waste disposal on land;

(c) CO_2 emissions from forest land.

143. Overall, the ERT considers that Estonia has the capacity to identify areas of land and areas of land-use change. Completeness of reporting of emissions and removals from afforestation and reforestation was improved during the review by provision of the estimates of emission from mineral soils. Accuracy of reporting of emissions and removals from afforestation and reforestation and from deforestation has been improved during the review by implementing a number of recommendations of the ERT on the use of EFs.

144. The Party recalculated GHG emissions from afforestation and reforestation and deforestation activities between the 2011 and 2012 annual submissions. These have been made due to:

(a) An updated area data for afforestation and reforestation (now only including plantations) and deforestation (using NFI data);

(b) A revised BEF and root–shoot ratio for afforestation and reforestation);

(c) The estimation for the first time of biomass burning on afforestation and reforestation areas;

(d) The estimation for the first time of emissions from deforestation from mineral soils and litter pools using an EF from Sweden.

145. Estonia has reported information on its accounting of Kyoto Protocol units in accordance with decision 15/CMP.1, annex, chapter I.E, and used the required reporting format tables as specified by decision 14/CMP.1.

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

147. 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.

148. Estonia has reported information under decision 15/CMP.1, annex, chapter I.H, "Minimization of adverse impacts in accordance with Article 3, paragraph 14" and changes thereof as part of its 2012 annual submission. The ERT concluded that, taking into account the changes in the reporting, the information provided is complete and transparent.

B. Recommendations

149. The ERT identifies issues for improvement as listed in table 6 below.

Table 6
Recommendations identified by the expert review team

Sector	*Category*	*Recommendation*	*Paragraph reference*
Cross-cutting	Completeness	Estimate mandatory pools and related emissions and removals.	10
	National system	Allocate the necessary resources in order to ensure a smooth transition period, in particular ensuring that the TUT energy expert will allocate enough time to support the preparation and quality checking of the 2013 energy sector.	17
	National system	Explore the possibility of strengthening the links between the GHG inventory compilers and Statistics Estonia, which would facilitate the preparation of the inventory for the energy sector.	19
	Key category analysis	Use the key category analysis to prioritize improvements of its inventory.	21
	Uncertainty analysis	Revise the uncertainty assessment and Include explanations for the changes in the uncertainty estimates compared with the previous NIR and include explanations or justifications for selected uncertainty values used for each category.	21, 24 and 25
	Recalculations	Provide transparent explanations for all recalculations in the next NIR.	29
	QA/QC	Perform on an annual basis the additional QA procedures for key categories and the checks between EU ETS data and the inventory.	31
	QA/QC	Improve the documentation of the overall QA/QC checks made by the QA/QC coordinator and of the cross-checks with EU ETS data.	32
	Transparency	Provide clearer information on all sectors in order to improve the transparency of the reporting	34
	Archiving	Ensure that all relevant material (also relevant material from the ftp site) is stored in the archive.	35
Energy	Consistency with IEA	Improve the consistency between data reported to the IEA and data from Statistics Estonia.	42
	Transparency	Improve the transparency of the reporting by providing more explanations on the CH_4 EF for natural gas distribution and on the CH_4 and N_2O emission estimates from road transportation using the COPERT IV model.	43
	Completeness	Improve the completeness of reporting by providing the relevant figures on apparent energy consumption in next annual submission.	47
	Transparency – International bunker fuels	Provide the information on data source and a description of the methodologies used.	48

Sector	*Category*	*Recommendation*	*Paragraph reference*
	Stationary combustion: solid fuels	Continue to compare the carbon balance with emission estimates for oil shale.	50
	Stationary combustion: gaseous fuels – CO_2	Correct the source reference and provide explanations on the carbon content of natural gas and oxidation rate used for estimation of CO_2 emissions in its next annual submission.	54
	Road transportation: liquid fuels – CO_2	Develop a county-specific CO_2 EF for gasoline for the entire time series by using a weighted average of country-specific EFs from the main import countries.	55
	Road transportation: liquid fuels – CH_4 and N_2O	Strengthen QA/QC procedures, for example by conducting model calibrations, and that Estonia provide the necessary explanations on emissions trends in the NIR to improve transparency.	56
	Fugitive emissions: natural gas – CH_4	Investigate the rationale of a constant CH_4 EF and refer correctly to the source of the EF in the NIR.	58
Industrial Processes	Transparency	Continue efforts to enhance the transparency and comparability of the reporting by providing a justification for the use of the methodologies in the consumption of halocarbons and SF_6 subcategories through a comparison of the country-specific methods used with those from the IPCC good practice guidance.	75
Agriculture	Transparency	Explain and refer to in the NIR to all tables and data in its next annual submission.	79
	Enteric fermentation – CH_4	Increase transparency by providing sufficient information on non-dairy cattle characteristics, such as animal weights and CH_4 conversion factors and the data sources used for the calculations of the CH_4 emission estimates.	82
	Enteric fermentation – CH_4	Report bovine cattle in the young cattle subcategory, because they are growing animals, and estimate CH_4 emissions from calves by applying a CH_4 conversion rate of zero for the period when they are milk-fed.	83
LULUCF	Completeness	Improve the completeness of the LULUCF estimates, in particular by beginning to implement the IPCC tier 1 method for mineral soils.	91 and 92
	Transparency	Party provide more information on the detailed methods used to identify the exact year when the land-use changes occurred on each sampling plot.	93
	Accuracy	Develop country-specific EFs and parameters where possible or, as an interim measure, use the EFs applied by the neighbouring countries with similar forest conditions and revise the estimates of BEFs, EFs and area of drained organic	94

Sector	*Category*	*Recommendation*	*Paragraph reference*
		soils.	
	Transparency	Provide more detailed information on the methodology used to estimate the carbon stock changes in any land converted to other land in the NIR.	95
	Forest land remaining forest land	Apply the revised calculation for estimating the carbon stock changes in living biomass in the next annual submission.	97
	Forest land remaining forest land	Explore ways to reduce the inter-annual fluctuations (for example by using the NFI data set for a specific year and that for the five previous years to compare the data of the same sampling plots) and provide quantitative information on the impact of storms in its next annual submission.	98 and 99
	Land converted to forest land	Use the same method for estimating emissions/removals in land converted to forest land as that applied for afforestation and reforestation (estimating the biomass increment using the mean increment per area unit of a certain age of the existing trees).	101
	Grassland remaining grassland	Use the same method for estimating emissions/removals in grassland remaining grassland as that applied for land converted to forest land (estimating the biomass increment using the mean increment per area unit of a certain age of the existing trees).	102
	Cropland remaining cropland	Develop country-specific EFs and parameters where possible and, as an interim solution, use the EF for cultivated organic soil developed by Sweden.	104
Waste	Solid waste disposal on land – CH_4	Improve the transparency of its reporting by providing more detailed information about the choice of waste deposition data, the CH_4 generation rate constant and the DOC content, and justify the use of parameters from the 2006 IPCC Guidelines in the next annual submission.	113
	Solid waste disposal on land – CH_4	Report CH_4 recovered and burned in a flare properly, as CH_4 recovered, as required by the IPCC good practice guidance.	114
	Wastewater handling – N_2O	Report N_2O emissions from human sewage separately from the subcategory domestic and commercial (without human sewage) to avoid double counting of emissions.	115
	Waste incineration – CO_2	Report emissions from biogenic and non-biogenic waste separately and include CO_2 from non-biogenic waste incineration in the total CO_2 emissions in its next annual submission.	116
KP-LULUCF	Afforestation and reforestation	Assess the impact of the application of different forest definitions specifically for afforested and reforested lands, and use the results to correct the areas of afforestation and reforestation obtained using the Statistics Estonia data.	120

Sector	*Category*	*Recommendation*	*Paragraph reference*
	Deforestation	Analyse other possible sources of information (land-use statistics, harvesting permits, land cadastre) to complement the NFI data, and include the results of this analysis in the next annual submission.	122
	Transparency	Improve the transparency of information provided in the NIR specifically on: (i) how afforested and reforested areas are identified by Statistics Estonia; (ii) how deforestation areas are detected in practice (areas identified, year of change); and (iii) how each plot is classified as deforested and then translated into deforestation area.	123
	Afforestation and reforestation	Develop country-specific EFs for litter, dead wood and mineral soil pools for afforestation and reforestation.	124
	Afforestation and reforestation	Use a lower BEF value which is more appropriate for the growing stocks of afforestation and reforestation areas in Estonia	126
	Afforestation and reforestation	Use the country-specific shares of different growing stocks and species to estimate more accurate BEFs; and develop species-specific values of biomass mean increment per unit area of a certain age of forest.	128
	Deforestation	Use, as an interim solution, the weighted average value EFs from Sweden, according to area of land-use changes (forest land converted to other land uses) existing in Estonia.	129
	Deforestation	Use the revised EFs of litter, mineral soils and organic soils in deforested areas in estimating relevant emissions and removals in its next annual submission.	130

IV. Questions of implementation

150. 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. *2006 IPCC Guidelines for National Greenhouse Gas Inventories*. Available at <http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html>.

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

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

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

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

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

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

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UNFCCC. *Standard Independent Assessment Report*, parts I and II. Available at <http://unfccc.int/kyoto_protocol/registry_systems/independent_assessment_reports/items/4061.php>.

B. Additional information provided by the Party

Responses to questions during the review were received from Ms. Anne Mändmets, Climate and Radiation Department, Ministry of the Environment, including additional material on the methodology and assumptions used in estimation of the GHG inventory.

Annex II

Acronyms and abbreviations

AD	activity data
BEF	biomass expansion factor
C	carbon
CH_4	methane
CMP	Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol
CO_2	carbon dioxide
CO_2 eq	carbon dioxide equivalent
CRF	common reporting format
DOC	degradable organic carbon
EF	emission factor
ERT	expert review team
EU ETS	European Union emissions trading scheme
F-gases	fluorinated gases
FAO	Food and Agriculture Organization of the United Nations
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
Gg	Gigagram (1 Gg = 1 kilotonne)
ha	hectar
HFCs	hydrofluorocarbons
IE	included elsewhere
IEA	International Energy Agency
IEF	implied emission factor
IPCC	Intergovernmental Panel on Climate Change
ITL	international transaction log
kg	kilogram (1 kg = 1,000 grams)
KP-LULUCF	Land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol
LULUCF	land use, land-use change and forestry
Mg	megagram (1 Mg = 1 tonne)
N_2O	nitrous oxide
NA	not applicable
NE	not estimated
NFI	national forest inventory
NH_3	ammonia
NIR	national inventory report
NO	not occurring
NOx	nitrogen oxides
PFCs	perfluorocarbons
PJ	petajoule (1 PJ = 10^{15} joule)
QA/QC	quality assurance/quality control
SEF	standard electronic format
SF_6	sulphur hexafluoride
SIAR	standard independent assessment report
t C	tonne of carbon
TJ	terajoule (1 TJ = 10^{12} joule)
UNFCCC	United Nations Framework Convention on Climate Change