United Nations FCCC/ARR/2012/LTU

Framework Convention on Climate Change

Distr.: General
8 March 2013

English only

Report of the individual review of the annual submission of Lithuania 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.

Please recycle

Contents

I. Introduction and summary

1. This report covers the in-country review of the 2012 annual submission of Lithuania, coordinated by the UNFCCC secretariat, in accordance with decision 22/CMP.1. The review took place from 1 to 6 October 2012 in Vilnius, Lithuania, and was conducted by the following team of nominated experts from the UNFCCC roster of experts: generalist – Mr. Tinus Pulles (Netherlands); energy – Mr. Tomas Gustafsson (Sweden); industrial processes – Ms. Birna Hallsdóttir (Iceland); agriculture – Mr. Jacques Kouazounde (Benin); land use, land-use change and forestry (LULUCF) – Mr. Sandro Federici (San Marino); and waste – Ms. Kaat Jespers (Belgium). Mr. Federici and Mr. Gustafsson were the lead reviewers. The review was coordinated by Ms. Lisa Hanle and Mr. Roman Payo (UNFCCC secretariat).

2. In accordance with the "Guidelines for review under Article 8 of the Kyoto Protocol" (decision 22/CMP.1), a draft version of this report was communicated to the Government of Lithuania, 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 Lithuania was carbon dioxide (CO_2), accounting for 64.3 per cent of total GHG emissions[1] expressed in carbon dioxide equivalent (CO_2 eq), followed by nitrous oxide (N_2O) (19.9 per cent) and methane (CH_4) (14.9 per cent). Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6) collectively accounted for 0.9 per cent of the overall GHG emissions in the country. The energy sector accounted for 59.7 per cent of total GHG emissions, followed by the agriculture sector (24.0 per cent), the industrial processes sector (10.5 per cent), the waste sector (5.4 per cent) and the solvent and other product use sector (0.4 per cent). Total GHG emissions amounted to 21,521.49 Gg CO_2 eq and decreased by 56.9 per cent between the base year[2] and 2010. The main decreases occurred in the early 1990s following the restoration of independence and the transition from a planned economy to a market economy.

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 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*
		Greenhouse gas	*Base year*[a]	*1990*	*1995*	*2000*	*2005*	*2008*	*2009*	*2010*	*Base year–2010 (%)*
Annex A sources		CO_2	36 479.26	36 479.26	15 269.92	12 074.02	14 204.54	15 097.64	12 951.86	13 848.49	–62.0
		CH_4	5 807.30	5 807.30	3 649.20	3 170.82	3 382.49	3 337.54	3 245.12	3 209.22	–44.7
		N_2O	7 647.74	7 647.74	3 668.64	4 880.97	6 127.85	6 505.18	4 320.02	4 280.80	–44.0
		HFCs	4.67	NA, NO	4.67	14.03	60.53	135.65	150.83	172.28	3 592.3
		PFCs	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA
		SF_6	0.05	NA, NO	0.05	0.22	1.38	6.24	5.00	10.70	22 072.8
KP-LULUCF	Article 3.3[b]	CO_2						–42.00	–72.97	–161.44	
		CH_4						0.01	0.01	0.01	
		N_2O						0.00	0.00	0.00	
	Article 3.4[c]	CO_2	NA					–8 170.07	–11 231.36	–12 091.22	NA
		CH_4	NA					0.31	0.87	0.05	NA
		N_2O	NA					23.04	23.12	23.10	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, NO = not occurring.

[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	33 703.62	33 703.62	14 298.55	11 036.25	13 044.86	13 147.84	11 947.52	12 853.54	–61.9
		Industrial processes	4 300.37	4 295.65	2 020.88	3 031.45	4 096.37	5 501.82	2 302.17	2 249.17	–47.7
		Solvent and other product use	197.61	197.61	186.36	173.54	161.92	95.53	100.34	92.62	–53.1
		Agriculture	10 571.71	10 571.71	4 870.01	4 676.77	5 259.78	5 162.06	5 153.33	5 164.91	–51.1
		Waste	1 165.70	1 165.70	1 216.69	1 222.06	1 213.85	1 175.00	1 169.47	1 161.25	–0.4
		LULUCF	NA	–6 291.60	–3 785.24	–7 582.92	–2 786.53	–7 512.46	–10 927.19	–11 714.57	NA
		Total (with LULUCF)	**NA**	**43 642.69**	**18 807.24**	**12 557.14**	**20 990.25**	**17 569.79**	**9 745.65**	**9 806.92**	**NA**
		Total (without LULUCF)	**49 939.01**	**49 934.30**	**22 592.48**	**20 140.06**	**23 776.78**	**25 082.25**	**20 672.84**	**21 521.49**	**–56.9**
		Other[b]	NA	NA	NA	NA	NA	NA	NA	NA	NA
KP-LULUCF	Article 3.3[c]	Afforestation and reforestation						–77.17	–83.77	–196.61	
		Deforestation						5.97	10.80	35.18	
		Total (3.3)						**–71.20**	**–72.96**	**–161.43**	
	Article 3.4[d]	Forest management						–8 146.72	–11 207.37	–12 068.06	
		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**					**–8 146.72**	**–11 207.37**	**–12 068.06**	**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 the 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	104 048 685	107 607 461		107 607 461
Annex A emissions for current inventory year				
CO_2	13 843 461	13 848 488		13 848 488
CH_4	3 209 063	3 209 217		3 209 217
N_2O	3 574 228	4 280 802		4 280 802
HFCs	172 280			172 280
PFCs	NA, NO			NA, NO
SF_6	10 705			10 705
Total Annex A sources	**20 809 737**	**21 521 492**		**21 521 492**
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	–196 611			–196 611
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	35 177			35 177
Activities under Article 3, paragraph 4, for current inventory year[c]				
3.4 Forest management for current year of commitment period	–12 068 063			–12 068 063
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 for 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.

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	12 948 552	12 951 862		12 951 862
CH_4	3 244 974	3 245 121		3 245 121
N_2O	3 610 112	4 320 023		4 320 023
HFCs	150 825			150 825
PFCs	NA, NO			NA, NO
SF_6	5 005			5 005
Total Annex A sources	**19 959 467**	**20 672 836**		**20 672 836**
Activities under Article 3, paragraph 3, for 2009				
3.3 Afforestation and reforestation on non-harvested land for 2009 as reported	–83 767			–83 767
3.3 Afforestation and reforestation on harvested land for 2009 as reported	NA, NO			NA, NO
3.3 Deforestation for 2009 as reported	10 803			10 803
Activities under Article 3, paragraph 4, for 2009[c]				
3.4 Forest management for 2009	–11 207 373			–11 207 373
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 for 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.

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	15 088 928	15 097 641		15 097 641
CH_4	3 337 342	3 337 540		3 337 540
N_2O	5 762 692	6 505 184		6 505 184
HFCs	135 649			135 649
PFCs	NA, NO			NA, NO
SF_6	6 239			6 239
Total Annex A sources	**24 330 850**	**25 082 253**		**25 082 253**
Activities under Article 3, paragraph 3, for 2008				
3.3 Afforestation and reforestation on non-harvested land for 2008 as reported	–77 170			–77 170
3.3 Afforestation and reforestation on harvested land for 2008 as reported	NA, NO			NA, NO
3.3 Deforestation for 2008 as reported	5 973			5 973
Activities under Article 3, paragraph 4, for 2008[c]				
3.4 Forest management for 2008	–8 146 722			–8 146 722
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 for 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. The national inventory report (NIR) was submitted on 14 April 2012. Lithuania 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. Lithuania officially submitted revised CRF tables on 25 May 2012 and a revised NIR on 26 May 2012 and on 9 July 2012. The Party officially submitted revised emission estimates on 5 October 2012, during the course of the in-country visit, in response to questions raised by the expert review team (ERT). The values used in this report are based on the values contained in the submission of 5 October 2012, unless otherwise specified.

8. The ERT also used previous years' submissions during the review. 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.[3]

9. During the review, Lithuania 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 covers all mandatory[4] source and sink categories for the period 1990–2010 and is complete in terms of years and geographical coverage.

2. Question of implementation raised in the 2010 annual review report

11. The ERT noted that the question of implementation raised in the 2010 annual review report[5] regarding the national system was still unresolved at the time of the 2012 review

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

[4] 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* (hereinafter referred to as the IPCC good practice guidance for LULUCF) provide methodologies and/or emission factors to estimate GHG emissions.

week. The ERT also noted that no new question of implementation was raised in the 2011 annual review report.[6] The ERT took note of the report on the expedited review for Lithuania (2012),[7] which was held on 28–29 September 2012, directly preceding the review of the 2012 annual submission. The expedited review concluded that Lithuania had fully addressed the issues that had resulted in non-compliance. The ERT also took note of the decision of the enforcement branch of the Compliance Committee of 24 October 2012 concerning reinstatement of eligibility to participate in the mechanisms under Articles 6, 12 and 17 of the Kyoto Protocol.[8] The branch concluded that the question of implementation had been resolved.

12. The ERT noted the effect on the quality of the inventory of the measures taken by Lithuania to resolve the question of implementation and concluded that Lithuania's 2012 annual submission is of a considerably higher quality than its 2011 annual submission, and that the 2012 annual submission fulfils the requirements of transparency, consistency, completeness, comparability and accuracy as laid down in the "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories" (hereinafter referred to as the UNFCCC reporting guidelines). The ERT commends Lithuania for these improvements, which have been achieved in a relatively short period of time, and encourages the Party to continue to improve the inventory by implementing the cross-cutting recommendations formulated in this review report in its next annual submission.

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

Overview

13. The ERT concluded that the national system performs its required functions.

14. In its NIR, Lithuania described the changes to the institutional arrangements and the national system since the previous annual submission (see para. 165 below).

Inventory planning

15. The NIR describes the national system for the preparation of the inventory.

16. The Ministry of Environment is the single national entity with overall responsibility for the national inventory and is in charge of the legal, institutional and procedural arrangements for the national inventory. Other agencies and organizations are also involved in the preparation of the inventory in accordance with specific legal arrangements, including:

(a) The Environmental Protection Agency, which is responsible, by Order No. D1-1017 of the Minister of Environment, for implementing the quality assurance/quality control (QA/QC) procedures and for the coordination and compilation of the NIR;

(b) The permanent GHG inventory working group, established by Governmental Resolution No. 334 and by Order No. DI-538 of the Minister of Environment, which is

[5] FCCC/ARR/2010/LTU.
[6] FCCC/ARR/2011/LTU.
[7] FCCC/EXP/2012/LTU. Available at <http://unfccc.int/resource/docs/2012/exp/ltu01.pdf>.
[8] CC-2011-18/Lithuania/EB. Available at <http://unfccc.int/files/kyoto_protocol/compliance/questions_of_implementation/application/pdf/cc-2011-3-18_ltu_eb_decision_on_reinstatement.pdf>.

responsible for the estimation of GHG emissions and removals, including the choice of methodological approaches;

(c) The State Forestry Service, which is responsible, by Order No. D1-666 of the Minister of Environment, for the estimation of emissions and removals in the LULUCF sector and the compilation of information for the reporting of KP-LULUCF activities. However, an amendment of Governmental Resolution No. 683 on the establishment of a permanent GHG inventory working group designated the Lithuanian Research Centre for Agriculture and Forestry as the organization responsible for providing the estimates of GHG emissions and removals for non-forestry categories in the LULUCF sector;

(d) The National Climate Change Committee, which is responsible for approving the final draft annual submission as part of its role to advise on the implementation of the provisions of the Convention and coordinate compliance with the requirements of the Kyoto Protocol;

(e) External consultants, who can be contracted on an annual basis in areas where specific expertise is required or where the experience and knowledge of the permanent GHG inventory working group is not sufficient.

17. To ensure better data collection for the preparation of the NIR, Amendment No. 1540 to Government Resolution No. 388 of 7 April 2004 was adopted on 3 November 2010. The Resolution determines the responsibilities of other ministries and their subordinated institutions, as well as other institutions and the state science research institutes, to collect, maintain and provide the data required for the compilation of the inventory.

Inventory preparation

Key categories

18. Lithuania has reported a key category tier 1 analysis, both level and trend assessment, as part of its 2012 annual submission. The key category analysis performed by Lithuania and that performed by the secretariat[9] produced different results, owing to the different level of disaggregation used. The Party 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).

19. Lithuania uses its key category analysis to select the methods to estimate GHG emissions and removals, but not to prioritize the development and improvement of the inventory. The ERT recommends that the Party also use the key category analysis to prioritize the development and improvement of the inventory.

20. Since Lithuania has reported a complete uncertainty analysis (see para. 22 below), the ERT encourages the Party to conduct a tier 2 key category analysis to take into account the information on uncertainties when prioritizing inventory improvements.

[9] 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.

21. Lithuania has identified forest management as the only key category among activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol for 2010. The identification has been performed in line with the IPCC good practice guidance for LULUCF.

Uncertainties

22. Lithuania has reported a tier 1 uncertainty analysis generally in line with the IPCC good practice guidance. However, the Party has reported the uncertainties for CO_2, CH_4 and N_2O emissions separately for every category. The ERT recommends that Lithuania, in its next annual submission, perform the uncertainty analysis for each category for all gases combined, thereby allowing the Party to use this information to greater effect when planning inventory improvements (see para. 19 above). In response to a recommendation from the previous review report, Lithuania has included the solvent and other product use sector in the uncertainty analysis reported in annex II to the NIR. However, Lithuania has reported in the first paragraph of page 48 in the NIR that this sector is excluded from the uncertainty analysis. The ERT therefore recommends that Lithuania improve the consistency of the information on the uncertainty analysis in the next annual submission. The total uncertainty is estimated at 26.3 per cent including the LULUCF sector and at 10.5 per cent excluding the LULUCF sector. The trend uncertainty is estimated at 4.1 per cent including the LULUCF sector and at 2.2 per cent excluding the LULUCF sector.

Recalculations and time-series consistency

23. Recalculations have been performed and reported in accordance with the IPCC good practice guidance. The ERT noted that recalculations reported by Lithuania of the time series 1990–2009 have been undertaken to take into account new activity data (AD) and improved emission estimation methods for many categories (see paras. 34, 65, 83, 106, 124 and 157 below). The impact of these recalculations on estimated total GHG emissions is a 0.6 per cent increase for 1990 and a 1.2 per cent decrease for 2009. The rationale for these recalculations is provided in the NIR and in CRF table 8(b).

24. The ERT considers that the time series of estimates are generally consistent. However, the ERT identified some issues with the consistency of the time series (see paras. 45, 69, 70, 107, 108, 116, 117 and 129 below) and therefore recommends that the Party address these issues in the next annual submission.

Verification and quality assurance/quality control approaches

25. The Ministry of Environment and the Environmental Protection Agency updated the QA/QC plan in 2011, adding some category-specific QC procedures. The Environmental Protection Agency is responsible for the coordination and implementation of the plan while the Ministry of Environment supervises the process. In its NIR, Lithuania explained that its QA/QC procedures are formally incorporated in the inventory improvement process, but that further improvements are planned. Under a partnership project with Norway, Lithuania will further develop the competence and expertise of its team of inventory experts and improve its QA/QC procedures. The partnership project is scheduled to run in 2012 and 2013. The ERT encourages the Party to report on the progress made in its next annual submission.

Transparency

26. Lithuania's 2012 annual submission is generally transparent. The transparency of the Party's reporting has improved significantly since previous submissions due to the implementation of many of the recommendations made in the previous review report but, as indicated in the sectoral chapters below on energy (see paras. 35, 41, 55 and 59 below),

industrial processes (see paras. 69, 72 and 77 below), agriculture (see paras. 91, 97, 101 and 102 below), LULUCF (see paras. and 107, 115 and 154 below) and waste (see paras. 129, 130, 132, 135, 137, 147 and 150 below),, the transparency of reporting could be improved in some categories through the inclusion of additional information.

Inventory management

27. Lithuania has a centralized archiving system, which includes the archiving of disaggregated emission factors (EFs) and AD, and documentation on how these EFs and AD have been generated and aggregated for the preparation of the inventory. The ERT commends Lithuania for these improvements to the archiving system. The archived information also includes documentation on QA/QC procedures, external and internal reviews, annual key categories and key category identification and planned inventory improvements. The archive is kept and managed by the Environmental Protection Agency and stored on a dedicated server.

28. As part of its archiving system, Lithuania uses specific data flow documentation protocols (tabular forms) that record the sources of the data (AD, EFs and other parameters) and the locations where these are stored, and include specific columns where QA/QC staff can ask questions to and receive answers from the sector experts. The ERT noted that these protocols also allow external reviewers to access all information necessary to assess the quality of any emissions estimate in the inventory of the 2012 annual submission and in all previous submissions since 2006. The ERT noted that some data providers regularly update their data. However, the documentation protocols do not record the date on which the data were received. The ERT encourages Lithuania to add a column in the protocols in which to record the date and time of each data delivery.

29. The ERT also noted that, for some methods based on complex models (e.g. road transportation), the protocols allow external users to quickly access the calculation spreadsheets or the assumptions used in the calculations. The ERT therefore encourages Lithuania to include an explanatory note in all calculation sheets that briefly documents any assumptions used in the calculations.

4. Follow-up to previous reviews

30. In its 2012 annual submission, Lithuania has benefitted for the first time from all of the measures undertaken in response to the issues identified in the 2010 review report that led to the question of implementation and to Lithuania being declared to be in non-compliance. These measures have led to many improvements in the submission, both in terms of transparency, completeness, consistency, comparability and accuracy and in terms of the inventory management and QA/QC procedures. The Party has also addressed most of the recommendations from the 2010 and 2011 review reports that were not related to the question of implementation. However, Lithuania is still working to address some of the recommendations regarding the transparency of its reporting for some categories and for the QA/QC procedures in several sectors, as indicated in the relevant paragraphs of this report.

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

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

32. 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

33. The energy sector is the main sector in the GHG inventory of Lithuania. In 2010, emissions from the energy sector amounted to 12,853.54 Gg CO_2 eq, or 59.7 per cent of total GHG emissions. Since 1990, emissions have decreased by 61.9 per cent. The key driver for the fall in emissions is the collapse of the former Soviet Union and the economic changes related thereto. The majority of the decrease in GHG emissions occurred during the period 1990–1995 and in energy industries. Within the sector, 42.4 per cent of the emissions were from energy industries, followed by 35.5 per cent from transport, 11.1 per cent from other sectors and 8.8 per cent from manufacturing industries and construction. Fugitive emissions from oil and natural gas accounted for 2.1 per cent. The remaining 0.1 per cent were from other (military use).

34. Lithuania has made recalculations for the energy sector between the 2011 and 2012 submissions mainly following changes in AD and EFs. The impact of these recalculations on the energy sector is an increase in total GHG emissions of 0.6 per cent for 2009. The main recalculations took place in the following categories:

(a) Other sectors: an increase in emissions of 5.1 per cent due to updated information from Statistics Lithuania on wood and wood waste consumption based on new survey data;

(b) Other non-specified (manufacturing industries and construction): an increase in emissions of 5.5 per cent due to updated information from Statistics Lithuania on peat consumption;

(c) Road transportation: a decrease in emissions of 0.4 per cent due to the change from a tier 1 method to a tier 3 method (COPERT IV), leading to lower CH_4 and N_2O EFs (see para. 39 below).

35. The ERT finds the explanations of the recalculations in the NIR to be generally sufficient. During the review week, Lithuania provided additional information on all major recalculations and the ERT is of the view that the recalculations have led to an improvement in the completeness, accuracy and transparency of the inventory. To further improve the transparency of the NIR, the ERT recommends that the Party include, in its next annual submission, information to justify the recalculations of key categories in terms of an improvement in accuracy, transparency or completeness. For example, if the AD from the energy balances are updated, the ERT recommends that Lithuania include, in the NIR, information on the fuels updated and the underlying reasons for the updates.

36. The energy sector is complete in terms of emission sources, gases, years and geographical coverage, and has generally been prepared in accordance with the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Revised 1996 IPCC Guidelines) and the IPCC good practice guidance.

37. With regard to CH_4 and N_2O emissions, Lithuania has applied country-specific EFs and EFs from the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the 2006 IPCC Guidelines) for several categories and fuels, without justifying why they are appropriate to national circumstances. This is not in line with the IPCC good practice guidance. The ERT noted that, in several cases, the values of the EFs used were lower than the default values from the Revised 1996 IPCC Guidelines and, without a rationale as to why the values are appropriate to national circumstances, could lead to the possible underestimation of emissions (e.g. the use of EFs from the 2006 IPCC Guidelines for CH_4 and N_2O emissions from liquefied petroleum gas and refinery gas for public electricity and heat production, and the country-specific EFs for CH_4 emissions

from residual fuel oil, diesel oil in railways and diesel oil in other transportation). This issue was noted in the previous review report.

38. In response to a question raised by the ERT during the review, Lithuania explained that experts from the Lithuanian Energy Institute had concluded that the 2006 IPCC Guidelines contained the most applicable EFs for Lithuania. This decision was based on the fact that these EFs take into account the latest scientific research (not available at the time of the compilation of the Revised 1996 IPCC Guidelines) and are developed by considering the results of emission measurements conducted over a long period of time. It was therefore decided that the best practice for Lithuania would be to use the CH_4 and N_2O EFs from the 2006 IPCC Guidelines. The Party also explained that the 2006 IPCC Guidelines include more disaggregated EFs for different types of fuel and that such disaggregation allows for the calculation of more accurate emission estimates. The ERT considers that Lithuania has justified its use of the 2006 IPCC Guidelines and strongly reiterates the recommendation from the previous review report that Lithuania include this information to justify the use of the EFs from the 2006 IPCC Guidelines in its next annual submission.

39. Since the 2011 annual submission, Lithuania has implemented several improvements in accordance with the recommendations made in previous review reports, including: archiving the procedures performed for the selection of AD, EFs and methodologies; and changing the country-specific CO_2 EF for peat, the documentation of which was previously determined to be lacking in transparency, from 102 kg/TJ to 106 kg/TJ (the default value from the Revised 1996 IPCC Guidelines). In addition, Lithuania has implemented the road transportation model COPERT IV (see para. 34(c) above). The ERT commends the Party for the improvements.

40. The transparency of the energy sector in the NIR has improved substantially since the 2011 annual submission. The NIR now follows the annotated outline provided in annex I to the UNFCCC reporting guidelines and most categories are clearly described in terms of an overview of the emissions, emission trends, methodologies, AD and EFs used. The ERT commends Lithuania for the improvements made since the previous annual submission.

41. The transparency of the transport section of the NIR could be improved by, for example, including information on: the assumption for the surrogate data used to extrapolate the jet kerosene consumption trend prior to 2001 for civil aviation; the data sources for the different parameters used in road transportation; and the fluctuations in the N_2O implied emission factor (IEF) for gasoline in road transportation for the period 2006–2008. In response to a question raised by the ERT during the review, Lithuania provided additional information explaining these issues. The ERT recommends that the Party include these explanations in its next annual submission.

42. Category-specific QA/QC procedures are not described in detail in the NIR, where the only references are to the general QA/QC plan. In response to a question raised by the ERT during the review, the ERT learned that the sector expert for the energy sector does not have a working manual to follow. The ERT recommends that Lithuania strengthen its QC procedures by developing formal documentation on the assumptions, EFs, AD sources and QC procedures for each key category. The ERT also recommends that the Party include descriptions of the tier 2 QA/QC procedures carried out for the key categories (e.g. analyses of the differences between the inventory data and the data reported under the European Union (EU) emissions trading scheme (ETS) and information on how such analyses are used to improve the GHG inventory) in the next annual submission.

43. The energy sector largely fulfils the IPCC quality criteria for comparability. However, the ERT noted that fugitive emissions from natural gas transmission and distribution are reported under other (oil and natural gas) instead of under natural gas, as required by the IPCC good practice guidance. To improve the comparability of the Party's

reporting, the ERT recommends that Lithuania reallocate the fugitive emissions from natural gas transmission and distribution to the appropriate category in accordance with the IPCC good practice guidance in its next annual submission.

44. The ERT noted that Lithuania has indicated in the CRF tables and in the NIR (e.g. page 88) that it uses a tier 1 method to estimate CO_2 emissions from stationary combustion. In response to a question raised by the ERT during the review regarding the choice of method used to estimate CO_2 emissions from stationary combustion, the Party clarified that the methodological approaches applied by the Party are in accordance with an IPCC tier 2 method, because the energy statistics used are available for specific categories and, in many cases, country-specific EFs are also available. The ERT recommends that Lithuania clarify which methodological approach is used to estimate the emissions and document this correctly in the next annual submission.

45. Emissions from the energy sector are generally estimated consistently over time. However, the ERT noted inconsistencies in the IEFs for CO_2, CH_4 and N_2O emissions from flaring of oil (the IEFs for CO_2, CH_4 and N_2O for the period 1990–2009 reported in CRF table 1.B.2 are 67.00 kg/m^3, 137.50 g/m^3 and 0.640 g/m^3, respectively, but 67.48 kg/m^3, 138.49 g/m^3 and 0.644 g/m^3, respectively, for 2010). In response to a question raised by the ERT during the review, Lithuania explained that the emissions were correctly estimated but that an error produced when transferring the AD to the CRF Reporter software was the cause of the inconsistent IEFs. The ERT recommends that Lithuania, in the next annual submission, improve its QA/QC procedures by performing time-series checks of data after they have been inputted into the CRF Reporter software and explain any recalculation for emissions from flaring in the oil industry.

46. The previous review report noted that the use of country-specific CO_2 EFs for some fuels was not properly documented in the NIR. In response to a question raised by the current ERT during the review, Lithuania presented results and documentation from a national study on CO_2 EFs carried out in 2012 (mentioned in the NIR as a planned improvement) and including most fuels. For gasoline, diesel, gasoil, jet kerosene and liquefied petroleum gas, the CO_2 EFs were determined on the basis of measurements performed by an accredited Lithuanian laboratory. Country-specific CO_2 EFs for coking coal, residual fuel oil, petroleum coke, orimulsion, non-liquefied petroleum gas and coke were developed on the basis of data provided by the operators under the EU ETS. The results show that the EFs from the study closely correspond to the EFs used in the 2012 annual submission, and, in most cases, the EFs are within the range of the default values contained in the Revised 1996 IPCC Guidelines. The ERT commends Lithuania for its efforts to properly document and justify its country-specific CO_2 EFs and recommends that the Party report the results of the study in its next annual submission, including documentation justifying the appropriateness of the EFs to national circumstances (in an annex to the NIR or in a separate peer-reviewed report referenced in the NIR).

47. Natural gas is one of the most important fuels used in Lithuania (accounting for 36.4 per cent of GHG emissions in the energy sector in 2010), both as combustion for heating purposes as well as for non-energy uses in industrial processes (e.g. ammonia and methanol production). In the energy sector, the Party uses a constant country-specific CO_2 EF for natural gas (56.90 t/TJ) for all categories for the whole time series (1990–2010), which is higher than the default value from the Revised 1996 IPCC Guidelines (56.10 t/TJ). In response to a question raised by the ERT during the review, Lithuania explained that the Party is considering using an updated country-specific CO_2 EF (55.23 t/TJ) based on a new national study. The ERT recommends that Lithuania include information on any recalculation in the next annual submission. In the industrial processes sector (NIR table 4-14), the Party stated that the annual carbon content of natural gas used for ammonia production is based on CO_2 measurements performed by the laboratory of Lithuania's

natural gas supplier (AB Lietuvos dujos). The carbon content of natural gas shows relatively significant variations over time (0.396–0.521 kg C/m^3), indicating that an annually variable CO_2 EF may better reflect the CO_2 emissions from natural gas combustion. In response to a question raised by the ERT during the review, Lithuania explained that the information on annual carbon content of natural gas used for ammonia production provided in table 4-14 in the NIR is no longer relevant and that the Party is using the same country-specific CO_2 EF (56.90 t/TJ) as in the energy sector. The ERT encourages Lithuania to derive annually variable CO_2 EFs if information on annual natural gas carbon content is available and report on any results in the next annual submission.

48. Lithuania uses a country-specific CO_2 EF for residual oil (81.29 t/TJ) that is higher than the IPCC default value (77.40 t/TJ), without providing explanations for the large divergence. During the review, the Party explained that the residual oil actually contains two different types of oil – regular residual fuel oil and non-tradable oil – with two different CO_2 EFs (77.60 t/TJ and 81.29 t/TJ, respectively). Further, Lithuania expressed its intention to revise the emission estimates in the 2013 annual submission by accounting for the fuel oils separately. The ERT commends Lithuania for its efforts to resolve the issue and recommends that the Party, in its next annual submission, recalculate the CO_2 emissions from residual fuel oil using the new information and include information justifying the changes.

49. Lithuania has estimated the uncertainties for all categories and gases in the energy sector, mainly based on the Revised 1996 IPCC Guidelines, the IPCC good practice guidance and the 2006 IPCC Guidelines. In most cases, the ERT agrees with the estimated uncertainties. However, with regard to biomass consumption in other sectors, Lithuania applies an uncertainty of ±5 per cent, which is lower than the suggested range in the IPCC good practice guidance (from ±10 to ±30 per cent for well-developed statistical systems and from ±30 to ±60 per cent for less-developed statistical systems). In response to a question raised by the ERT during the review, Lithuania explained that it intends to use the range ±30 to ±60 per cent for biomass consumption in its next annual submission. The ERT recommends that the Party make the intended changes and report thereon in its next annual submission.

50. In addition to implementing the results of the newly developed country-specific CO_2 EFs for stationary combustion (see para. 46 above), the NIR mentions several planned improvements for the categories under transport, including: using a tier 2 methodology for civil aviation emissions using detailed AD on take-off/landing cycles; refining the AD for liquefied petroleum gas fuel cars to match the tier 3 methodology used for road transportation; and investigating the possibility of implementing a tier 2 approach for railways. The ERT recommends that Lithuania use the results of the key category analysis when determining the focus of its improvement efforts.

2. Reference and sectoral approaches

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

51. For 2010, the CO_2 emissions estimated using the reference approach are 0.19 per cent higher than the CO_2 emissions estimated using the sectoral approach. The differences between the reference and sectoral approaches for every year in the period 1990–2010 range from –4.62 per cent to 1.75 per cent. With regard to gaseous and solid fuels, there are systematic differences over time, with the sectoral approach resulting in higher CO_2 emissions than the reference approach for all years of the time series, whereas the differences for energy consumption are much smaller, indicating the differences in the CO_2 EFs used. The ERT encourages Lithuania to investigate any systematic differences in the

net calorific values and CO_2 EF used in the reference and sectoral approaches and include the results in the next annual submission.

52. There are large differences between the total energy consumption reported to the International Energy Agency (IEA) (215,080.00 TJ for 2010) and that reported in CRF table 1.A(b) (194,968.00 TJ for 2010). In response to a question raised by the ERT during the review week, Lithuania explained that this is mainly due to the differences in natural gas imports (103,990.00 TJ for 2010 according to the data reported to IEA and 81,703.00 TJ according to the data reported in the CRF tables for 2010). In CRF table 1.A(b), Lithuania has excluded from the import data all natural gas used for non-energy purposes. This is not in line with the IPCC good practice guidance. The Party also explained that it intends to correct this in the 2013 annual submission. The ERT recommends that Lithuania report all imported natural gas in CRF table 1.A(b) in the next annual submission.

53. Lithuania further explained that the differences in natural gas consumption between the IEA data and the reference approach may also be due to the use of different types of calorific values: the reference approach uses a net calorific value whereas the IEA data are reported using a gross calorific value. The ERT encourages Lithuania to investigate the effect of the use of different types of calorific values and include the results in the next annual submission.

54. In addition, there are several significant differences between the IEA data and the values in the CRF tables, including: crude oil imports for 1991–1994 and 2000; crude oil stocks for 1990; refinery feedstock imports for 1990–2010; refinery feedstock stocks for 1990–2010; and naphtha exports for 2001–2009. In response to a question raised by the ERT during the review, the Party explained that it intends to investigate these differences in cooperation with Statistics Lithuania. The ERT recommends that Lithuania explain and, if appropriate, correct these differences in the next annual submission.

International bunker fuels

55. Information on bunker fuels is provided by Statistics Lithuania for the complete time series (1990–2010) for marine activities. With regard to aviation fuel, information is only available from 2001 onwards. Following a recommendation from the previous review report, Lithuania extrapolated the data for aviation fuel for the period 1990–2000 using surrogate parameters. The ERT noted that the description in the NIR of the assumptions used for the extrapolation was not transparent. In response to a question raised by the ERT during the review, Lithuania provided extensive information clarifying the underlying parameters and assumptions used. The ERT recommends that the Party improve the transparency of the NIR by including a summary of this information in the next annual submission.

56. The ERT noted discrepancies between CRF tables 1.A(b) and 1.C for jet kerosene (international aviation bunkers) for the period 1990–2005 and for 2010. For example, for 2010, Lithuania has reported 2,237.00 TJ of jet kerosene for international bunkers in CRF table 1.A(b) but 2,012.00 TJ in CRF table 1.C . In response to a question raised by the ERT during the review, Lithuania expressed its intention to correct these inconsistencies in the next annual submission. The ERT recommends that the Party correct these inconsistencies and include a QC check for inconsistencies between CRF tables 1.A(b) and 1.C in the next annual submission.

Feedstocks and non-energy use of fuels

57. The information on feedstocks and non-energy use of fuels is reported separately from other fuel consumption by Statistics Lithuania in the energy balances. In Lithuania,

large amounts of natural gas are used for the production of ammonia and methanol. However, the Party has reported that the carbon stored from natural gas used for non-energy use has been excluded from the reference approach in CRF table 1.A(d). This is not in line with the Revised 1996 IPCC Guidelines. The ERT recommends that Lithuania include the natural gas used for non-energy purposes in the reference approach, and account for it as feedstocks and carbon stored in CRF table 1.A(d) accordingly, in the next annual submission.

58. To further improve the transparency of the reporting, the ERT recommends that Lithuania indicate, for each fuel, how feedstocks and non-energy use of fuels have been accounted for and where they have been allocated (i.e. the amount stored on a long-term basis in products and the amount released as CO_2 during its use) in the next annual submission. The ERT also recommends that the Party cross-check the data reported as non-energy use under the energy sector with the data reported under the industrial processes sector, in the next annual submission.

59. The previous review report recommended that Lithuania include an explanation of the non-energy use of gaseous fuels in the documentation boxes in CRF tables 1.A(c) and 1.A(d). In its 2012 annual submission, Lithuania has included some information in the documentation box of CRF table 1.A(c) but not for CRF table 1.A(d). The current ERT reiterates the recommendation from the previous review report that Lithuania include an explanation of the non-energy use of gaseous fuels in the documentation box in CRF table 1.A(d), in the next annual submission.

3. Key categories

Stationary combustion: solid fuels and biomass – CO_2 and CH_4

60. In response to a question raised by the ERT during the review, Lithuania explained that the coke used for the production of metals is reported together with coking coal consumption under other (manufacturing industries and construction). The ERT believes that this may lead to a possible underestimation of emissions, as coke normally has a higher carbon content than coking coal. Lithuania corrected its reporting of coke and coking coal in the revised CRF tables submitted during the review week by using the CO_2 EF for coke from the Revised 1996 IPCC Guidelines to estimate CO_2 emissions from coke. The ERT recommends that the Party report emissions from coke and coking coal separately in the next annual submission.

61. Lithuania has estimated CH_4 emissions from biomass combustion using a tier 1 approach. This is not in line with the IPCC good practice guidance as some categories under stationary combustion are key categories. In response to a question raised by the ERT during the review, the Party explained that measurements conducted over a long period of time are needed to develop country-specific CH_4 EFs. The ERT reiterates the recommendation from the previous review report that Lithuania estimate these emissions, in its next annual submission, using a tier 2 approach (e.g. by investigating whether internationally referenced EFs or the EFs used by neighbouring countries are also appropriate to Lithuania's national circumstances).

Other transportation: liquid fuels – CH_4

62. Lithuania has applied a CH_4 EF from the 2006 IPCC Guidelines to estimate emissions from diesel oil in off-road vehicles and other machinery (other transportation) without justifying why it is appropriate for the Party. The ERT concluded that the CH_4 EF used may lead to a possible underestimation of emissions, as its value (1.67 kg/TJ) is lower than the default value from the Revised 1996 IPCC Guidelines (5 kg/TJ in table 1-7). Lithuania submitted revised emission estimates in the CRF tables submitted during the

review week by applying the default EF from the Revised 1996 IPCC Guidelines. The ERT considers that the potential underestimation has been resolved. The ERT recommends that Lithuania justify the use of the CH_4 EF for diesel oil for off-road vehicles and other machinery from the 2006 IPCC Guidelines or apply the default EF from the Revised 1996 IPCC Guidelines in the next annual submission.

4. Non-key categories

Navigation: liquid fuels – CH_4

63. Lithuania has used country-specific CH_4 EFs to estimate CH_4 emissions from residual fuel oil and diesel oil from navigation without providing proper justification. The ERT believes that the EFs used may lead to a possible underestimation of emissions, because the values of these EFs (3.0 kg/TJ in both cases) are lower than the default values from the Revised 1996 IPCC Guidelines (5 kg/TJ in both cases). Lithuania submitted revised estimates in the CRF tables submitted during the review week by applying the default EFs from the Revised 1996 IPCC Guidelines. The ERT considers that the potential underestimation has been resolved. The ERT recommends that Lithuania justify the use of the country-specific CH_4 EFs or apply the default EFs from the Revised 1996 IPCC Guidelines, in the next annual submission.

C. Industrial processes and solvent and other product use

1. Sector overview

64. In 2010, GHG emissions from the industrial processes sector amounted to 2,249.17 Gg CO_2 eq, or 10.5 per cent of total GHG emissions, and emissions from the solvent and other product use sector amounted to 92.62 Gg CO_2 eq, or 0.4 per cent of total GHG emissions. Since the base year, emissions have decreased by 47.7 per cent in the industrial processes sector, and decreased by 53.1 per cent in the solvent and other product use sector. The key drivers for the fall in emissions in the industrial processes sector are related to the decrease in emissions from 1990 to 2010 from cement production (by 1,379.03 Gg CO_2 eq, or 82.7 per cent) and nitric acid production (by 350.95 Gg CO_2 eq, or 37.8 per cent). Within the industrial processes sector, 76.8 per cent of the emissions were from chemical industry, followed by 14.5 per cent from mineral products and 8.1 per cent from consumption of halocarbons and SF_6. Other production accounted for 0.4 per cent. The remaining 0.2 per cent were from metal production.

65. Lithuania has made recalculations for the industrial processes sector between the 2011 and 2012 submissions. The recalculations are in line with the IPCC good practice guidance. Some recalculations have improved the completeness of the inventory, as emission estimates for several categories were reported for the first time (e.g. CO_2 emissions from asphalt roofing, HFC-227ea emissions from fire extinguishers and CO_2 emissions from food and drink production). In addition, in response to recommendations from the previous review report, Lithuania has recalculated HFC emissions from foam blowing (using country-specific AD and a methodology from the IPCC good practice guidance) and N_2O emissions from nitric acid production (using plant and production unit-specific EFs and unit-specific AD). The Party has made further recalculations following changes in AD and EFs for GHG emissions from mineral wool production, mobile air conditioning and domestic refrigeration. The impact of these recalculations on the industrial processes sector is a decrease in emissions of 1.3 per cent for 2009.

66. Lithuania has not made recalculations for the solvent and other product use sector between the 2011 and 2012 annual submissions.

67. Lithuania has used the notation key "NE" (not estimated) to report emissions for the entire time series for some categories for which methodologies and/or EFs are not available in the IPCC good practice guidance or the Revised 1996 IPCC Guidelines, including: CO_2 emissions from road paving with asphalt; CH_4 and N_2O emissions from glass production; CO_2 emissions from chemical products, manufacture and processing; and N_2O emissions from degreasing and dry cleaning, and from other solvent and other product use (except for the use of N_2O for anaesthesia, where emissions have been estimated). The ERT encourages Lithuania to explore the possibility of estimating these emissions in its next annual submission.

68. Since its previous annual submission, Lithuania has made many improvements to the information on the industrial processes sector in the NIR. The NIR is more complete, more transparent, better structured and now contains information on category-specific QA/QC activities for some categories. The ERT encourages Lithuania to continue to improve its inventory, for example by explaining, in its next annual submission, emission trends, especially where they show large variations or are particular to national circumstances, as well as any inter-annual fluctuations in the IEFs.

2. Key categories

Cement production – CO_2

69. In a similar way to that identified in the previous review report, Lithuania has used a tier 2 methodology from the IPCC good practice guidance with plant-specific data (data on annual clinker production, the calcinated fraction of the cement kiln dust data and the calcium oxide and magnesium oxide content of the clinker) to estimate CO_2 emissions from cement production for the period 1990–2004, while for the period 2005–2010, the Party has used data reported under the EU ETS. Lithuania compared the results of the two methods for the period 2005–2010and concluded that the difference between them is minor and, hence, the consistency of the entire time series has been maintained, in line with the IPCC good practice guidance. In response to a question raised by the ERT during the review, the Party explained that the difference between the methods is less than 0.2 per cent. The ERT reiterates the recommendation that Lithuania provide information on the comparison of the two methods in its next annual submission in order to increase the transparency of its reporting.

Ammonia production – CO_2

70. As identified in the previous review report, the ERT noted some inter-annual variations in the IEF for ammonia production. For example, the IEF for 2003 was 1.66 t CO_2/t ammonia, while for all other years of the time series the IEFs were higher than 2.0 t CO_2/t ammonia. The ERT reiterates the recommendation that Lithuania explain these variations, in particular for the years where the inter-annual fluctuations are most significant, in its next annual submission.

71. According to the NIR, Lithuania has estimated the CO_2 emissions from ammonia production using data on natural gas consumption and carbon content. In response to a question raised by the ERT during the review, the Party explained that data on ammonia production, consumption of natural gas and carbon content were provided by the single national producer (AB Achema). According to AB Achema, the amount of natural gas is measured at the production unit entrance point (i.e. without disaggregating the natural gas used directly for production processes and the gas used for thermal processes (combustion)). Therefore, the amount of natural gas used directly for production processes is calculated by the plant proportionally to the emitted CO_2. Lithuania also explained that part of the natural gas is not oxidized due to inefficiencies in the combustion processes and

is emitted in the form of ash and smoke. The Party provided the ERT with the relevant calculation sheet.

72. The ERT noted that, according to the calculations provided during the review, the CO_2 emissions are calculated by multiplying the natural gas consumption (in TJ) by a country-specific CO_2 EF (56.90 t/TJ). The carbon content of the natural gas is then calculated from the emissions. The ERT also noted that the information in the NIR, which states that the CO_2 emissions are calculated from gas consumption and carbon content data, is incorrect (see para. 47 above). The ERT further noted that Lithuania has used an oxidation factor of 1.0 in the calculations, thereby assuming that all carbon is oxidized. To improve the transparency of its reporting, the ERT recommends that Lithuania correct and improve the information on the estimation and allocation of CO_2 emissions from ammonia production, including an explanation of how the natural gas consumption is divided between thermal processes and production processes.

Nitric acid production – N_2O

73. Lithuania has recalculated N_2O emissions from nitric acid production for the entire time series (1990–2010) using plant and production unit-specific EFs and unit-specific AD. For the years 1990–2008, for which measurement data do not exist, Lithuania has identified which production units were in operation, extrapolated the production per unit from production data for the period 2009–2011 and reported the annual emissions using the mean value of the EFs for the operating units. The ERT commends the Party for this improvement.

Consumption of halocarbons and SF_6 – HFCs and SF_6

74. With regard to emissions from consumption of halocarbons and SF_6, the transparency and completeness of the annual submission has improved since the 2011 annual submission. Lithuania has provided revised estimates of HFC emissions from foam blowing in accordance with the IPCC good practice guidance, and estimates of HFC-227ea emissions from fire extinguishers have been provided for the first time. Emission estimates for mobile air conditioning and domestic refrigeration have been improved (through the use of an updated calculation method to account for the age of the units, as well as through the inclusion of estimates for the whole time series) and some of the estimates of potential HFC emissions that were missing from previous annual submissions have been reported in the 2012 annual submission. The ERT welcomes these improvements. In 2012, Lithuania carried out a study on the use of fluorinated gases (F-gases) and the Party informed the ERT that the results of the study will be included in the 2013 annual submission.

75. In the 2010 review report, the ERT applied an adjustment to the Party's estimate of HFC emissions from foam blowing.[10] In the 2011 annual submission, Lithuania used the same method as the one used by the ERT for the adjustment ("average emission rate from a cluster of countries based on a driver"). In its 2012 annual submission, the Party has reported a revised estimate in accordance with the IPCC good practice guidance (equation 3.38), as recommended in the previous review report. The ERT commends Lithuania for this improvement.

76. The ERT noted that Lithuania has provided disaggregated emission estimates for different HFC species in table 4-33 of the NIR, including for HFC-365mfc and HFC-245fa. The ERT also noted that these two HFC species are not included in the list of HFCs contained in the UNFCCC reporting guidelines and therefore commends Lithuania for reporting these emissions. The ERT further noted that the Party has reported HFC emissions from foam blowing under an unspecified mix of HFCs listed in CRF table 2(II),

[10] See, in particular, paragraphs 140–159 of the 2010 ARR (FCCC/ARR/2010/LTU).

and that these emissions include emissions of HFC-365mfc and HFC-245fa. The ERT recommends that Lithuania exclude the emissions of HFC-365mfc and HFC-245fa from CRF table 2(II), and report the emissions from these two species in CRF table 9(b) in the next annual submission. As the Party has already reported disaggregated data on emissions of HFC-134a and HFC-227ea in table 4-33 of the NIR, the ERT recommends that Lithuania report these emissions separately in CRF table 2(II) in the next annual submission.

77. Lithuania carried out a survey in 2008 to collect data on F-gases from importers and users. The results of the survey, along with new AD, were used in the 2012 annual submission. The ERT noted that the Party has not included information in the NIR on the methods used by the sector experts to derive the estimates of F-gas emissions. In response to a question raised by the ERT during the review, Lithuania provided more information on the methods used by the experts, including how data extrapolation was used where AD were not available and how the information from supply companies was used in the estimations. The ERT recommends that the Party include this information in its next annual submission, in order to improve the transparency of its reporting.

78. The ERT noted that Lithuania has reported PFC emissions from consumption of halocarbons and SF_6 as "NO" (not occurring). In response to a question raised by the ERT during the review, the Party confirmed that, according to its surveys, no refrigerant blends containing PFCs are used in the country.

79. The leakage rate factor for lifetime emissions of HFCs from commercial and industrial refrigeration equipment is among the lowest for reporting Parties. For example, for HFC-125 emissions from commercial refrigeration, Lithuania has used a product life factor of 3.0 per cent, compared with a range of 1.5–24.3 per cent for all reporting Parties. In response to a question raised by the ERT during the review, Lithuania explained that this factor is based on the results of a survey of the eight companies involved in the installation and operation of equipment containing F-gases (2008 survey (see para. 77 above)). The ERT welcomes the Party's intention to use the results from the 2012 study (see para. 74 above) in the next annual submission and encourages Lithuania to provide additional information in the NIR to corroborate the low leakage factor.

80. In CRF table 2(II).F, Lithuania has reported HFC emissions from the disposal of commercial and industrial refrigeration equipment as "NE" for 2010. In response to a question raised by the ERT during the review, the Party explained that, according to the 2008 survey (see para. 77 above), fluorinated refrigerants in commercial and industrial refrigeration equipment were used in Lithuania in newly installed systems from approximately 2003 onwards. The Party has therefore assumed that the commercial and industrial systems have not yet reached the end of their operational lifetime limit. No data are thus far available on the decommissioning of commercial and industrial refrigeration equipment in the country; this was confirmed by the single national recycling company. The ERT encourages Lithuania to include data on the decommissioning of all refrigeration equipment in its data collection procedures in the next annual submission. Further, the ERT recommends that the Party, in its next annual submission, report emissions from the disposal of commercial and industrial refrigeration equipment as "NO" (rather than as "NE") until the decommissioning of this equipment begins.

D. Agriculture

1. Sector overview

81. In 2010, GHG emissions from the agriculture sector amounted to 5,164.91 Gg CO_2 eq, or 24.0 per cent of total GHG emissions. Since 1990, emissions have decreased by 51.1 per cent. The key drivers for the fall in emissions are the decrease in the livestock

population (especially for cattle, horses and swine), the reduction in the amount of nitrogen (N) fertilizer applied to soils and the decrease in agricultural production following the significant socio-economic reforms of the early 1990s, particularly after the restoration of independence and the transition to a market economy. Within the sector, 62.3 per cent of the emissions were from agricultural soils, followed by 23.1 per cent from enteric fermentation and 14.6 per cent from manure management. N_2O emissions accounted for 67.8 per cent of sectoral emissions and CH_4 emissions accounted for the remaining 32.2 per cent.

82. Lithuania has reported GHG emissions from rice cultivation, prescribed burning of savannas and field burning of agricultural residues as "NO". Further, the Party has reported CH_4 emissions from all relevant categories under agricultural soils as "NA" (not applicable), indicating that neither the Revised 1996 IPCC Guidelines nor the IPCC good practice guidance provide a methodology to estimate these emissions. The ERT encourages Lithuania to estimate these emissions in the next annual submission. If this is not possible, the ERT recommends that the Party report these CH_4 emissions as "NE" in the next annual submission.

83. Lithuania has made recalculations for the agriculture sector between the 2011 and 2012 submissions in response to the recommendations made in the 2011 annual review report, following changes in AD and in order to rectify identified errors. The impact of these recalculations on the agriculture sector is an increase in emissions of 10.4 per cent for 2009. The main recalculations took place in the following categories:

(a) CH_4 emissions from enteric fermentation (for the entire time series) due to: the update and correction of the population data for cattle (for the periods 1997–1998 and 2007–2009), sheep (for the period 2004–2009) and swine (for the period 1997–1998); the disaggregation of non-dairy cattle, swine and sheep into subcategories with the application of a subcategory-specific gross energy intake, thereby leading to the update of the EFs for the entire time series; the use of a tier 2 method for sheep; and the update of the milk fat data for dairy cattle for the period 1990–1998;

(b) CH_4 emissions from manure management (for the entire time series) due to: the disaggregation of the non-dairy cattle and swine populations into subcategories with the application of a subcategory-specific gross energy intake for the entire time series; the update of the milk fat data for the gross energy estimates for dairy cattle (for the period 1997–2009); the correction of the data on the animal population and the update of the population data for cattle, sheep, swine and poultry (for the period 1997–2009) (see para. 83(a) above); and the update of the data on the biogas recovery of CH_4 from swine manure management (for the period 2004–2010);

(c) N_2O emissions from manure management (for the period 1990–2009) due to: the recalculation of the N excretion rate for cattle and swine using a tier 2 method; and the update of the data on the animal herd structure and protein consumption;

(d) N_2O emissions from agricultural soils (for the entire time series) due to: the recalculation of the N excretion rate for cattle and swine which in turn led to changes in the estimates of N_2O emissions from manure application to soils; and the update and correction of the AD for synthetic fertilizers for the years 2003–2004, 2006 and 2008.

84. The inventory is complete in terms of categories and gases; emission estimates have been provided for all years of the time series.

85. The ERT commends the Party for the improvements in transparency and consistency in the 2012 annual submission following the recommendations in the previous review report (e.g. the provision of some explanatory and background information on the methodologies used to estimate the country-specific CH_4 EFs). However, the ERT

considered that the information provided was not sufficient to replicate the emission calculations (see para. 91 below). The ERT reiterates the recommendation from the previous review report that Lithuania report the unpublished information and data necessary to calculate the country-specific CH_4 EFs.

86. Lithuania has calculated the uncertainty in the agriculture sector following a tier 1 approach. The Party uses default values from the IPCC good practice guidance to quantify the uncertainty of the EFs. With regard to the AD, Lithuania describes the potential sources of the uncertainties for the CH_4 emissions from enteric fermentation and manure management. The ERT reiterates the recommendation from the previous review report that Lithuania provide more detailed information on the uncertainties of the AD and EFs used in its uncertainty analysis.

87. In the NIR, Lithuania has provided a description of the QA/QC activities implemented in response to the recommendations from the previous review report. However, some recommendations have not yet been addressed, including: typographical errors; the inconsistency between CRF tables 4.A and 4.B(a) regarding the animal mass reported for swine; and the inconsistency between the non-dairy cattle subcategories reported in NIR tables 6-5 and 6-8. In addition, the livestock population values reported for cattle and sheep in the CRF tables differ from the values reported to the Food and Agriculture Organization of the United Nations and the rationale is not provided in the NIR. In response to questions raised by the ERT during the review, Lithuania explained that this difference is due to the different accounting rules applied and, for some years of the time series, the different data sources used. The ERT recommends that the Party provide this information in the next annual submission. The ERT also recommends that, in its next annual submission, Lithuania improve its QC activities to ensure the consistency and transparency of its reporting.

88. Lithuania has reported, in CRF tables 4.A (additional information) and 4.B(a) that the mass of non-dairy cattle is 326.21 kg and the mass of swine is 67.90 kg. However, in the NIR, the Party has incorrectly reported that the mass of non-dairy cattle is 323.94 (NIR table 6-25) and the mass of swine is 66.96 kg (NIR table 6-26). In response to a question raised by the ERT during the review, Lithuania confirmed that the correct values are those reported in the CRF tables. The ERT recommends that the Party correct the animal mass information for non-dairy cattle and swine in the NIR and reiterates the recommendation from the previous review report that Lithuania develop and implement effective QA/QC procedures to prevent these types of errors in the next annual submission.

2. Key categories

Enteric fermentation – CH_4

89. Lithuania has used a tier 2 method with country-specific CH_4 EFs to estimate CH_4 emissions from dairy and non-dairy cattle, sheep and swine. For the remaining livestock, a tier 1 method with default EFs was used. The ERT noted that the methods have been applied in line with the IPCC good practice guidance.

90. Lithuania has defined an enhanced characterization for cattle, sheep and swine and has applied country-specific CH_4 EFs. The subcategories defined do not include livestock under weaning age as this livestock is assumed not to produce CH_4 emissions. In response to questions raised by the ERT during the review, the Party explained that the weaning period is negligible: one to three days for cattle, 21 to 28 days for swine and two months for sheep. The ERT recommends that Lithuania provide this information in its next annual submission.

91. The ERT noted a lack of transparency in the information reported by Lithuania on enteric fermentation; for example, the weight and weight gain required for the estimation of the CH_4 EF for the tier 2 method for enteric fermentation are not provided in the NIR; CRF table 4.A (additional information) is only partly completed (e.g. all indicators for sheep are reported as "NA"); and the data sources for the swine population size and for the methane conversion factor (MCF) for CH_4 emissions from enteric fermentation are not reported. The ERT recommends that Lithuania improve the transparency of its reporting and enhance its QC activities in the next annual submission.

92. In response to the recommendations from the previous review report, Lithuania has described in the NIR the different AD sources (Statistics Lithuania and the Register of Agricultural Information) and has estimated the country-specific CH_4 EF for swine for the entire time series. The ERT welcomes these improvements.

Manure management – CH_4 and N_2O

93. In CRF table 4.B(a), Lithuania has reported the average typical animal mass, the average daily excretion of volatile solids and the average CH_4 production potential as "NE" for sheep, goats, horses and poultry. In response to a question raised by the ERT during the review, Lithuania explained that, as a tier 1 method is used for this category, these data are not required. The ERT agreed with the Party that these data are not required when a tier 1 method is used and concluded that the appropriate notation key is therefore "NA". The ERT recommends that the Party correct this error in the next annual submission.

94. In response to the encouragement in the previous review report, Lithuania has provided a description in the NIR of the recalculations made in this category, as well as detailed background information on the country-specific parameters used. Lithuania has also estimated the CH_4-producing capacity of manure for cows, other cattle and swine, as contained in the list of planned improvements provided in the 2011 NIR. The ERT commends Lithuania for these improvements.

95. Lithuania has used for the first time a tier 2 method for the estimation of CH_4 emissions from enteric fermentation for sheep. The ERT noted that this implies that the Party has the necessary data to implement a tier 2 method for the estimation of CH_4 emissions from manure management for sheep. In response to a question raised by the ERT during the review, Lithuania acknowledged the possibility of implementing a tier 2 method for sheep. The ERT encourages the Party to implement a tier 2 method for the estimation of CH_4 emissions from manure management in the next annual submission.

96. To estimate N_2O emissions from manure management for cattle and swine, Lithuania has used the method from the IPCC good practice guidance with country-specific N excretion values. For the remaining livestock categories, default EFs have been used. This is in line with the IPCC good practice guidance.

97. Lithuania has used the N retention as input data to calculate the N excretion rate for cattle and swine, but the Party has not provided the reference for the data in the NIR. The ERT recommends that Lithuania improve the transparency of the information on the country-specific N excretion rate for cattle and swine by providing the source of these data in the next annual submission.

98. For the calculation of N_2O emissions from livestock, except cattle and swine, Lithuania has used a default N excretion rate from the Revised 1996 IPCC Guidelines without applying the default adjustment factor to this parameter for young animals, as suggested by the IPCC good practice guidance. The ERT recommends that Lithuania apply the default adjustment factor to the default N excretion rate for young animals in the next annual submission.

99. In response to a recommendation in the previous review report, Lithuania has recalculated the country-specific N excretion rates for dairy and non-dairy cattle for the entire time series (1990–2009), thereby correcting the inconsistencies in the trend that were due to the use of different methodological approaches for the calculation of the N excretion rates. The ERT welcomes this improvement.

Direct soil emissions –N_2O

100. Lithuania has estimated direct N_2O emissions from agricultural soils using a tier 1a method with a default EF and other emission parameters from the IPCC good practice guidance. As agricultural soils is a key category, the ERT reiterates the encouragement from the previous review report that Lithuania implement a higher-tier method for the estimation of emissions from this category in the next annual submission.

101. In response to a recommendation from the previous review report, Lithuania has compared the national data on synthetic fertilizer consumption provided by UAB Agrochema with the data provided by the International Fertilizer Industry Association (IFA) in the NIR, but the Party did not explain the differences observed between the data from the two sources. In response to a question raised by the ERT during the review, Lithuania indicated that it is difficult to explain the differences between the national data and the IFA data on synthetic fertilizer consumption, as Lithuania does not have any information on the methodology and data sources used to calculate the IFA data. The ERT recommends that Lithuania continue to investigate these differences and report on the findings in the next annual submission, in order to improve the transparency of its reporting.

102. The ERT also noted a lack of transparency with regard to the approach used to estimate the fraction of livestock N excreted and deposited onto soil during grazing ($Frac_{GRAZ}$) when calculating N_2O emissions from animal manure applied to soils, as the underlying background information is not provided in the NIR. In response to a question raised by the ERT during the review, Lithuania provided this information. The ERT reiterates the recommendation from the previous review report that the Party provide the background information used to calculate $Frac_{GRAZ}$ in the next annual submission.

103. The ERT noted that sewage sludge is applied as a soil amendment in Lithuania, but the associated emissions are not estimated. In response to a question raised by the ERT during the review, the Party explained that there are no data in Lithuania on the N content in sewage sludge and no default data are contained in the Revised 1996 IPCC Guidelines or the IPCC good practice guidance. The ERT noted that the Party, as a member State of the EU, is bound by EU directive 86/278/EEC[11] and its amendments, and that data on the N content in sewage sludge for Lithuania may be or become available. The ERT strongly encourages Lithuania to research the availability of country-specific data on N content in sewage sludge applied to soils and report N_2O emissions from this activity in the next annual submission. If these data are not available, the ERT strongly encourages the Party to explore the possibility of using the values from neighbouring countries in order to estimate the N_2O emissions from this activity in the next annual submission.

Indirect emissions –N_2O

104. Lithuania has estimated indirect N_2O emissions from agricultural soils using a tier 1a method with a default EF and other emission parameters from the IPCC good practice guidance. As this category is a key category, the ERT reiterates the encouragement from

[11] Council directive of 12 June 1986 on the protection of the environment, and in particular of the soil, when sewage sludge is used in agriculture. Available at <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:1986:181:0006:0012:EN:PDF>.

the previous review report that Lithuania implement a higher-tier method for the estimation of emissions from this category in the next annual submission.

E. Land use, land-use change and forestry

1. Sector overview

105. In 2010, net removals from the LULUCF sector amounted to 11,714.57 Gg CO_2 eq. Since 1990, net removals have increased by 86.2 per cent. The key driver for the rise in removals is the increase in removals from forest land remaining forest land, although the ERT noted that Lithuania has incorrectly applied the stock change method from the IPCC good practice guidance for LULUCF to estimate emissions and removals from this category (see para. 114 below). Within the sector, net removals of 12,280.47 Gg CO_2 eq were from forest land, followed by net removals of 28.26 Gg CO_2 eq from cropland, while net emissions of 537.69 Gg CO_2 eq were from grassland, followed by net emissions of 56.47 Gg CO_2 eq from wetlands.

106. Lithuania has made recalculations for the LULUCF sector between the 2011 and 2012 submissions in response to the recommendations in the 2011 review report. The impact of these recalculations on the LULUCF sector is an increase in removals of 190.4 per cent for 2009. The main recalculations took place in the following categories for 2009:

(a) Forest land: an increase in net removals of 156.5 per cent as a consequence of new AD (see para. 107 below);

(b) Cropland: the provision of estimates for the net removals of CO_2, and for emissions of CH_4 and N_2O, which were previously reported as "NA and NE";

(c) Grassland: the provision of estimates for the net emissions of CO_2, and for emissions of CH_4 and N_2O, which were previously reported as "NA and NE";

(d) Wetlands: a decrease in net CO_2 emissions of 51.0 per cent as a consequence of new AD;

(e) Settlements: an increase in net CO_2 emissions of 48.1 per cent as a consequence of new AD;

(f) Land converted to other land: CO_2 net emissions, which were previously estimated, have been reported as "NO" as a consequence of new AD.

107. Lithuania has recalculated the complete time series of land use and land-use change matrices by integrating different sources of data from two new research studies: the first study estimated the area of the forest-related land categories (i.e. forest land remaining forest land, land converted to forest land and forest land converted to other uses); the second study, building on the results of the first, provided area estimates for all remaining land-use and land-use change categories. An extensive amount of information is reported in the NIR to explain how the different sources of data have been harmonized to produce a consistent land representation. Although the ERT considers that the time series of the land use and land-use change matrices is consistent, it recommends that Lithuania improve the transparency of its reporting by including decisions trees in the NIR that show the methods, including assumptions, and rules applied in both studies. Such decision trees would demonstrate how the Party has avoided the double counting or omission of emissions and removals in the accounting of land areas between the studies and within each study.

108. The time series of the areas subject to land-use change reported in the land-use change area matrices in annex VI to the NIR shows large inter-annual variations. For example, conversion of forest land to settlements is reported as zero for all years except 2006 and 2009, where 399 ha of conversion have been reported. Similarly, conversion of

settlements to forest land is reported as zero for all years except 1990, 1991 and 1994, where 399 ha of conversion have been reported. The variations are mainly due to the methodology used: in the year when a plot is sampled and a land-use change observed, the method assumes that 399 ha changed to a different land-use category. However, the change is likely to have occurred gradually during the period between the two surveys, rather than in a single year. The ERT encourages Lithuania to apply data analysis techniques (e.g. a five-year rolling average), to reduce the inter-annual variations in the time series of the areas subject to land-use change.

109. The ERT noted that, with the exception of land converted from grassland to cropland and vice versa, and deforestation, the stock changes in soil organic matter (SOM) associated with land-use changes have not been estimated and are reported as "NA" and "NO" in CRF tables 5.A–5.F. The ERT reiterates the recommendations from previous review reports that Lithuania estimate the SOM changes associated with land-use changes, applying the IPCC default methodology. Where a lack of country-specific data on the soil carbon content for the different land-use categories hinders the estimation of the SOM changes, the ERT recommends that Lithuania use default data from the IPCC good practice guidance for LULUCF; the ERT notes that data on European soils are also stored in the European Union Joint Research Centre data repository.[12]

110. The ERT noted that, with the exception of land converted to forest land, Lithuania does not follow the IPCC method of reporting cumulative areas over a 20-year transition period (or over a longer transition period selected by the Party) for the land-use change conversion categories. Therefore, the ERT recommends that Lithuania report the areas converted to a different land use under the relevant land-use conversion category for 20 consecutive years before reporting them under the corresponding "land remaining" category. This means that, for each year, the cumulative total area reported under each land-use change category should equal the cumulative area that has been converted to that land use over the last 20 years; however, the area of land under conversion that has been subject to a second land-use change during the 20-year conversion period should be subtracted by the cumulative total. Further, for a Party that does not have unmanaged lands, for each year, the area reported under a "land remaining under the same land use" category should equal the area reported for that category for the previous year minus the area lost during the year because of conversion to other land uses plus the area that was converted to this category 20 years before, or in a previous year in accordance with the conversion period selected by the Party.

111. The ERT noted that the SOM changes in mineral soils due to changes in management practices are not reported under any land-use category. Having SOM stocks in equilibrium is a default assumption for forest land under the tier 1 method from the IPCC good practice guidance for LULUCF, but it is not a good practice for cropland and grassland. Further, Lithuania has reported the total area of organic soils covered by different land uses, although only a portion of that area is drained (drainage is the single management practice reported by the Party that determines emissions). The ERT encourages Lithuania to move to a tier 2 method for forest land, where data are available, and recommends that Lithuania estimate and report the stock changes in SOM due to management changes in cropland and grassland in the next annual submission. The ERT also reiterates the recommendations from previous review reports that the Party report, in the CRF tables, the total area of organic soils and, in the information boxes of the relevant CRF tables, the portion of the area of organic soils where drainage has occurred, in the next annual submission.

[12] Available at <http://eusoils.jrc.ec.europa.eu/library/esdac/esdac_access2.cfm>.

112. The ERT identified a number of inconsistencies in the estimates of the carbon stock changes for biomass, dead wood and litter associated with land-use conversions. For example, increases in biomass carbon stocks are reported for land-use conversions from cropland to grassland and from grassland to cropland; decreases in biomass carbon stocks are reported for land-use conversions from other land to wetlands; and no losses in the carbon stocks of dead organic matter are reported for the conversion of forest to other land uses. The ERT recommends that Lithuania revise, where relevant, the carbon stock change factors and assumptions used for the estimation of the carbon stock changes in biomass, dead wood and litter and ensure comparability between the land-use changes both to and from one category to another. For example, the per unit of area losses of biomass carbon stock due to the conversion of grassland to cropland are expected to be equivalent, in magnitude, to the gains of biomass carbon stock due to the conversion of cropland to grassland.

113. Lithuania's uncertainty analysis of the LULUCF sector is mostly based on expert judgement. In addition, the Party has applied equations that are not fully consistent with those contained in the IPCC good practice guidance for LULUCF; for example, in forest land, the uncertainty of the per hectare average biomass is calculated as the standard error times 100 divided by the mean value, while the correct calculation, using the normal distribution, is twice the standard deviation times 100 divided by the mean value. The Party has generally used the standard error to calculate the uncertainties of the LULUCF variables instead of the standard deviation. Further, as the forest biomass annual stock changes are calculated on one fifth of the forest inventory plot area (see para. 115 below), the related uncertainty should not be calculated using the standard deviation for the data on the whole forest area but rather using the standard deviation associated with the data on one fifth of the total plot area. The ERT recommends that Lithuania revise the uncertainty analysis of the LULUCF sector, including by applying the equations contained in chapters 5.1 and 5.2 of the IPCC good practice guidance for LULUCF and either by providing information on the uncertainties or by justifying the values derived by expert judgement.

2. Key categories

Forest land remaining forest land – CO_2, CH_4 and N_2O[13]

114. For forest land remaining forest land and for land converted to forest land, the ERT noted that, when applying the stock change method from the IPCC good practice guidance for LULUCF to calculate the carbon stock changes in different pools, Lithuania has not ensured that the stocks, at two points in time, are calculated on the same area (i.e. for every pool, the area used to calculate the stock at time 1 can be different from that used to calculate the stock at time 2). This is not in line with the IPCC good practice guidance for LULUCF (e.g. equation 3.2.14 regarding the stock change method for mineral soils). This practice also results in the accounting of emissions and removals that never occur in reality, since the accounted fluxes are simply the result of the transfer of carbon stocks from one category to another; therefore, the applied method provides biased GHG emission estimates. The ERT recommends that Lithuania, when applying the stock change method, calculate the carbon stock values at two consecutive points in time in the same area[14] and

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

[14] For example, in a country where there are no unmanaged forests, the use of the stock change method to calculate a carbon stock change in forest land remaining forest land (FLrFL) between time 1 (t1) and time 2 (t2) results in the following equation: carbon stock change = the carbon stock in the FLrFL area at t2 *minus* (the carbon stock at t1 in the FLrFL area *minus* the carbon stock at t1 in the area deforested between t1 and t2) *minus* the carbon stock after 20 years in the area that at t1 has been

revise its estimates of the carbon stock changes and associated emissions and removals in its next annual submission.

115. Lithuania has estimated the annual biomass stock changes using successive forest inventory measurements collected on one fifth of the national territory each year. For each year, the biomass stock change of the national forest area is calculated as the cumulated change that has occurred over a five-year period on one fifth of the national forest area (i.e. each year, the total stock is the sum of the stock derived from the data collected on one fifth of the territory *plus* the stock that was measured over the previous four years for the other four fifths of the territory). The ERT noted that, as a result of the approach applied in the continuous inventory system, the reported inter-annual changes may not represent the actual trends in annual stock changes in real time, and the signals of sudden stock changes may not be registered in the estimates at the proper point in time. The ERT encourages Lithuania to explore alternative methods to annually forecast, on the basis of new measured data, the stock changes for areas not measured and to revise, each year, the values forecast on the basis of newly measured data, with the aim of reflecting, as far as possible, the real inter-annual variability in the carbon stocks dynamic. Further, in order to increase transparency, the ERT recommends that Lithuania report, in its NIR, annual estimates of the carbon gains and losses in forest land using the IPCC default method (equation 3.2.2 and associated equations of the IPCC good practice guidance for LULUCF).

Land converted to forest land – CO_2, CH_4 and N_2O[15]

116. To estimate the biomass stock changes, Lithuania has built a yield curve where the annual per hectare stock value has been calculated by averaging the data collected during the same year for different plots located in different age classes. However, the age class (ranging from one year to 20 years) for each year of the time series has a different area extension. Further, not every age class is sampled every year, so that the per hectare average value is not the weighted average by area extension of all age classes. In afforested and reforested land, the continuous annual addition and subtraction of areas and the shifting of areas from younger age classes to older age classes results in annual changes in the contribution of each age class to the mean value (indeed, the area extension of each age class provides the weight for each age class value when calculating an unbiased average for all afforested/reforested lands), so that the curve calculated by Lithuania cannot be applied to extrapolations for different conditions, wherein the total afforested/reforested area is composed of a different distribution among age classes.

117. The ERT therefore recommends that Lithuania build a new yield curve for biomass stock, where the data sampled are aggregated on the basis of the age class to which they pertain, whenever data have been collected, so that they can be used to estimate the biomass stock of each age class for each year of the time series, including for the interpolation and extrapolation of data for age classes for which sampled data are not available. Consequently, the annual estimates of biomass carbon stocks gains can be calculated for each age class by multiplying the area of the age class using the difference between the mean value of that age class and the mean value of the previous (the younger) age class, as provided by the yield curve. The ERT also recommends that Lithuania update the yield curve on an annual basis with the newly available data so that the curve accurately reflects the actual carbon stocks dynamic in land converted to forest land.

reported under land converted to forest land and that, being older than 20 years at t2, has been transferred to the FLrFL category.

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

Cropland remaining cropland – CO_2

118. According to the NIR, Lithuania has applied a tier 1 method for woody biomass in cropland with a net carbon accumulation of 2.1 t/ha/year over a 20-year period, and, after 20 years, the biomass carbon stock of the woody plantation achieves an equilibrium level so that the annual net change becomes zero. However, Lithuania has applied the carbon stock change factor to all areas, without distinguishing between old plantations (areas containing wood crops for over 20 years, irrespective of their rotation cycle) and young plantations (areas containing wood crops for less than 20 years), thereby resulting in an overestimation of net carbon stock changes. The ERT recommends that the Party assume an equilibrium (i.e. no net stock changes) in living biomass in areas where wood crops have been established for more than 20 years prior to the inventory year, and recalculate the whole time series accordingly in its next annual submission.

3. Non-key categories

Wetlands remaining wetlands – CO_2 and N_2O

119. Lithuania has reported the carbon stock changes in SOM for wetlands remaining wetlands and for all pools under forest land converted to wetlands in CRF table 5.D, assuming that conversion to wetlands determines the instant oxidation of all biomass and dead organic matter. The ERT notes that the Party has not reported separately the area of wetlands that is managed, unmanaged, or where peat extraction occurs, and recommends that Lithuania do so in its next annual submission. Further, the ERT encourages the Party to distinguish between peat extracted for energy purposes and that extracted for horticultural purposes and to report, in CRF table 5(II), N_2O emissions emitted on-site due to the drainage of cultivated peat and CO_2 emissions emitted off-site due to horticultural uses, in the next annual submission. If necessary, the ERT suggests that Lithuania apply the same methodology as that used by other Parties, for example the United Kingdom of Great Britain and Northern Ireland, as described in the NIR of the United Kingdom.

Biomass burning – CO_2

120. Lithuania has reported, in CRF table 5(V), CO_2 emissions from wildfires in forest land remaining forest land and land converted to forest land. However, when the stock change method is applied, CO_2 emissions due to wildfires are automatically accounted for when estimating the stock changes in forest land. The ERT therefore recommends that Lithuania report the CO_2 emissions associated with wildfires as information only in its NIR and report the emissions as "IE" (included elsewhere) in CRF table 5(V) in the next annual submission.

121. The ERT noted that, for forest land remaining forest land and for land converted to forest land, Lithuania has used a default value for biomass consumption (19.8 t/ha) from table 3.A.1.13 of the IPCC good practice guidance for LULUCF that represents the product of the available fuel and the combustion efficiency (values B and C, respectively, in equation 3.2.20 of the IPCC good practice guidance for LULUCF). In addition, Lithuania has used incorrect CH_4 and N_2O EFs (derived from emission ratios of 0.012 and 0.007 for CH_4 and N_2O, respectively), instead of those reported in table 3.A.1.16 of the IPCC good practice guidance for LULUCF. The ERT recommends that the Party use the correct CH_4 and N_2O EFs from table 3.A.1.16 of the IPCC good practice guidance for LULUCF and recalculate the corresponding emissions and removals for the entire time series in the next annual submission. The ERT also recommends that Lithuania use country-specific data for the mass of available fuel, including dead wood and litter, in the next annual submission.

122. Lithuania has reported CH_4 and N_2O emissions from biomass burning in wildfires for land converted to forest land as "IE" in CRF table 5(V). These emissions have been

reported under the forest land remaining forest land category. As this method is not consistent with the IPCC good practice guidance for LULUCF, the ERT recommends that Lithuania report these emissions under the category land converted to forest land in the next annual submission. If appropriate data are not available, the ERT suggests that the Party subdivide the forest area burned on the basis of the proportional contribution of each category to the total forest land area.

F. Waste

1. Sector overview

123. In 2010, emissions from the waste sector amounted to 1,161.25 Gg CO_2 eq, or 5.4 per cent of total GHG emissions. Since 1990, emissions from the waste sector have decreased by 0.4 per cent. The key drivers for the fall in emissions are the decrease in emissions from wastewater handling (since 1990) and the decrease in emissions from solid waste disposal sites (since 2003). Within the sector, 82.2 per cent of the emissions were from solid waste disposal on land, followed by 17.6 per cent from wastewater handling. The remaining 0.2 per cent were from waste incineration.

124. Lithuania has made recalculations for the waste sector between the 2011 and 2012 submissions in response to the recommendations in the 2011 review report and following changes in AD and EFs. The recalculations resulted in a decrease in emissions from the waste sector for all reported years. The impact of these recalculations on the waste sector is a decrease of 18.9 per cent for 2009. The main recalculations took place in the following categories:

(a) CH_4 emissions from managed waste disposal on land: an increase in emissions of 15.4 per cent (see para. 125 below);

(b) Unmanaged waste disposal sites: an increase in emissions of 16.0 per cent;

(c) Domestic and commercial wastewater: a decrease in emissions of 62.0 per cent.

125. The recalculations were performed due to the reallocation of CH_4 emissions from the disposal on land of sewage sludge from wastewater handling to solid waste disposal on land, as recommended in the previous review report. Lithuania has also changed the method used to estimate CH_4 emissions from disposed sewage sludge, from a tier 1 method (wastewater handling) to a tier 2 method (solid waste disposal on land), in line with the IPCC good practice guidance.

126. The ERT considers that the transparency of the description of the overview of the waste sector in the NIR is limited. In response to a question raised by the ERT during the review, Lithuania provided the ERT with a general overview of the waste sector. The ERT reiterates the recommendation from the previous review report that the Party improve the general overview of the waste sector in the NIR in the next annual submission. The information provided by the Party could include: the amounts and sources (e.g. domestic or industrial) of the waste generated and the waste treatment processes (e.g. the percentage of the waste disposed on land, incinerated or composted). The ERT also recommends that Lithuania describe the wastewater generation processes and the types and shares of wastewater and sludge treatment methods in the next annual submission.

127. During the review, Lithuania also provided the ERT with additional information on the factors that have influenced the emissions trends, including the Party's independence, the changes in waste management policies and measures, the economic situation and the closure and opening of treatment plants. The ERT recommends that Lithuania report this information in its next annual submission.

128. The NIR does not transparently explain whether CH_4 emissions are recovered for energy purposes and where the emissions from those energy-producing activities are allocated. In response to a question raised by the ERT during the review, Lithuania explained that CH_4 recovery, both in landfills and in wastewater treatment plants, is used for energy purposes and that the emissions from these electricity- and heat-producing activities are included under the energy sector. The ERT recommends that Lithuania include this information in the next annual submission.

129. Lithuania has only briefly reported on the time-series consistency of the AD, EFs and parameters used for the waste sector. The ERT recommends that Lithuania improve the transparency of its reporting on time-series consistency in the next annual submission.

130. The AD for the waste sector are mostly available from 1991 onwards. The ERT considers that the NIR is not always transparent with regard to the assumptions used to estimate emissions for 1990. The ERT recommends that Lithuania transparently report on the assumptions used in the NIR of the next annual submission.

131. The QA/QC procedures performed in the preparation of the inventory for the waste sector are well described in the NIR. For example, in order to verify its estimates of CH_4 emissions from solid waste disposal sites, Lithuania conducted a quantitative and qualitative comparison of its CH_4 emissions with those of neighbouring countries. The ERT commends Lithuania for this approach.

2. Key categories

Solid waste disposal on land – CH_4

132. Lithuania has used the first order decay (FOD) method from the 2006 IPCC Guidelines to estimate CH_4 emissions from solid waste disposal on land (both managed and unmanaged sites). The ERT noted that no justification was provided in the NIR for this methodological choice. In response to a question raised by the ERT during the review, Lithuania explained that it had used the decision tree (figure 5.1) from the IPCC good practice guidance and selected the FOD method to estimate the CH_4 emissions from solid waste disposal, in line with the IPCC good practice guidance. The Party also explained that the 2006 IPCC Guidelines take into account the latest research (e.g. the degradable organic carbon (DOC) values provided therein allow Lithuania to disaggregate the emissions more finely by waste type). Lithuania further explained that the Revised 1996 IPCC Guidelines and the IPCC good practice guidance do not provide differentiated parameter values for the methane generation rate constant, but that the 2006 IPCC Guidelines do provide differentiated methane generation rate constants per type of waste, as used by Lithuania. The IPCC good practice guidance does not provide any parameter values for sludge, but the 2006 IPCC Guidelines do. The ERT considers the justification sufficient. The ERT recommends that Lithuania include this justification in its next annual submission.

133. Lithuania indicated during the review week that a new study on wastewater and sewage sludge, which began in September 2012, will provide country- or plant-specific information on MCFs for disposed sewage sludge and will enable a more reliable calculation of CH_4 emissions from sewage sludge. The ERT encourages Lithuania to include the results of the study when estimating the emissions from disposed sewage sludge in the next annual submission.

134. Although Lithuania has estimated the CH_4 emissions from managed and unmanaged waste disposal on land using methods from the 2006 IPCC Guidelines, the Party has used default uncertainty values from the IPCC good practice guidance. The ERT recommends that Lithuania, in its next annual submission, use the uncertainty values from the 2006

IPCC Guidelines if the Party also estimates the emissions using the method from the 2006 IPCC Guidelines.

135. The ERT noted that Lithuania has not transparently described in the NIR all of the assumptions used to calculate emissions from solid waste disposal on land for the time series 1950–1999. For example, the ERT noted that the assumptions used for the composition of waste for the time series 1950–1999 or for the distribution of solid waste (municipal, industrial/commercial and sewage sludge) to the different types of waste disposal sites (managed, and deep and shallow unmanaged) have not been clearly reported in the NIR. The latter assumption is especially important for sewage sludge, since sewage sludge is disposed on specific sewage sludge disposal sites. For this reason, the ERT recommends that Lithuania more transparently document the assumptions used for the AD in the next annual submission. The ERT also recommends that the Party justify the methodology used to calculate the distribution of the different solid waste types to the different waste disposal sites for all solid waste categories in the next annual submission.

136. The previous review report recommended that Lithuania either provide an explanation as to why the waste composition is assumed to remain constant over the period 1950–1989 for all waste types and, from 1990, for municipal solid waste (MSW), or estimate the historical waste composition. In its NIR, Lithuania has reported the waste composition of MSW from various limited, partially analytical tests. However, the results of the tests are not sufficiently representative to estimate the historical waste composition. The Party has also reported that the Ministry of Environment requires, as of 2012, that regional waste centres perform analyses of the waste composition. In response to a question raised by the ERT during the review, Lithuania expressed its intention to analyse the data as soon they become available (the final results covering all four seasons are expected by the end of 2013). The ERT recommends that Lithuania analyse the results of this study and include a comparison of the waste composition between rural and urban areas, if possible for the entire time series, in future annual submissions.

137. The ERT considers that the NIR is not completely transparent with regard to why Lithuania considers the data for the period 1991–1998 reported by companies on the amount of waste disposed as industrial and commercial waste to be reliable, but does not consider the data on the waste disposed as MSW to be reliable. In response to a question raised by the ERT during the review, Lithuania explained that, in the early 1990s, the revenues for MSW collection companies depended on the amount of waste delivered to landfills, but the loads were not weighed and an overestimation of the weight of the loads is therefore suspected. On the other hand, industrial and commercial waste was transported by the companies generating the waste and was subject to a fee per truckload of waste deposited, not per the weight of each truckload of waste. To increase the transparency of the choice of AD, the ERT recommends that Lithuania include this information in the NIR of its next annual submission.

138. Lithuania has used a default value of 0.5 contained in the IPCC good practice guidance for the share of CH_4 in landfill gas. The regional waste management centres provide site-specific information (reported in NIR table 8-11). The ERT recommends that Lithuania, in its next annual submission, follow up on the site-specific results on the measured fraction of CH_4 in the extracted landfill gas of the closed waste disposal sites that are equipped with CH_4 recovery, because they could provide Lithuania with country-specific or even site-specific information on the composition of the landfill gas.

139. The methane generation rate constant and the DOC fraction reported in CRF table 6.A (additional information) represent the weighted average for all components and should show slight inter-annual variations depending on the waste composition. The ERT noted that Lithuania has reported incorrect values for these two parameters in CRF table 6.A (constant methane generation rate for the period 1990–2009 and constant DOC values for

the period 1990–2004 and 2006–2009) although the emission estimates are correct because the values in the FOD model are correct. The ERT recommends that Lithuania report the correct values for these two parameters for the whole time series in the next annual submission.

140. The ERT noted that, although the formula used by Lithuania to calculate the amount of MSW disposed on the three types of landfill site is correct, it has been incorrectly reported on page 338 of the NIR: the definition of the parameter WT, "total waste generation", should read "total waste disposed minus waste disposed on the new regional landfills". The ERT recommends that Lithuania revise the NIR accordingly in the next annual submission.

141. Lithuania has reported CH_4 emissions from other (solid waste disposal on land) as "NA", whereas in the previous annual submission it reported emission estimates together with the comment "stored sewage sludge". In response to a question raised by the ERT during the review, the Party explained that the sewage sludge from wastewater handling sites is partly disposed on separate sewage sludge disposal sites, and that these emissions are reported under solid waste disposal on land. The remaining sewage sludge is treated in anaerobic digesters, and all CH_4 generated is captured and used for energy production; the associated emissions are reported under the energy sector. The ERT recommends that Lithuania include this information in the next annual submission.

3. Non-key categories

Wastewater handling – CH_4

142. Lithuania has reported the CH_4 emissions from wastewater (industrial wastewater) under wastewater (domestic and commercial wastewater). The ERT considers that this is in line with the IPCC good practice guidance because industrial wastewater is discharged into the domestic sewer system.

143. Lithuania has reported N_2O emissions from industrial wastewater and sludge as "NA" in CRF table 6.B, indicating that neither the Revised 1996 IPCC Guidelines nor the IPCC good practice guidance include a methodology to estimate these emissions. To improve transparency, the ERT recommends that Lithuania report these emissions as "NE" in the next annual submission.

144. The ERT noted that Lithuania has not reported in the NIR a reference for the source used to calculate the percentage of the Lithuanian population not connected to a centralized sewer network. In response to a question raised by the ERT during the review, the Party provided this information to the ERT. The ERT recommends that Lithuania include this information in its next annual submission.

145. Lithuania has used country-specific instrumental measurements of wastewater discharges and organic matter content to estimate CH_4 emission from wastewater. The Party has also used the MCF from the 2011 NIR of Denmark. In response to a question raised by the ERT during the review, Lithuania explained the rationale for using the Danish MCF: Denmark was involved in the development of the Lithuanian wastewater handling system and the two systems are very similar. The ERT recommends that the Party include this information in the next annual submission. Lithuania also explained that the country-specific instrumental measurements provide more reliable and precise results than the IPCC default data (EFs and AD) which are based on conditions in other countries. The ERT commends Lithuania for the method used and encourages the Party to use country-specific data on the CH_4-producing capacity of its wastewater handling system as well as a country-specific MCF where possible, in the next annual submission.

146. Further, the ERT encourages Lithuania to include, to the extent possible, the results from the new study on wastewater and sewage sludge, which began in September 2012 and is scheduled to be completed by the end of 2012, in the next annual submission, in order to improve the accuracy of the emission estimates for wastewater and sewage sludge. Lithuania explained that it intends to include the results of the study in its 2013 annual submission.

147. The ERT considers that the information on the treatment of sewage sludge is not transparently presented in the NIR. In response to a question raised by the ERT during the review, Lithuania explained that the sewage sludge is deposited in specific waste disposal sites, or treated in anaerobic digesters, or incinerated or used as fertilizer in the agriculture sector. However, none of this information is provided in the NIR. The ERT recommends that Lithuania, in the next annual submission, include this information as well as information on the allocation of the GHG emissions associated with sewage sludge.

148. Lithuania has reported, on page 347 of its NIR, the existence of CH_4 recovery in four anaerobic digestion facilities for sewage sludge; however, the Party has not reported any CH_4 emissions from this potential source and no justification for doing so has been provided in the NIR. In response to a question raised by the ERT during the review, Lithuania explained that these four anaerobic digestion facilities do not emit any CH_4 due to the hermetic equipment used and the operating conditions in place (e.g. the working pressure is lower than the design pressure). The ERT recommends that the Party provide a more detailed explanation of the four anaerobic digesters and include a justification for the non-occurrence of emissions, in the NIR of its next annual submission.

Waste incineration –N_2O

149. N_2O emissions from waste incineration were reported in the 2011 annual submission for the first time, using the method from the IPCC good practice guidance. In the 2012 annual submission, Lithuania has improved the transparency of its reporting by providing further information on the types of waste incineration facilities and the abatement techniques used. The ERT welcomes these efforts.

150. The ERT noted that Lithuania has not transparently described the waste incineration category. In response to a question raised by the ERT during the review, the Party provided the ERT with additional information. To improve transparency, the ERT encourages Lithuania to include, in the next annual submission, a general description of the waste incineration category, including the number of installations (active and inactive), information on whether energy recovery occurs, and available AD, including data used in the Party's reporting requirements to the EU.

Other (waste) – CH_4 and N_2O

151. The ERT noticed that there were 13 waste composting facilities in operation in Lithuania in 2010. The Party has not reported any emissions from this activity. Neither the Revised 1996 IPCC Guidelines nor the IPCC good practice guidance provide a methodology to calculate emissions from waste composting sites. The ERT encourages Lithuania to search for appropriate data and methodologies in order to estimate CH_4 and N_2O emissions for these waste composting sites.

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

152. Lithuania has included information on anthropogenic GHG emissions by sources and removals by sinks from LULUCF activities under Article 3, paragraph 3, of the Kyoto Protocol, and for the elected activity under Article 3, paragraph 4, of the Kyoto Protocol (i.e. forest management). The Party has chosen to account for activities under Article 3, paragraphs 3 and 4, at the end of the Kyoto Protocol first commitment period. The inventory of emissions and removals resulting from KP-LULUCF activities is complete. The emissions and removals from all KP-LULUCF activities were estimated following the IPCC good practice guidance for LULUCF and reported in accordance with decisions 15/CMP.1 and 16/CMP.1.

153. Lithuania has submitted a complete time series of KP-LULUCF CRF tables with estimates and relevant information, thereby demonstrating the capacity of the Party's national system to plan, prepare and manage the information needed to fulfil Lithuania's reporting requirements for activities under Article 3, paragraph 3, of the Kyoto Protocol and for forest management (the only activity elected by the Party under Article 3, paragraph 4, of the Kyoto Protocol).

154. The ERT notes that it is good practice to report disaggregated estimates according to the year of the conversion. Therefore, in order to increase the transparency of its reporting on afforestation and reforestation, and deforestation, the ERT recommends that Lithuania report, in its next annual submission, estimates of the carbon stock changes for each pool, disaggregated according to the year of the area conversion.

155. The ERT notes that Lithuania has reported, on page 387 of the NIR, that the information on the year of the onset of a KP-LULUCF activity, if it occurs after 2008, is not relevant. However, the ERT notes that the estimates of carbon stock changes are directly influenced by the year of conversion during which an afforestation, reforestation or deforestation activity occurs. Considering that Lithuania's national system, which applies a statistical approach, is able to provide annual data on land area representation, including the identification and tracking of units of land subject to KP-LULUCF activities, the ERT recommends that the Party revise the information reported in the NIR and in the KP-LULUCF CRF tables, in its next annual submission.

156. As identified for the LULUCF sector, to estimate emissions from biomass burning, Lithuania uses a default value for biomass consumption (19.8 t/ha) from table 3.A.1.13 of the IPCC good practice guidance for LULUCF which represents the product of the available fuel and the combustion efficiency (values B and C, respectively, of equation 3.2.20 of the IPCC good practice guidance for LULUCF). In addition, the Party uses incorrect CH_4 and N_2O EFs, instead of those reported in table 3.A.1.16 of the IPCC good practice guidance for LULUCF. Further, the Party has reported, in CRF table 5(KP-II)5, CO_2 emissions associated with wildfires in forest land. However, as Lithuania uses the stock change method, the CO_2 emissions from biomass burning should be reported as "IE". The ERT recommends that the Party use the correct CH_4 and N_2O EFs from table 3.A.1.16 of the IPCC good practice guidance for LULUCF and report the CO_2 emissions in CRF table 5(KP-II)5 as "IE" in the next annual submission. The ERT also recommends that Lithuania use country-specific data on the mass of available fuel, including dead wood and litter, in the next annual submission.

157. Lithuania has made recalculations for the KP-LULUCF activities between the 2011 and 2012 submissions in response to recommendations from the 2011 review report and due to the availability of a revised AD time series. The impact of these recalculations on each KP-LULUCF activity for 2009 is as follows:

(a) Afforestation and reforestation: a decrease in net removals of 74.5 per cent;

(b) Deforestation: a decrease in net emissions of 98.3 per cent;

(c) Forest management: an increase in net removals of 136.8 per cent.

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

Afforestation and reforestation – CO_2

158. The ERT reiterates the findings reported in the LULUCF chapter of this report under the category forest land regarding the implementation of the stock change method (see para. 114 above) and under the category land converted to forest land regarding the calculation of annual biomass stock values (see para. 115 above). The ERT therefore recommends that, when calculating the changes using the stock change method, Lithuania calculate the carbon stock values at two consecutive points in time in the same area (the area at time 2). The ERT also recommends that the Party, in its next annual submission, build a new yield curve for biomass stock changes and aggregate the data sampled on the basis of the age class to which they pertain, which would allow the Party to estimate the biomass stock for each age class, including in the interpolation and extrapolation of data for age classes for which sampled data are not available. This would also enable Lithuania to calculate annual estimates of the biomass carbon stocks for each age class by multiplying the area of the age class by the difference between the mean value of that age class and the mean value of the previous age class, as provided by the yield curve. The ERT further recommends that Lithuania update the yield curve on an annual basis with the newly collected data so that the curve accurately reflects the actual carbon stocks dynamic in land converted to forest land.

159. The ERT notes that afforestation and reforestation in natural grassland would usually result in a loss of carbon in SOM in the early years of the time series; however, Lithuania has not reported the stock changes in SOM (reported as "NA" in KP-LULUCF table 5(KP-I)A.1.1). The ERT therefore recommends that Lithuania, in its next annual submission, further revise the information that demonstrates that the SOM is not a net source by providing a comprehensive evaluation of the stock changes in SOM in afforested and reforested land (i.e. afforested/reforested cropland, abandoned agricultural land and natural grassland), in order to assess whether this pool is a net sink.

Activities under Article 3, paragraph 4, of the Kyoto Protocol

Forest management – CO_2

160. The ERT reiterates the findings reported in the LULUCF chapter of this report under the category forest land regarding the implementation of the stock change method (see para. 114 above) and under the category forest land remaining forest land regarding the calculation of annual biomass stock change values (see para. 115 above). The ERT therefore recommends that, when calculating the changes using the stock change method, Lithuania calculate the carbon stock values at two consecutive points in time in the same area (the area at time 2), in the next annual submission. The ERT encourages the Party to explore methods to provide annual forecasts, on the basis of newly measured data, of the stock changes for areas not measured and to revise, each year, the values forecast on the basis of newly measured data, with the aim of reflecting, as far as possible, the real inter-

annual variability in the carbon stocks dynamic. Further, with the aim of verifying the reported estimates, the ERT recommends that Lithuania report, in its NIR, annual estimates of the carbon gains and losses in forest land using the IPCC default method (equation 3.2.2 and associated equations of the IPCC good practice guidance for LULUCF).

2. Information on Kyoto Protocol units

Standard electronic format and reports from the national registry

161. Lithuania 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.[16] The SIAR was forwarded to the ERT prior to the review, pursuant to decision 16/CP.10. The ERT reiterates the main findings and recommendations contained in the SIAR.

162. 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). The transactions of Kyoto Protocol units initiated by the national registry are in accordance with the requirements of the annex to decision 5/CMP.1 and the annex to decision 13/CMP.1. No 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

163. 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

164. Lithuania has reported its commitment period reserve in its 2012 annual submission. In its NIR submitted on 9 July 2012, Lithuania reported its commitment period reserve to be 104,048,685 t CO_2 eq, five times the total GHG emissions for 2010 according to the CRF tables submitted on 25 May 2012. After submitting revised estimates on 5 October 2012, the Party reported its commitment period reserve to be 107,607,461 t CO_2 eq, based on the revised total GHG emissions for 2010 (21,521.49 Gg CO_2 eq). The ERT agrees with this figure.

3. Changes to the national system

165. Lithuania has reported that there have been changes to its national system since the previous annual submission. In its NIR, the Party described the following changes to its national system:

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

(a) An amendment of Governmental Resolution No. 683 on the establishment of a permanent GHG inventory working group, designating the Lithuanian Research Centre for Agriculture and Forestry as responsible for providing the GHG emission and removal estimates for non-forestry categories in the LULUCF sector;

(b) An increase in the capacity of several institutions involved in the compilation of the inventory;

(c) The implementation of a redesigned centralized archiving system with appropriate QA/QC procedures to ensure that all AD, EFs and other parameters used in the estimation of emissions and removals of GHGs for the annual inventory submissions are archived and available for external reviews;

(d) The development of the "Action plan to improve LULUCF reporting", endorsed by Order No. D1-987/3D-927 of the Minister of Environment and Minister of Agriculture; this plan has now been largely implemented. The improvements include: making the State Forest Cadastre (SFC) the main repository of information related to the reporting of GHG emissions and removals for the LULUCF sector; introducing a requirement for land-use change actions to be legally authorized and registered by the SFC; archiving in a single location, the State Forest Service, all information compiled for the preparation of estimates for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol; and formalizing QA/QC procedures and responsibilities for reporting estimates for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol;

(e) The initiation of a partnership project entitled "Cooperation on GHG inventory" between Lithuania and Norway, which is scheduled to run in 2012 and 2013.

166. The ERT concluded that, taking into account the confirmed changes to the national system, Lithuania's national system is now in accordance with the requirements of national systems outlined in decision 19/CMP.1. The ERT commends Lithuania for its effective response to the issues identified in previous review reports and notes that further improvements might be expected when all of the actions mentioned in paragraph 165 (d–e) above are fully operational.

4. Changes to the national registry

167. Lithuania has reported that there have been changes to its national registry since the previous annual submission. In its NIR, the Party reported the following changes to its national registry: a new contact name, an improved security procedure and a minor, but important, change in the internet address for the national registry. The ERT concluded that, taking into account the confirmed changes in the national registry, Lithuania'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 decisions of the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol (CMP).

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

168. Lithuania did not provide information on changes in its reporting of the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol in its annual submission. However, in response to a question raised by the ERT during the review, the Party acknowledged the following changes in its reporting: measures to support the flexibility mechanisms of the Kyoto Protocol and bilateral assistance projects with Georgia, the Republic of Moldova and Ukraine on the mitigation of and adaptation to climate change as well as to raise awareness of climate change.

169. Lithuania has also reported that it has started the implementation of its fast start financing (the Party has committed to provide EUR 3 million during the period 2010-2012), collaborated financially with the Energy Sector Management Assistance Program of the World Bank, and established a special programme for climate change to implement adaptation to and mitigation of climate change measures in Lithuania and other Parties (this programme has a budget of EUR 0.29 million for 2012).

170. The ERT concluded that, taking into account the confirmed changes, the information provided is complete and transparent. The ERT recommends that Lithuania report any changes in its information provided under Article 3, paragraph 14, in accordance with decision 15/CMP.1, annex, chapter I.H, in the next annual submission.

III. Conclusions and recommendations

A. Conclusions

171. Lithuania made its annual submission on 13 April 2012 (the NIR was submitted on 14 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 the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol). This is in line with decision 15/CMP.1.

172. Lithuania resubmitted its NIR on 26 May 2012 and on 9 July 2012. The Party resubmitted the CRF tables on 25 May 2012 and, in response to questions raised by the ERT during the review week, on 5 October 2012.

173. The ERT concludes that the inventory submission of Lithuania has been prepared and reported in accordance with the UNFCCC reporting guidelines. The inventory submission is complete and Lithuania 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.

174. 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.

175. Lithuania'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. The ERT noted that the transparency and consistency of some of the information provided requires further improvement (see para. 26 above). In addition, Lithuania has not used higher-tier methods and country-specific data for all of the key categories identified. However, the ERT noted that Lithuania has improved its reporting in many aspects and commends the Party for these improvements.

176. Lithuania has made recalculations for the inventory between the 2011 and 2012 submissions in response to the 2011 review report, following changes in AD and EFs, and in order to rectify identified errors. The impact of these recalculations on the national totals is a decrease in emissions of 1.2 per cent for 2009. The main recalculations took place in the following sectors/categories:

(a) The energy sector: other sectors (see para. 34(a) above);

(b) The industrial processes sector: chemical industry and consumption of halocarbons and SF_6 (see paras. 65 and 74 above);

(c) The agriculture sector: enteric fermentation, manure management and agricultural soils (see para. 83 above);

(d) The LULUCF sector: all categories (see paras. 106 and 107 above);

(e) The waste sector: solid waste disposal on land and wastewater handling (see paras. 124 and 125 above).

177. Lithuania has reported information on activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, as set out in paragraphs 5–9 of the annex to decision 15/CMP.1, and consistent with decision 16/CMP.1. However, the ERT identified areas for improvement regarding the transparency of the information reported in relation to the land area identification and the choice of methods used for land identification, and the accuracy of the methods used for the estimation of emissions and removals.

178. Lithuania has made recalculations for the KP-LULUCF activities between the 2011 and 2012 submissions in response to recommendations from the 2011 review report, following changes in AD and in order to rectify identified errors. The impact of these recalculations on each KP-LULUCF activity for 2009 is as follows:

(a) Afforestation and reforestation: a decrease in net removals of 77.8 per cent;

(b) Deforestation: a decrease in net emissions of 98.1 per cent;

(c) Forest management: an increase in net removals of 179.5 per cent.

179. Lithuania 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.

180. The national system performs its required functions as set out in the annex to decision 19/CMP.1. The ERT commends Lithuania for the changes introduced since the previous annual submission to improve the institutional capacity and continuity of the inventory preparation process (see paras. 12, 15, 16, 152, 165 and 166 above).

181. 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 (see para. 167 above).

182. Lithuania has reported information under decision 15/CMP.1, annex, chapter I.H, "Minimization of adverse impacts in accordance with Article 3, paragraph 14" as part of its 2012 annual submission. However, the ERT noted that the Party has not provided information on changes in its reporting. With the additional information provided by the Party during the review week, the information provided is complete and transparent (see paras. 168 and 170 above).

B. Recommendations

183. The ERT identified the 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	Key category analysis	Use the key category analysis to prioritize the development and improvement of the inventory	19 and 50
	Uncertainties	Perform the uncertainty analysis for each category for all gases combined and improve the consistency of the information	22
Energy	Overview	Include information to justify the recalculations of key categories in terms of an improvement in accuracy, transparency or completeness	35
		Include information to justify the use of the emission factors (EFs) from the Intergovernmental Panel on Climate Change (IPCC) *2006 IPCC Guidelines for National Greenhouse Gas Inventories* (the 2006 IPCC Guidelines)	37 and 38
		Improve the transparency of the assumptions and data sources used in civil aviation and road transportation and the fluctuations in the implied emission factor (IEF) for gasoline in road transportation	41
	Quality assurance and quality control (QA/QC)	Strengthen the QC procedures by developing formal documentation on the assumptions, EFs, activity data (AD) sources and QC procedures for each key category	42
		Include descriptions of the tier 2 QA/QC procedures carried out for the key categories (e.g. analyses of the differences between the inventory data and the data reported under the European Union emissions trading scheme (EU ETS) and information on how such analyses are used to improve the greenhouse gas inventory)	42
	Fugitive emissions	Reallocate the fugitive emissions from natural gas transmission and distribution from other (oil and natural gas) to natural gas	43
	Stationary combustion	Clarify which methodological approach is used to estimate the emissions and document this correctly	44
	Time-series consistency	Improve the QA/QC procedures by performing time-series checks of data after they have been inputted into the common reporting format (CRF) Reporter software	45
	Overview	Use country-specific CO_2 EFs and justify their appropriateness to national circumstances	46
		Explain any recalculation to the CO_2 EF for natural gas	47

Sector	*Category*	*Recommendation*	*Paragraph reference*
		Recalculate the CO_2 emissions from residual fuel oil	48
	Uncertainties	Revise the uncertainty values used	49
	Reference approach	Report all imported natural gas in CRF table 1.A(b)	52
	Comparison with international statistics	Explain and, if appropriate, correct the differences for several values between the CRF tables and the International Energy Agency data	54
	International bunker fuels	Improve the transparency of the assumptions used for the extrapolations	55
		Correct the inconsistencies between CRF tables 1.C and 1.A(b)	56
	Feedstocks and non-energy use of fuels	Include the natural gas used for non-energy purposes in the reference approach, and account for it as feedstocks and carbon stored in CRF table 1.A(d) accordingly	57
		Indicate, for each fuel, how feedstocks and non-energy use of fuels have been accounted for and where have been allocated, and cross-check the data reported as non-energy use under the energy sector with the data reported under the industrial processes sector	58
		Improve the transparency of the information in the documentation box of CRF tables and 1.A(d)	59
	Stationary combustion: solid fuels – CO_2	Report emissions from coke and coking coal separately	60
	Stationary combustion: biomass – CH_4	Estimate CH_4 emissions from biomass combustion using a tier 2 approach	61
	Other transportation: liquid fuels – CH_4	Justify the use of the CH_4 EF or apply the default EF from the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (the Revised 1996 IPCC Guidelines)	62
	Navigation: liquid fuels – CH_4	Justify the use of the CH_4 EFs or apply the default EFs from the Revised 1996 IPCC Guidelines	63
Industrial processes	Cement production – CO_2	Report on the comparison of the estimates obtained using EU ETS data and using a tier 2 method	69
	Ammonia production – CO_2	Explain the variations in the IEF for ammonia production	70

Sector	*Category*	*Recommendation*	*Paragraph reference*
		Correct and improve the information on the estimation and allocation of CO_2 emissions from ammonia production, including an explanation of how the natural gas consumption is divided between thermal processes and production processes	72
	Consumption of halocarbons and SF_6 – HFCs	Exclude the emissions of HFC-365mfc and HFC-245fa from CRF table 2(II), and report the emissions from these two species in CRF table 9(b)	76
		Report the emissions of HFC-134a and HFC-227ea separately in CRF table 2(II)	76
		Improve the transparency of the information on how expert judgement is used in the estimation of fluorinated gas emissions	77
		Report emissions from the disposal of commercial and industrial refrigeration equipment as "NO" (not occurring) rather than as "NE" (not estimated) until the decommissioning of this equipment begins	80
Agriculture	Agricultural soils – CH_4	Report CH_4 emissions from agricultural soils as "NE" and not as "NA" (not applicable)	82
	Use of country-specific CH_4 EFs	Provide more detailed information on the country-specific CH_4 EFs	85
	Uncertainties	Provide more detailed information on the uncertainty of the AD and EFs used in the uncertainty analysis	86
	Comparison with international statistics	Explain the differences in the livestock population between the data reported in the CRF tables and the data reported to the Food and Agriculture Organization of the United Nations	87
	QA/QC	Improve the consistency of the information between the CRF tables and the national inventory report (NIR)	87 and 88
	Enteric fermentation – CH_4	Improve the transparency of the information on the characterization of livestock, weight and weight gain and data sources for the methane conversion factor	90 and 91
	Manure management – CH_4	Revise the notation key used to report the average typical animal mass, the average daily excretion of volatile solids and the average CH_4 production potential	93
		Improve the transparency of the information on the country-specific nitrogen (N) excretion rate for cattle and swine by providing the source of these data	97

Sector	*Category*	*Recommendation*	*Paragraph reference*
		Apply the default adjustment factor to the default N excretion rate for young animals	98
	Direct soil emissions – N_2O	Continue to investigate the differences between the data on synthetic fertilizer consumption	101
		Improve the transparency of the information on the approach used to estimate the fraction of livestock N excreted and deposited onto soil during grazing	102
LULUCF	Overview	Improve transparency by including decisions trees in the NIR that show the methods and rules applied in the studies that integrate the different data sources	107
		Estimate the stock changes in soil organic matter (SOM) associated with land-use changes applying the IPCC default methodology and, where a lack of data on the soil carbon content for the different land-use categories hinders the estimation of the SOM changes, use default data from the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry* (IPCC good practice guidance for LULUCF)	109
		Report the areas converted to a different land use under the relevant land-use conversion category for 20 consecutive years before reporting them under the corresponding "land remaining" category	110
		Estimate the stock changes due to management changes in cropland and grassland; and report in the CRF tables the total area of organic soils and, in the information boxes of the relevant CRF tables, the portion of the area of organic soils where drainage has occurred	111
		Revise, where relevant, the carbon stock change factors and assumptions used for the estimation of the carbon stock changes in biomass, dead wood and litter and ensure comparability between the land-use changes both to and from one category to another	112
	Uncertainties	Revise the uncertainty analysis for the LULUCF sector, including by applying the equations contained in chapters 5.1 and 5.2 of the IPCC good practice guidance for LULUCF and either by collecting information on the uncertainties or by justifying the values derived by expert judgement	113

Sector	*Category*	*Recommendation*	*Paragraph reference*
	Forest land remaining forest land – CO_2	Calculate the carbon stock values at two consecutive points in time in the same area when applying the stock change method from the IPCC good practice guidance for LULUCF, and revise the estimates of the carbon stock changes and associated emissions and removals	114
		Report, in the NIR, annual estimates of the carbon gains and losses in forest land using the IPCC default method (equation 3.2.2 and associated equations of the IPCC good practice guidance for LULUCF)	115
	Land converted to forest land – CO_2	Build a new yield curve for biomass stock and update this curve on an annual basis with the newly available data	117
	Cropland remaining cropland – CO_2	Assume an equilibrium (i.e. no stock changes) in living biomass in areas where wood crops have been established for more than 20 years prior to the inventory year and recalculate the whole time series accordingly	118
	Wetlands remaining wetlands – CO_2 and N_2O	Reported separately the area of wetlands that is managed, unmanaged, or where peat extraction occurs	119
	Biomass burning – CO_2	Report the CO_2 emissions associated with wildfires as information only in the NIR and report them as "IE" (included elsewhere) in CRF table 5(V)	120
	Biomass burning – CH_4 and N_2O	Use the correct CH_4 and N_2O EFs from table 3.A.1.16 of the IPCC good practice guidance for LULUCF and recalculate the corresponding emissions and removals for the entire time series	121
		Report emissions of CH_4 and N_2O due to biomass burning under the category land converted to forest land	122
Waste	Transparency	Improve the information on the general overview of the waste sector in the NIR, including the wastewater generation processes, the types and shares of wastewater and sludge treatment methods, the emission trends, time-series consistency and the assumptions used to estimate the emissions for 1990	126, 127, 129 and 130
	Uncertainties	Revise the consistency of the uncertainty values by using the corresponding method from the same IPCC guidelines used to estimate the emissions	134
	Solid waste disposal on land – CH_4	Justify the use of the method contained in the 2006 IPCC Guidelines	132

Sector	*Category*	*Recommendation*	*Paragraph reference*
		Provide more detailed information on CH_4 recovery and use and on the AD and methods used to estimate emissions from solid waste disposal on land	128, 135, 136, 137, 138 and 141
		Report the correct values for the methane generation rate constant and the degradable organic carbon fraction reported in CRF table 6.A (additional information)	139
		Revise the definition of the formula used to calculate the amount of municipal solid waste disposed	140
	Wastewater handling – CH_4	Revise the notation key used to report N_2O emissions from industrial wastewater and sludge	143
		Include the source of the data used to calculate the percentage of the population not connected to a centralized sewer network	144
		Justify the use of the methane conversion factor from the 2011 NIR of Denmark	145
		Improve the transparency of the information on the final destination of sewage sludge	147
		Improve the transparency of the information on CH_4 recovery from the anaerobic treatment of sludge and its associated emissions	148
LULUCF activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol	Overview	Report estimates of the carbon stock changes for each pool, disaggregated according to the year of area conversion	154
		Revise the information on the year of the onset of an activity	155
	Biomass burning – CH_4 and N_2O	Revise the notation key, EFs and mass of available fuel used to estimate these emissions	156
	Afforestation and reforestation – CO_2	Calculate the carbon stock values at two consecutive points in time in the same area when using the stock change method from the IPCC good practice guidance for LULUCF and revise and update, on an annual basis, the yield curve for biomass stock	158
		Comprehensively evaluate the stock changes in SOM in afforested and reforested lands	159
	Forest management – CO_2	Calculate the carbon stock values at two consecutive points in time in the same area when using the stock change method and report the annual estimates of the carbon gains and losses in forest land	160

Sector	*Category*	*Recommendation*	*Paragraph reference*
Information on Kyoto Protocol units		Implement the recommendations contained in the standard independent assessment report	161
Minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol		Report any changes in its information provided under Article 3, paragraph 14, in accordance with decision 15/CMP.1, annex, chapter I.H, "Minimization of adverse impacts in accordance with Article 3, paragraph 14"	170

IV. Questions of implementation

184. 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>.

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

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>.

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

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

Status report for Lithuania 2012. Available at <http://unfccc.int/resource/docs/2012/asr/ltu.pdf>.

Synthesis and assessment report on the greenhouse gas inventories submitted in 2012. Available at <http://unfccc.int/resource/webdocs/sai/2012.pdf>.

FCCC/ARR/2010/LTU. Report of the individual review of the annual submission of Lithuania submitted in 2010. Available at <http://unfccc.int/resource/docs/2011/arr/ltu.pdf>.

FCCC/ARR/2011/LTU. Report of the individual review of the annual submission of Lithuania submitted in 2011. Available at <http://unfccc.int/resource/docs/2012/arr/ltu.pdf>.

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: Mr. Vitalijus Auglys, Ms. Stasilė Znutienė and Ms. Jolanta Merkelienė (Ministry of Environment), Ms. Steigvilė Byčenkienė (Institute of Physics), Ms. Inga Konstantinavičiūtė (Lithuanian Energy Institute), Mr. Romualdas Lenkaitis and Mr. Simonas Valatka (Center for Environmental Policy), Mr. Remigijus Juška (Institute of Animal Science), Mr. Albertas Kasperavičius, Mr. Andrius Kuliešis, Mr. Ričardas Beniušis and Mr. Karolis Mickevičius (State Forest Service), Mr. Saulius Marcinkonis (Lithuanian Research Centre for Agriculture and Forestry), Ms. Rita Tijūnaitė, Ms. Giedrė Raginytė, Mr. Tomas Aukštinaitis and Ms. Neringa Kisielytė (Environmental Protection Agency) and Ms. Justė Akmenskytė (Lithuanian Environmental Investment Fund), including additional material on the methodologies and assumptions used. The following documents[1] were also provided by Lithuania:

State Forest Service of the Ministry of Environment. *Lithuanian statistical yearbook of forestry 2011*. Kaunas: State Forest Service of the Ministry of Environment.

State Forest Survey Service of the Ministry of Environment. *Lithuanian National Forest Inventory 2003-2007. Forest resources and their dynamic*. Kaunas: State Forest Survey Service of the Ministry of Environment.

Extracts from the State Forest Cadastre: maps and associated statistical data. Available for registered users at <http://www.amvmt.lt:81/vmtgis>.

Lithuanian Energy Institute. 2012. *Determination of National GHG emission factors for energy sector (fuel combustion) - Summary*.

K Armolaitis, V Zekaite, J Aleinikoviene, R Cesnuleviciene (2011). *Renaturalization of Arenosols in the land afforested with Scots pine (*Pinus sylvestris L.*) and abandoned arable land*. Zemdirbyste=Agriculture, Vol. 98, No. 3. Pages 275–282.

[1] Reproduced as received from the Party.

Annex II

Acronyms and abbreviations

AD	activity data
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-gas	fluorinated gas
FLrFL	forest land remaining forest land
FOD	first order decay
$Frac_{GRAZ}$	fraction of livestock nitrogen excreted and deposited onto soil during grazing
GHG	greenhouse gas; unless indicated otherwise, GHG emissions are the sum of CO_2, CH_4, N_2O, HFCs, PFCs and SF_6 without GHG emissions and removals from LULUCF
HFCs	hydrofluorocarbons
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	LULUCF emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol
LULUCF	land use, land-use change and forestry
m^3	cubic metre
MCF	methane conversion factor
MSW	municipal solid waste
N	nitrogen
N_2O	nitrous oxide
NA	not applicable
NE	not estimated
NIR	national inventory report
NO	not occurring
PFCs	perfluorocarbons
QA/QC	quality assurance/quality control
SEF	standard electronic format
SF_6	sulphur hexafluoride
SFC	State Forest Cadastre
SIAR	standard independent assessment report
SOM	soil organic matter
TJ	terajoule (1 TJ = 10^{12} Joule)
UNFCCC	United Nations Framework Convention on Climate Change