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**Report of the individual review of the greenhouse gas inventories of  
Lithuania submitted in 2007 and 2008\***

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\* In the symbol for this document, 2008 refers to the year in which the inventory was submitted, and not to the year of publication.

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## I. Overview

### A. Introduction

1. This report covers the centralized review of the 2007 and 2008 greenhouse gas (GHG) inventory submissions of Lithuania, coordinated by the UNFCCC secretariat, in accordance with decision 22/CMP.1. In accordance with the conclusions of the Subsidiary Body for Implementation at its twenty-seventh session, the focus of the review is on the most recent (2008) submission.<sup>1</sup> The review took place from 15 to 20 September 2008 in Bonn, Germany, and was conducted by the following team of nominated experts from the UNFCCC roster of experts: generalists – Mr. William Kojo Agyemang-Bonsu (Ghana) and Mr. Vlad Trusca (Romania); energy – Ms. Branca Americano (Brazil), Mr. Frank Neitzert (Canada) and Mr. Matej Gasperic (Slovenia); industrial processes – Mr. Jos Olivier (Netherlands) and Mr. Teemu Oinonen (Finland); agriculture – Ms. Penny Reyenga (Australia) and Mr. Washington Zhakata (Zimbabwe); land use, land-use change and forestry (LULUCF) – Mr. Zhang Xiaoquan (China) and Mr. Aleksi Lehtonen (Finland); and waste – Ms. Kyoko Miwa (Japan) and Mr. Eduardo Calvo (Peru). Ms. Americano and Ms. Reyenga were the lead reviewers. The review was coordinated by Mr. Tomoyuki Aizawa and Mr. Matthew Dudley (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 made no comment on it.

### B. Inventory submission and other sources of information

3. The 2008 inventory was submitted on 11 April 2008; it contains a complete set of common reporting format (CRF) tables for the period 1990–2006, with the exception of table 8(b) recalculation – explanatory information, and a national inventory report (NIR). This is in line with decision 15/CMP.1. The Party indicated that the 2008 submission is also its voluntary submission under the Kyoto Protocol.<sup>2</sup> In its 2007 submission, Lithuania included a complete set of CRF tables for the period 1990–2005 and an NIR, which were submitted on 17 April 2007 and 30 August 2007, respectively. Where needed the expert review team (ERT) also used previous years’ submissions, additional information provided during the review and other relevant information. The full list of materials used during the review is provided in the annex to this report.

### C. Emission profiles and trends

4. In 2006 (as reported in the 2008 annual inventory submission), the main GHG in Lithuania was carbon dioxide (CO<sub>2</sub>), accounting for 62.5 per cent of total GHG emissions<sup>3</sup> expressed in CO<sub>2</sub> eq, followed by nitrous oxide (N<sub>2</sub>O) (22.5 per cent) and methane (CH<sub>4</sub>) (14.5 per cent). Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF<sub>6</sub>) collectively accounted for 0.5 per cent of the overall GHG emissions in the country. The energy sector accounted for 57.6 per cent of the total GHG emissions, followed by agriculture (18.4 per cent), industrial processes (17.0 per cent), waste (6.6 per cent), and solvent and other product use (0.4 per cent). Total GHG emissions amounted to

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<sup>1</sup> FCCC/SBI/2007/34, paragraph 104.

<sup>2</sup> Parties may start reporting information under Article 7, paragraph 1, of the Kyoto Protocol from the year following the submission of the initial report, on a voluntary basis (decision 15/CMP.1).

<sup>3</sup> In this report, the term “total GHG emissions” refers to the aggregated national GHG emissions expressed in terms of CO<sub>2</sub> eq excluding LULUCF, unless otherwise specified.

23,221.77 Gg CO<sub>2</sub> eq and decreased by 53.0 per cent between the base year<sup>4</sup> and 2006. In 2005 (as contained in the 2007 inventory submission), total GHG emissions amounted to 22,681.86 Gg CO<sub>2</sub> eq. The shares of gases and sectors in 2006 (2008 inventory submission) were similar to those of 2005 (2007 inventory submission).

5. Lithuania reported a significant reduction in GHG emissions in the period 1990–2006 for CO<sub>2</sub> (59.8 per cent), CH<sub>4</sub> (45.1 per cent) and N<sub>2</sub>O (26.2 per cent). However, emissions of all three gases increased in the period 2000–2006, mainly due to the growth in gross domestic product and industrial output. The trend in HFC emissions shows large variations between years, especially from 1990 to 2000 and from 2005 to 2006, but no information is provided in the NIR. Lithuania experienced a significant decrease in emissions in all sectors in the period 1990–2000 owing to the restructuring of the economy, similar to that experienced by other Parties included in Annex I to the Convention with economies in transition. The sector with the most significant GHG emissions reductions over the period 1990–2006 was the energy sector (–60.3 per cent), followed by the agriculture (–54.7 per cent) and waste (–23.7 per cent) sectors.

6. Tables 1 and 2 show GHG emissions by gas and by sector, respectively.

#### **D. Key categories**

7. Lithuania has reported a tier 1 key category analysis, based only on level assessment, as part of its 2008 submission. Lithuania reported that the key category analysis is used to prioritize the improvement of the inventory. Lithuania has not included the trend assessment or the LULUCF sector in its key category analysis, as recommended by the previous reviews, which is not 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). The key category analysis performed by the Party and that performed by the secretariat<sup>5</sup> produced similar results considering the fact that the LULUCF sector was not included in the level assessment. The key category analysis included in the NIR is different from that presented in the CRF and includes key categories that should be excluded from the analysis (e.g. international bunkers). The same key categories were identified in the 2007 submission.

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<sup>4</sup> Base year refers to the base year under the Kyoto Protocol, which is 1990 for CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O, and 1995 for HFCs, PFCs and SF<sub>6</sub>. The base year emissions do not include any possible emissions from deforestation; however, these are taken into account for the purpose of calculating the assigned amount.

<sup>5</sup> 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. 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.

**Table 1. Greenhouse gas emissions by gas, 1990–2006**

Greenhouse gas emissions	Gg CO <sub>2</sub> eq								Change base year–2006 (%)
	Base year <sup>a</sup>	1990	1995	2000	2003	2004	2005	2006	
CO <sub>2</sub>	36 168.77	36 168.77	15 158.44	12 084.84	12 976.36	13 595.51	14 313.80	14 523.83	–59.8
CH <sub>4</sub>	6 133.25	6 133.25	3 651.30	3 230.12	3 319.97	3 324.21	3 331.28	3 367.81	–45.1
N <sub>2</sub> O	7 067.72	7 067.72	3 125.27	4 024.63	4 676.88	4 794.59	5 015.35	5 215.47	–26.2
HFCs	44.61	0.00	44.61	30.14	21.94	36.83	18.94	112.99	153.3
PFCs	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA
SF <sub>6</sub>	0.05	0.00	0.05	0.22	1.93	0.86	1.38	1.67	3 365.3

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

<sup>a</sup> Base year refers to the base year under the Kyoto Protocol, which is 1990 for CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O, and 1995 for HFCs, PFCs and SF<sub>6</sub>. The base year emissions do not include any possible emissions from deforestation; however, if applicable, these are taken into account when the assigned amount is calculated.

**Table 2. Greenhouse gas emissions by sector, 1990–2006**

Sectors	Gg CO <sub>2</sub> eq								Change base year–2006 (%)
	Base year <sup>a</sup>	1990	1995	2000	2003	2004	2005	2006	
Energy	33 639.65	33 639.65	14 203.14	11 077.85	11 918.30	12 549.92	13 189.41	13 369.33	–60.3
Industrial processes	4 210.33	4 165.68	1 965.66	2 783.71	3 159.78	3 274.92	3 809.58	3 951.16	–6.2
Solvent and other product use	100.53	100.53	98.17	94.69	93.58	93.02	92.42	90.94	–9.5
Agriculture	9 463.40	9 463.40	4 077.66	3 840.95	4 323.03	4 296.58	4 045.04	4 284.33	–54.7
LULUCF	NA	–11 050.88	–8 166.87	–9 001.86	–8 638.16	–8 943.39	–9 412.51	–7 951.88	NA
Waste	2 000.48	2 000.48	1 635.03	1 572.75	1 502.39	1 537.56	1 544.29	1 526.02	–23.7
Other	NA	NA	NA	NA	NA	NA	NA	NA	NA
<b>Total (with LULUCF)</b>	NA	38 318.85	13 812.79	10 368.09	12 358.92	12 808.61	13 268.23	15 269.89	NA
<b>Total (without LULUCF)</b>	49 414.39	49,369.73	21 979.66	19 369.96	20 997.08	21 752.00	22 680.74	23 221.77	–53.0

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

<sup>a</sup> Base year refers to the base year under the Kyoto Protocol, which is 1990 for CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O, and 1995 for HFCs, PFCs and SF<sub>6</sub>. The base year emissions do not include any possible emissions from deforestation; however, if applicable, these are taken into account when the assigned amount is calculated.

8. The ERT strongly recommends that Lithuania prepare a key category analysis, in accordance with the IPCC good practice guidance and the IPCC good practice guidance for LULUCF, by including the trend assessment and LULUCF sector in the assessment, and that the Party present this analysis in its next annual submission. At the same time, Lithuania is encouraged to improve consistency between the NIR and the CRF tables and to provide further information on the key category analysis.

### **E. Main findings**

9. The inventory is generally in line with the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Revised 1996 IPCC Guidelines), the IPCC good practice guidance and the IPCC good practice guidance for LULUCF. Lithuania has made some improvements since the 2006 submission, in response to recommendations in the previous review report (e.g. recalculations for the entire time series; some categories that were previously missing have been included for the first time; a more transparent NIR has been prepared; and the quality assurance/quality control (QA/QC) plan has been updated). However, Lithuania has not reported emission estimates for a number of categories identified during the previous review, nor has it provided an explanation for the missing categories.

10. The NIR has not been structured fully in accordance with the “Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories” (hereinafter referred to as the UNFCCC reporting guidelines). Lithuania has not included the following in the NIR: chapter 10 (recalculations and improvements annex 1 (key categories); annex 4 (CO<sub>2</sub> reference approach and comparison with the sectoral approach, and relevant information on the national energy balance); and annex 5 (assessment of completeness, and (potential) sources and sinks of GHG emissions and removals excluded). Moreover, the NIR does not follow the structure outlined in the UNFCCC reporting guidelines at the individual source/sink category level.

### **F. Cross-cutting issues**

#### **1. Completeness**

11. The 2008 inventory submission covers all years from 1990 to 2006, and is generally complete in its category, gas and geographic coverage. However, several mandatory categories were not estimated, mostly in the LULUCF sector (e.g. cropland remaining cropland, grassland converted to cropland, grassland remaining grassland, cropland converted to grassland, etc.), but also in other sectors (e.g. CO<sub>2</sub> emissions from limestone and dolomite use, CO<sub>2</sub> emissions from road paving with asphalt, CO<sub>2</sub> emissions from food and drink, CO<sub>2</sub> emissions from solid waste disposal on land, etc.). The ERT encourages Lithuania to estimate and report in its next annual submission on emissions from categories currently reported as not estimated (“NE”), giving priority to the largest categories, by allocating more resources and expert judgement to choose suitable methods.

12. Lithuania has provided CRF tables for the period 1990–2006, with the exception of table 8(b). The NIR is not complete in terms of the structure and content presented in the UNFCCC reporting guidelines. The Party only reported actual HFC and SF<sub>6</sub> emissions for the period 1995–2006. The ERT recommends that Lithuania estimate actual HFC and SF<sub>6</sub> emissions for the period 1990–1994. The ERT encourages Lithuania to estimate potential emissions for HFCs and SF<sub>6</sub>, to complete CRF table 8(b) and to follow the required structure in the NIR in its next annual submission.

#### **2. Transparency**

13. The transparency of the NIR submitted by Lithuania in 2008 has improved since the 2006 and 2007 submissions. However, the ERT observed that insufficient information was provided in the NIR

and the inventory is not fully transparent. The transparency of the NIR could be improved further with respect to the provision of information on national system description, key category analysis, uncertainty analysis, assignment of different QA/QC activities to experts, recalculations in the general introduction of the NIR, as well as information on large variations in trends, activity data (AD) providers, rationale for the selection of country-specific emission factors (EFs) and methods, references for methods and EFs, and expert judgement on choosing method and assumptions in the sectoral chapters. The ERT reiterates the recommendations from previous reviews regarding the transparency of the inventory and requests that Lithuania resolve this problem and that the Party report thereon in its next annual submission.

14. The ERT strongly recommends that Lithuania further improve the transparency of the inventory by using the structure outlined in the UNFCCC reporting guidelines and that the Party include additional detailed information and references in the NIR for cross-cutting issues and at the source/sink category level.

### 3. Recalculations and time-series consistency

15. The ERT noted that recalculations have been undertaken by Lithuania for the time series from 1990 to 2005 following recommendations made during the previous review. However, CRF table 8(b) and the chapter on recalculations and improvements in the NIR were not included in the inventory submission and the Party provided only limited information on recalculations in the introduction to the NIR. Following the recalculations (reported in the CRF), there was a decrease in emissions estimates in CO<sub>2</sub> eq, excluding LULUCF, of 0.81 per cent for 1990 and a decrease of 2.3 per cent for 2005. The ERT recommends that Lithuania comply with the UNFCCC reporting guidelines and that the Party include the missing elements in the NIR and CRF, providing detailed information on recalculations.

### 4. Uncertainties

16. In accordance with the UNFCCC reporting guidelines, Lithuania provided an IPCC tier 1 uncertainty analysis, presenting the results of the analysis both at summary level and at the individual category level in accordance with the IPCC good practice guidance. However, very limited information is provided in the NIR regarding the assumptions, estimates made using expert judgement and data used to estimate uncertainties and the results of the uncertainty analysis. The ERT recommends that Lithuania provide information and documentation regarding the assumptions and expert judgement used in the uncertainty analysis in the NIR of its next annual submission.

### 5. Verification and quality assurance/quality control approaches

17. Lithuania has not developed its QA/QC system since the previous review. In its 2008 inventory submission, the Party has provided information on QA/QC procedures. However, the introduction in the NIR presents only general information on QA/QC activities and does not focus on specific conditions in Lithuania. The QA/QC plan, including the specific assignment of different activities to experts and institutions in Lithuania, is not sufficiently described in the NIR in accordance with the IPCC good practice guidance and decision 19/CMP.1. Moreover, no evidence or description of the QA/QC activities implemented is included in the NIR. During the review, Lithuania submitted to the ERT a summary of its updated QA/QC procedures, based on a recommendation made during the initial review, and also submitted evidence of the implementation of tier 1 QC activities in line with the updated QA/QC procedures. The ERT strongly recommends that Lithuania provide evidence of the QA/QC activities implemented, as well as detailed information in the NIR regarding the updated QA/QC plan in accordance with the IPCC good practice guidance in its next annual submission.

### 6. Follow-up to previous reviews

18. Lithuania has presented in the NIR the significant improvements that have been made to the inventory. Following the recommendations made during the previous review in May 2007, the Party has



made some improvements to cross-cutting issues in the inventory (e.g. estimating the complete time series, estimating emissions from some sources that were previously missing, improving the consistency of the inventory, providing more information on AD, methodologies and EFs in the NIR, and updating the QA/QC plan).

19. However, Lithuania has not implemented several recommendations made during the previous review. These recommendations include:

- (a) Providing evidence that the Party has implemented the QA/QC plan in accordance with the IPCC good practice guidance;
- (b) Presenting the NIR fully in accordance with the structure outlined in the UNFCCC reporting guidelines;
- (c) Documenting information on expert judgement and uncertainty estimates, in accordance with IPCC good practice guidance;
- (d) Including the LULUCF sector and trend assessment analysis in the key category analysis;
- (e) Providing sufficient information on recalculations and notation keys.

#### **G. Areas for further improvement**

##### **1. Identified by the Party**

20. The 2008 NIR does not identify any areas for improvement, including any planned improvements at the category level.

##### **2. Identified by the expert review team**

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

- (a) The implementation of the updated QA/QC plan in accordance with the IPCC good practice guidance and the provision of evidence and information on this in the NIR of the Party's next annual submission;
- (b) The establishment and implementation of a plan for inventory improvement and the provision of relevant information in the next annual submission in both the general section of the NIR and at the sectoral level in the NIR;
- (c) The provision of a comprehensive section in the NIR regarding the national system, including sufficient information on the legal, institutional and procedural frameworks, and the full cycle of the inventory preparation;
- (d) The preparation of a key category analysis in accordance with the IPCC good practice guidance and the IPCC good practice guidance for LULUCF by including the trend assessment and the LULUCF sector in the key category analysis;
- (e) The improvement of the transparency of the inventory by using the structure of the NIR outlined in the UNFCCC reporting guidelines and the inclusion of additional detailed information and references;
- (f) The provision of information and documentation in the NIR regarding the assumptions and expert judgement used in the uncertainty analysis;
- (g) The improvement of consistency in the inventory between the CRF and NIR;

(h) The provision of detailed information on recalculations and improvements.

22. Recommended improvements relating to specific source/sink categories are presented in the relevant sector chapters of this report.

## II. Energy

### A. Sector overview

23. In 2006, the energy sector accounted for 13,369.33 Gg CO<sub>2</sub> eq, or 57.6 per cent of total GHG emissions. Emissions from the energy sector decreased by 60.3 per cent between 1990 and 2006. The key driver for this fall in emissions was the decrease in CO<sub>2</sub> emissions from energy industries. Within the sector, 40.9 per cent of GHG emissions were from energy industries, followed by 33.7 per cent from transport, 11.9 per cent from manufacturing industries and construction, and 11.8 per cent from other sectors. CO<sub>2</sub> was the dominant GHG, accounting for 95.6 per cent of the sectoral emissions in 2006; CH<sub>4</sub> accounted for 3.2 per cent and N<sub>2</sub>O accounted for 1.1 per cent.

24. Lithuania recalculated CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O emissions from transport for 2005 in the 2008 submission. The effect of these recalculations on emission estimates is negligible. The reason for the recalculations is not explained; the ERT recommends that Lithuania use CRF table 8(b) to provide reasons for any recalculations. No recalculations were conducted for the 2007 submission.

25. The inventory is largely complete with the exception of emissions from oil distribution, which are reported as included elsewhere ("IE"); there is no explanation for this in CRF table 9(b). The ERT recommends that Lithuania provide information on the category under which these emissions are included both in the CRF and the NIR in its next annual submission.

### B. Reference and sectoral approaches

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

26. In 2006, the difference in CO<sub>2</sub> emissions between the reference and sectoral approaches was 19.8 per cent. The CRF table containing the differences was not updated from previous submissions (i.e. there is no information on 2006 differences in CO<sub>2</sub> emissions between the reference and sectoral approaches). The explanation provided in the NIR for this difference is identical to that from previous years when the differences were much lower than 19.8 per cent. During the review, Lithuania provided a corrected version of CRF table 1.A(b). However, as Lithuania only provided CRF table 1.A(b), and not CRF table 1.A(c) also, it was not possible to assess the effect of the correction.

27. It was not possible for the ERT to compare the data reported in the CRF tables with statistics from the International Energy Agency (IEA), as the CRF tables in the 2006 submission still contained some errors after corrections were made. The ERT noted that in CRF table 1.A(b), under the reference approach, industrial spirits production is reported as not applicable ("NA"); however, according to data provided by Statistics Lithuania, production of industrial spirits is 2,436 TJ.

28. In order to improve the transparency of reporting, the ERT recommends that Lithuania correct these errors and provide an explanation for this in the NIR in its next annual submission.

#### 2. International bunker fuels

29. Data on marine bunkers is provided in the Lithuanian Statistical Yearbook. The split between domestic and international aviation is made on the basis of fuel type. Aviation gasoline is presumed to be used for domestic aviation and gasoline and kerosene-type jet fuels for international aviation. The NIR indicated that the disaggregated data on aviation fuel types have only been available since 2001, but emissions are not reported until 2003. For years prior to 2003 international bunker emissions for both

marine and aviation fuels are reported as not occurring (“NO”). From the information provided, it is unclear whether these emissions have in fact been included under the domestic categories. The ERT recommends that Lithuania review the allocation of fuels between the domestic and international bunkers for the period 1990–2002, and that the Party provide detailed information on the methods and assumptions used to produce estimates in its next annual submission.

30. Some discrepancies between the IEA data and national data were identified for international aviation gasoline consumption in 1997. Lithuania informed the ERT during the review that the energy balance data for 1997 will be checked by the Department of Statistics to the Government of Lithuania.

### 3. Feedstocks and non-energy use of fuels

31. The reporting of feedstocks and non-energy use of fuels in the CRF tables is generally in accordance with the Revised 1996 IPCC Guidelines. However, the ERT identified an error in CRF table 1.A(d) under lubricants where Lithuania reports the fraction of carbon stored in 2006 as 5.00. Furthermore, additional information under the column “subtracted from energy sector” in table 1.A(d) is reported with figures; the table requires specific source categories to be reported. The ERT noted that the Party did not provide explanations about the sectors from which the CO<sub>2</sub> not emitted is subtracted (i.e. the column “subtracted from energy sector”).

32. There is no background information provided in the NIR on feedstocks and non-energy use of fuels. The ERT recommends that Lithuania provide additional information in the NIR of its next annual submission on the carbon flow for feedstocks and non-energy use of fuels in order to increase transparency and avoid the possibility of double counting or underestimating GHG emissions.

## C. Key categories

### 1. Stationary combustion: liquid fuels – CO<sub>2</sub>

33. Lithuania reports in the NIR that CO<sub>2</sub> emissions from stationary combustion of liquid fuels are calculated using a tier 2 methodology. However, the ERT took note of the table of EFs and recommends that Lithuania provide further information on, and explanations for, the national EFs that differ significantly from the IPCC default values and ranges. Lithuania is encouraged to compare national EFs and net calorific values (NCVs), using established studies and information available from the European Union emissions trading scheme (EU ETS), and to update EFs where appropriate.

34. The ERT reiterates the recommendation from the previous review that Lithuania review its reporting on the use of lubricants and its allocation of emissions between the energy and waste sectors.

### 2. Stationary combustion: gaseous fuels – CO<sub>2</sub>

35. Lithuania reports in the NIR that CO<sub>2</sub> emissions from stationary combustion of gaseous fuels are calculated in accordance with the IPCC good practice guidance using a tier 2 methodology and a country-specific EF. Emissions in 2006 decreased by 2.1 per cent from 4,426.76 Gg to 4,334.24 Gg CO<sub>2</sub> in 2005. The ERT reiterates the recommendation from the previous review that Lithuania provide in its next annual submission the rationale for the selection of the country-specific EF and information on the decreasing trend in the emissions, and that the Party enhance transparency by providing further information in the NIR.

36. The ERT recommends that Lithuania improve documentation on the statistics for final energy use on which the allocation of emissions between the energy and industrial processes sectors is based. The ERT also recommends that Lithuania provide sufficient information on the allocation of final energy use and explain the assumptions used in order to improve transparency and avoid a possible underestimation of emissions from fuel combustion in its next annual submission.

37. The ERT encourages Lithuania to report the carbon flow for natural gas, lubricants, refinery feedstock and paraffin waxes in order to improve the transparency of reporting in the inventory on the carbon stored and CO<sub>2</sub> emissions resulting from use of these fuels and to avoid a possible underestimation of emissions from this category.

### 3. Road transportation – CO<sub>2</sub>

38. Section 3.2.3 of the NIR does not include a detailed description and analysis of the emissions from transport, in particular CO<sub>2</sub> emissions from road transportation, which is one of the main key categories (contributing 13.3 per cent to the national total GHG emissions according to the level assessment and 14.2 per cent according to the trend assessment). The ERT recommends that Lithuania present a description of how emissions from road transportation were estimated providing detailed information on models, algorithms, equations and all of the information used in the NIR of its next annual submission.

#### **D. Non-key categories**

##### Off-road vehicles: liquid fuels – CH<sub>4</sub> and N<sub>2</sub>O

39. The ERT encourages Lithuania to use appropriate CH<sub>4</sub> and N<sub>2</sub>O EFs for off-road vehicles, rather than the EFs for stationary combustion, and to review the determination of fuel use by off-road vehicles as was encouraged by the previous EFT.

## **III. Industrial processes and solvent and other product use**

### **A. Sector overview**

40. In 2006, the industrial processes sector accounted for 3,951.16 Gg CO<sub>2</sub> eq, or 17.0 per cent of total GHG emissions, and the solvent and other product use sector accounted for 90.94 Gg CO<sub>2</sub> eq, or 0.4 per cent of total GHG emissions. Emissions from the industrial processes sector decreased by 6.2 per cent between 1990 and 2006, and emissions from the solvent and other product use sector decreased by 9.5 per cent between 1990 and 2006. The key driver for the fall in emissions is the decrease in CO<sub>2</sub> emissions from cement production. Within the industrial processes sector, 84.1 per cent of emissions were from the chemical industry, followed by 13.0 per cent from mineral products and 2.9 per cent from consumption of halocarbons and SF<sub>6</sub>. N<sub>2</sub>O was the dominant GHG, accounting for 55.5 per cent of industrial processes emissions in 2006. CO<sub>2</sub> emissions accounted for 41.6 per cent and fluorinated gases emissions for 2.9 per cent. CH<sub>4</sub> emissions accounted for the remaining 0.1 per cent.

41. Lithuania recalculated CO<sub>2</sub> emissions from mineral products for 2005 in the 2008 submission. The effect of the recalculation on emissions estimates is negligible. The reason for the recalculation is not explained; the ERT recommends that Lithuania use CRF table 8(b) to provide reasons for any recalculations. No recalculations were conducted for the 2007 submission. The ERT also recommends that Lithuania further improve transparency by including descriptions of the methodologies used in the industrial processes sector, taking into account the issue of confidentiality for certain categories. Details of specific recommendations are provided in paragraphs 43–47 below.

42. The following categories are reported as “NE”: limestone and dolomite use, food and drink, and consumption of halocarbons and SF<sub>6</sub>, except refrigeration and air-conditioning equipment. The ERT recommends that Lithuania estimate emissions from categories included in the Revised 1996 IPCC Guidelines or the IPCC good practice guidance.

## **B. Key categories**

### **1. Ammonia production – CO<sub>2</sub>**

43. Lithuania only reports emissions from ammonia production, as the AD and implied emission factor (IEF) are reported as confidential (“C”). No methodological information is provided in the NIR. The ERT noted that previous review reports indicate that Lithuania has switched from using national production statistics and a default EF to using natural gas consumption calculations and a default EF. According to an estimate made by the ERT based on international statistics, emissions should be approximately 70 per cent lower than the estimates reported by Lithuania; therefore, the ERT recommends that Lithuania check whether natural gas used for energy purposes is included in the natural gas consumption calculations and that the Party remove any double counting in its next annual submission.

### **2. Nitric acid production – N<sub>2</sub>O**

44. Lithuania only reports emissions from nitric acid production, as the AD and IEF are reported as “C”. The ERT estimated emissions by using plant capacity reported on the producer’s website, and making assumptions regarding plant utilization rate. The results give an IEF comparable to that in the IPCC good practice guidance. The ERT recommends that Lithuania report in the NIR on the type of process used in order to compare it with that described in the IPCC good practice guidance. The ERT also recommends that Lithuania include in the NIR a reference calculation based on the published plant capacity and an assumed plant utilization rate (e.g. 80 per cent), and that the Party report the calculated IEF in the NIR of its next annual submission.

## **C. Non-key categories**

### **1. Metal production – CO<sub>2</sub>**

45. The ERT noted that Lithuania had not followed the recommendation from the previous review to estimate possible emissions from metal production. As this may lead to an underestimation of total GHG emissions, the ERT recommends that Lithuania prepare and report this emission estimate. If sources are not present in Lithuania, the ERT recommends that the Party include a transparent explanation in the NIR.

### **2. Consumption of halocarbons and SF<sub>6</sub> – HFCs, PFCs and SF<sub>6</sub>**

46. The ERT noted that all subcategories other than refrigeration and air-conditioning equipment are reported as “NE” by Lithuania; this may lead to an underestimation of total emissions. Therefore, the ERT recommends that Lithuania prepare and report estimates, both potential and actual, for these subcategories.

### **3. Solvent and other product use – CO<sub>2</sub> and N<sub>2</sub>O**

47. Lithuania reported CO<sub>2</sub> emissions and non-methane volatile organic compound emissions from this sector for all years. N<sub>2</sub>O emissions from this sector were reported as not applicable (“NA”) and “NE”. The ERT commends Lithuania for including CO<sub>2</sub> emissions in the category solvent and other product use. The ERT encourages Lithuania to consider also including N<sub>2</sub>O emissions under this sector.

## **IV. Agriculture**

### **A. Sector overview**

48. In 2006, the agriculture sector accounted for 4,284.33 Gg CO<sub>2</sub> eq, or 18.4 per cent of total GHG emissions. Emissions from the sector decreased by 54.7 per cent between 1990 and 2006. The key driver for the fall in emissions was the economic recession and the restructuring of the Lithuanian

agriculture sector following independence, which led to a reduction in animal numbers and fertilizer consumption.

49. Within the sector, 57.5 per cent of emissions were from agricultural soils, followed by 30.3 per cent from enteric fermentation and 12.2 per cent from manure management. Most of the GHG emissions came from N<sub>2</sub>O, which accounted for 65.3 per cent of the sectoral emissions, while CH<sub>4</sub> accounted for 34.7 per cent.

50. Reporting for the agriculture sector is complete and covers all major categories. Rice cultivation, and savanna and field burning of crop residues do not occur in Lithuania. There have been no recalculations since the revised 2006 submission. Although the transparency of the NIR has been improved since the previous submission, further efforts are needed to ensure that all data used to estimate emissions using tier 2 methods are provided and that the trends in emissions are explained. No information is provided on sector-specific QA/QC procedures or planned improvements, only qualitative assessments of uncertainty are provided.

## **B. Key categories**

### Manure management – CH<sub>4</sub> and N<sub>2</sub>O

51. Lithuania uses the same allocation of manure to different animal waste management systems (AWMS) for the entire time series. As there has been major restructuring within the agriculture sector in Lithuania, there may also have been changes to the manure management systems over the time series. During the previous review, the Party indicated that it plans to undertake a survey in 2010; in the interim, the ERT encourages the Party to consult with agricultural experts to review the current allocations of manure as part of its QA procedures.

52. The reporting of the allocation of animal waste to different AWMS in CRF table 4B(a)2 is incorrect; the values reported for allocation of manure in cool climate region should equal 100 per cent for each animal category. There is also an inconsistent use of notation keys; when the Party does not have a particular AWMS or climate region, the allocation and associated methane conversion factor should be reported as “NO”. These issues should be corrected in the next annual submission.

53. The Party uses the IPCC default value for Eastern Europe in order to determine the nitrogen (N) excretion rates (N<sub>EX</sub>). Milk production in Lithuania now exceeds the level on which the IPCC default is based, and using this default value may lead to an underestimation of emissions from dairy cows. It is also possible that emissions from non-dairy cows are being overestimated. As Lithuania now estimates intake for these animals using the tier 2 method, the ERT recommends that the Party implement the tier 2 method from the IPCC good practice guidance (equation 4.19) to estimate N excretion in its next annual submission.

54. As the Party has an increasing number of fur-coated animals, it may wish to investigate whether manure from these animals is a significant category of emissions.

## **V. Land use, land-use change and forestry**

### **A. Sector overview**

55. In 2006, the LULUCF sector was a net sink of 7,951.88 Gg CO<sub>2</sub> eq. The LULUCF sector offset 34.2 per cent of total GHG emissions in 2006 and 22.4 per cent in 1990. The net sink decreased by 28.0 per cent between 1990 and 2006.

56. Within the LULUCF sector, forest land remaining forest land was a net sink of 7,466.59 Gg CO<sub>2</sub> eq. Land converted to forest land was a net sink of 562.89 Gg CO<sub>2</sub> eq and wetlands remaining wetlands was a net sink of 57.60 CO<sub>2</sub> eq.

57. Lithuania has improved the transparency of its inventory since its previous submission by describing the method used to estimate the sink in forest biomass. The method used to estimate emissions from drained forest soils has also been included in the NIR.

58. Lithuania recalculated removals from forest land for the period 1990–2005 in its 2008 submission. The recalculations of removals in the LULUCF sector in 2005 resulted in an overall increase of 311.87 Gg CO<sub>2</sub> in the estimate of the net sink (from –9,174.49 Gg in the 2007 submission to –9,486.36 Gg in the 2008 submission). The reason for the recalculation is not explained in the CRF; the ERT recommends that Lithuania use CRF table 8(b) to provide reasons for any recalculations. No recalculations were conducted in the 2007 submission.

59. Lithuania provides information on national land-use categories for the period 1990–2006. Emissions and removals are estimated for forest land and wetlands; cropland emissions from liming are reported for the period 1990–1996, while grassland emissions and sinks are not estimated. The ERT recommends that Lithuania estimate emissions and removals for croplands and grasslands. The ERT encourages Lithuania to increase the completeness of the inventory for the LULUCF sector, and to estimate sinks and sources occurring in mineral and organic soil for croplands, which are likely to be a key category due to the substantial land area.

60. The ERT noted with concern that Lithuania reported emissions and removals from only forest land and wetlands; this could cause problems with reporting in 2010 of mandatory activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol. During the review the ERT also noted a number of issues relating to the national system and its ability to ensure that land areas subject to LULUCF activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol are identifiable. The ERT recommends that Lithuania report a complete inventory for the LULUCF sector under the Convention, address effectively the issues relating to the national system and its ability to cover activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, and report thereon in its next annual submission.

## **B. Key categories**

### Forest land remaining forest land – CO<sub>2</sub>

61. According to Lithuania's definition of forest, all of its forests are managed. Carbon stock changes in living biomass are estimated in accordance with the IPCC good practice guidance for LULUCF and are based largely on country-specific data provided by the national forest inventory (NFI) of Lithuania and by the Statistical Yearbook of Forestry. Lithuania compares different data sources in table 7.3 of the NIR, which shows that the NFI provides a higher estimate for forest area than the forest assessment. The ERT strongly recommends that Lithuania use the statistical NFI as the main data source for the LULUCF inventory. The NFI is based on systematic sampling, and quantifies land areas, growing stock and increment with uncertainty estimates; it therefore produces more accurate data than those produced by the forest assessment.

62. Lithuania describes the methodology to estimate the carbon stock increment in tree biomass by combining the increment in the NFI with the land areas in the Statistical Yearbook of Forestry, but the results of the estimation (increments and losses) were not clearly reported in the NIR. In order to increase the transparency of the NIR, the ERT recommends that Lithuania also provide a summary table in the NIR describing the increments and losses in forest land remaining forest land.

63. According to the European Commission Joint Research Centre (JRC) website, Lithuania has an extensive soil carbon database. This database and the guidelines prepared by the JRC could be used to study carbon stock change in mineral soils under the forest land remaining forest land category. The ERT recommends that Lithuania investigate the different options for estimating soil carbon stock changes using IPCC good practice guidance for LULUCF, country-specific data or modelling.

64. Lithuania reports emissions from drained organic forest soils, which is in line with the IPCC good practice guidance for LULUCF. However, in the 2008 submission, the time series is not complete; only emissions for 2006 are reported in the CRF table, while the NIR (p. 66) states that the area of drained peatlands has been constant since 1990. The ERT recommends that Lithuania provide estimates for the entire time series in its next annual submission.

### **C. Non-key categories**

#### Wetlands remaining wetlands – CO<sub>2</sub>

65. Lithuania reports emissions from peat extraction sites under wetlands in the CRF tables and reports the methodology used in the NIR; the ERT commends this improvement on the previous submission. However, in order to further increase the transparency of reporting, the ERT recommends that Lithuania report water bodies, swamps and peat extraction areas as separate subcategories under wetlands.

## **VI. Waste**

### **A. Sector overview**

66. In 2006, the waste sector accounted for 1,526.02 Gg CO<sub>2</sub> eq, or 6.6 per cent of total GHG emissions. Emissions from the sector decreased by 23.7 per cent between 1990 and 2006. The key driver for the fall in emissions is the reduction of CH<sub>4</sub> emissions from solid waste disposal on land and wastewater handling (industrial, and domestic and commercial wastewater).

67. Within the sector, 60.2 per cent of emissions were from solid waste disposal on land, followed by 39.4 per cent from wastewater handling. The remaining 0.4 per cent was from waste incineration. Most of the emissions are CH<sub>4</sub>, which accounted for 94.7 per cent of the sectoral emissions, while N<sub>2</sub>O accounted for 4.9 per cent and CO<sub>2</sub> for 0.4 per cent.

68. The following categories are reported as “NE”: CO<sub>2</sub> emissions from solid waste disposal on land; CH<sub>4</sub> from waste incineration; and N<sub>2</sub>O from industrial wastewater handling and waste incineration. The ERT recommends that Lithuania estimate emissions for categories included in the Revised 1996 IPCC Guidelines or the IPCC good practice guidance.

69. No recalculations have been made since the revised 2006 submission. CH<sub>4</sub> emissions from solid waste disposal on land and wastewater handling were identified as key categories by both the Party and the secretariat. Information on the uncertainties of emission estimates in the waste sector is provided in the NIR. The ERT encourages Lithuania to improve the reporting of its uncertainty analysis by including information in the NIR on methodology and results. The ERT also encourages Lithuania to develop sector-specific QA/QC procedures and to describe these in the NIR.

### **B. Key categories**

#### 1. Solid waste disposal on land – CH<sub>4</sub>

70. Lithuania has used the tier 2 first order decay model in accordance with the IPCC good practice guidance with a methane correction factor (MCF) derived from expert judgement and country-specific degradable organic carbon. The MCF is incorrectly referred to as an IPCC default in the NIR. The statistics for solid waste disposal on land are provided by the Lithuanian Environmental Protection Agency (EPA) for the years 1991–2006. Prior to 1990 these AD (waste generation) were estimated based on expert judgement. The ERT recommends that Lithuania improve the transparency of the rationale for the derivation of the AD in the NIR and encourages Lithuania to improve the description in the NIR (possibly in an annex) of how the time series of the waste data (1990–2006) is calculated.



## 2. Wastewater handling – CH<sub>4</sub>

71. A tier 1 method with country-specific MCFs was used to estimate emissions from wastewater handling. Data on the total chemical oxygen demand (COD) for industrial wastewater and biochemical oxygen demand (BOD) for domestic wastewater were obtained from the EPA waste database, but transparency with regard to how the AD were derived (COD for industrial wastewater and BOD for domestic and commercial wastewater) could be improved in the NIR. Lithuania informed the ERT during the review that a study has been conducted on CH<sub>4</sub> emissions from wastewater, and the data from this study will be used to recalculate estimates in its next annual submission. The ERT recommends that Lithuania provide detailed information on sludge handling and the derivation of a country-specific MCF in its future submissions.

### C. Non-key categories

#### Wastewater handling – N<sub>2</sub>O

72. The IPCC methodology with default EFs is applied for this category. The figure for protein intake used to calculate emissions from human sewage in Lithuania, based on unpublished data from the National Nutrition Centre of the Ministry of Health, is approximately 30 per cent lower than that reported by the Food and Agriculture Organization of the United Nations. The ERT recommends that Lithuania investigate the reasons for this difference and that the Party provide an explanation for this in its next annual submission.

## VII. Other issues

### 1. Changes to the national system

73. Lithuania has not reported on changes to the national system, except for an update to the QA/QC plan. However, recommendations from previous reviews have not been followed and insufficient information is provided in the NIR regarding the national system, especially on the legal and procedural arrangements in place in Lithuania. Furthermore, the assignment of activities to different institutions included in the framework of the national system is not clearly presented and the full cycle of the inventory management is not described in detail in the NIR. No information is presented regarding the tendering procedure for reporting, the possible outsourcing of the inventory preparation or the composition of the team of experts that compile the GHG inventory, which was recommended by the previous ERT. The ERT strongly recommends that Lithuania provide comprehensive information on its national system in its next annual submission, including sufficient information on the legal, institutional and procedural frameworks and on the full cycle of the inventory planning.

### 2. Changes to the national registry

74. Lithuania has not reported on changes to its national registry in the 2008 submission. In response to questions raised by the ERT during the review the Party confirmed that no changes to the national registry had taken place. The ERT recommends that Lithuania provide updated information on its national registry as supplementary information under Article 7, paragraph 1, of the Kyoto Protocol in its next annual submission.

### 3. Commitment period reserve

75. The Party has not reported its commitment period reserve in the 2008 submission. In response to questions raised by the ERT during the review Lithuania reported its commitment period reserve to be 116 108 865 t CO<sub>2</sub> eq based on the national emissions in its most recently reviewed inventory (23,221.77 Gg CO<sub>2</sub> eq). The ERT agrees with this figure. The ERT recommends that Lithuania include information on its commitment period reserve in its next annual submission.

## VIII. Conclusions and recommendations

76. In 2008, Lithuania submitted its inventory, containing a complete set of CRF tables for the period 1990–2006, with the exception of table 8(b), and an NIR, in accordance with the deadline established by the UNFCCC reporting guidelines. The submission was largely complete in terms of its source/sink category, gas and geographic coverage; however, several categories were not estimated, mainly in the industrial processes and LULUCF sectors. The transparency of the NIR needs significant improvement. The ERT concluded that the inventory submission is generally in line with the UNFCCC reporting guidelines.

77. The inventory is mostly in line with the Revised 1996 IPCC Guidelines, the IPCC good practice guidance and the IPCC good practice guidance for LULUCF. However, the ERT identified some instances of possible underestimation and overestimation of emissions (see paras. 32, 37, 42, 44, 45, 53 and 72 above). The ERT requests that Lithuania resolve these problems and that the Party report on them in its next annual submission.

78. The key recommendations are that Lithuania:

- (a) Provide in the NIR a comprehensive description of its national system, including information on the legal, institutional and procedural frameworks, and the full cycle of the inventory preparation, management and planning;
- (b) Provide in the NIR detailed information on the QA/QC plan and evidence on what general and category-specific activities have been undertaken or are planned in accordance with the IPCC good practice guidance;
- (c) Prepare the level and trend assessment of the key categories, and include the LULUCF sector in the key category assessment in accordance with the IPCC good practice guidance for LULUCF;
- (d) Improve the transparency of the inventory by following the recommended structure of the NIR and by providing more detailed information on the methods, data and EFs used for all sectors;
- (e) Estimate and report emissions from the categories currently reported as “NE” for which the Revised 1996 IPCC Guidelines and the IPCC good practice guidance provide methods, in particular for the industrial processes and LULUCF sectors, giving priority to the largest sources;
- (f) Provide more information on, and an explanation for, national EFs, in particular for those that differ significantly from the IPCC default values and ranges;
- (g) Review the estimates of GHG emissions from ammonia production to assess whether natural gas used for energy purposes is also included in this category in order to identify possible double counting;
- (h) Implement the tier 2 method for estimating N excretion from animals in the estimation of N<sub>2</sub>O emissions from manure management;
- (i) Use the Statistical Forest Inventory as the main data source for estimating emissions/removals from forest land, as it provides more accurate data than those in the forest assessment;
- (j) Provide detailed information in the NIR on the method, assumptions and inputs used in the uncertainty analysis;
- (k) Provide detailed information on recalculations in both the NIR and CRF tables.

## **IX. Questions of implementation**

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

Annex**Documents and information used during the review****A. Reference documents**

Intergovernmental Panel on Climate Change. *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*. Available at <<http://www.ipcc-nggip.iges.or.jp/public/gl/invs1.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/gp/landuse/gp/landuse.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 2007. Available at <<http://unfccc.int/resource/docs/2007/asr/ltu.pdf>>.

Status report for Lithuania 2008. Available at <<http://unfccc.int/resource/docs/2008/asr/ltu.pdf>>.

Synthesis and assessment report on the greenhouse gas inventories submitted in 2007. Available at <<http://unfccc.int/resource/webdocs/sai/2007.pdf>>.

Synthesis and assessment report on the greenhouse gas inventories submitted in 2008. Available at <<http://unfccc.int/resource/webdocs/sai/2008.pdf>>.

FCCC/ARR/2006/LTU. Report of the individual review of the greenhouse gas inventory of Lithuania submitted in 2006. Available at <<http://unfccc.int/resource/docs/2007/arr/ltu.pdf>>.

FCCC/IRR/2007/LTU: Report of the review of the initial report of Lithuania. Available at <<http://unfccc.int/resource/docs/2007/irr/ltu.pdf>>.

**B. Additional information provided by the Party**

Responses to questions during the review were received from Mr. Simonas Noreika (the Lithuanian Environmental Protection Agency), including additional material on the methodology and assumptions used.

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