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Report of the individual review of the annual submission of Luxembourg submitted in 2009*

* In the symbol for this document, 2009 refers to the year in which the inventory was submitted, and not to the year of publication.

CONTENTS

I. Overview

A. Introduction

1. This report covers the centralized review of the 2009 annual submission of Luxembourg, coordinated by the UNFCCC secretariat, in accordance with decision 22/CMP.1. The review took place from 21 to 26 September 2009 in Bonn, Germany, and was conducted by the following team of nominated experts from the UNFCCC roster of experts: generalists – Ms. Kristina Saarinen (Finland) and Mr. Marius Țăranu (Republic of Moldova); energy – Mr. Pascal Bellavance (Canada), Mr. Tomas Gustafsson (Sweden) and Mr. Benon Bibbu Yassin (Malawi); industrial processes – Mr. Afshin Matin (Canada) and Ms. Suvi Monni (European Community); agriculture – Mr. Leonard Brown (New Zealand) and Ms. Hongmin Dong (China); land use, land-use change and forestry (LULUCF) – Ms. Tracy Johns (United States of America) and Mr. Harry Vreuls (Netherlands); and waste – Ms. Maryna Bereznytska (Ukraine) and Mr. Carlos Lopez (Cuba). Mr. Brown and Mr. Țăranu were the lead reviewers. The review was coordinated by Ms. Sevdalina Todorova 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 Luxembourg, which provided comments that were considered and incorporated, as appropriate, into this final version of the report.

B. Emission profiles and trends

3. In 2007, the main greenhouse gas (GHG) in Luxembourg was carbon dioxide (CO_2), accounting for 91.7 per cent of total GHG emissions[1] expressed in CO_2 eq, followed by nitrous oxide (N_2O) (4.1 per cent) and methane (CH_4) (3.5 per cent). Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6) collectively accounted for 0.04 per cent of the overall GHG emissions in Luxembourg. The energy sector accounted for 87.9 per cent of the total GHG emissions, followed by industrial processes (6.1 per cent), agriculture (5.5 per cent), waste (0.4 per cent) and solvent and other product use (0.1 per cent). Total GHG emissions amounted to 12,913.52 Gg CO_2 eq in 2007 and emissions decreased by 1.6 per cent between the base year[2] and 2007. The trends of the different gases are reasonable.

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

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

[2] "Base year" refers to the base year under the Kyoto Protocol, which is 1990 for CO_2, CH_4 and N_2O, and 1995 for HFCs, PFCs and SF_6. The base year emissions includes emissions from Annex A sources only.

Table 1. Total greenhouse gas emissions by gas, 1990–2007[a]

Greenhouse gas	Gg CO_2 eq							Change base year–2007 (%)
	Base year[b]	1990	1995	2000	2005	2006	2007	
CO_2	12 136.02	12 136.02	9 204.52	8 897.31	12 330.08	12 245.75	11 844.04	–2.4
CH_4	466.01	466.01	470.12	476.10	458.63	456.11	453.54	–2.7
N_2O	498.65	498.65	518.20	551.20	514.88	511.26	524.96	5.3
HFCs	14.21	14.21	14.21	43.01	82.54	87.04	87.04	512.5
PFCs	NO	NO	NO	NO	NO	NO	NO	0.00
SF_6	2.91	2.91	2.91	3.52	3.78	3.86	3.94	35.4

Abbreviation: NO = not occurring.
[a] "Total greenhouse gas emissions" includes emissions from Annex A sources only (and excludes emissions/removals from the LULUCF sector).
[b] "Base year" refers to the base year under the Kyoto Protocol, which is 1990 for CO_2, CH_4 and N_2O, and 1995 for HFCs, PFCs and SF_6. The base year emissions include emissions from Annex A sources only.

Table 2. Greenhouse gas emissions by sector, 1990–2007

Sector	Gg CO_2 eq							Change base year–2007 (%)
	Base year[a]	1990	1995	2000	2005	2006	2007	
Energy	10 642.61	10 642.61	8 542.38	8 349.84	11 882.12	11 740.68	11 345.27	6.6
Industrial processes	1 612.68	1 612.68	992.16	761.99	736.22	793.78	783.66	–51.4
Solvent and other product use	23.90	23.90	19.74	15.81	18.47	17.88	18.81	–21.3
Agriculture	775.27	775.27	778.38	782.18	699.54	695.54	710.64	–8.3
LULUCF	NA	208.44	–384.86	–471.37	–493.42	–388.69	–390.64	NA
Waste	63.34	63.34	57.30	61.32	54.36	56.14	55.14	–12.9
Other	NA	NA	NA	NA	NA	NA	NA	NA
Total (with LULUCF)	**NA**	**13 326.23**	**10 005.10**	**9 499.77**	**12 897.29**	**12 915.33**	**12 522.88**	**NA**
Total (without LULUCF)	**13 117.79**	**13 117.79**	**10 3089.96**	**9 971.14**	**13 390.71**	**13 304.02**	**12 913.52**	**–1.6**

Abbreviations: LULUCF = land use, land-use change and forestry, NA = not applicable.
[a] "Base year" refers to the base year under the Kyoto Protocol, which is 1990 for CO_2, CH_4 and N_2O, and 1995 for HFCs, PFCs and SF_6. The base year emissions include emissions from Annex A sources only.

C. Annual submission and other sources of information

5. Luxembourg submitted a complete set of common reporting format (CRF) tables for the period 1990–2007 on 19 May 2009, a national inventory report (NIR) on 28 May 2009 and an updated version of the NIR on 12 June 2009. The Party also submitted information required under Article 7, paragraph 1, of the Kyoto Protocol, namely information on its Kyoto Protocol units. The standard electronic format (SEF) tables were submitted on 19 May 2009. The annual submission was made in accordance with decision 15/CMP.1; however, Luxembourg submitted its inventory at the end of six weeks "grace" period after the submission due date of April 15. Luxembourg indicated that the 2009 submission is also its voluntary submission under the Kyoto Protocol. The expert review team (ERT) strongly encourages Luxembourg to submit its next inventory by 15 April 2010 or within six weeks from that date as required by decision 15/CMP.1.

6. In response to questions raised by the ERT, Luxembourg provided on 24 September 2009 information on the problem with regard to the timeliness of the annual submission (see para. 22 below) and on 30 September 2009 information on the completeness of its inventory (see para. 10 below).

7. Where necessary, the ERT also used previous years' submissions during the review. In addition, the ERT used the standard independent assessment report (SIAR) to review information on the accounting of Kyoto Protocol units (including the SEF tables and the SEF comparison report) and on the national registry.[3]

8. During the review, Luxembourg provided the ERT with additional information. The full list of materials used during the review is provided in the annex I to this report.

Completeness of inventory

9. The inventory is complete in terms of years, sectors and geographical coverage. Some minor categories are missing in the 2009 submission for the entire time series, particularly in the industrial processes sector (actual emissions of HFCs from fire extinguishers, solvents, other applications using ozone-depleting substance (ODS) substitutes, semiconductor manufacturing, potential emissions of fluorinated gases (F-gases)); the energy sector (emissions of CO_2 and CH_4 from distribution of oil products), the LULUCF sector (e.g. carbon stock changes in wetlands, settlements, and other land and the category other; some categories under biomass burning and nitrogen (N) fertilization); and the waste sector (CH_4 and N_2O emissions from sludge under the category wastewater handling). There are also reporting gaps for some small animal populations for some years in the agriculture sector.

10. In response to questions raised by the ERT, Luxembourg indicated that it would address the completeness of its inventory in its next annual submission in regards to the actual HFC emissions from fire extinguishers, solvents, other applications that use substitutes for ODS; and emissions from semiconductor manufacturing. The Party also indicated that the efforts required to estimate these emissions are resource intensive. The ERT noted Luxembourg's concerns. The ERT recommends that Luxembourg improve the completeness of its next annual submission, especially for those categories that are known to occur within the Party and for which methodologies are available in the Intergovernmental

[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. The SIAR is not publicly available.

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 *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Revised 1996 IPCC Guidelines). The ERT encourages the Party to explore approaches available in the scientific literature, to estimate emissions for categories that do not have methodologies prescribed in the Revised 1996 IPCC Guidelines nor the IPCC good practice guidance, with a view to enhance further, to the extent possible, the completeness and accuracy of its inventory. The ERT also recommends that the Party, when reporting emissions data for the first time for a given category, ensure that emissions data are provided for the entire inventory time series, and that the choice of methods and EFs are clearly explained in the NIR.

11. The ERT noted the improved transparency of reporting (CRF table 9(a) and in the NIR) and the improved completeness of reporting, especially by including new estimates in the LULUCF sector.

12. Table 2(II).F is not reported for the entire time series. The ERT recommends Luxembourg to include table 2(II).F in next annual submission.

D. Main findings

13. The inventory is generally in line with the Revised 1996 IPCC Guidelines, 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) with the exception of the omission of some categories (e.g. in the industrial processes sector), the misallocation of some emissions in the energy sector, the lack of transparency of background information and of documentation supporting recalculations in the NIR in some instances and the lack of a complete uncertainty analysis covering all categories.

14. The ERT commends Luxembourg for the significant improvement on the previous submission in the reporting of the LULUCF sector, the implementation of a quality assurance/quality control (QA/QC) system and inventory improvement plan, and improvements in the transparency, completeness and time-series consistency of the inventory.

15. During the review, the ERT expressed concern with regard to the timing of submission of the 2009 inventory. In accordance with decision 15/CMP.1, Parties must submit their inventory within six weeks of the submission date established by the Conference of the Parties (15 April); Luxembourg submitted its 2009 inventory on 28 May 2009, which was at the end of this six week "grace" period. In response to a question raised by the ERT, Luxembourg provided several reasons to explain why the submission had been delayed (see para. 22 below). The Party explained that the timeline for the inventory compilation process has been revised and the Party assured the ERT that the new timeline would be followed for future submissions. The ERT was satisfied with the response and considered that Luxembourg demonstrated sufficient capacity to comply with the "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories" (hereinafter referred to as the UNFCCC reporting guidelines).

16. The Party has submitted, in part, on a voluntary basis supplementary information required under Article 7, paragraph 1, of the Kyoto Protocol in accordance with Part I of the annex to decision 15/CMP.1. The Party did not submit on a voluntary basis information on activities under Article 3, paragraph 3, of the Kyoto Protocol,[4] information on changes in the national system and in the national registry, and information on the minimization of adverse impacts under Article 3, paragraph 14, of the Kyoto Protocol. Luxembourg has reported information on its accounting of Kyoto Protocol units in

[4] Luxembourg did not elect to account for land activities under Article 3, paragraph 4, of the Kyoto Protocol.

accordance with section I.E of the annex to decision 15/CMP.1, and used the SEF tables as required by decision 14/CMP.1. The national system continues to perform its required functions as set out in the annex to decision 19/CMP.1. 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 decisions of the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol (CMP).

17. The ERT encourages Luxembourg to explore the possibility of structuring its reporting, in its next annual submission, following the annotated outline of the NIR, and the guidance contained therein, that can be found on the UNFCCC website.[5]

18. In the course of the review, the ERT formulated a number of recommendations relating to the timeliness, the completeness, and the transparency of the submission (see para. 40 below). Specific recommendations for categories are included in the sector chapters of this report.

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

1. Overview

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

20. The NIR describes the national system for the preparation of the inventory and includes the regulation to set up a national system in Luxembourg in annex I to the NIR. A Grand-Ducal Regulation[6] designates Luxembourg's Single National Entity (SNE), the National Inventory Compiler and the National GHG Inventory Focal Point. The Ministry of the Environment is the national focal point and submits the inventories to the UNFCCC secretariat and the European Commission. The Environment Agency is the designated SNE with overall responsibility for the GHG inventory. The regulation also defines and allocates specific responsibilities for the GHG inventory within the SNE.

21. During the review, the ERT expressed concern with regard to the timing of the inventory submission. The NIR was submitted on 28 May 2009, at the limit of the six week "grace" period after the submission due date of 15 April, as established in paragraph 3 (a) of decision 15/CMP.1. The ERT noted that the submission of the NIR in 2008 was not in accordance with decision 15/CMP.1, as the NIR was submitted on 2 June 2008 and a revised NIR was submitted on 19 July 2008. This delay caused the previous ERT to question the capacity of the national system to plan, prepare and report annual inventories and supplementary information in a timely manner, as requested in paragraph 10 (d) of the annex to decision 19/CMP.1, and in accordance with decision 15/CMP.1.

22. In response to a question raised by the ERT, Luxembourg stated that the 2009 annual submission was delayed to allow the Party to incorporate recommendations made during the in-country review that took place in October 2008 and due to the fact that a new person had taken over the role of national inventory compiler. Luxembourg also explained that the timeline for the inventory compilation process had been revised and the Party assured the ERT that the revised timeline would be followed for future submissions. Luxembourg informed the ERT that an inventory approval procedure has been established for future submissions and a decision-making body has been established to guide the revisions to and

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

[6] Reglement grand-ducal du 1er aout 2007 relatif a la mise en place d'un Systeme d'Inventaire National des emissions de gaz a effet de serre dans le cadre de la Convention-cadre des Nations Unies sur le Changement Climatique, Memorial A-N 130 du 7 aout 2007, pp. 2318-2320: see <http://www.legilux.public.lu/leg/a/archives/2007/1300708/1300708.pdf>.

prioritization of work on the inventory. The decision-making body held its first meeting in July 2009. Luxembourg stated that it would consider providing additional human resources in order to support the inventory team in line with the recommendations made by the ERT during the in-country review in October 2008.

23. The ERT noted that the improvements already made will enable the timely submission of the inventory in future years and considered that the national system has the capacity to plan and prepare annual inventories and supplementary information in a timely manner. The ERT strongly encourages Luxembourg to adhere to its revised timeline for the submission of the inventory and encourages the Party to submit its next inventory by 15 April 2010 or within six weeks of that date as required by decision 15/CMP.1.

2. Inventory planning

24. The Environment Agency as the SNE has the overall technical responsibility for the GHG inventory. The overall management of the inventory is assigned to one staff member in the Environment Agency who is designated the GHG inventory focal point. The Environment Agency collects and validates activity data (AD), emission factors (EFs), parameters and emission estimates from sector experts and produces emission estimates.

25. The Grand-Ducal Regulation indicates that data providers have to transmit quality AD using formats, and respecting the deadlines, defined by the SNE. The NIR provides information on the responsibilities within the national inventory system on data provision, choice of EF, methods and emission estimates at the sectoral level. According to the NIR, the following organizations contribute to the preparation of the inventory: the Agriculture Technical Services Administration and Agriculture Economic Service under the Ministry of Agriculture; Energy Directorate and the National Statistical Institute (STATEC) under the Ministry of Economic Affairs and External Trade; the Water and Forestry Administration and the Environment Agency under the Ministry of the Environment; Customs and Excises Administration under the Ministry of Finance; the Water Agency under the Ministry of Internal Affairs and Spatial Planning; and the Vehicles Check Administration under the Ministry of Transport.

26. The quality management system of Luxembourg was implemented with the help of external consultants.[7] It supplies procedures to check integrity, correctness and completeness of data, identify errors and omissions, reduce uncertainties of emission estimates, document and archive inventory calculation sheets and background data. The QA/QC plan and the established decision-making body will prioritize the inventory improvements (see paras. 22 and 33).

3. Inventory preparation

Key categories

27. Luxembourg reported a key category tier 1 analysis, both level and trend assessment, as part of its 2009 submission. The key category analysis performed by the Party and that performed by the secretariat[8] produced similar results.

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[7] SEG-Umwelt Service GmbH (Mettlach, Germany) and the Austrian Federal Environment Agency (Umweltbundesamt, Vienna, Austria).

[8] 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.

28. Following a recommendation made during the previous review, Luxembourg included the LULUCF sector in its key category analysis. The analysis was performed in accordance with the IPCC good practice guidance and the IPCC good practice guidance for LULUCF. However, only the key category analysis reported in the NIR includes the LULUCF sector. CRF table 7 reports only the key categories excluding LULUCF. The ERT recommends that Luxembourg update its reporting in CRF table 7 in its next annual submission. There were some other inconsistencies between the reporting of key categories in the CRF and in the NIR. For example, emissions from F-gases are reported as a key category in the NIR (trend assessment) but they are not reported as a key category in the CRF table; 2007 estimates of direct N_2O emissions from soils and pasture, range and paddock are reported as key categories in tables 1–5 and 1–7 in the NIR and CRF table 7, but these are reported as non-key categories in tables 1–6 and 1–8 in the NIR. The ERT recommends that Luxembourg ensure consistency in its reporting of key categories within the NIR and between the NIR and the CRF tables.

Uncertainties

29. Luxembourg provided a quantitative tier 1 level uncertainty analysis in accordance with the IPCC good practice guidance. However, the uncertainty analysis only includes key categories. Other categories, such as the uncertainties of emissions in all categories in the waste sector, and the LULUCF sector (except for forest land remaining forest land), are not included in the analysis. The ERT recommends that Luxembourg include all categories in the uncertainty analysis. The ERT encourages Luxembourg to include a tier 2 analysis for the key categories that contribute most to the key category level assessment.

30. The ERT noted that the overall uncertainty of the inventory excluding LULUCF is estimated at ±2.82 per cent (this figure was 2.86 per cent in the previous submission) and the uncertainty of the trend is estimated at ±1.83 per cent (this figure was 1.77 per cent in the previous submission). The overall uncertainty including LULUCF is estimated at ±2.91 per cent and the trend uncertainty is estimated at ±1.79 per cent. Uncertainty estimates including LULUCF were not included in the previous submission. The ERT noted that the uncertainty ranges reported are very low but this is explained by the large share of CO_2 emissions from the energy sector. The uncertainty analysis is used to prioritize improvements in the inventory.

31. The ERT noted that Luxembourg uses the uncertainty of EFs sourced from Austria and IPCC default values (e.g. for the agriculture sector). The ERT encourages Luxembourg to include actual uncertainty estimates from the survey and census data for AD and to try to use more country-specific uncertainty values for the EFs and parameters used in the estimates.

Recalculations and time-series consistency

32. Luxembourg has undertaken numerous recalculations and improvements across all sectors since the last submission aiming at improving the completeness of the inventory (e.g. the estimation of N_2O emissions from industrial wastewater handling), incorporating new AD (e.g. in the energy sector) and introducing methodological changes (e.g. in the LULUCF sector). Recalculations have been performed and reported in accordance with the UNFCCC reporting guidelines and IPCC good practice guidance. The rationale for these recalculations is provided in the NIR and in CRF table 8(b) and most recalculations have been undertaken to address recommendations made during the previous review. The overall impact of the recalculations was a decrease of 0.52 per cent in total GHG emissions in the base year and a decrease of 0.14 per cent in 2006. The impact on the trend of the emissions for the period 1990–2006 was a decrease of 0.14 per cent. At the category level, the recalculations are significant; for example, emissions from wastewater handling increased by 125.6 per cent for 1990 and 99.2 per cent for 2006 and emissions from metal production increased by 23.1 per cent in 2006. The recalculations are generally documented transparently, except for some gaps in the reporting in the

agriculture and energy sectors (see paras. 46 and 79 below). The ERT commends Luxembourg for these efforts and considers that the recalculations improve the accuracy of the inventory.

Verification and quality assurance/quality control approaches

33. The ERT concludes that, based on the information provided in the NIR, the outlines for a new quality management system and quality plan are in accordance with the guidelines on national systems (decision 19/CMP.1) and the IPCC good practice guidance. The ERT also reviewed the quality plan and inventory improvement plan provided during the review. The quality plan contains details of the responsibilities for quality management and the dates of implemented check and data comparisons. The ERT recommends that Luxembourg include more detailed information in the sectoral chapters of the NIR on the QA/QC checks applied for each sector during inventory preparation.

Transparency

34. The ERT concludes that Luxembourg's inventory is generally transparent and noted that the transparency and consistency of the 2009 submission has been improved by including a description of the inventory preparation process and improving methodological descriptions (e.g. revising the documentation for the waste sector). The ERT commends Luxembourg for the wide use of the documentation boxes in the CRF tables and the use of CRF table 8(b) (recalculations) and CRF table 9 (completeness) to improve the transparency of the reported inventory information.

35. The ERT noted that the structure of the NIR does not follow precisely the structure recommended in the UNFCCC reporting guidelines and encourages Luxembourg to include in its next annual submission any annexes that are currently missing from the NIR. The ERT recommends that Luxembourg include in the NIR the additional information requested by the ERT during the review and that the Party provide more justification for the recalculations undertaken in the energy and agriculture sectors.

4. Inventory management

36. Luxembourg has a centralized data management and archiving system (based on CIRCA, the data exchange and storage system of the European Union), which includes the archiving of disaggregated EFs and AD and documentation on how these EFs and AD have been generated and aggregated for the inclusion in the inventory. The archived information also includes internal documentation on QA/QC procedures, external and internal reviews, and documentation on annual key categories and key category identification and planned inventory improvements. The archive is managed by the Environment Agency. In response to recommendations made during the previous review, Luxembourg included in the electronic archiving system inventory submissions from 1990 to the present and is using a centralized data storage and processing system for the preparation of submissions.

F. Follow-up to previous reviews

37. Luxembourg has implemented the following improvements identified during the previous review:

(a) Improved data exchange between governmental and non-governmental bodies via a centralized data management and archiving system;

(b) Improvements in the mandatory reporting of emissions data from facilities are being made gradually while renewing permits (in collaboration with the Operating Permits Division of the Environment Agency);

(c) A list of improvements with an implementation schedule has been officially accepted by an inventory decision-making body at the Environment Agency;

(d) Improved transparency and consistency in the NIR following the addition of a description of the inventory preparation process and the revision of documentation on the waste sector;

(e) Recalculation of estimates for the LULUCF sector;

(f) Improved completeness of the inventory by estimating most of the previously missing categories;

(g) Implementation of a new inventory management tool is underway. The system includes all the necessary elements of a quality management system, including a centralized archive.

38. Some of the recommendations had not been implemented at the time of the review, but were included in the improvements planned for the 2010 submission. These improvements include: developing a tier 2 key category analysis, updating the uncertainty analysis, establishing criteria for prioritizing activities in the QA/QC plan, and internalizing procedures that are currently outsourced (uncertainty assessment and the QA/QC system). Luxembourg has not addressed all the sector-specific recommendations made during previous reviews (see sector chapters of this report). The ERT recommends that Luxembourg address the remaining recommendations from previous reviews or provide a justification in chapter 10 in the NIR (annotated outline of the NIR) as to why these recommendations have not been implemented.

G. Areas for further improvement

1. Identified by the Party

39. The 2009 NIR identifies several areas for improvement and planned improvements are listed at the category level. Regarding cross-cutting issues, Luxembourg indicated that it is mainly working to reduce uncertainty by improving the methods applied in line with the IPCC good practice guidance and trying to use country-specific EFs and parameters wherever possible. The Party also indicated that it is working to improve the completeness and time-series consistency of emission estimates.

2. Identified by the expert review team

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

(a) Addressing the recommendations made by previous reviews or providing a justification in chapter 10 in the NIR as to why the recommendations have not been implemented;

(b) Adhering to the revised timeline for inventory submission and submitting the next inventory by 15 April 2010 or within six weeks of that date as required by decision 15/CMP.1;

(c) Proceeding with the implementation of the new QA/QC management system;

(d) Providing all annexes to the NIR in accordance with the UNFCCC reporting guidelines;

(e) Improving transparency by including references to supporting materials and data used to calculate emission estimates and including additional information to support the rationale and data used in recalculations;

(f) Increasing efforts to collect country-specific data rather than using data or studies from neighbouring countries, when these data could be obtained with reasonable effort and at a reasonable cost. In cases when data from other countries are used, the ERT recommends that the Party justify how these data or studies are appropriate to Luxembourg;

(g) Including all categories in its uncertainty analysis and consider the possibility of developing a tier 2 uncertainty analysis for key categories;

(h) Including information on the commitment period reserve, changes in the national system and national registry, as well as for the other elements under Article 7, paragraph 1, of the Kyoto Protocol in its next submission;

(i) Ensuring that sufficient resources are available in the national registry to allow the Party to report in a timely manner on Kyoto Protocol units, Kyoto Protocol transactions and its national registry;

(j) Enhancing the user interface of its national registry by providing all the public information referred to in paragraphs 46 and 47 of the annex to decision 13/CMP.1 and report on any changes to that public information in its next annual submission.

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

II. Energy

A. Sector overview

42. The energy sector is the main sector in the GHG inventory of Luxembourg. In 2007, emissions from the energy sector amounted to 11,345.27 CO_2 eq, or 87.9 per cent of total GHG emissions. Since 1990, emissions have increased by 6.6 per cent. The major increase occurred in the transport category, where CO_2 emissions have increased by 143.2 per cent and N_2O emissions have increased by 173.4 per cent since the base year. The driver for this increase was a rise in diesel oil consumption in road transportation. Within the sector, 58.9 per cent of the emissions were from transport, followed by 16.0 per cent from manufacturing industries and construction, 12.5 per cent from other sectors and 12.0 per cent from energy industries. Oil and natural gas (fugitive emissions) accounted for 0.4 per cent and the category other (fuel combustion) accounted for 0.1 per cent.

43. Reporting of the energy sector is generally complete, except for CO_2 and CH_4 emissions from distribution of oil products, which are reported as not estimated ("NE"). The ERT reiterates the recommendation from the previous review that Luxembourg explore the possibility of reporting fugitive CO_2 and CH_4 emissions from the distribution of oil products in its next annual submission.

44. The information provided in the NIR is generally transparent and sufficiently detailed. The ERT commends Luxembourg for documenting AD and EFs and their references in the NIR. The ERT reiterates the recommendation made during the previous review that Luxembourg improve the explanations supporting the use of default EFs in its next submission and particularly when values from the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the 2006 IPCC Guidelines) are used.

45. Luxembourg undertook a number of recalculations in the energy sector that affected all categories and years. The ERT concluded that the recalculations improved the overall completeness and time-series consistency of the inventory. Many of the recalculations addressed recommendations made

during the previous review, such as (i) reallocation of biofuel from fuel combustion to the memo items; (ii) use of the COPERT IV model instead of the COPERT III model; (iii) reallocation of emissions from off-road vehicles and other machineries, (iv) application of annual net calorific values (NCVs) across the time series for natural gas; (v) reporting of CO_2 emissions from lignite use in the asphalt industry; and (vi) reallocation of emissions from the subcategory other (manufacturing industries and construction) to the appropriate IPCC subcategories. The ERT commends Luxembourg for addressing these recommendations. Other recalculations were carried out following the availability of updated AD derived from energy balances.

46. The recalculations resulted in a decrease in emission estimates for the energy sector by 71.33 Gg CO_2 eq (0.6 per cent of sectoral emissions) in 2006 and a decrease in emission estimates by 87.44 CO_2 eq (0.8 per cent of sectoral emissions) in the base year. In particular, N_2O emissions from transport decreased by 62.4 per cent in 2006, emissions from the category other (1.A.5) increased by 12 per cent in 2006 and emissions from oil and natural gas decreased by 33.3 per cent in 1990 and 12.9 per cent in 2006. The ERT noted that Luxembourg included information on the recalculations conducted for each category in the NIR; however, the ERT considered that the information in the NIR did not sufficiently justify the recalculations. The ERT strongly recommends that Luxembourg include in its next inventory submission, a detailed explanation and summary of the revised AD and EFs to justify recalculations.

47. Luxembourg uses in the inventory energy statistics from STATEC or data obtained directly from plant operators. Information from the European Union emissions trading scheme (EU ETS) is used to cross-check data as part of Luxembourg's QA/QC procedures. In previous reviews it has been noted that there are a few discrepancies between the different data sources in Luxembourg. In response to a question raised by the ERT, Luxembourg informed the ERT that the confidentiality of plant data limits the amount of information that can be included in the NIR about these discrepancies. The ERT acknowledges the constraints regarding the reporting of confidential data and encourages Luxembourg to report in its next submission a summary of this information in order to support the review process.

48. Luxembourg uses a combination of country-specific and default IPCC NCVs and EFs. The ERT commends Luxembourg for its efforts to develop country-specific NCVs and EFs for some of the fuels and to upgrade the estimates to a tier 2 methodology. However, the ERT noted that Luxembourg still uses default NCVs and EFs in some cases for the key categories and key fuels. Luxembourg states in the NIR that it plans to investigate whether it would be feasible to obtain country-specific NCVs and EFs for gas oil, diesel oil and gasoline. The ERT reiterates the recommendation made during the previous review that Luxembourg allocate resources to allow it to develop national NCVs and EFs for key fuels in line with the IPCC good practice guidance.

49. Following a recommendation made by the previous ERT, Luxembourg applied an annual NCV for natural gas in the 2009 submission. In response to a question from the present ERT, Luxembourg explained that it intends to include in the 2010 submission a table containing all of the NCVs used in the inventory as well as a summary of the energy balance. The ERT supports this intention.

50. Luxembourg provided information in its NIR on several planned improvements in the energy sector, including revising the N_2O EF for municipal solid waste, updating the country-specific parameters used in the COPERT IV model, refining the method used to split emissions between domestic and international aviation gasoline, reallocating emissions from pleasure boats that use gasoline from road transportation to navigation, refining the method used to split fuel consumption between the commercial/institutional sector, the residential sector and the agriculture/forestry/fisheries sector, and selecting EFs from neighbouring countries to estimate emissions from distribution of oil products. The ERT recommends that Luxembourg continue with the planned improvements and report on the improvements and results in its next annual submission.

B. Reference and sectoral approaches

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

51. CO_2 emissions from fuel combustion were calculated using the reference approach and the sectoral approach. For the year 2007, there is a difference between the two approaches of –5.98 per cent in the CO_2 emission estimates. The difference between the reference approach and sectoral approach indicates that the sectoral approach provides systematically higher CO_2 emission estimates for almost all years in the time series, which could be as a result of double counting of emissions in the sectoral approach. Luxembourg provided a list of possible reasons for the differences. The ERT recommends that Luxembourg provide a quantitative estimate of each separate discrepancy. Furthermore, the ERT noted that natural gas consumption is about 10 per cent higher in the sectoral approach than the reference approach. Luxembourg explained that this was due to the use of different NCVs. The ERT recommends that Luxembourg update the reference approach using the latest available data and that it apply the same NCVs and EFs in the reference approach and the sectoral approach.

52. Luxembourg estimates separately emissions from biomass and emissions from fossil fuels in the sectoral approach, whereas in the reference approach, all emissions from municipal solid waste and all blended diesel and gasoline are accounted for as fossil fuels. The ERT recommends that Luxembourg separate biogenic matter from fossil fuels in the reference approach.

53. There are a number of unresolved discrepancies between data in the CRF tables and data reported to the International Energy Agency (IEA). For example, in 1997 the amount of liquefied petroleum gas imports and exports reported in the CRF table 1.A(b) (598 TJ and 46 TJ, respectively) varies significantly from those reported to IEA (1,104 TJ and 230 TJ, respectively) and carbon stock changes in liquid fossil fuels were reported with opposite negative and positive signs in the CRF table 1.A(b) compared to what was reported to IEA in 2007. The ERT recommends that Luxembourg improve QC procedures for data reported to different organizations and that it investigate and explain any differences between data in its next annual submission.

2. International bunker fuels

54. Luxembourg considers that all kerosene and 10 per cent of the aviation gasoline consumed are used for international aviation and 20 per cent of the navigation emissions are considered as marine bunkers. Emissions from the use of jet kerosene in international aviation were recalculated applying a tier 2 methodology for the entire time series. The ERT agrees with the recalculation of emissions from international bunker fuels, but recommends that Luxembourg include references for the expert judgement and assumptions used in the allocation of fuel in its next annual submission.

55. Small amounts of marine bunker gasoline are reported under domestic road transportation. In response to a question from the ERT, Luxembourg informed the ERT that this is due to confidentiality issues, because the AD reported are from one operator. The ERT noted the small size of this source but reiterates the recommendation made during the previous review that Luxembourg make an effort to, at least intermittently, collect the necessary data from the operator and allocate relevant emissions from gasoline from road transportation to marine bunkers and that it report the AD in table 1.C as confidential ("C").

3. Feedstocks and non-energy use of fuels

56. Feedstocks and non-energy use of fuels are reported in the CRF tables, but there is insufficient information on how feedstocks and non-energy use of fuels are accounted for in the NIR. The ERT recommends that Luxembourg include supporting information on feedstocks and non-energy use of fuels in its next submission.

57. In the reference approach and in CRF table 1.A(d) there is no reference to the non-energy use of fuels in iron and steel production that are reported under industrial processes (e.g. anthracite). The ERT recommends that Luxembourg estimate the amount of carbon stored in products and that it report this information in accordance with the Revised 1996 IPCC Guidelines in CRF tables 1.A(b) and 1.A(d). The ERT noted that reporting of feedstocks and non-energy use of fuels would reduce the differences between the sectoral and reference approach.

58. Luxembourg outlined a planned improvement to allocate 50 per cent of the carbon in lubricants not stored in products to road transportation. The ERT recommends that Luxembourg provide transparent information on the estimated emissions from lubricants in its next submission.

C. Key categories

1. Stationary combustion: solid fuels, liquid, gaseous fuels – CO_2

59. The ERT noted that the CO_2 implied emission factor (IEF) for solid fuels for public electricity and heat production of 257.18 t/TJ for the period 1990–1997 is significantly higher than that reported by other Parties (76.52–151.28 t/TJ). In response to a question raised by the ERT, Luxembourg explained the high IEF is due to use of blast furnace gas with a high EF in one plant operated by an iron and steel industry. The ERT noted that the allocation of emissions from this plant under the category public electricity and heat production is not in accordance with the Revised IPCC 1996 Guidelines if these emissions are derived from by-products in the iron and steel plant, and thus considered as auto-producers. The ERT recommends that Luxembourg reallocate emissions from any iron and steel auto-producers in public electricity and heat production to the iron and steel category in its next submission.

60. Following a recommendation made during the previous review, several recalculations were undertaken in the category manufacturing industries and construction. The recalculations included: making changes in AD; applying annual country-specific NCVs and EFs for natural gas; using country-specific EFs for blast furnace gas; and reallocating emissions from the category other (manufacturing industries and construction) to the relevant subcategories. The ERT commends Luxembourg for the recalculations.

61. The ERT noticed a sharp decrease in gaseous fuel consumption in the subcategory chemicals between 2006 and 2007 (–15.8 per cent). Luxembourg explained that the decrease was caused by a decrease in the consumption of natural gas by a gas turbine of one of the auto-producers in the chemicals industry. In response to the draft report, Luxembourg provided further explanations on the fluctuations. The ERT encourages Luxembourg to include this information in its next submission.

62. Luxembourg allocates emissions from off-road vehicles and other machinery used within manufacturing industries and construction to the subcategories within manufacturing industries and construction and has not reported these emissions under a separate subcategory for off-road vehicles and other machinery. The ERT recommends that Luxembourg reallocate emissions from off-road vehicles and other machinery to the category other (manufacturing industries and construction) in line with the Revised 1996 IPCC Guidelines.

2. Road transportation: liquid fuels – N_2O

63. Following a recommendation made during the previous review, Luxembourg applied the COPERT IV model to estimate emissions from road transportation. Luxembourg is in the process of developing country-specific EFs for this key category. The ERT noticed that the N_2O IEF for diesel oil increased by 134.6 per cent between 1990 and 2007 with significant variation across the years; for example, the N_2O IEF increased by 28.3 per cent in the period 2002–2003, 15.9 per cent in the period 2003–2004, 12.6 per cent in the period 2004–2005 and 14.9 per cent in the period 2006–2007.

In response to a question raised during the review, Luxembourg informed the ERT that this increase in the IEF may be due to increased use of diesel and biodiesel in commuters, vehicles in transit through the country and in the domestic fleet. The ERT recommends that Luxembourg include more supporting information on the underlying parameters used and that Luxembourg provide contextual information on its national circumstances affecting the IEF in its next submission.

64. Luxembourg applies the country-specific EFs for domestic vehicles also to the vehicles commuting to and in transit through the country, which contributes for the major part of the emissions in road transportation. The ERT expressed its concern that this assumption may lead to an over or under-estimation of emissions and recommends that Luxembourg assess the assumption and if possible include information in its next submission on the accuracy of the assumptions used in the calculations.

III. Industrial processes and solvent and other product use

A. Sector overview

65. In 2007, emissions from the industrial processes sector amounted to 783.66 Gg CO_2 eq, or 6.1 per cent of total GHG emissions, and emissions from the solvent and other product use sector amounted to 18.81 Gg CO_2 eq, or 0.1 per cent of total GHG emissions. Since 1990, emissions have decreased by 51.4 per cent in the industrial processes sector and by 21.3 per cent in the solvent and other product use sector. The key driver for the fall in emissions is the decrease of 79.3 per cent in emissions from metal production following a shift in the iron and steel industry from the use of basic oxygen furnaces to electric arc furnaces. However, emissions of F-gases have increased by 431.6 per cent in the same period. Within the industrial processes sector, 62.4 per cent of emissions were from mineral products, followed by 26.0 per cent from metal production. Consumption of halocarbons and SF_6 accounted for 11.6 per cent of the emissions from this sector.

66. The inventory of Luxembourg is generally complete, except some minor categories and F-gases have not been estimated, as indicated by the previous ERT. Actual emissions of HFCs from fire extinguishers, solvents, other applications of ODS substitutes and semiconductor manufacture are reported as "NE". Potential emissions of HFCs and SF_6 have not been estimated for several subcategories. The ERT reiterates the recommendation made during the previous review that Luxembourg estimate these emissions.

67. The transparency of the inventory has improved since the previous submission. For example, in response to a recommendation made by the previous ERT, Luxembourg has improved the methodological descriptions for the solvent and other product use sector, which has enhanced transparency.

68. The previous ERT recommended that Luxembourg investigate whether soda ash has uses in the country other than in glass production. In response to a question raised during the review, Luxembourg informed the ERT that there are no other uses. The ERT recommends that Luxembourg include this information in its next annual submission.

69. Luxembourg recalculated emissions from iron and steel production to include for the first time emissions from steel production using the PRIMUS process whereby steelmaking dust is transformed into iron using a combination of an advanced multiple-heath furnace and a specially designed electric arc furnace. The recalculation affected the emissions data for the years 2005–2006. As a result, emission estimates for this category for 2005 and 2006 increased by 28.4 and 23.1 per cent, respectively. Total GHG emission estimates for the industrial processes sector are 5.2 per cent higher for 2006 than in the previous inventory submission.

B. Key categories

1. Cement production – CO_2

70. Luxembourg applies a tier 2 methodology based on the calcium oxide (CaO) content of clinker. This is in line with the IPCC good practice guidance. Data on CaO content are provided once every five years by the only cement production plant in the country and are interpolated for the other years by the Environment Agency. During the previous review, the ERT recommended that Luxembourg collect and use annual data on the CaO content of clinker. The ERT reiterates this recommendation. The previous ERT also recommended that Luxembourg find out if dolomite is used as a raw material in cement production and that Luxembourg modify the methodology used, if necessary. Luxembourg intends to address these recommendations as part of its planned inventory improvements. The ERT encourages Luxembourg to report on the results in its next annual submission.

2. Iron and steel production – CO_2

71. Luxembourg adopted a tier 2 methodology for this category in line with the IPCC good practice guidance, taking into account all carbon-containing materials. The ERT noted that Luxembourg did not double count emissions from iron and steel production and emissions reported under the energy sector. Emissions from blast furnace gas consumption are reported under the energy sector, whereas emissions from anthracite, carbon, other fuels and electrodes used as reducing agents are reported under the industrial processes sector under the category iron and steel production. Luxembourg recalculated emission estimates from the category iron and steel production using the PRIMUS steel production that started in 2005 and was not included in the previous inventories.

3. Consumption of halocarbons and SF_6 – HFCs, PFCs and SF_6

72. Luxembourg calculates its emission estimates for F-gases based on a report produced in 1999, which includes projections up to 2010. During the previous review, the ERT recommended that Luxembourg recalculate its emission estimates for the time series based on actual values and not projections. In response to a question raised during the review, Luxembourg explained that a new study on F-gases had been commissioned and a first draft of the report had been received by the inventory team. The ERT welcomes this new study and recommends that Luxembourg recalculate its emission estimates and report them and their documentation in the next annual submission.

73. The NIR states that HFC emissions from stationary refrigeration and the mobile air conditioning are estimated using per capita emission estimates from Germany and proportioned to the population in Luxembourg. In response to a question raised during the review, Luxembourg informed the ERT that some AD on refrigeration equipment are not available. The ERT reiterates the recommendation made by the previous ERT that Luxembourg increase its efforts to collect country-specific data when these data are available or can be obtained with reasonable effort rather than rely on data or studies carried out in neighbouring countries.

C. Non-key categories

Solvent and other product use – CO_2 and N_2O

74. The ERT noted the efforts made by Luxemburg regarding the reporting in the inventory of CO_2 emissions from use of solvents along with the reporting of emissions of non-methane volatile organic compounds. The emissions from solvent and other product use have decreased by 21.3 per cent between 1990 and 2007. The CO_2 emissions from solvent use have been recalculated following the availability of new AD and changes in the methodologies and EFs used. The recalculated CO_2 emission estimates are 61.7 per cent higher in the base year and 30.0 per cent higher in 2006 than those reported in the previous

inventory submission. The estimates are based partly on data from Luxembourg (e.g. for solvent production and solvent balance) and partly on data from Austria (e.g. for solvent use per employee of the relevant branches) applied to the conditions in Luxembourg. The ERT recommends that Luxembourg try to obtain more country-specific data in order to establish the emission level.

75. N_2O emissions from anaesthesia are estimated by combining emissions data from Germany scaled to the relative population in Luxembourg. The previous ERT recommended that Luxembourg examine the possibility of acquiring data on the consumption of anaesthesia products in Luxembourg. In the NIR, Luxembourg reports that it plans to investigate the possibility of acquiring data on the consumption of anaesthesia products in Luxembourg. The ERT encourages this planned improvement.

IV. Agriculture

A. Sector overview

76. In 2007, emissions from the agriculture sector amounted to 710.64 Gg CO_2 eq, or 5.5 per cent of total GHG emissions. Since the base year, emissions have decreased by 8.3 per cent. The key drivers for the fall in emissions are reductions in the number of the cattle population and a decline in synthetic fertilizer application. The main decrease in emissions was in the category agricultural soils. Within the sector, 47.8 per cent of the emissions were from agricultural soils, followed by 34.7 per cent from enteric fermentation and 17.4 per cent from manure management. Rice cultivation, field burning of agricultural residues and prescribed burning of savannahs do not occur in Luxembourg.

77. The inventory for 2007 contains estimates of all gases and from all categories in the agriculture sector. The ERT noted that detailed information is available on cattle in Luxembourg due to a register of cattle created following the outbreak of bovine spongiform encephalopathy and monitoring for the purposes of agricultural subsidies. The ERT reiterates the recommendation made by the previous review that Luxembourg provide a complete time series for some minor species, such as goats and rabbits, that were not included in the annual livestock census prior to 1997. The ERT noted that Luxembourg has already identified this as a planned improvement. Due to the small population of these minor species and the low anticipated level of emissions, the ERT considers that if actual population data cannot be obtained with reasonable effort, then an extrapolation of a driver or an expert estimate would be appropriate.

78. Luxembourg has made significant improvements with regard to the transparency of the agriculture section of the inventory since the previous submission. However, the ERT noted that there is still room for enhancing the transparency of reporting. The ERT reiterates the recommendation made during the previous review that Luxembourg increase the transparency of its reporting, especially regarding the parameters used for crop residues and N-fixing crops. The ERT noted that the provision of calculation spreadsheets for this sector, which are referenced in the NIR and were provided by Luxembourg to the ERT, significantly increase the transparency of the inventory. The ERT recommends Luxembourg to include additional information on the parameters, units, parameter description and source (columns A–E from the spreadsheets) as tables in the NIR in its next annual submission.

79. In the inventory, recalculations undertaken in the agriculture sector affected emission estimates for the following categories: CH_4 and N_2O emissions from manure management and N_2O emissions from agricultural soils. The recalculations were carried out following the availability of revised parameters and AD and the reallocation of emissions between N-fixing and non-N fixing crops. The impact of the recalculations resulted in an increase in emissions in 2006 by 0.1 per cent (0.68 Gg CO_2) and a decrease in emissions in 1990 by 0.1 per cent (0.68 Gg CO_2 eq). There were no significant changes made to methodologies used in the 2008 submission. The ERT found that the NIR lacked sufficient information

to support the recalculations and recommend that Luxembourg include detailed supporting information for each recalculation in future annual submissions.

B. Key categories

1. Enteric fermentation – CH_4

80. The enteric fermentation of cattle accounts for 97.4 per cent of CH_4 emissions from this category. In accordance with the IPCC good practice guidance, Luxembourg uses a tier 2 method to estimate emissions from cattle and a tier 1 method to estimate emissions from all other species. There is a complete time series of milk production and cattle live weights from the Agriculture Economic Service (Service d'Economie Rurale (SER)). The ERT noted that the NIR states that the cattle live weight data has not been officially published by the SER.

81. The parameter for net energy for pregnancy (NEp) in cattle was updated in the 2009 submission. The update changed the gross energy intake and resulted in a recalculation of CH_4 emissions from enteric fermentation and manure management. The recalculation resulted in an increase in emissions from enteric fermentation from cattle in 2006 by 0.05 per cent, or 0.1 Gg CO_2 eq. The NIR stated that that the net energy for pregnancy parameter was updated on the basis of expert opinion from the SER. The NIR does not contain any information to support the expert opinion. The ERT recommends that Luxembourg include information in the NIR to support any changes made to parameters. The ERT noted the improvement in the net energy for pregnancy parameter for cattle and reiterates the recommendation made during the previous review that Luxembourg identify and improve the input parameters used that have the greatest effect on country-specific EFs for key livestock species.

2. Direct soil emissions – N_2O

82. Direct soil emissions comprise 49.0 per cent of emissions from agricultural soils. Within the category, 46.2 per cent of emissions are from consumption of synthetic fertilizer. The NIR only briefly describes how the AD for fertilizer consumption are derived. For example, the NIR states that the AD for synthetic fertilizer consumption are derived from a N balance of 800 farms that is scaled up to the agricultural area of Luxembourg. No detailed information on the N balance or the calculation of AD is provided in the NIR. The ERT recommends that Luxembourg include a thorough description of the method used for calculating synthetic fertilizer consumption, including a description or reference to the N balance in future annual submissions.

83. The following three subcategories were recalculated in this category: N-fixing crops, crop residue (following the availability of new AD and the reallocation of N-fixing and non-N fixing crops) and the application of sewage sludge to soils following the revision of AD. The impact of the recalculations was an increase in the estimate of direct soil emissions by 0.06 per cent (0.1 Gg CO_2 eq) in 2006. The revision of AD for sewage sludge application resulted in an increase in the emission estimate by 13.1 per cent (0.2 Gg CO_2 eq) in 2006. The ERT noted that the data used to calculate emissions from sewage sludge application in 2006 and 2007 were provisional data obtained from the Ministry for the Environment. It was not clear from the information contained in the NIR what processes Luxembourg had in place to obtain sewage sludge data for future years. The ERT recommends that Luxembourg include an explanation for this in its next annual submission.

84. The previous ERT recommended removing pasture and beet from N-fixing crops. The NIR stated that a reallocation had occurred but in response to a question from the ERT, Luxembourg stated that the reallocation was not to remove pasture and beet from N-fixing crops. The ERT concluded that the amount of information included in NIR to support the recalculations was not sufficient. The ERT recommends that Luxembourg include further information in the NIR to support the new AD and reallocation of emission estimates and reiterates the recommendation made during the previous review

that Luxembourg remove pasture and beet from the subcategory N-fixing crops. In response to the draft report, Luxembourg stated that it will remove pasture and beet from N-fixing crops in its next annual submission.

85. Luxembourg uses N excretion values from the SER prepared for the Council of European Communities directive on nitrates from agricultural sources (directive 91/676/EEC) and the Agro-environmental Indicators Database of the Organisation for Economic Co-operation and Development. While the excretion values are within 3 per cent of the tier 1 values for Western Europe, the NIR notes that these data are not published by the SER. The ERT considers that the NIR does not contain sufficient information on how the N_{ex} values are determined. In addition, the ERT noted that the value for non-dairy cattle of 68 kg N/head/year is less than the IPCC default value of 70 kg N/head/year. This may lead to an underestimation of emissions if the use of the country-specific value cannot be adequately justified. In response to the draft review report, Luxembourg provided further explanation on the N excretion values. The ERT recommends that Luxembourg include this explanation and additional information on how the excretion rates are determined to ensure the calculation is transparent.

3. Pasture, range and paddock – N_2O

86. Luxembourg uses the tier 1 method and the default EF of 0.02 kg N_2O-N/kg N excreted from the IPCC good practice guidance to estimate emissions from this category. The ERT encourages Luxembourg to assess whether the IPCC default value was the most appropriate value available for Luxembourg and whether country-specific values are available.

4. Indirect emissions – N_2O

87. The revised AD for sewage sludge production and spreading affected estimates of indirect emissions from agricultural soils. Emissions from N leaching and run-off accounted for 83.5 per cent of emissions in this category. Luxembourg uses an IPCC tier 1 method and an IPCC default EF for this category. According to the NIR, Luxembourg plans to review the N balance in order to improve the estimates for this subcategory. The ERT encourages Luxembourg to proceed with the review and report on progress made in its next annual submission.

C. Non-key categories

Manure management – CH_4

88. This category was recalculated due to the change in volatile solid production from an updated gross energy intake in the tier 2 modelling. The use of biogas combustion as an animal waste management system in Luxembourg increased from 1 per cent of animal waste management systems for cattle in 2000 to 5 per cent in 2006. The ERT welcomed the reporting of emissions from biogas installations in the inventory. The ERT noted that information on biogas combustion was provided in the energy sector as recommended during the previous review.

V. Land use, land-use change and forestry

A. Sector overview

89. In 2007, net removals from the LULUCF sector amounted to 390.78 Gg CO_2 eq. In the base year the LULUCF sector was a net source of 208.44 Gg CO_2 eq. The year 1990 and 1991 are the only years in which the sector was a source of emissions. During these years the source of emissions was windthrow in forests. Within the sector, forest land is the largest contributor to the sink in 2007, removing 396.47 Gg CO_2 eq. Cropland was a small source of emissions, contributing 6.46 Gg CO_2.

Grassland was a minor sink, removing 0.76 Gg CO_2 eq. Overall, the sector reduced total GHG emissions by 3.0 per cent.

90. Luxembourg has improved the inventory by including separate estimates for many of the categories and subcategories for all years. For the first time, Luxembourg supplied estimates of carbon stock change in living biomass and soils for the categories forest land, cropland and grassland. The recalculations were undertaken following the reallocation of estimates, the revision of AD and methodologies, and the availability of new country-specific and default parameters consistent with the IPCC good practice guidance for LULUCF. The ERT commends Luxembourg for the significant improvements in completeness in the LULUCF sector.

91. No estimates have been provided for carbon stock changes in the categories settlements and other land. Emissions from N fertilization of land converted to forest land are currently reported as "NE", but Luxembourg informed the ERT during the review that these emissions do not occur and that it intends to change the notation key used in the CRF tables to not occurring ("NO") in its next annual submission. Luxembourg does not estimate emissions from controlled burning of forest land remaining forest land or of forest land converted to cropland. The ERT encourages Luxembourg to explore ways of reporting emissions from controlled burning in future annual submissions. It further recommends that Luxembourg investigate options to report estimates for all mandatory categories currently reported as "NE", namely the conversion to and from settlements and of conversion of other land to forest land.

92. The ERT commends Luxembourg for improving the transparency of the inventory by including detailed information on methodologies, AD and EFs. Data sources for most calculations are clearly referenced in the NIR. However, some sources of information are not included. For example, there is only a partial reference in the NIR to the EFs used for forest land remaining forest land. In addition, in the category of forest land remaining forest land, some parameters provided and used to calculate an increment for specific ages for beech and oak did not include an explanation of what the calculations were based on or a reference to data sources. The ERT recommends that Luxembourg include a separate reference section in its next annual submission to enable the ERT to verify the applicability of the country-specific data used.

93. In addition, the ERT recommends that further revisions be made to the use of notation keys in the CRF tables. In the category other land, the notation key "NO" is used in several cells in the CRF tables, with a notation stating that background data are not available. The ERT noted that if background data are not available, the correct notation key to use would be "NE". The ERT recommends that Luxembourg report clearly whether the emissions or removals are not occurring or whether there is insufficient data to allow Luxembourg to report them.

94. The LULUCF sector was not included in the uncertainty analysis. The ERT recommends that the LULUCF sector be included in the uncertainty analysis and that QA/QC procedures for LULUCF be implemented and documented. In response to a question raised by the ERT, Luxembourg stated its intention to implement both of these recommendations in its next annual submission.

95. The ERT noted that the estimates for the LULUCF sector reported in the inventory are only provisional since Luxembourg plans to update its land use and land-use change data in order to include more detailed data based on aerial imagery. In addition, Luxembourg stated in the NIR that a comprehensive revision of AD and methodologies used to estimate emissions and removals in forest land is currently underway and that the first set of results would be available in 2009. The Party stated that the purpose of this revision is to support the reporting of emissions from afforestation, reforestation and deforestation under the Kyoto Protocol, as well as to provide updates on forest typologies in privately owned forest. In response to a question raised by the ERT, Luxembourg provided an update on the status

of the forest monitoring project.[9] The data obtained from this project will be used to make a comprehensive revision to estimates in the forest category. Due to delays in carrying out the study, the data were not available in time to be included in the submission, but the Party intends to use these data in the next inventory. The ERT welcomes this intention.

B. Key categories

Forest land remaining forest land – CO_2

96. Luxembourg stated that around 50 per cent of its forest area is privately owned and that information on carbon losses in private forests is not known. Luxembourg assumes that carbon losses in private forests are the same as in public forests. In the NIR, Luxembourg reports that it uses questionnaires filled in by forest owners as a data source for the section on forest in the inventory. In response to a question raised by the ERT, Luxembourg noted that this was misinformation and that the inventory is actually based only on aerial images and area measurements. The ERT recommends Luxembourg to clearly identify the data sources used for this category in the NIR and to report on how Luxembourg obtains information on carbon losses in private forests.

97. Luxembourg reported on land-use change to and from forest land as well as forest land remaining forest land. However, Luxembourg uses a broad definition of forest land for LULUCF reporting that includes land covered by bushes or rocks and land that is no longer used for agriculture. The ERT recommends that Luxembourg provide additional documentation on the difference between the definition of forest reported under the Convention and reporting activities under Article 3, paragraph 3, of the Kyoto Protocol.

98. Luxembourg reports estimates for living biomass and mineral soils but does not report emissions and/or removals for dead organic matter. The ERT welcomes the reporting of estimates for living biomass and mineral soils and recommends Luxembourg to improve its reporting by providing emission and/or removal estimates for dead organic matter.

C. Non-key categories

Cropland – CO_2

99. The ERT noted an inconsistency between the area of cropland reported in CRF table 5.B and the area reported in table 7–4 in the NIR for the years 1989, 2000 and 2007. The ERT recommends that Luxembourg correct this inconsistency in its next submission.

VI. Waste

A. Sector overview

100. In 2007, emissions from the waste sector amounted to 55.14 Gg CO_2 eq, or 0.4 per cent of total GHG emissions excluding LULUCF. Since the base year, emissions have decreased by 12.9 per cent. The key driver for this fall was the decrease in CH_4 emissions from solid waste disposal on land (47.8 per cent) and wastewater handling (39.7 per cent). The trend is explained by the lowering of emissions from a closed landfill and the reduction of CH_4 emissions from mechanical wastewater treatment plants. Within the sector, 45.3 per cent of the emissions were from solid waste disposal on land, followed by 28.1 per cent from wastewater handling and 26.6 per cent from composting. Luxembourg reports emissions from waste incineration under the energy sector in line with the IPCC

[9] Global Monitoring for Environment and Security (GMES) Service Element on Forest Monitoring Luxembourg.

good practice guidance. No key categories were identified in the waste sector in the key category analysis.

101. The ERT commends Luxembourg for its efforts to improve the completeness of the inventory by estimating N_2O emissions from industrial wastewater for the first time and including emission estimates from the SIDA[10] landfill that closed 1 January 1994. The ERT noted that only aerobic treatment of industrial wastewater occurs in the country but the notation key "NE" is used for CH_4 emissions in CRF table 6.B. The ERT recommends that the notation key "NE" be changed to "NO".

102. The information reported under the waste sector is generally transparent. The recommendation made during the previous review to include new data sources for AD and information on management practices were taken into account. The NIR includes detailed explanations of the AD, EFs and methods used and recalculations. However, the ERT recommends that Luxembourg provide more detailed information on AD (number of population not connected to wastewater treatment plants) and include additional information on the estimates of N_2O emissions from domestic and commercial wastewater in its next annual submission using the information and references provided to the ERT during the review.

103. Luxembourg recalculated emissions from the waste sector following the recommendations made during the previous review. The recalculations affected the estimates of CH_4 emissions from solid waste disposal on land, CH_4 emissions from wastewater handling and N_2O emissions from wastewater handling. All of the recalculations are described in the NIR in a transparent manner and are explained in CRF table 8(b). The ERT noted that recalculations resulted in an increase in the estimate of sectoral emissions of 27.9 per cent for 1990 and 23.4 per cent for 2006. The impact of the recalculations on total emissions was an increase of 0.05 per cent for 2006.

104. The ERT noted that Luxembourg uses extensive QA/QC checks in calculation spreadsheets for the waste sector during the preparation of the annual inventory; however, QA/QC procedures are only reported for wastewater handling. The ERT recommends that Luxembourg include in its next submission details of the QA/QC procedures for all waste categories.

105. Uncertainties are also only reported for wastewater handling. The ERT recommends that the Party provide uncertainty estimates for all reported categories. Luxembourg provided information in the NIR on the uncertainties of each parameter used in calculation of emissions in the NIR. However, the uncertainties of the emission estimates are not provided for the sector. The ERT recommends that Luxembourg report on the uncertainty of these emission estimates in its next annual submission.

B. Non-key categories

1. Solid waste disposal on land – CH_4

106. Luxembourg applies the IPCC tier 2 first order decay (FOD) method and IPCC default parameters to estimate CH_4 emissions from solid waste disposal on land. Luxembourg recalculated these emissions following the availability of new data as result of the inclusion of emissions from closed landfills; however, most of the recommendations made during the previous review had not been addressed. The ERT reiterates the recommendations made during the previous review that Luxembourg interpolate and extrapolate the data on waste composition in order to improve time-series consistency and that Luxembourg use historical data on waste disposal and waste composition starting with the year 1948. In response to a question raised by the ERT, Luxembourg informed the ERT of the results of a new study intended to help address these recommendations in the next annual submission.

[10] Landfill operated by the Association for the management of household and similar to household waste for the municipalities of the region Wiltz and other regions of the north of the country.

107. The half-life and/or the reaction constant k used in the FOD method calculation is reported as 0.5 in the NIR and 0.05 in CRF table 6.A (the additional information box). The ERT recommends Luxembourg to eliminate inconsistencies between the NIR and CRF in its next annual submission.

2. Wastewater handling – CH_4 and N_2O

108. Luxembourg estimated N_2O emissions from industrial wastewater for the first time in the 2009 submission. This improvement addresses a recommendation made during the previous review. The estimate uses plant-specific AD and parameters for the measured flow of wastewater and N concentration. The change is applied consistently for the entire time series.

109. N_2O emissions from human sewage are reported by Luxembourg as not applicable ("NA"); however, N_2O emissions from domestic and commercial wastewater (excluding human sewage) are estimated by Luxembourg for different population categories and different types of wastewater treatment plants in accordance with the 2006 IPCC Guidelines. The ERT recommends that Luxembourg verify its use of the notation key "NA" for N_2O emissions from human sewage and consider whether the notation key for the emissions from human sewage should be included elsewhere ("IE").

3. Waste incineration – CO_2, CH_4 and N_2O

110. Luxembourg estimates emissions of CO_2, CH_4 and N_2O from waste incineration. The 2009 NIR includes detailed explanations of the AD, EFs and methods used under the energy sector, public electricity and heat production category. This is in line with the IPCC good practice guidance. Luxembourg provided detailed information on country-specific NCVs for different types of waste incinerated.

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

A. Information on Kyoto Protocol units

1. Standard electronic format and reports from the national registry

111. Luxembourg reported information on its accounting of Kyoto Protocol units in the relevant 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 their comparison report.[11] 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.

112. The reported information on the total quantities and transactions of Kyoto Protocol units is complete and has been reported in accordance with decision 14/CMP.1 and section I.E of the annex to decision 15/CMP.1. 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 set out in paragraphs 88 (a)– (j) of the annex to decision 22/CMP.1.
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 discrepancies have been identified by the ITL and no non-replacement has occurred.

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

2. National registry

113. The ERT took note of 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 has adequate security, data safeguard and disaster recovery measures in place and its operational performance is adequate.

114. However, the SIAR identified a problem with regard to publicly available information relating to the registry referred to in paragraphs 46 and 47 of the annex to decision 13/CMP.1 and the timing of the submission of the information and requested answers and comments to the draft SIAR. The ERT reiterates the recommendation of the SIAR and strongly recommends that Luxembourg ensure sufficient resources are allocated to allow Luxembourg to report in a timely manner on Kyoto Protocol units, Kyoto Protocol transactions and changes in its national registry and to allow Luxembourg to report on any actions undertaken to address problems in its next annual submission. The ERT further recommends that Luxembourg enhance the user interface of its national registry by providing all the public information referred to in paragraphs 46 and 47 of the annex to decision 13/CMP.1, and report, in its next annual submission, on any changes to that public information.

3. Calculation of commitment period reserve

115. Luxembourg did not report its commitment period reserve in the 2009 annual submission. When commenting on the SIAR, Luxembourg reported its commitment period reserve to be 42,662,696 t CO_2 eq, calculated as 90 per cent of Luxembourg's assigned amount. The ERT agrees with this figure. The ERT recommends that Luxembourg include information on its commitment period reserve in its next annual submission.

B. Changes to the national system

116. Luxembourg reported no change in its national system since the previous annual submission. However, during the review, Luxembourg informed the ERT there had been a change of personnel in the national inventory compiler and a decision-making body had been established to oversee revisions to the national inventory and to prioritize inventory work. The ERT concluded that Luxembourg's national system continues to be in accordance with the requirements of national systems outlined in decision 19/CMP.1.

C. Changes to the national registry

117. Luxembourg did not include in its NIR information on changes in its national registry since the previous annual submission. When commenting on the SIAR, Luxembourg reported that no changes have occurred in the national registry in the reported year. The ERT concluded that Luxembourg's national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1, and continues to adhere to the technical standards for data exchange between registry systems in accordance with relevant CMP decisions. However, the ERT recommends that Luxembourg in its next annual submission report any change(s) in its national registry in accordance with section I.G of the annex to decision 15/CMP.1.

VIII. Conclusions and recommendations

118. Luxembourg submitted its CRF tables on 19 May 2009, the NIR on 28 May 2009 and an updated version of the NIR on 12 June 2009. Luxembourg indicated that 2009 annual submission is a voluntary submission under the Kyoto Protocol. 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 on its accounting of Kyoto Protocol units. The ERT strongly encourages Luxembourg to submit its next inventory by 15 April 2010 or within six weeks from that date as required by decision 15/CMP.1.

119. The annual submission was made in accordance with decision 15/CMP.1; however, Luxembourg submitted the inventory at the end of the six weeks "grace" period after the submission date of April 15. During the review, the ERT expressed its concern with regard to the timing of the inventory submission and considered the timing of the submission of the annual inventory as a potential problem in the national system with respect to its capacity to plan and prepare national annual inventories and supplementary information in a timely manner. In response to the questions raised by the ERT, Luxembourg provided information on improvements made to the inventory submission process, including a revised submission timeline. Luxembourg informed the ERT that the timeline would be followed for future submissions. The ERT was satisfied with the response.

120. The ERT concludes that the inventory submission of Luxembourg has been prepared and reported in accordance with the UNFCCC reporting guidelines, the Revised 1996 IPCC Guidelines, the IPCC good practice guidance and the IPCC good practice guidance for LULUCF with the exception of the omission of some categories, the misallocation of some emissions in the energy sector, the transparency of documentation for emission categories, documentation supporting recalculations in the energy and agriculture sectors and a complete uncertainty analysis for all categories. The inventory submission is in general complete in terms of geographical coverage, years, sectors and gases, and the Party has submitted a set of CRF tables for the years 1990–2007 (except for table 2(II).F) and an NIR. However, the ERT also concludes that the completeness of the inventory submission could be improved in terms of the coverage of categories, notably categories that have currently been reported as "NE" in the industrial processes sector and for which methodologies to estimate emissions are available in the Revised 1996 IPCC Guidelines and in the IPCC good practice guidance. The ERT noted Luxembourg's concerns regarding the resources required to obtain these data.

121. The ERT commends Luxembourg for the significant improvements made in the LULUCF sector since the previous submission and instances where Luxembourg has improved the transparency and completeness of the inventory (see paras. 37, 45, 67, 78, 90 and 101 above).

122. The submission on a voluntary basis of information required under Article 7, paragraph 1, of the Kyoto Protocol has been prepared and reported in accordance with decision 15/CMP.1. Luxembourg did not report on a voluntary basis information on activities under Article 3, paragraph 3, of the Kyoto Protocol, information on changes in the national system and changes in the national registry, the commitment period reserve, and information on minimization of adverse impacts under Article 3, paragraph 14, of the Kyoto Protocol.

123. Luxembourg reported information on its accounting of Kyoto Protocol units in accordance with section I.E of the annex to decision 15/CMP.1, and used the SEF tables as required by decision 14/CMP.1 and reported information on the national registry.

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

125. 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. However, problems were identified in the SIAR regarding public access to the registry and the timely submission of the information and requested answers and comments.

126. In the course of the review, the ERT formulated a number of recommendations[12] relating to the timeliness, the completeness and the transparency of the submission. The key cross-cutting recommendations are that Luxembourg:

(a) Address the recommendations made during previous reviews and provide a justification in chapter 10 of the NIR to explain why recommendations have not been implemented;

(b) Adhere to the revised timeline for the submission of the inventory and submit the next inventory by 15 April 2010 or within six weeks from that date as required by decision 15/CMP.1;

(c) Improve the completeness of the inventory by including emission estimates, especially for those categories for which methods to estimate emissions are available in either the Revised 1996 IPCC Guidelines or the IPCC good practice guidance;

(d) Proceed with the implementation of the new QA/QC management system;

(e) Include all annexes to the NIR in accordance with the UNFCCC reporting guidelines;

(f) Ensure that the use of methods, parameters, EFs and other information contained in the 2006 IPCC Guidelines is adequately justified and shown to be suitable for the national circumstances;

(g) Improve transparency by including references to supporting documents and data for categories and include additional information to support the rationale and data used for recalculations;

(h) Increase efforts to collect country-specific data rather than use data or studies from neighbouring countries when these data can be obtained with reasonable effort and cost. In cases where data from other countries are used, the ERT recommends that Luxembourg justify how these data or studies are appropriate to its national circumstances;

(i) Include all categories in the uncertainty analysis and consider the possibility of developing a tier 2 uncertainty analysis for key categories;

(j) Include information on the commitment period reserve, changes in the national system and national registry, as well as other elements under Article 7, paragraph 1, of the Kyoto Protocol in the next submission;

(k) Ensure that sufficient resources are available in the registry to allow Luxembourg to report in a timely manner on Kyoto Protocol units, Kyoto Protocol transactions and the national registry;

(l) Enhance the user interface of its national registry by providing all the public information referred to in paragraphs 46 and 47 of the annex to decision 13/CMP.1, and report in its next annual submission on any changes made to that public information.

IX. Questions of implementation

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

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

Annex I

Documents and information used during the review

A. Reference documents

Intergovernmental Panel on Climate Change. *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*. Available at <http://www.ipcc-nggip.iges.or.jp/public/gl/invs1.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 Luxembourg 2009. Available at <http://unfccc.int/resource/docs/2009/asr/lux.pdf>.

Synthesis and assessment report on the greenhouse gas inventories submitted in 2009. Available at <http://unfccc.int/resource/webdocs/sai/2009.pdf>.

FCCC/ARR/2008/LUX. Report of the individual review of the greenhouse gas inventory of Luxembourg submitted in 2007 and 2008. Available at <http://unfccc.int/resource/docs/2009/arr/lux.pdf>.

FCCC/IRR/2007/LUX. Report of the review of the initial report of Luxembourg. Available at <http://unfccc.int/resource/docs/2007/irr/lux.pdf>.

UNFCCC. Standard independent assessment report. Unpublished document.

B. Additional information provided by Luxembourg

Responses to questions during the review were received from Mr. Marc Schuman (Environment Agency of Luxembourg), including additional material on the methodology and assumptions used.

Tables of "Actions taken to implement recommendations or encouragements in the 2008 review report" responses from Luxembourg.

Letter from Mr. Marc Schuman (Environment Agency of Luxembourg) dated 24 September 2009 "Subject: Question regarding a potential problem in the NS of Luxembourg".

Excel Spreadsheet "MEV_AGRICULTURE_090123.xls" provided by Mr. Marc Schuman (Environment Agency of Luxembourg).

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
CaO	calcium oxide
CO_2	carbon dioxide
CO_2 eq	carbon dioxide equivalent
CRF	common reporting format
EF	emission factor
ERT	expert review team
F-gas	fluorinated gas
FOD	first order decay
Gg	gigagram
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
LULUCF	land use, land-use change and forestry
NA	not applicable
NE	not estimated
NCV	net calorific value
NO	not occurring
N_2O	nitrous oxide
NIR	national inventory report
ODS	ozone-depleting substances
PFCs	perfluorocarbons
QA/QC	quality assurance/quality control
SEF	standard electronic format
SF_6	sulphur hexafluoride
SIAR	standard independent assessment report
t	tonne
TJ	terajoule (1 TJ = 10^{12} joule)
UNFCCC	United Nations Framework Convention on Climate Change

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