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Report on the individual review of the annual submission of Luxembourg submitted in 2016*

Note by the expert review team

Summary

Each Party included in Annex I to the Convention must submit an annual greenhouse gas (GHG) inventory covering emissions and removals of GHG emissions for all years from the base year (or period) to two years before the inventory due date (decision 24/CP.19). Parties included in Annex I to the Convention that are Parties to the Kyoto Protocol are also required to report supplementary information required under Article 7, paragraph 1, of the Kyoto Protocol, with the inventory submission due under the Convention. This report presents the results of the individual inventory review of the 2016 annual submission of Luxembourg, conducted by an expert review team in accordance with the “Guidelines for review under Article 8 of the Kyoto Protocol”. The review took place from 26 September to 1 October 2016 in Bonn, Germany.

* In the symbol for this document, 2016 refers to the year in which the inventory was submitted, not to the year of publication.

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I. Introduction¹

1. This report covers the review of the 2016 annual submission of Luxembourg organized by the UNFCCC secretariat, in accordance with the “Guidelines for review under Article 8 of the Kyoto Protocol” (decision 22/CMP.1, as revised by decision 4/CMP.11) (hereinafter referred to as the Article 8 review guidelines). As indicated in the Article 8 review guidelines, this review process also encompasses the review under the Convention, as described in the “Guidelines for the technical review of information reported under the Convention related to greenhouse gas inventories, biennial reports and national communications by Parties included in Annex I to the Convention” (hereinafter referred to as the UNFCCC review guidelines) and particularly part III, “UNFCCC guidelines for the technical review of greenhouse gas inventories from Parties included in Annex I to the Convention”. The review took place from 26 September to 1 October 2016 in Bonn, Germany, and was coordinated by Mr. Simon Wear and Mr. Vitor Gois Ferreira (UNFCCC secretariat). Table 1 provides information on the composition of the expert review team (ERT) that conducted the review of Luxembourg.

Table 1

Composition of the expert review team that conducted the review of Luxembourg

<i>Area of expertise</i>	<i>Name</i>	<i>Party</i>
Generalist	Ms. Lea Kai Aboujaoude	Lebanon
	Mr. Lindsay Pratt	Canada
Energy	Mr. Sangay Dorji	Bhutan
	Ms. Inga Konstantinaviciute	Lithuania
	Ms. Laetitia Nicco	France
	Ms. Awassada Phongphiphat	Thailand
IPPU	Ms. Mausami Desai	United States of America
	Mr. David Kuntze	Germany
	Ms. Emilija Poposka	The former Yugoslav Republic of Macedonia
Agriculture	Ms. Agita Gancone	Latvia
	Ms. Sumaya Ahmed Zakieldein	Sudan
LULUCF	Ms. María Fernanda Alcobé	Argentina
	Ms. Yasna Rojas Ponce	Chile
	Mr. Nijavalli Ravindranath	India
Waste	Ms. Kaat Jaspers	Belgium
	Ms. Hlobisile P. Sikhosana-Shongwe	Swaziland

¹ At the time of publication of this report, Luxembourg had not yet submitted its instrument of ratification of the Doha Amendment, and the amendment had not yet entered into force. The implementation of the provisions of the Doha Amendment is therefore considered in this report in the context of decision 1/CMP.8, paragraph 6, pending the entry into force of the amendment.

<i>Area of expertise</i>	<i>Name</i>	<i>Party</i>
Lead reviewers	Ms. Lea Kai Aboujaoude Mr. David Kuntze	

Abbreviations: IPPU = industrial processes and product use, LULUCF = land use, land-use change and forestry.

2. This report contains findings based on the assessment by the ERT of the 2016 annual submission against the Article 8 review guidelines. The ERT has made recommendations to resolve those findings related to issues,² including issues related to problems.³ Other findings, and if applicable, the ERT’s encouragements to resolve them, are also included.

3. 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.

4. Annex I shows annual greenhouse gas emissions for Luxembourg, including totals excluding and including the land use, land-use change and forestry sector, indirect carbon dioxide emissions and emissions by gas and by sector. Annex I also contains background data related to emissions and removals from activities under Article 3, paragraph 3, forest management under Article 3, paragraph 4, and, additional activities under Article 3, paragraph 4, of the Kyoto Protocol, if elected, by gas, sector and activity for Luxembourg.

5. Information to be included in the compilation and accounting database can be found in annex II.

6. The ERT notes that Luxembourg’s 2015 annual submission was delayed, consistent with decision 6/CMP.9, paragraph 4. As a result, the review of the 2016 annual submission is being held in conjunction with the review of the 2015 annual submission, in accordance with decision 10/CMP.11, paragraph 1. To the extent that identical information is presented in both annual submissions, the ERT has reviewed this information only once, and, as appropriate, has replicated the findings below in both the 2015 and the 2016 annual review reports.

II. Summary and general assessment of the 2016 annual submission

7. Table 2 provides the ERT assessment of the annual submission with respect to the tasks undertaken during the review. Further information on the issues identified, as well as additional findings, may be found in tables 3 and 5 below.

² Issues are defined in decision 13/CP.20, annex, paragraph 81.

³ Problems are defined in decision 22/CMP.1, annex, paragraphs 68 and 69, as revised by decision 4/CMP.11.

Table 2
Summary of review results and general assessment of the inventory of Luxembourg

<i>Assessment</i>		<i>Issue or problem ID #(s) in tables 3 and/or 5^a</i>	
Dates of submission	Original submission: 15 April 2016 (NIR), 15 June 2016, Version 4 (CRF tables), 31 May 2016 (SEF tables) Revised submissions: 15 June 2016 (NIR), 16 November 2016, Version 5 (CRF tables), 22 January 2017, Version 6 (CRF tables) The values from the latest submission are used in this report		
Review format	Centralized		
Application of the requirements of the UNFCCC Annex I inventory reporting guidelines and Wetlands Supplement (if applicable)	Have any issues been identified in the following areas:		
	(a) Identification of key categories	Yes	G.8
	(b) Selection and use of methodologies and assumptions	Yes	W.3, W.4
	(c) Development and selection of emission factors	Yes	W.7
	(d) Collection and selection of activity data	Yes	E.10, E.12, E.18, I.9, L.4, W.13
	(e) Reporting of recalculations	No	
	(f) Reporting of a consistent time series	Yes	I.2, L.4
	(g) Reporting of uncertainties, including methodologies	Yes	G.3, I.8, L.3, L.13
	(h) QA/QC	QA/QC procedures were assessed in the context of the national system (see below)	
	(i) Missing categories/completeness ^b	Yes	W.6, W.9
	(j) Application of corrections to the inventory	No	
Significance threshold	For categories reported as insignificant, has the Party provided sufficient information showing that the likely level of emissions meets the criteria in paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines?	NA	
Description of trends	Did the ERT conclude that the description in the NIR of the trends for the different gases and sectors is reasonable?	Yes	
Supplementary information under the Kyoto Protocol	Have any issues been identified in the following areas:		
	1. National system:		
	(a) The overall organization of the national system, including the effectiveness and reliability of the institutional, procedural and legal arrangements	No	

Assessment			<i>Issue or problem ID #(s) in tables 3 and/or 5^a</i>
	(b) Performance of the national system functions	No	
2.	National registry:		
	(a) Overall functioning of the national registry	No	
	(b) Performance of the functions of the national registry and the technical standards for data exchange	No	
3.	ERUs, CERs, AAUs and RMUs and on information on discrepancies reported in accordance with decision 15/CMP.1, annex, chapter I.E, taking into consideration any findings or recommendations contained in the SIAR	No	
4.	Matters related to Article 3, paragraph 14, of the Kyoto Protocol, specifically problems related to the transparency, completeness or timeliness of reporting on the Party's activities related to the priority actions listed in decision 15/CMP.1, annex, paragraph 24, including any changes since the previous annual submission	No	
5.	LULUCF activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol:		
	(a) Reporting in accordance with the requirements of decision 2/CMP.8, annex II, paragraphs 1–5	No	
	(b) The Party has demonstrated methodological consistency between the reference level and reporting on forest management in accordance with decision 2/CMP.7, annex, paragraph 14	No	
	(c) The Party has reported information in accordance with decision 6/CMP.9	No	
	(d) Country-specific information has been reported to support provisions for natural disturbances, in accordance with decision 2/CMP.7, annex, paragraphs 33 and 34	No	
	(e) Other issues	No	
CPR	Was the CPR reported in accordance with the annex to decision 18/CP.7, the annex to decision 11/CMP.1 and decision 1/CMP.8, paragraph 18?	No	G.10
Adjustments	Has the ERT applied an adjustment under Article 5, paragraph 2, of the Kyoto Protocol?	No	
	The ERT accepts that the revised estimate submitted by Luxembourg in its 2016 submission can replace a previously applied adjustment in the compilation and accounting database	NA	
Response from the Party during	Has the Party provided the ERT with responses to the questions raised, including the data and information	Yes	

Assessment	Issue or problem ID #(s) in tables 3 and/or 5 ^a
the review necessary for the assessment of conformity with the UNFCCC Annex I inventory reporting guidelines and any further guidance adopted by the Conference of the Parties?	
Recommendation for an exceptional in-country review On the basis of the issues identified, does the ERT recommend that the next review be conducted as an in-country review?	No
Question of implementation Did the ERT list a question of implementation?	No

Abbreviations: AAU = assigned amount unit, CER = certified emission reduction unit, CPR = commitment period reserve, CRF = common reporting format, ERT = expert review team, ERU = emission reduction unit, LULUCF = land use, land-use change and forestry, NA = not applicable, NIR = national inventory report, QA/QC = quality assurance/quality control, RMU = removal unit, SEF = standard electronic format, SIAR = standard independent assessment report, UNFCCC Annex I inventory reporting guidelines = “Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual greenhouse gas inventories”, Wetlands Supplement = *2013 Supplement to the 2006 Intergovernmental Panel on Climate Change Guidelines for National Greenhouse Gas Inventories: Wetlands*.

^a The ERT identified additional issues in all sectors that are not specifically listed in table 2 but are included in table 3 and/or 5.

^b Missing categories, for which methods are provided in the *2006 Intergovernmental Panel on Climate Change Guidelines for National Greenhouse Gas Inventories*, may affect completeness and are listed in annex III to this document.

III. Status of implementation of issues and/or problems raised in the previous review report

8. Table 3 compiles all the recommendations made in the previous review report. Owing to the unique circumstances of the 2015 annual submission described in paragraph 6 above, the latest available review report was for the review of the 2014 annual submission, published on 12 May 2015. For each issue and/or problem, the ERT specified whether it believes the issue and/or problem has been resolved by the conclusion of the review of the 2016 annual submission and provided the rationale for its determination, taking into consideration the publication date of the previous review report and national circumstances.

Table 3
Status of implementation of issues and/or problems raised in the previous review report of Luxembourg

ID#	Issue and/or problem classification ^{a, b}	Recommendation made in previous review report ^f	ERT assessment and rationale
General			
G.1	QA/QC and verification (14, 2014) Adherence to UNFCCC Annex I inventory reporting guidelines	Address inconsistencies between the CRF tables and the NIR and improve the effectiveness of the QA/QC procedures	Resolved. Known inconsistencies were addressed, however, the CRF tables still contain errors
G.2	Uncertainty analysis (16, 2014) (16, 2013) Adherence to UNFCCC Annex I	Include all categories in its uncertainty analysis	Resolved. This has been implemented in the 2016 submission (cf. NIR, p. 88, section 1.7.1.3)

<i>ID#</i>	<i>Issue and/or problem classification^{a, b}</i>	<i>Recommendation made in previous review report^c</i>	<i>ERT assessment and rationale</i>
	inventory reporting guidelines		
G.3	Key category analysis (20, 2014) (18, 2013) Transparency*	Include more detailed information on its uncertainty analysis and key category analysis in the NIR	Addressing. This will be implemented in the next submission. The Party is currently doing a reassessment of the input uncertainties from all sectors
Energy			
E.1	1. General (energy sector) – (25, 2014) (34, 2012) Transparency*	Expand the recalculation sections within each category and subcategory to include recalculated values and the impact of the change, or include a cross reference to the section in the NIR where recalculations are explained	Addressing. Recalculation sections are included in the NIR but should be more detailed in terms of values and impact of change
E.2	1. General (energy sector) – (28, 2014) (23, 2013) (39, 2012) (47, 2011) Transparency*	Report and explain the differences between the reference and sectoral approaches, including the net calorific value used in the inventory and in the energy balance	Not resolved. See E.16 in table 5
E.3	1. General (energy sector) – liquid (29, 2014) (22/30, 2013) Transparency*	Continue the efforts to fix the problem related to the reporting of AD for emissions from lubricants as fuels in the reference approach	Resolved. AD and emissions from lubricants in the reference approach are corrected
E.4	1. General (energy sector) – (30, 2014) (22, 2013) Adherence to UNFCCC Annex I inventory reporting guidelines	Implement a planned improvement that fuels used in marine activities will be subtracted from the reference approach, where they are still included, enter all fuels used in the country in the reference approach estimates, and improve its QC procedures	Addressing. The Party has planned two improvements: (1) to move the fuel consumption of international marine activities from imports to international bunkers for gas/diesel oil in the reference approach (table 1.A(b)); and (2) to add other fuels consumed and CO ₂ emissions in the reference approach that are not included in the national energy balance
E.5	1. General (energy sector) – (33, 2014) Transparency*	Implement the planned improvement on the transparency of section 3.2.3.1 of the NIR by adding a table listing AD, carbon stored and emissions, as well as listing in which CRF category they are reported	Resolved. Information available in the NIR (sections 3.2.3.1 and 4.5.1)
E.6	International	Report fuel consumption in marine bunkers and	Addressing. Fuel

<i>ID#</i>	<i>Issue and/or problem classification^{a, b}</i>	<i>Recommendation made in previous review report^c</i>	<i>ERT assessment and rationale</i>
	navigation – liquid (32, 2014) Transparency*	associated emissions in the CRF tables	consumption in marine bunkers has been reported in table 1.D but not in table 1.A(b). This is already a planned improvement (see E.4 above)
E.7	International aviation – liquid (31, 2014) (25, 2013) Transparency*	Describe transparently the methodology used to split national and international (bunker) fuel consumption to ensure that civil aviation emissions are accurately estimated	Resolved. The methodology is described in sections 3.2.2.1 and 3.2.8.2.2 of the 2016 NIR
E.8	1.A.2 Manufacturing industries and construction – liquid (35, 2014) (47, 2013) (54, 2012) Transparency*	Implement the planned effort to improve the transparency (through the reallocation of emissions) and accuracy of these emissions and report emissions from off-road vehicles under the category mobile under other (fuel combustion) and clearly explain any reallocation and recalculation in its NIR	Resolved. Emissions from off-road machinery are now reported under 1.A.2.g.vii
E.9	1.A.3.b Road transportation – liquid – N ₂ O (34, 2014) (32, 2013) (47, 2012) (56, 2011) Transparency*	Incorporate findings to explain large differences in the N ₂ O IEF for gasoline for different years (ranging from 2.25 to 6.85 kg/TJ) from the study on N ₂ O emissions for gasoline from road transportation	Resolved. New methodology taking into account the study described in the NIR (section 3.2.8.2.2)
E.10	1.A.3.d Domestic navigation – liquid – CO ₂ , CH ₄ , N ₂ O (26, 2014) (37, 2012) (59, 2011) Accuracy*	Review the possible double counting of emissions from leisure boats reported under navigation	Addressing. The subject is under discussion with the National Statistics Office of Luxembourg and will be addressed in the 2017 submission
E.11	1.B.2 Oil and natural gas and other – liquid, gas – CO ₂ (26, 2014) (37, 2012) (60, 2011) Adherence to UNFCCC Annex I inventory reporting guidelines	Collect country-specific data for estimating CH ₄ emissions from natural gas distribution	No longer relevant. This category is not a key category: tier 1 EF can be used
IPPU			
I.1	2. General (IPPU) – (38, 2014) Transparency*	Explain every recalculation such as the emissions from the solvent and other product use sector update of AD and EFs, and state correctly that recalculations have not been implemented in the solvent and other product use sector	Not resolved. The Party has made efforts to provide more information on the types of updates, but has not provided sufficient detail to explain its recalculations. For all

<i>ID#</i>	<i>Issue and/or problem classification^{a, b}</i>	<i>Recommendation made in previous review report^c</i>	<i>ERT assessment and rationale</i>
			recalculations, the Party needs to transparently explain updates to EFs, AD and the impact of recalculations in the NIR. See table 5 below for additional examples
I.2	2. General (IPPU) – HFCs, SF ₆ (40, 2014) Consistency*	Revise the estimates of HFC emissions from foam blowing and SF ₆ emissions from electrical equipment for 1990–1995 to ensure time-series consistency of these categories in accordance with the IPCC good practice guidance	Addressing. Emissions have been revised for both categories, but the Party has not reported these recalculations in the NIR or CRF tables, or explained the approach applied to ensure time-series consistency
I.3	2.F. Product uses as substitutes for ozone depleting substances – HFCs (42, 2014) (40, 2013) (54, 2012) (76, 77, 2011) Transparency*	Report AD, IEF and emissions from refrigeration and air-conditioning equipment and noise reduction windows in CRF table 2(II).F to improve the consistency of the reporting	Resolved. Submitted 2016 CRF tables include the completed CRF table 2(II).F reporting information consistent with categories relevant to the Party
I.4	2.F.5 Solvents – N ₂ O (46, 2014) (44, 2013) (63, 2012) (81, 2011) Consistency*	Demonstrate the consistency of the time series or collect country-specific data for the entire time series for N ₂ O emissions	Resolved. The Party has provided information on pages 357 and 358 of the NIR to demonstrate time-series consistency
I.5	2.F.6 Other applications (product uses as substitutes for ozone depleting substances) – SF ₆ (43, 2014) (41, 2013) Transparency*	Provide a more detailed explanation in the NIR of the country-specific methodologies and AD used to estimate SF ₆ emissions from electrical equipment in order to increase the transparency of the reporting	Not resolved. More description is provided on the EFs during operation, but not on EFs during manufacture. Further, the NIR provides no direct reference to which IPCC methodology is applied and does not provide the AD to estimate emissions from manufacturing, operation and then disposal
I.6	2.F.6 Other applications (product uses as substitutes for ozone depleting substances) PFCs (44, 2014) (42, 2013) Not an issue	For potential PFC emissions, replace the notation key “NO” (not occurring) with either a value or the notation key “NE” (not estimated)	No longer relevant. Reporting of potential emissions is no longer required under the 2006 IPCC Guidelines

<i>ID#</i>	<i>Issue and/or problem classification^{a, b}</i>	<i>Recommendation made in previous review report^c</i>	<i>ERT assessment and rationale</i>
Agriculture			
A.1	3.B Manure management – CH ₄ , N ₂ O (49, 2014) Transparency*	Describe the changes in the estimation of CH ₄ emissions from manure management in the NIR	Addressing. A rationale table was provided with estimates; in addition, information that explains the changes was provided by Luxembourg during the review
A.2	3.B.3 Swine – CH ₄ , N ₂ O (50, 2014) (50, 2013) (75, 2012) (92, 2011) Adherence to UNFCCC Annex I inventory reporting guidelines	Implement a higher-tier method for manure management from swine	Resolved. A tier 2 method for manure management for swine was implemented
A.3	3.D Direct and indirect N ₂ O emissions from agricultural soils – N ₂ O (52, 2014) Transparency*	Describe the methodology for the revision of the estimation of nitrogen excretion (Nex) used for mature dairy cattle in the NIR	Not resolved. The ERT noted the lack of information and references that assist in understanding all the changes related to the selection of values of Nex from dairy cows
A.4	3.D Direct and indirect N ₂ O emissions from agricultural soils – N ₂ O (54, 2014) Transparency*	Describe the methodology for nitrogen emissions from agricultural soils in the NIR, and the amount of AD for synthetic fertilizer applied, revisions to AD for peas, carrots and leeks and the amount of sewage sludge applied to soils for 2012	Resolved. The description of the methodology to estimate N ₂ O emissions from agricultural soils has been included in the NIR (pp.396–408)
LULUCF			
L.1	4. General (LULUCF) – (58, 2014) (53, 2013) (83, 2012) (99, 2011) (64, 2010) Transparency*	Improve the transparency of the reporting by providing references for LULUCF and KP-LULUCF in a systematic manner with references for EFs and AD that were provided in earlier reports (e.g. the meaning of “IFL1” in the NIR (2014, p.367); the soil carbon content of various land uses; the country-specific value for carbon stock of forest land biomass before conversion; the annual volume increment of species other than spruce, Douglas fir, beech and oak)	Addressing. The NIR now provides references and elaborates the QC procedures that are in place for land area estimates and emission or removal factors that come from NFI for forest land. There is scope for further improvement in providing references, especially for AD and EFs for land categories other than forest land. References could be provided for the soil carbon content of various land uses; the country-specific value for

<i>ID#</i>	<i>Issue and/or problem classification^{a, b}</i>	<i>Recommendation made in previous review report^c</i>	<i>ERT assessment and rationale</i>
			carbon stock of forest land biomass before conversion; and the annual volume increment of species other than spruce, Douglas fir, beech and oak
L.2	4. General (LULUCF) – (59, 2014) (55, 2013) (86, 2012) (102, 2011) (66, 2010) Transparency*	Improve the QC procedures, in particular regarding references for EFs and AD, and regarding consistency between the NIR and the CRF tables	Not resolved. The Party has described elaborate QC procedures for land area AD, however, the QC procedures for other land category emission and removal factors need to be described
L.3	4. General (LULUCF) – (60, 2014) Transparency*	Report the uncertainty analysis for LULUCF in accordance with the IPCC good practice guidance for LULUCF and transparently describe the method used to estimate the uncertainty	Not resolved. Uncertainty is provided for the whole sector. The Party intends to submit full details for different land categories in the 2017 submission
L.4	4.A.1 Forest land remaining forest land – CO ₂ (61, 2014) Accuracy*	Reproduce the entire time series of harvest statistics, provide an explanation for the inconsistency between harvesting trends and carbon stock changes in living biomass and investigate the discrepancy between STATEC and FAOSTAT data on harvest	Addressing. The Party has provided all the data available from FAO and national sources. Luxembourg intends to adopt an improved method for estimating and reporting AD for harvested wood products in the coming years
L.5	4.A.1 Forest land remaining forest land – CO ₂ (62, 2014) (60, 2013) (89, 2012) (103, 2011) (67, 2010) Transparency*	Use the results from the second NFI to recalculate the emission/removal estimates from forest land remaining forest land and all categories involving forest land	Resolved. The Party has used emission/removal factors from the NFI
L.6	4.A.1 Forest land remaining forest land – CO ₂ (63, 2014) Transparency*	Describe transparently the planned improvements to estimate the increment and harvest for species other than beech, oak, spruce and Douglas fir	Resolved. Data on gains and losses and information is to be provided from the NFI for the forest land category
L.7	4.A.2 Land converted to forest land – CO ₂ (64, 2014) Transparency*	Include clarification on the method for calculating carbon stock changes for conversions to forest land from wetlands, settlements and other land in the NIR	Resolved. The Party has largely used emission/removal factors from IPCC defaults and from the NFI

<i>ID#</i>	<i>Issue and/or problem classification^{a, b}</i>	<i>Recommendation made in previous review report^c</i>	<i>ERT assessment and rationale</i>
L.8	A.2 Land converted to forest land – CO ₂ (65, 2014) Accuracy*	Report on the results of the investigation into the accuracy of the 2000–2007 values of the areas in view of the new AD for 2008–2012, paying particular attention to areas that may have undergone a back-and-forth classification from and to forest land	Resolved. Luxembourg is using multi-temporal RapidEye data (satellite images)
L.9	4.B.1 Cropland remaining cropland – N ₂ O (68, 2014) Transparency*	Explain explicitly in the NIR that forest fertilization does not occur and correct the inconsistency between the NIR and CRF table for cropland remaining cropland	Resolved. The NIR provides information on the ban on fertilization of forest land
L.10	4.C.2 Land converted to grassland – CO ₂ (66, 2014) Transparency*	Review the drivers of the decrease in forest land to grassland converted annually; report all areas of cropland converted to grassland in the category land converted to grassland	Resolved. CO ₂ emissions/removals for cropland converted to grassland is reported correctly
L.11	4.C.2 Land converted to grassland – CO ₂ (67, 2014) Adherence to UNFCCC Annex I inventory reporting guidelines	Correct the NIR to ensure consistency between the NIR and the CRF tables	Addressing. Significant improvement has been made. There are still a few inconsistencies, especially in the NIR
Waste			
W.1	5.A Solid waste disposal on land – CH ₄ (75, 2014) (70, 2013) (104, 2012) Transparency*	Assess whether the assumption of the 90% reduction for the methane correction factor is valid for the Party's national circumstances and provide the results of this assessment	Addressing. The Party explained that a study was conducted, taking into account the previous recommendations. The methodology is currently under validation and will be implemented in the 2017 submission. The ERT believes that this issue should be considered further in future reviews to confirm that emissions are not underestimated
W.2	5.D Wastewater treatment and discharge – N ₂ O (77, 2014) Accuracy*	Review the N ₂ O EF for plants with significant denitrification and use a consistent methodology to estimate these emissions	Addressing. The Party explained that a study was conducted to completely revise the calculation of emissions from wastewater treatment in Luxembourg, taking into account any

<i>ID#</i>	<i>Issue and/or problem classification^{a, b}</i>	<i>Recommendation made in previous review report^c</i>	<i>ERT assessment and rationale</i>
			changes coming from the 2006 IPCC Guidelines and the recommendations in previous ARR. Validation is still to be completed. The results of the study will be included in the 2017 submission, subject to available resources
W.3	5.D Wastewater treatment and discharge – N ₂ O (79, 2014) Accuracy*	Take into account the nitrogen removed in the sludge spread on agricultural fields when estimating the N ₂ O emissions from wastewater in order to avoid double counting; revise the method to estimate N ₂ O emissions from wastewater handling	Addressing. The Party explained that a study was conducted to completely revise the calculation of emissions from wastewater treatment in Luxembourg, taking into account any changes coming from the 2006 IPCC Guidelines and the recommendations in previous ARR. Validation is pending. Hence, the results of the study will be included in the 2017 submission, subject to available resources
W.4	5.D.3 Other (wastewater treatment and discharge) – N ₂ O (78, 2014) Accuracy*	Review the estimates from all discharges of wastewater, including those from wastewater plants, to confirm there are no underestimates, and that all N ₂ O emissions are estimated and nitrogen removal at these plants should be considered in the estimates	Addressing. The Party explained that a study was conducted to completely revise the calculation of emissions from wastewater treatment in Luxembourg, taking into account any changes coming from the 2006 IPCC Guidelines and the recommendations in previous ARR. Validation is pending. Hence, the results of the study will be included in the 2017 submission, subject to available resources
KP-LULUCF			
KL.1	General (KP-LULUCF) – (83, 2014) Transparency*	Improve the transparency of the reporting by including the explanation on species mix estimation in the NIR	Resolved. Species mix and areas are described in the land use change matrix and the NIR
KL.2	General (KP-LULUCF) – (84, 2014)	Classify afforestation and reforestation, and deforestation as key categories according to the IPCC good practice guidance for LULUCF	Resolved. According to NIR 2016, only forest land remaining forest land is

<i>ID#</i>	<i>Issue and/or problem classification^{a, b}</i>	<i>Recommendation made in previous review report^c</i>	<i>ERT assessment and rationale</i>
	Transparency*		estimated as a key category. Thus afforestation/deforestation categories are not key categories
KL.3	General (KP-LULUCF) – (85, 2014) (76, 2013) (112, 2012) (133, 2011) Comparability*	Report carbon stock changes in below-ground biomass and litter for the KP-LULUCF categories separately	Resolved. The CRF tables show they are reported separately
KL.4	Afforestation and reforestation – (86, 2014) (76, 2013) CO ₂ Transparency*	Improve the transparency of the reporting under the Kyoto Protocol and separately report the carbon stock changes for the living biomass pools (above-ground and below-ground) using the information already available within the national inventory system	Resolved. The NIR provides all the details of carbon stock change estimation
KL.5	Deforestation – (91, 2014) CO ₂ Transparency*	Explain the revisions in the estimation of changes in mineral soil organic carbon stock in deforestation resulting from the conversion of forest to grassland	Resolved. NIR 2016 provides sufficient explanation on AD and EF used

Abbreviations: AD = activity data, ARR = annual review report, CRF = common reporting format, EF = emission factor, ERT = expert review team, FAO = Food and Agriculture Organization of the United Nations, IEF = implied emission factor, IPCC = Intergovernmental Panel for Climate Change, IPCC good practice guidance for LULUCF = *Good Practice Guidance for Land Use, Land-Use Change and Forestry*, IPPU = industrial processes and product use, KP-LULUCF = LULUCF emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, LULUCF = land use, land-use change and forestry, NFI = national forest inventory, NIR = national inventory report, QA/QC = quality assurance/quality control, UNFCCC Annex I inventory reporting guidelines = “Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual greenhouse gas inventories”, 2006 IPCC Guidelines = *2006 IPCC Guidelines for National Greenhouse Gas Inventories*.

^a References in parentheses are to the paragraph(s) and the year(s) of the previous review report(s) where the issue was raised. Issues are further classified as defined in decision 13/CP.20, annex, paragraph 81. In the review of the supplementary information reported in accordance with Article 7, paragraph 1, of the Kyoto Protocol, the ERT has applied the classification in decision 22/CMP.1, annex, paragraph 69, in conjunction with decision 4/CMP.11.

^b An asterisk is included next to each issue type for all issues that are also problems, as defined in decision 22/CMP.1, annex, paragraphs 68 and 69, including those that lead to an adjustment or a question of implementation.

^c The review of the 2016 annual submission is being held in conjunction with the review of the 2015 annual submission, and as such, the 2015 annual review report was not available at the time of this review. Therefore, the recommendations reflected in table 3 are from the 2014 annual review report. For the same reason, the year 2015 is excluded from the list of years in which the issue has been identified.

IV. Issues identified in three successive reviews and not addressed by the Party

9. In accordance with paragraph 83 of the UNFCCC review guidelines, the ERT noted that the issues included in table 4 have been identified in three successive reviews, including the review of the 2016 annual submission of Luxembourg, and have not been addressed by the Party.

Table 4
Issues identified in three successive reviews and not addressed by Luxembourg

<i>ID#^a</i>	<i>Previous recommendation for the issue identified</i>	<i>Number of successive reviews issue not addressed^b</i>
General		
G.3	Include more detailed information on its uncertainty analysis and key category analysis in the NIR	3 (2013, 2014, 2015/2016)
Energy		
E.1	Expand the recalculation sections within each category and subcategory to include recalculated values and the impact of the change, or include a cross reference to the section in the NIR where recalculations are explained	3 (2013, 2014, 2015/2016)
E.2	Report and explain the differences between the reference and sectoral approaches, including the net calorific value used in the inventory and in the energy balance	5 (2011, 2012, 2013, 2014, 2015/2016)
E.4	Implement a planned improvement that fuels used in marine activities will be subtracted from the reference approach, where they are still included, enter all fuels used in the country in the reference approach estimates, and improve its QC procedures	3 (2013, 2014, 2015/2016)
E.10*	Enter all fuels used in the country in the reference approach estimates and improve the QC procedures	4 (2012, 2013, 2014, 2015/2016)
IPPU		
I.5	Provide a more detailed explanation in the NIR of the country-specific methodologies and AD used to estimate SF ₆ emissions from electrical equipment in order to increase the transparency of the reporting	3 (2013, 2014, 2015/2016)
Agriculture		
No such issues for the agriculture sector were identified		
LULUCF		
L.1	Improve the transparency of the reporting by providing references for LULUCF and KP-LULUCF in a systematic manner with references for EFs and AD that were provided in earlier reports (e.g. the meaning of “IFL1” in the NIR (2014, p.367); the soil carbon content of various land uses; the country-specific value for carbon stock of forest land biomass before conversion; the annual volume increment of species other than spruce, Douglas fir, beech and oak)	6 (2010, 2011, 2012, 2013, 2014, 2015/2016)
L.2	Improve the QC procedures, in particular regarding references for EFs and AD, and regarding consistency between the NIR and the CRF tables	6 (2010, 2011, 2012, 2013, 2014, 2015/2016)

<i>ID#^a</i>	<i>Previous recommendation for the issue identified</i>	<i>Number of successive reviews issue not addressed^b</i>
Waste		
W.1	Assess whether the assumption of the 90% reduction for the methane correction factor is valid for the Party's national circumstances and provide the results of this assessment	3 (2013, 2014, 2015/2016)
KP-LULUCF		
No such issues for KP-LULUCF activities were identified		

Abbreviations: AD = activity data, CRF = common reporting format, EF = emission factor, IPPU = industrial processes and product use, KP-LULUCF = LULUCF emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, LULUCF = land use, land-use change and forestry, NIR = national inventory report, QC = quality control.

^a An asterisk is included after any issue ID# where the underlying issue is related to accuracy or completeness of a key category, a missing category or a potential key category, as indicated in decision 13/CP.20, annex, paragraph 83.

^b The review of the 2016 annual submission is being held in conjunction with the review of the 2015 annual submission. As the reviews of the 2015 and 2016 annual submissions are not “successive” reviews, but are rather being held in conjunction, for the purpose of counting successive years in table 4, 2015/2016 is considered as one year. The ERT noted that this table 4 is the same as that in the 2015 annual review report for Luxembourg, modified to reflect the combined 2015/2016 review.

V. Additional findings made during the 2016 technical review

10. Table 5 contains findings made by the ERT during the technical review of the 2016 annual submission of Luxembourg that are additional to those identified in table 3 above.

Table 5
Additional findings made during the 2016 technical review of the annual submission of Luxembourg

<i>ID#</i>	<i>Finding classification</i>	<i>Description of the finding with recommendation or encouragement</i>	<i>Is finding an issue^a and/or a problem^b? If yes, classify by type</i>
General			
G.4	NIR	<p>Luxembourg submitted an NIR, including information on key categories, methods, data sources, uncertainty estimates, QA/QC, verification activities, etc. The NIR provides a description of the QA/QC and verification procedures used in the preparation of the GHG inventory. However, Luxembourg did not include in its NIR annexes on key categories, uncertainty assessment, methodological description and energy balance, as per decision 24/CP.19</p> <p>The ERT encourages Luxembourg to follow the outline and general structure contained in annex I to decision 24/CP.19 in its NIR</p>	Not an issue
G.5	Time series consistency	<p>Luxembourg has performed a trend analysis for the 1990–2014 period and has clearly explained the drivers behind the changes in CO₂, CH₄ and N₂O emissions. However, no explanation was provided of the reasons for the increase in F-gases (23,903%) during this period. In response to a question raised by the ERT, the Party provided a clear explanation of the rationale behind the increase in F-gases</p> <p>In order to increase transparency, the ERT recommends that Luxembourg provide a detailed explanation of the main drivers of the increase in F-gases in its NIR</p>	Yes. Transparency*
G.6	CRF	<p>Luxembourg provided adequate information in CRF table 9 on the use of notation keys “NE” (not estimated) and “IE” (included elsewhere). However, no explanation was included in the NIR</p> <p>The ERT encourages Luxembourg to provide a summary of the use of the notation keys in its NIR and a detailed explanation of the reasons for the use of “IE” and “NE” in each sector to increase transparency</p>	Not an issue
G.7	CRF	<p>The ERT notes that there is no consistency between the use of the notation keys “IE” (included elsewhere) and “NE” (not estimated) in the CRF tables (tables 9 and 10) and the NIR sectoral tables on completeness (tables 3.4, 4.3, 4.4, 4.23, 5.3 and 7.2)</p> <p>The ERT encourages Luxembourg to improve the consistency of the reporting of notation keys between the CRF tables and the NIR</p>	Not an issue
G.8	Key category analysis	<p>Key category analysis was performed using the IPCC tier 1 and level and trend assessment. Luxembourg has included the LULUCF sector in its assessment of the key categories. However, the ERT identified differences in the key categories reported in the NIR and in CRF tables that may lead</p>	Yes. Adherence to UNFCCC Annex I inventory reporting

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue ^a and/or a problem ^b ? If yes, classify by type
		to inconsistencies The ERT recommends that Luxembourg improve its QA/QC in the key category analysis to ensure consistency in reporting	guidelines
G.9	Uncertainty analysis	Uncertainty analysis was performed using the tier 1 approach. Following the recommendations of previous ERT reports, all IPCC categories have been included in the uncertainty analysis. Uncertainties are presented in a summary section and are disaggregated into a detailed sectoral level. The NIR also states that an IPCC tier 2 uncertainty analysis will be performed for the Party's next submission The ERT commends Luxembourg for the improvement of its uncertainty analysis and encourages the use of the tier 2 approach	Not an issue
G.10	National registry	The ERT noted that the NIR (chapter 12.5) indicates that the CPR will be calculated once Luxembourg submits its report to facilitate the calculation of the assigned amount. During the review, the Party indicated that its CPR is 65,209,026 t CO ₂ eq and that it is based on the assigned amount for the second commitment period of the Kyoto Protocol. The ERT agrees with this value The ERT recommends that the Party report the calculation of its CPR in its NIR	Yes. Transparency*
Energy			
E.12	Fuel combustion-reference approach – All fuels	The comparison of the apparent energy consumption for the reference approach and the sectoral approach shows noticeable discrepancies for the other fuels (–48.20%), gaseous fuels (–5.21%), liquid fuels (–3.13%) and solid fuels (–1.56%). In the NIR, the discrepancies for gaseous fuels and other fuels are explained and improvements are planned but not for the solid fuels and liquids. During the review week, the Party explained that the difference for solid fuels mainly derives from a calculation error (double exclusion of the carbon derived from other bituminous coal in iron and steel production) The ERT recommends that Luxembourg correct the calculation error detected in the reference approach for solid fuels concerning the double exclusion of carbon from other bituminous coal in iron and steel production	Yes. Accuracy*
E.13	Fuel combustion-reference approach – All fuels	The ERT identified several discrepancies between data submitted in CRF tables and international data (IEA and Eurostat) related to quantities of waste fuels, NCV used for motor gasoline, quantities of imports for solid fuels, quantities of lubricants, imports of bitumen and stock changes for gas/diesel oil in 2005	Not an issue

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue ^a and/or a problem ^b ? If yes, classify by type
		The ERT encourages Luxembourg to provide in its NIR all information at its disposal that explains the discrepancies between international data (IEA and Eurostat) and data used in the inventory (difference in NCV, definition of fuel categories, etc.)	
E.14	Fuel combustion-reference approach – petroleum coke, other kerosene, other oil (white spirit)	International data (IEA) reports imports of petroleum coke, other kerosene and other oil (white spirit) which are not reported in the CRF tables. During the review week, Luxembourg stated that emissions for these fuels are reported under 2.D.3 other (non-energy products from fuels and solvent use), and hence excluded from the reference approach The ERT recommends that the Party include data on petroleum coke, other kerosene and other oil (white spirit) in the reference approach as it is possible to enter fuels in CRF table 1.A(b) that are used for non-energy purposes in CRF table 1.A(d)	Yes. Adherence to UNFCCC Annex I inventory reporting guidelines
E.15	Feedstocks, reductants and other NEU of fuels – All fuels	The ERT notes that Luxembourg uses the notation key “NE” (not estimated) instead of “IE” (included elsewhere) for use of fuels/solid fuels/anthracite and other bituminous coal in CRF table 1.A(d) and explains that emissions are reported under 2.C.1. In response to a question raised by the ERT, Luxembourg indicated that the notation key would be changed in its next submission The ERT recommends that Luxembourg replace the notation key “NE” with the notation key “IE” in reporting emissions for use of fuels/solid fuels/anthracite and other bituminous coal in CRF table 1.A(d)	Yes. Transparency*
E.16	1.A. Fuel Combustion-Sectoral Approach – gaseous fuels – CO ₂ , CH ₄ , N ₂ O	Differences between the sectoral and the reference approaches for the apparent consumption of natural gas have been identified in previous ARRs and are still visible in the submission. For the period 1995–1999, the total natural gas energy consumption in the sectoral approach is lower than that in the reference approach (3.79 to 6.92%) whereas for the period 2000–2014, the total natural gas consumption in the sectoral approach is greater than in the reference approach (1.67 to 8.45%) During the review, the Party explained that discussions with experts from the National Statistics Institute of Luxembourg have identified that the difference lies in the balancing between the top-down sectoral fuel consumption from the energy balance as provided by the institute, and the bottom-up approach for the inventory calculation in which specific consumption as reported by the main companies for a given category are summed. The problem originates from the national energy balance, and this was confirmed in a meeting with the institute. During this meeting, a possible solution was discussed on how to better equilibrate the energy amounts (especially natural gas) consumed by the industry, by taking into account emission trading scheme declarations. This work is currently under way, and will be implemented for the 2017 submission. This will lead to a revision of the natural gas consumption data mainly for categories 1.A.2 and 1.A.4, with the national total for the energy balance remaining unchanged. Moreover, the difference between reference approach and	Yes. Transparency*

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue ^a and/or a problem ^b ? If yes, classify by type
		<p>sectoral approach will tend towards zero</p> <p>Thus the Party confirmed that the methodology applied in the sectoral approach in the last submission resulted in an overestimation of the natural gas consumption in different subcategories of 1.A.2</p> <p>The ERT recommends that the Party correct the natural gas consumption data in the sectoral approach using the newly revised energy balance in order to avoid underestimates for the period 1995–1999 and overestimates for the period 2000–2014</p> <p>The ERT also recommends that Luxembourg strengthen its QC procedures by ensuring that total natural gas consumption in the sectoral approach is equal to total natural gas consumption from the energy balance. If this is not the case, the ERT recommends that the Party provide the rationale for the differences in its NIR</p>	
E.17	1.A.2.e Food processing, beverages and tobacco – liquid fuels	<p>Inter-annual changes were identified as exceptional and occur in the AD for subcategory 1.A.2.e (liquid fuels) for the years 1993/1994 (83.2%), 1998/1999 (93.8%) and 2008/2009 (158.3%). During the review week, the Party explained the drivers of these inter-annual changes: increase in gas oil as reported by the national energy balance (1993/1994), a switch from residual fuel oil to gas oil (1998/1999) and the emptying of gas oil stocks at one facility prior to shutting down (2008/2009)</p> <p>The ERT recommends that the Party include the explanations for the inter-annual changes in AD of 1.A.2.e (liquid fuels) in the NIR</p>	Yes. Transparency*
E.18	1.A.2.g Other (manufacturing industries and construction) – liquid fuels – CO ₂	<p>AD and emissions from off-road machinery in the industry sector are accounted for in 1.A.2.g.vii. In the NIR and the CRF tables, the Party states that this off-road machinery consumes gasoline and diesel oil. In the road transportation sector, biofuels have been used since 2004</p> <p>During the review week, the ERT asked the Party if off-road machinery was consuming biofuels. The Party answered that biofuels have been consumed in this sector since 2004 but Luxembourg considers these biofuels as fossil fuels in this submission (i.e. the NCVs and EFs of gasoline and diesel are applied). This results in an overestimation of CO₂ emissions for the years 2004 to 2014</p> <p>The ERT recommends that Luxembourg take into account the biofuel consumptions for off-road machinery, to allocate them to biomass fuels and to correct the CO₂ overestimation for the years 2004 to 2014</p>	Yes. Accuracy*
E.19	1.A.3.b Road transportation – gasoline – CO ₂	Luxembourg uses a country-specific CO ₂ EF for motor gasoline of 72.0 t CO ₂ /TJ. As explained in the NIR (p.191 and following), motor gasoline is exclusively imported from neighbouring countries (Belgium, Germany and Netherlands) and as Luxembourg has no access to the carbon content of this	Yes. Transparency*

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue ^a and/or a problem ^b ? If yes, classify by type
E.20	1.A.3.b Road transportation – liquid fuels – CO ₂ , CH ₄ , N ₂ O	<p>fuel, it derives the country-specific EF from the EFs of the corresponding import countries in relation to the yearly imported quantities</p> <p>The value 72.0 t CO₂/TJ is the gasoline EF applied by the Netherlands in submissions 2014, 2015 and 2016. For Germany, 72.0 t CO₂/TJ was the gasoline EF value used for the 2014 submission. However, the value for the 2015 submission was around 73.1 t CO₂/TJ (see table 88 in Germany's NIR 2016)</p> <p>During the review, Luxembourg explained that the EF for gasoline was indeed fixed in 2012 at 72.0 t CO₂/TJ based on the EFs used by Germany and the Netherlands at that time, as the EF used by Belgium was considered as a non-country-specific value by the ERT (use of the default IPCC value of 69.3 t CO₂/TJ by Belgium). Luxembourg agreed with the ERT that as the EF used by Germany was recently revised, Luxembourg should also revise its EF</p> <p>Considering the previous available submissions of Belgium (which no longer uses the Revised 1996 IPCC Guidelines default value), Germany and the Netherlands, a new estimate of the CO₂ EFs for motor gasoline could be provided by the Party. The ERT considers that CO₂ emissions from gasoline are potentially overestimated and included this issue in the list of potential problems and further questions raised by the ERT during the review</p> <p>Luxembourg submitted revised estimates on 16 November 2016 for road transportation in response to the list of potential problems and further questions raised by the ERT regarding the underestimation. The revised estimates reduced the total GHG emissions in 1990 from the energy sector by 6.67 Gg CO₂ eq (0.1%) and the ERT considered the problem solved</p> <p>The ERT commends Luxembourg for the improvements mentioned during the review week that in order to clarify Luxembourg's situation conclusively, the Party has recently commissioned, through its fuel quality monitoring system (European Union fuel quality directive), additional analysis of motor gasoline and diesel oil being sold at refuelling stations, in order to determine the carbon content of these fuels. Luxembourg will report on these findings in the next submission, and if necessary, revise its national EF accordingly</p> <p>The ERT recommends that the Party explain how it estimated the CO₂ EF for gasoline used in road transportation in its NIR</p> <p>In the NIR and CRF tables, the consumption of biofuels in the road transportation sector are considered and presented blended with gasoline and diesel, respectively. The NIR also states that biofuels were introduced in 2007 for biogasoline and 2004 for biodiesel. When comparing the IEF from Luxembourg with those of other Parties for gasoline, diesel or biomass (biofuels), it is not possible to compare the data since biofuels are included in the gasoline and diesel data for</p>	Yes. Comparability*

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue ^a and/or a problem ^b ? If yes, classify by type
		<p>Luxembourg. During the review, the Party provided details on biogasoline and biofuel quantities as well as information on the source of the data. The Party also explained that it reported the blended fuel consumption in the CRF tables in order to avoid inconsistency with CH₄ and N₂O IEFs</p> <p>The ERT recommends that Luxembourg report the biogenic part of AD and emissions for biofuels in the road transportation sector under the fuel category biomass in order to ensure comparability of the IEF with those of other countries. The ERT also recommends that the Party include detailed information about biofuels in its NIR</p>	
E.21	1.B.2.b Natural gas – gaseous fuels	<p>Inter-annual changes in the AD of category 1.B.2.b.4 were identified in 2001/2002 (43.0%) and 2012/2013 (–15.3%). During the review week, the Party explained the main drivers of these changes: operational start of the 350 MW power plant in 2001/2002 (gas turbine) and partial shutdown in 2012/2013</p> <p>The ERT recommends that the Party include the explanations about the inter-annual changes of AD for 1.B.2.b.4 in section 3.3.2.2.1 of the NIR in order to increase transparency in this category</p>	Yes. Transparency*
IPPU			
I.7	2. General (IPPU) – CO ₂ and HFCs	<p>The CO₂ emissions from other solvent use in CRF table 2(I).A-Hs2 (cell G27) across the entire time series are incorrect owing to a transcription error identified in the CRF Reporter import file. In response to a question from the ERT, the Party confirmed that the values are correct in the NIR, but not in the CRF tables. The NIR table 4-22 (p. 314), also excludes a summary of emissions from table 4-32 (standardized nomenclature for air pollutant (SNAP) 0604). For commercial refrigeration, the figure for CO₂ emissions from newly manufactured HFC-125-filled products in 2006/2007 is large (1,803.9%). The Party indicated that the value for 2007 in the CRF table is incorrect. The error will be corrected in the next submission</p> <p>The ERT recommends that the Party ensure accuracy and consistency for CO₂ emissions from other solvent use between the NIR and the CRF tables</p>	Yes. Transparency*
I.8	2.A.3 Glass production – CO ₂	<p>The ERT notes that uncertainties associated with AD and EFs for estimating CO₂ emissions from glass production are based on “expert judgement” in the NIR, but the Party does not explain the source of such expert judgment</p> <p>The ERT recommends that the Party explain the sources of information used to inform the uncertainty of key parameters such as AD and EFs for this category</p>	Yes. Adherence to UNFCCC Annex I inventory reporting guidelines
I.9	2.F.1 Refrigeration and air conditioning	<p>The ERT notes from the European effort-sharing decision comprehensive review report provided by the Party that the time series of transport refrigeration was identified as very variable and low. In response to a question raised during that review, Luxembourg explained that only newly registered</p>	Yes. Accuracy*

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue ^a and/or a problem ^b ? If yes, classify by type
	– HFCs	<p>refrigerated vehicles are considered when emissions are estimated, and that emissions from the total amount of refrigerants in operating systems is not included. The ERT considers that this approach is not in accordance with the 2006 IPCC Guidelines, as excluding emissions from the total stock in operation will lead to an underestimate of emissions</p> <p>The ERT agrees with and supports the findings from the European Environment Agency's comprehensive review of the GHG inventory in the context of the effort-sharing decision completed just prior to the centralized review</p> <p>The ERT recommends that the Party collect the relevant AD to reflect total stock in operation to provide an accurate estimate of HFC emissions from transport refrigeration. The ERT believes that this issue should be considered further in future reviews to confirm there is an underestimate of emissions. From communication with the Party during the review week and the effort-sharing decision report, the ERT understands that Luxembourg has already recalculated the 1995–2014 data and will extend recalculations to the full time series in its next annual submission</p>	
I.10	2.F.1 Refrigeration and air conditioning – HFCs	<p>There is as an especially large increase in HFC 134a filled into new manufactured products for commercial and industrial refrigeration during 1993/1994 (9,477.4%). During the review, the Party provided some indication of likely drivers (e.g. the opening of new supermarkets). This information is a good basis for developing a description of trends to include in the Party's next annual submission</p> <p>The ERT recommends that the Party provide an explanation of emission trends, in particular significant variations across the time series, by providing more information on the drivers influencing HFC emissions from refrigeration and air conditioning, in particular commercial and industrial refrigeration</p>	Yes. Transparency*
I.11	2.F.1 Refrigeration and air conditioning – HFCs	<p>The manufacturing and disposal EFs selected in the NIR (e.g. 0.2 and 20%, respectively, for stationary air conditioning (p. 344)) are at the lower end of the 2006 IPCC Guidelines ranges (e.g. EFs for percentage of initial charge/year ($0.2 \leq k \leq 1$) and end-of-life emission (%) ($0 < p < 80$) for residential and commercial air conditioning, including heat pumps, in table 7.9). The Party does not explain the choice of EF in relation to the range provided by the IPCC. During the review, the Party indicated that the selected values were suggested by expert judgment from various representatives (technical personnel, etc.) active in the stationary air-conditioning field</p> <p>The ERT recommends that</p> <p>the Party describe in its NIR the expert consultation process applied to inform its choice of EF used for estimating emissions during manufacturing and disposal for estimating emissions from stationary air conditioning</p>	Yes. Transparency*

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue ^a and/or a problem ^b ? If yes, classify by type
I.12	2.F.1 Refrigeration and air conditioning – HFCs	<p>CRF table 2(II)B-Hs2 indicates that some HFC emissions are recovered from commercial/industrial refrigeration and stationary air conditioning (cells L13–15, etc.). The NIR does not explain the emissions from recovery during disposal nor does it provide information on AD, EF or the source for these assumptions. In response to a question raised during the review, the Party indicated that emissions corresponding to recovery are included in the annual totals but are not displayed separately nor are the corresponding EF and AD indicated in the NIR. This lack of transparency will be improved upon in the next submission</p> <p>The ERT recommends that the Party provide in its NIR the methods (IPCC tier or country specific), AD and EF applied to estimate HFC emissions during manufacture, operation, disposal and recovery (occurring during disposal phase) for the reporting of refrigeration and air-conditioning categories, especially commercial refrigeration and stationary air-conditioning categories</p>	Yes. Transparency*
Agriculture			
A.5	3. General (agriculture)	<p>During the review, Luxembourg indicated that a complete revision of the agriculture sector was implemented, which was not satisfactorily addressed in the NIR and was found to be connected to justification, and which had implications for the different categories of the sector</p> <p>The ERT recommends that the Party include in the NIR information related to the complete revision that was undertaken in the agriculture sector, preferably in the sector overview section as well as elaborating as appropriate in the other sections, in order to the enhance the transparency and understanding of issues that are affected by the revision</p>	Yes. Transparency*
A.6	3.B Manure management – CH ₄	<p>The MCF that was used for the subcategory digester of animal waste management system was an issue in the 2014 ARR. In the current submission, no reference was made to the previous revision. During the review, Luxembourg provided values for the MCF from the anaerobic digester, which were agreed by the previous ERT as the Party had performed a complete revision of the agriculture sector that involved changes in different categories</p> <p>The ERT recommends that Luxembourg report on the values used for MCF from the anaerobic digester, particularly in relation to or comparison with the recommendation in the ARR 2014</p>	Yes. Transparency*
A.7	3.B Manure management – N ₂ O, CH ₄	<p>Luxembourg did category-specific recalculations (for N₂O and CH₄ between submissions 2014v3.1 and this submission) and explained that these were made in response to the review process. Almost no information was provided to explain the category-specific recalculations that were displayed in table 5-27 of the NIR. In response to questions during the review, Luxembourg stated that there was a complete update of the agriculture sector that included many changes which were performed in response to the review process as well as following the need to streamline Luxembourg's reporting both under the UNFCCC and the Convention on Long-Range Transboundary Air Pollution.</p>	Yes. Transparency*

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue ^a and/or a problem ^b ? If yes, classify by type
A.8	3.B Manure management – N ₂ O	<p>Luxembourg also provided a list of the main revisions, which include the change in methodology from the Revised 1996 IPCC Guidelines to the 2006 IPCC Guidelines as well as calculation methods, default EFs, etc., that were changed. Luxembourg also showed the main AD for the calculation of emissions from manure management. The clarifications provided by Luxembourg were helpful in enhancing the understanding of the recalculations</p> <p>Nex from dairy cows was revised for Luxembourg in the previous review (ARR 2014). In response to a question by the ERT, Luxembourg used a revised estimate (107.89 kg N/head/year) to account for dairy cattle with milk production of 7,260 kg/head/year. As the revised estimate in response to the previous review was not included in the current NIR and the revised value of Nex was not used, it was not possible to understand why Luxembourg is now using the old value of Nex. In response to questions raised during the review, the Party stated that there had been a complete revision of the agriculture sector, and accordingly Nex rates are taken from the National Regulation on Direct Payments and Rural Development. The reference for that, which contains a key table, was provided. Luxembourg also provided useful information that made some justification for the adopted approach. The ERT underlines the importance of providing all the information and references that assist in understanding all the changes related to the selection of values for Nex from dairy cows</p> <p>The ERT recommends that the Party include all the necessary explanations, information and references in the NIR as they will improve the transparency of the submission</p>	Yes. Transparency*
A.9	3.H Urea application – CO ₂	<p>Luxembourg stated in the NIR (section 5.8, p.412) that there are currently no AD available on urea use in agriculture. Accordingly, in CRF table 3.H-J, urea was reported as “NE” (not estimated). Luxembourg provided additional information related to urea and stated that currently it does not have any statistical data on urea use in agriculture. The Party also referred to Eurostat reports on the import/export statistics for several urea compounds for Luxembourg. In addition to that, Luxembourg provided the Eurostat estimates to confirm whether potential emissions would be above the significance threshold. Luxembourg concluded that the use of “NE” for urea application is justified as the emissions would be above the significance threshold for 2013 only</p> <p>The ERT concludes that this is an overestimate in the base year as the estimates for urea are underestimated and the value underestimated, albeit for one year, 2013, only, could be considered significant. The ERT included this issue in the list of potential problems and further questions raised by the ERT during the review. Luxembourg submitted revised estimates in response to the list of potential problems and further questions raised by the ERT regarding the underestimation. The revised estimates reduced the total GHG emissions in 1990 from the agriculture sector by 1.00 Gg CO₂ eq (0.14%). The ERT considers that the revised estimates solved the issue</p> <p>The ERT recommends that the Party explain, in its NIR, how it estimated CO₂ emissions from urea</p>	Yes. Transparency*

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue ^a and/or a problem ^b ? If yes, classify by type
A.10	J Other (CO ₂ emissions from liming, urea application and other carbon-containing fertilizers)– CO ₂	<p>application</p> <p>Luxembourg stated in the NIR (section 5.8, pp.409–412) that data on the use of dolomite were not available. However, in accordance with information in CRF table 3.H-J, the use of dolomite is reported as “NO” (not occurring). During the review week and in response to a question raised by the ERT, Luxembourg stated that “NO” was used as no data were available on dolomite use in liming activities. Hence, it is for instance not known if the figures used for limestone in table 5-36 include dolomite use or not. The Party also indicated that the data that have been used are of low quality and they might include dolomite; however, it also indicated that has not so far been confirmed</p> <p>The ERT recommends that Luxembourg include in the NIR refined documentation on the level of use of both dolomite and limestone, and also indicate this reporting of emissions from agricultural applications of these carbonates in IPPU under other process uses of carbonates</p>	Yes. Transparency*
LULUCF			
L.12	4. General (LULUCF) – All gases	<p>Luxembourg has largely adopted tier 1 methods for cropland, grassland, wetlands, settlements and other land. It has adopted tier 1 and tier 2 methods for the FL category</p> <p>The ERT recommends that the Party adopt and report GHG inventory estimates using a tier in accordance with the 2006 IPCC Guidelines</p>	Yes. Adherence to UNFCCC Annex I inventory reporting guidelines
L.13	4. General (LULUCF) – CO ₂	<p>The Party has provided an uncertainty estimate for the whole LULUCF sector and for the FL category. It is good practice to provide an uncertainty estimate for all categories</p> <p>The ERT recommends that the Party enhance the submission by reporting uncertainty for all land categories. Luxembourg plans however to include more detail in the uncertainty chapter of the LULUCF section in its 2017 submission. The ERT appreciates the planned improvement of the Party to include details of uncertainty estimation in Luxembourg’s 2017 submission</p>	Yes. Adherence to UNFCCC Annex I inventory reporting guidelines
L.14	4. General (LULUCF) – All gases	<p>There are many inconsistencies between the values given in the text of the NIR and those provided in the CRF tables. For example, in the executive summary, since 1990, net emissions have decreased by 983% (the sector was a source of net emissions in 1990 (52.13 Gg CO₂ eq) and a source of net removals in 2014). In section 6.1, net removals from the LULUCF sector amounted to 455.3 Gg CO₂ eq. Since 1990, net emissions have decreased by 1060.5% (the sector was a source of net emissions in 1990 (52.91 Gg CO₂ eq) and a source of net removals in 2014). Table 6.1 indicates the net emission decrease is 1,082.52%. Therefore, there are three different values in the NIR text and CRF tables</p> <p>The ERT recommends that the Party ensure accuracy in the NIR text, tables and figures and</p>	Yes. Transparency*

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue ^a and/or a problem ^b ? If yes, classify by type
		consistency between the NIR and CRF tables, and improve its QC	
Waste			
W.5	5. General (waste) – CO ₂ , CH ₄ , N ₂ O	<p>The ERT notes some discrepancies in the trends described in the NIR and the trends in the CRF tables. The percentages used in the NIR either are not well formulated and result in misinterpretation, or are not consistent with the trends in the CRF tables. The ERT also notes in the wastewater treatment chapter of the NIR (section 7.6, from p.508) that the new CRF nomenclature was confused with the previous CRF codes. In response to questions raised by the ERT during the review, Luxembourg took note of the transparency issues (e.g. pp.163 and 164; p.490, table 7-1; pp.492, 508, 509 and following)</p> <p>The ERT recommends that Luxembourg ensure the consistency of the information on trends and category codes between the NIR and the CRF tables</p>	Yes. Transparency*
W.6	5.A Solid waste disposal on land – CH ₄	<p>Luxembourg does not estimate CH₄ emissions for one industrial solid waste disposal site (Ronnebiere) that was closed in the early 1990s for the inventory years 1990–1999. In response to a question raised by the ERT on the missing emissions, Luxembourg explained that since 2000, the emission estimates are based on annual measurements at the site (the ERT notes that the emissions since 2000 are reported in the NIR but not in the CRF tables; see W.9 below). The Party does not have historical data on the waste amounts and composition of the waste disposed at this site. The ERT notes that this may lead to an underestimation of the base year (1990) and the years 1991–1999</p> <p>The ERT recommends that Luxembourg estimate the missing CH₄ emissions for 1990–1999 for the industrial solid waste disposal site (Ronnebiere) that was closed in the early 1990s. During the review, the ERT proposed a method to Luxembourg (based on appropriate extrapolation methods, starting from the estimated CH₄ emissions of 2000, and a default half-life value for bulk waste in wet temperate climate zones of seven years) for estimating the emissions for the years 1990–1999 and encourages Luxembourg to consider this proposal in its next submission.</p> <p>In order to improve the transparency, the ERT also recommends adding the methodology for estimating the emissions for the Ronnebiere site between 2000 and 2014 in the NIR. Luxembourg explained that the estimates were based on measurements; the ERT recommends that the Party justify the representativeness of its monitoring</p>	Yes. Completeness*
W.7	5.A.1 Managed waste disposal sites – CH ₄	<p>Luxembourg refers to the description in the 2006 IPCC Guidelines (volume 5, p.4.4) to justify the use of an MCF of 0.1 (instead of 1.0 for managed solid waste disposal sites) from 2007 onwards. Luxembourg uses this low MCF to bring into account that all waste disposed since 2007 is pre-treated before disposal. The pre-treatment reduces the amount of material and the organic content of the material, resulting in less CH₄ emissions after disposal. The ARRs from 2012 to 2014 all made recommendations to justify the use of this low MCF by Luxembourg (see ID# W.1 in table 3). In</p>	Yes. Accuracy*

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue ^a and/or a problem ^b ? If yes, classify by type
		<p>response to questions raised by the ERT, Luxembourg explained the reason for its application of the MCF of 0.1, but agreed with the ERT that it would be better to change the DOC values to country-specific values instead of using the low MCF, since the latter should be interpreted as the waste management correction factor, which reflects the management aspect from landfills, in the calculation method. Luxembourg explained that in a recently conducted study, CH₄ emissions were calculated separately for directly disposed waste with the multiphase model and pre-treated waste with a single-phase model. For the pre-treated waste, the model will take into account a reduced DOC, as suggested by the ERT. In addition, and as was independently suggested, in order to differentiate whether waste is landfilled directly or pre-treated, an MCF of 1.0 will be applied to managed anaerobic landfills</p> <p>This approach is currently under validation in Luxembourg and the ERT recommends that Luxembourg explain its choice of MCF and DOC values in its NIR</p>	
W.8	5.A.1 Managed waste disposal sites – CH ₄	<p>In the NIR (p.495) a short summary from paragraph 7.3.2.1 gives the impression that Luxembourg does not take the amounts of waste landfilled to the many smaller unmanaged dumping sites before 1972 and 1979 into account in its emission estimations. Responding to a question raised during the review, Luxembourg provided information to the ERT on these unmanaged disposal sites and agreed with the ERT to improve the description of these historical dumping sites and their handling for the emission estimates in the next submission</p> <p>The ERT welcomes Luxembourg’s intentions and recommends that the Party provide appropriate documentation and references so that the reported emission estimates are transparent and steps in their calculation may be retraced</p>	Yes. Transparency*
W.9	5.A.1 Managed waste disposal sites – CH ₄	<p>The ERT noted that Luxembourg omitted the CH₄ emissions from one industrial solid waste disposal site (Ronneberg) in the total of CH₄ emissions from all the solid waste disposal sites in CRF tables 5.A for the years 2000–2014. In the NIR, however, the correct emissions are provided in table 7–3 (p.493). The ERT considers this to be an underestimation of CH₄ emissions in the CRF tables for the years 2000–2014. In response to a question raised by the ERT on the missing emissions in the CRF tables, Luxembourg responded that the data in the NIR are correct and the data in the CRF tables are erroneous. Luxembourg expressed its intention to correct the data in the CRF tables for its next submission</p> <p>The missing emissions do not exceed the significance thresholds (decision 24/CP.19, paragraph 37(b)) of 0.05% of national total GHG emissions and do not exceed 500 kt CO₂ eq. The maximum missing emissions amount to 0.02% of total GHG emissions in Luxembourg in the year 2000 and a minimum of 0.001% of total GHG emissions in the year 2013 and 0.002% in the year 2014</p> <p>Since Luxembourg must take into account the total national aggregate of estimated emissions for all</p>	Yes. Completeness*

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue ^a and/or a problem ^b ? If yes, classify by type
		gases and categories, those considered insignificant must remain below 0.1% of the national total GHG emissions, and since Luxembourg already has emission estimates available in its NIR (table 7-3, p.493; ranging from 3.197 kt CH ₄ to 1.161 kt CH ₄ per year), the ERT recommends that the Party include the missing CH ₄ emissions for the one industrial solid waste disposal site for the years 2000–2014 in CRF table 5.A	
W.10	5.B.1 Composting – CH ₄ , N ₂ O	<p>Luxembourg estimates CH₄ and N₂O emissions from composting for seven composting installations and one co-composting installation with sewage sludge with a tier 1 methodology, using default 2006 IPCC Guidelines EFs (on a wet basis) for CH₄ and N₂O (table 4.1 of volume 5 of the 2006 IPCC Guidelines). The description in the NIR does not cover whether private composting by households is included in the emission estimates. In response to a question raised by the ERT, Luxembourg explained that all households are covered by a collection scheme for biodegradable waste</p> <p>The ERT recommends that Luxembourg include this information in the NIR for more transparency on the completeness of the emission inventory</p>	Yes. Transparency*
W.11	5.B.2 Anaerobic digestion at biogas facilities – CH ₄ , N ₂ O	<p>Luxembourg provides no information on CH₄ emission estimates for anaerobic digestion facilities in the waste chapter of the NIR. In the relevant CRF table (table 5.B), notation keys “NE” (not estimated) and “NO” (not occurring) are used for CH₄. In response to a question raised during the review, Luxembourg explained that the digestion of organic waste streams is occurring and that CH₄ and N₂O emissions, linked to the burning process for electricity and/or heat production in biogas facilities, are included in the energy sector. CO₂ emissions are also reported in the energy sector as a memo item. However, the emissions due to handling before and after the digestion process (storage in bunkers, digestate storage) and the unintentional leakages and process disturbances are not included in any emission estimates in the waste sector or in the energy sector</p> <p>In order to ensure that the significance thresholds of decision 24/CP.19, annex I, paragraph 37(b), are respected and that the “NE” reported for CH₄ emissions from anaerobic digestion (5.B.2) is justified, the ERT requested Luxembourg to make its own estimation with approximated AD and the default 2006 IPCC Guidelines EFs in order to derive a likely level of emissions for the category 5.B.2</p> <p>Since Luxembourg had not yet collected AD on the waste amounts (tonnes of wet or dry waste) that are digested, Luxembourg made a first conservative estimate of the missing emissions during the review using the default value from the 2006 IPCC Guidelines, volume 5, chapter 4, paragraph 4.1, from unintentional leakages and process disturbances of 5% of the amount of CH₄ generated, as proposed by the ERT. In the calculation, Luxembourg assumed a CH₄ content in the biogas of 75%</p> <p>This estimation demonstrated an underestimation of CH₄ emissions for the years 2004–2014, which</p>	Yes. Transparency*

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue ^a and/or a problem ^b ? If yes, classify by type
		<p>is above the threshold of 0.05% as set out in decision 24/CP.19, annex I, paragraph 37(b) (0.17% of total GHG emissions excluding LULUCF in 2014). The ERT included this issue in the list of potential problems and further questions raised by the ERT during the review</p> <p>In response to this list, Luxembourg resubmitted CH₄ emissions for this category using the same methodology as discussed with the ERT during the review: using the generated amounts of biogas for energy purposes in Luxembourg, the CH₄ content in the biogas and a share of CH₄ emitted from unintentional leakages and disturbances. Luxembourg provided references and information to justify the use of the CH₄ content in the biogas of 58.5%^d and the leakage/disturbance percentage of 3.1% CH₄ of total CH₄ generated by biogas production^e (instead of the default of 5% proposed by the 2006 IPCC Guidelines (volume 5, chapter 4, paragraph 4.1)). The ERT considers that the revised estimates solved the issue. The ERT commends Luxembourg for its intention to develop in the following months a method more specific to the national situation</p> <p>The ERT recommends that the Party explain, in its NIR, how it estimates CH₄ emissions from anaerobic digestion facilities</p>	
W.12	5.C.2 Open burning of waste – CO ₂ , CH ₄ , N ₂ O	<p>Luxembourg did not provide in the NIR information on the use of the notation key “NO” (not occurring) for emissions from the open burning of waste (category 5.C.2). In response to a question raised during the review, Luxembourg informed the ERT of a ban on the open burning of all waste types set out in national legislation</p> <p>To improve transparency the ERT recommends that the Party include a paragraph in the NIR with information on the national ban on the open burning of all types of waste in the open air with references to the national legislation</p>	Yes. Transparency*
W.13	5.D.1 Domestic wastewater – CH ₄ , N ₂ O	<p>Luxembourg explained in earlier NIRs (NIR 2013, p.402; NIR 2014, p.424) and also in the current submission (NIR, p.511) that a new data source (2011 national census) could be used to update the estimate of the number of inhabitants not connected to a central wastewater treatment plant (instead using a septic tank or a small mechanical treatment plant). The 2011 national census should provide updated data for recent years. In response to a question raised during the review on the 2011 national census, Luxembourg explained that the results were not officially available in time for the current submission; however, data are available from the 2011 census and the AD to estimate CH₄ emissions from wastewater treatment for inhabitants not connected to a central treatment plant will be updated in accordance with the new source in the Party’s next submission</p> <p>The ERT recommends that Luxembourg use the data from the 2011 census to improve the accuracy of CH₄ and N₂O emissions from this category</p>	Yes. Accuracy*
	5.D.1 Domestic wastewater	The methodology for estimating N ₂ O emissions from domestic and commercial wastewater handling (NIR, pp.513–517) did not change between the 2014 and the current submissions of Luxembourg. In	Yes. Transparency*

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue ^a and/or a problem ^b ? If yes, classify by type
– N ₂ O		<p>ARR 2014 (para. 77), the ERT recommended that Luxembourg revise the N₂O emissions for wastewater treatment plants with significant denitrification. Luxembourg was using the Revised 1996 IPCC Guidelines default value of 3.2 g N₂O per person per day as the EF for the wastewater treated in wastewater treatment plants with significant denitrification levels. For the wastewater treated without significant denitrification levels, a much higher country-specific EF (estimated by the current ERT to be approximately 37 g N₂O per capita per year) was used. This is not consistent with increased denitrification leading to higher N₂O emissions</p> <p>A recommendation from ARR 2014 (see W.4 in table 3) referred to the missing estimation of N₂O emissions for the effluent of the wastewater treatment plants. Another recommendation from ARR 2014 (see W.3 table 3) referred to the possible double counting of N₂O emissions from sludge that is spread out on land (as fertilizer) in the agriculture sector. An emission estimate is made in the agriculture sector, but no reduction of nitrogen is taken into account in the N₂O emission estimates for 5.D.1, regarding the nitrogen from the sewage sludge that is removed from the wastewater system to agriculture</p> <p>Following recommendations from the ARR 2014 Luxembourg informed the ERT that a study had been started to revise the calculation of emissions from wastewater treatment in Luxembourg, taking into account any changes coming from the 2006 IPCC Guidelines. Luxembourg confirmed that the study has been finalized but validation is required. Therefore, the results could not yet be integrated into the 2016 submission. Luxembourg intends to integrate the results of the study into its 2017 submission, subject to available resources</p> <p>The ERT welcomes the efforts of Luxembourg to improve the emission estimates for the wastewater sector and recommends that the Party implement the results of the study in its next submission, taking into account the recommendations of earlier reviews</p>	
KP-LULUCF	KL.6 General (KP-LULUCF)	<p>The NIR (p.551) states that “An uncertainty assessment of emissions/removals of the afforestation, reforestation and deforestation and forest management (FM) units is planned in 2016, depending on the availability of financial resources”</p> <p>The ERT recommends that the Party estimate and report uncertainty for each KP-LULUCF activity</p>	Yes. Transparency*
KL.7	Afforestation and reforestation – CO ₂	<p>CRF table (4KP-I) A.1 reports a carbon stock change for above-ground biomass of 3.11 t C, however, NIR table 11.7 provides an above-ground biomass gain value of 6.5 t C/ha per year (0 to 20 years) and 9.91 t C/ha per year for 20 to 40 years; therefore, these references are not consistent. Furthermore, the references for biomass gain estimation are not provided for afforestation and reforestation areas</p> <p>The ERT recommends that the Party ensure consistency of the information on carbon stock change</p>	Yes. Transparency*

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue ^a and/or a problem ^b ? If yes, classify by type
KL.8	Afforestation and reforestation – CO ₂	<p>for above-ground biomass between CRF tables and NIR data, and the ERT also recommends that the Party provide information and references for biomass growth rates used for afforestation and reforestation areas</p> <p>The NIR provides a biomass growth rate of 6.65 t C/ha per year (table 11.7) for all land categories converted to FL (wetlands converted to FL, cropland converted to FL, grasslands converted to FL and even other land converted to FL). However, the ERT considers that it is unlikely that the biomass growth rate will be the same for all land categories converted to FL</p> <p>The ERT recommends that the Party generate biomass growth rates separately for the conversion of different land categories to FL</p>	Yes. Accuracy*

Abbreviations: AD = activity data, ARR = annual review report, C = carbon, CPR = commitment period reserve, CRF = common reporting format, DOC = degradable organic carbon, EF = emission factor, ERT = expert review team, FL = forest land, GHG = greenhouse gas, IEA = International Energy Agency, IEF = implied emission factor, IPCC = Intergovernmental Panel on Climate Change, IPPU = industrial processes and product use, KP-LULUCF = LULUCF emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, LULUCF = land use, land-use change and forestry, MCF = methane conversion factor, NCV = net calorific value, NEU = non-energy use, Nex = nitrogen excretion, NFI = national forest inventory, NIR = national inventory report, QA/QA = quality assurance/quality control, Revised 1996 IPCC Guidelines = *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*, UNFCCC Annex I inventory reporting guidelines = “Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual greenhouse gas inventories”, 2006 IPCC Guidelines = *2006 IPCC Guidelines for National Greenhouse Gas Inventories*.

^a Recommendations are related to issues as defined in decision 13/CP.20, annex, paragraph 81, or problems as identified in decision 22/CMP.1, annex, paragraph 69, identified by the ERT during the review. Encouragements are made to the Party to address all findings not related to such issues.

^b An asterisk is included next to each issue type that is also a problem, as defined in decision 22/CMP.1, annex, paragraphs 68 and 69, including those that lead to an adjustment or a question of implementation.

^c Amon et al., 2006.

^d Flesch et al., 2011; Dumont et al., 2011.

1.

VI. Application of adjustments

11. The ERT has not identified the need to apply any adjustments to the 2016 annual submission of Luxembourg.

VII. Accounting quantities for activities under Article 3, paragraph 3, and, if any, activities under Article 3, paragraph 4, of the Kyoto Protocol

12. Luxembourg has elected commitment period accounting and therefore the issuance and cancellation of units for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol are not applicable for the 2016 review.

VIII. Questions of implementation

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

Annex I

Overview of greenhouse gas emissions and removals for Luxembourg for submission year 2016 and data and information on activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol

1. Tables 6–9 provide an overview of total greenhouse gas emissions and removals as submitted by Luxembourg.

Table 6

Total greenhouse gas emissions for Luxembourg, base year^a–2014^b

(kt CO₂ eq)

	Total GHG emissions excluding indirect CO ₂ emissions		Total GHG emissions including indirect CO ₂ emissions ^c		Land-use change (Article 3.7 bis as contained in the Doha Amendment ^d)	KP-LULUCF activities (Article 3.3 of the Kyoto Protocol) ^e	KP-LULUCF activities (Article 3.4 of the Kyoto Protocol)	
	Total including LULUCF	Total excluding LULUCF	Total including LULUCF	Total excluding LULUCF			CM, GM, RV, WDR	FM
FMRL								–418.00
Base year	12 925.00	12 872.86	12 925.00	12 872.86	268.38		NA	
1990	12 906.58	12 854.45	12 906.58	12 854.45				
1995	9 508.96	10 072.21	9 508.96	10 072.21				
2000	9 019.28	9 721.13	9 019.28	9 721.13				
2010	12 062.59	12 215.56	12 062.59	12 215.56				
2011	11 810.68	12 085.66	11 810.68	12 085.66				
2012	11 402.93	11 765.81	11 402.93	11 765.81				
2013	10 669.11	11 207.73	10 669.11	11 207.73		–135.25	NA	–436.29
2014	10 313.00	10 773.44	10 313.00	10 773.44		–134.14	NA	–359.70

Abbreviations: CM = cropland management, FM = forest management, FMRL = forest management reference level, GHG = greenhouse gas, GM = grazing land management, KP-LULUCF = LULUCF emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, LULUCF = land use, land-use change and forestry, NA = not applicable, RV = revegetation, WDR = wetland drainage and rewetting.

^a Base year refers to the base year under the Kyoto Protocol, which is 1990 for CO₂, CH₄ and N₂O, and 1995 for HFCs, PFCs, SF₆ and NF₃. Luxembourg has not elected any activities under Article 3, paragraph 4, of the Kyoto Protocol. For activities under Article 3, paragraph 3, of the Kyoto Protocol and forest management under Article 3, paragraph 4, only the inventory years of the commitment period must be reported.

^b Emissions/removals reported in the sector other (sector 6) are not included in total GHG emissions.

^c The Party has not reported indirect CO₂ emissions in common reporting format table 6.

^d The value reported in this column refers to 1990.

^e Activities under Article 3, paragraph 3, of the Kyoto Protocol, namely afforestation and reforestation, and deforestation.

Table 7

Greenhouse gas emissions by gas for Luxembourg, excluding land use, land-use change and forestry, 1990–2014^a(kt CO₂ eq)

	<i>CO₂^b</i>	<i>CH₄</i>	<i>N₂O</i>	<i>HFCs</i>	<i>PFCs</i>	<i>Unspecified mix of HFCs and PFCs</i>	<i>SF₆</i>	<i>NF₃</i>
1990	11 945.00	619.80	288.77	0.00	NO	NO	0.88	NO
1995	9 156.75	610.77	285.39	17.90	NO	NO	1.39	NO
2000	8 796.97	605.30	287.95	28.98	NO	NO	1.93	NO
2010	11 280.63	605.39	270.34	52.33	NO	NO	6.87	NO
2011	11 166.14	579.16	277.86	55.19	NO	NO	7.31	NO
2012	10 867.96	567.56	265.07	57.53	NO	NO	7.68	NO
2013	10 297.56	571.51	269.44	61.17	NO	NO	8.05	NO
2014	9 824.06	578.85	296.01	66.08	NO	NO	8.44	NO
Per cent change 1990–2014	–17.8	–6.6	2.5	92 414 848.2	NA	NA	863.3	NA

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

^a Emissions/removals reported in the sector other (sector 6) are not included in total greenhouse gas emissions.

^b Luxembourg did not report indirect CO₂ emissions in common reporting format table 6.

Table 8
Greenhouse gas emissions by sector for Luxembourg, 1990–2014^{a, b}
 (kt CO₂eq)

	<i>Energy</i>	<i>IPPU</i>	<i>Agriculture</i>	<i>LULUCF</i>	<i>Waste</i>	<i>Other</i>
1990	10 393.69	1 648.46	716.21	52.13	96.08	NO
1995	8 242.27	1 037.03	699.41	-563.24	93.50	NO
2000	8 154.28	782.33	697.30	-701.85	87.22	NO
2010	10 802.75	672.53	670.42	-152.97	69.86	NO
2011	10 665.53	690.52	664.26	-274.98	65.35	NO
2012	10 429.87	631.40	644.81	-362.88	59.73	NO
2013	9 878.55	609.68	660.55	-538.62	58.94	NO
2014	9 396.38	645.78	672.72	-460.44	58.56	NO
Per cent change 1990–2014	-9.6	-60.8	-6.1	-983.2	-39.1	NA

Abbreviations: IPPU = industrial processes and product use, LULUCF = land use, land-use change and forestry, NA = not applicable, NO = not occurring.

^a Emissions/removals reported in the sector other (sector 6) are not included in total greenhouse gas emissions.

^b Luxembourg did not report indirect CO₂ emissions in common reporting format table 6.

Table 9
Greenhouse gas emissions/removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol by activity, base year^{a,b}–2014, for Luxembourg
 (kt CO₂ eq)

	<i>Article 3.7 bis as contained in the Doha Amendment^c</i>			<i>Article 3.3 of the Kyoto Protocol</i>					<i>Forest management and elected Article 3.4 activities of the Kyoto Protocol</i>			
	<i>Land-use change</i>	<i>Afforestation and reforestation</i>	<i>Deforestation</i>	<i>Forest management</i>	<i>Cropland management</i>	<i>Grazing land management</i>	<i>Revegetation</i>	<i>Wetland drainage and rewetting</i>				
FMRL				-418.00								
Technical correction				NA								
Base year	268.38					NA	NA	NA		NA		NA
2013		-179.37	44.12	-436.29		NA	NA	NA		NA		NA
2014		-176.28	42.14	-359.70		NA	NA	NA		NA		NA
Per cent change base year– 2014						NA	NA	NA		NA		NA

Abbreviations: FMRL = forest management reference level, NA = not applicable.

^a Base year refers to the base year under the Kyoto Protocol, which is 1990 for CO₂, CH₄ and N₂O, and 1995 for HFCs, PFCs SF₆ and NF₃. Luxembourg has not elected any activities under Article 3, paragraph 4, of the Kyoto Protocol. For activities under Article 3, paragraph 3, of the Kyoto Protocol, and forest management under Article 3, paragraph 4, only the inventory years of the commitment period must be reported.

^b Values in this table include emissions on lands subject to natural disturbances, if applicable.

^c The value reported in this column refers to 1990.

2. Table 10 provides an overview of relevant key data for Luxembourg's reporting under Article 3, paragraphs 3 and 4, of the Kyoto Protocol.

Table 10

Key relevant data for Luxembourg under Article 3, paragraphs 3 and 4, of the Kyoto Protocol

<i>Key parameters</i>	<i>Values</i>
Periodicity of accounting	(a) Afforestation/reforestation: commitment period accounting (b) Deforestation: commitment period accounting (c) Forest management: commitment period accounting (d) Cropland management: not elected (e) Grazing land management: not elected (f) Revegetation: not elected (g) Wetland drainage and rewetting: not elected
Election of activities under Article 3, paragraph 4	None
Election of application of provisions for natural disturbances	Yes, for afforestation and reforestation and forest management
3.5% of total base year GHG emissions, excluding LULUCF and including indirect CO ₂ emissions	450.550 kt CO ₂ eq (3 604.402 kt CO ₂ eq for the duration of the commitment period)
Cancellation of AAUs, ERUs, CERs and/or issuance of RMUs in the national registry for:	
1. Afforestation and reforestation in 2014	NA
2. Deforestation in 2014	NA
3. Forest management in 2014	NA
4. Cropland management in 2014	NA
5. Grazing land management in 2014	NA
6. Revegetation in 2014	NA
7. Wetland drainage and rewetting in 2014	NA

Abbreviations: AAU = assigned amount unit, CER = certified emission reduction, ERU = emission reduction unit, GHG = greenhouse gas, LULUCF = land use, land-use change and forestry, NA = not applicable, RMU = removal unit.

Annex II

Information to be included in the compilation and accounting database

Tables 11 and 12 include the information to be included in the compilation and accounting database for Luxembourg. Data shown are from the original annual submission of the Party, including the latest revised estimates submitted, adjustments (if applicable), as well as the final data to be included in the compilation and accounting database.

Table 11

Information to be included in the compilation and accounting database for 2014, including the commitment period reserve, for Luxembourg

(t CO₂ eq)

	<i>Original submission</i>	<i>Revised estimates</i>	<i>Adjustment^a</i>	<i>Final^b</i>
Commitment period reserve	NR	65 209 026		65 209 026
Annex A emissions for 2014				
CO ₂	9 829 929	9 824 059		9 824 059
CH ₄	570 123	578 849		578 849
N ₂ O	296 011			296 011
HFCs	66 077			66 077
PFCs	NO			NO
Unspecified mix of HFCs and PFCs	NO			NO
SF ₆	8 441			8 441
NF ₃	NO			NO
Total Annex A sources	10 770 581	10 773 437		10 773 437
Activities under Article 3, paragraph 3, of the Kyoto Protocol for 2014				
3.3 Afforestation and reforestation		-176 278		-176 278
3.3 Deforestation		42 136		42 136
Forest management and elected activities under Article 3, paragraph 4, of the Kyoto Protocol for 2014				
3.4 Forest management for 2014		-359 703		-359 703

Abbreviations: Annex A sources = sources included in Annex A to the Kyoto Protocol, NO = not occurring, NR = not reported.

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

^b "Final" includes revised estimates, if any, and/or adjustments, if any.

Table 12
Information to be included in the compilation and accounting database for 2013 for Luxembourg
(t CO₂ eq)

	<i>Original submission</i>	<i>Revised estimates</i>	<i>Adjustment^a</i>	<i>Final^b</i>
Annex A emissions for 2013				
CO ₂	10 305 282	10 297 565		10 297 565
CH ₄	563 364	571 509		571 509
N ₂ O	269 436			269 436
HFCs	61 168			61 168
PFCs	NO			NO
Unspecified mix of HFCs and PFCs	NO			NO
SF ₆	8 051			8 051
NF ₃	NO			NO
Total Annex A sources	11 207 301	11 207 729		11 207 729
Activities under Article 3, paragraph 3, of the Kyoto Protocol for 2013				
3.3 Afforestation and reforestation		-179 371		-179 371
3.3 Deforestation		44 119		44 119
Forest management and elected activities under Article 3, paragraph 4, of the Kyoto Protocol for 2013				
3.4 Forest management for 2013		-436 290		-436 290

Abbreviations: Annex A sources = sources included in Annex A to the Kyoto Protocol, NO = not occurring.

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

^b "Final" includes revised estimates, if any, and/or adjustments, if any.

Annex III

Additional information to support findings in table 2

Missing categories that may affect completeness

The categories for which methods are included in the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* were reported as “NE” (not estimated) or for which the expert review team otherwise determined that there may be an issue with the completeness of reporting in the Party’s inventory are the following:

- (a) 5.A Solid waste disposal on land (methane) (refer to table 5, W.6);
- (b) 5.A.1 Managed waste disposal sites (methane, nitrous oxide) (refer to table 5, W.9).

Annex IV

Documents and information used during the review

A. Reference documents

Aggregate information on greenhouse gas emissions by sources and removals by sinks for Parties included in Annex I to the Convention. Note by the secretariat. Available at <http://unfccc.int/resource/webdocs/agi/2015.pdf>.

Annual status report for Luxembourg for 2016. Available at <http://unfccc.int/resource/docs/2016/asr/lux.pdf>.

FCCC/ARR/2015/LUX. Report on the individual review of the annual submission of Luxembourg submitted in 2015. Available at <http://unfccc.int/resource/docs/2016/arr/lux.pdf>.

FCCC/ARR/2014/LUX. Report on the individual review of the annual submission of Luxembourg submitted in 2014. Available at <http://unfccc.int/resource/docs/2015/arr/lux.pdf>.

FCCC/ARR/2013/LUX. Report of the individual review of the annual submission of Luxembourg submitted in 2013. Available at <http://unfccc.int/resource/docs/2014/arr/lux.pdf>.

“Guidelines for national systems for the estimation of anthropogenic greenhouse gas emissions by sources and removals by sinks 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 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>.

“Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual greenhouse gas inventories”. Annex I to decision 24/CP.19. Available at <http://unfccc.int/resource/docs/2013/cop19/eng/10a03.pdf#page=4>.

“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 the technical review of information reported under the Convention related to greenhouse gas inventories, biennial reports and national communications by Parties included in Annex I to the Convention”. Annex to decision 13/CP.20. Available at <http://unfccc.int/resource/docs/2014/cop20/eng/10a03.pdf#page=6>.

“Implications of the implementation of decisions 2/CMP.7 to 4/CMP.7 and 1/CMP.8 on the previous decisions on methodological issues related to the Kyoto Protocol, including those relating to Articles 5, 7 and 8 of the Kyoto Protocol, part I: implications related to accounting and reporting and other related issues”. Decision 3/CMP.11. Available at <http://unfccc.int/resource/docs/2015/cmp11/eng/08a01.pdf#page=5>.

“Implications of the implementation of decisions 2/CMP.7 to 4/CMP.7 and 1/CMP.8 on the previous decisions on methodological issues related to the Kyoto Protocol, including those relating to Articles 5, 7 and 8 of the Kyoto Protocol, part II: implications related to review

and adjustments and other related issues”. Decision 4/CMP.11. Available at <<http://unfccc.int/resource/docs/2015/cmp11/eng/08a01.pdf#page=30>>.

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

Intergovernmental Panel on Climate Change. 2014. *2013 Revised Supplementary Methods and Good Practice Guidance Arising from the Kyoto Protocol*. Available at <<http://www.ipcc-nggip.iges.or.jp/public/kpsg>>.

Intergovernmental Panel on Climate Change. 2014. *2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands*. Available at <<http://www.ipcc-nggip.iges.or.jp/public/wetlands/index.html>>.

Intergovernmental Panel for Climate Change. 2003. *Good Practice Guidance for Land Use, Land-Use Change and Forestry*. Available at <<http://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf.html>>.

Standard independent assessment report, part 1, for Luxembourg for 2016. Available at <http://unfccc.int/files/kyoto_mechanisms/application/pdf/siar_2016_lux_1_2.pdf>.

Standard independent assessment report, part 2, for Luxembourg for 2016. Available at <http://unfccc.int/files/kyoto_mechanisms/application/pdf/siar_2016_lux_2_2.pdf>.

B. Additional information provided by the Party

Responses to questions during the review were received from Mr. Marc Schuman (Environment Agency), including additional material on the methodology and assumptions used. The following documents¹ were also provided by Luxembourg:

Amon et al. 2006. Thomas Amon, Barbara Amon, Vitaliy Kryvoruchko, Werner Zollitsch, Karl Mayer, and Leonhard Gruber, Biogas production from maize and dairy cattle manure—Influence of biomass composition on the methane yield, *Agriculture, Ecosystems & Environment*; Volume 118, Issues 1–4, January 2007, Pages 173–182.

Dumont et al. 2011. Methane emissions in biogas production. Pages 248–266 in Chapter 11: *The Biogas Handbook – Science, production and applications*, 2011.

Flesch et al. 2011. *Biomass and Bioenergy* Volume 35, Issue 9, October 2011, Pages 3927–3935.

¹ Reproduced as received from the Party.

Annex V

Acronyms and abbreviations

AAU	assigned amount unit
AD	activity data
ARR	annual review report
AWMS	animal waste management system
C	carbon
CER	certified emission reduction
CH ₄	methane
CL	cropland
CO ₂	carbon dioxide
CO ₂ eq	carbon dioxide equivalent
CPR	commitment period reserve
CRF	common reporting format
DOC	degradable organic carbon
EF	emission factor
ERT	expert review team
ERU	emission reduction unit
FAO	Food and Agriculture Organization of the United Nations
FL	forest land
FM	forest management
GHG	greenhouse gas
GL	grassland
IE	included elsewhere
IEF	implied emission factor
IPCC	Intergovernmental Panel on Climate Change
IPPU	industrial processes and product use
KP-LULUCF	LULUCF emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol
kt	kilotonne
LULUCF	land use, land-use change and forestry
MCF	methane correction factor
Nex	nitrogen excretion
NA	not applicable
NCV	net calorific value
NE	not estimated
NFI	national forest inventory
NIR	national inventory report
NO	not occurring
NR	not reported
QA/QC	quality assurance/quality control
RMU	removal unit
SEF	standard electronic format
SIAR	standard independent assessment report
UNFCCC	United Nations Framework Convention on Climate Change