



COMPLIANCE COMMITTEE

**CC/ERT/2019/18
5 September 2019**

**Report of the technical review of the seventh national communication
of Luxembourg**

Note by the secretariat

The report of the technical review of the seventh national communication of Luxembourg was published on 13 March 2019. For purposes of rule 10, paragraph 2, of the rules of procedure of the Compliance Committee (annex to decision 4/CMP.2, as amended by decisions 4/CMP.4 and 8/CMP.9), the report is considered received by the secretariat on the same date. This report, FCCC/IDR.7/LUX, contained in the annex to this note, is being forwarded to the Compliance Committee in accordance with section VI, paragraph 3, of the annex to decision 27/CMP.1.



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Report on the technical review of the seventh national communication of Luxembourg

Parties included in Annex I to the Convention were requested by decision 9/CP.16 to submit their seventh national communication to the secretariat by 1 January 2018. According to decision 15/CMP.1, Parties included in Annex I to the Convention that are also Parties to the Kyoto Protocol are required to include in their national communications supplementary information under Article 7, paragraph 2, of the Kyoto Protocol. This report presents the results of the technical review of the seventh national communication and relevant supplementary information under the Kyoto Protocol of Luxembourg, conducted by an expert review team in accordance with 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” and the “Guidelines for review under Article 8 of the Kyoto Protocol”.

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Abbreviations and acronyms

AEA	annual emission allocation
BR	biennial report
CH ₄	methane
CO ₂	carbon dioxide
CO ₂ eq	carbon dioxide equivalent
CRF	common reporting format
CTF	common tabular format
ERT	expert review team
ESD	effort-sharing decision
EU	European Union
EU ETS	European Union Emissions Trading System
F-gas	fluorinated gas
GCOS	Global Climate Observing System
GDP	gross domestic product
GHG	greenhouse gas
HFC	hydrofluorocarbon
IE	included elsewhere
IGBP	International Geosphere-Biosphere Programme
IPCC	Intergovernmental Panel on Climate Change
IPPU	industrial processes and product use
LULUCF	land use, land-use change and forestry
MSDI	Ministry of Sustainable Development and Infrastructure of Luxembourg
NA	not applicable
NC	national communication
NE	not estimated
NF ₃	nitrogen trifluoride
NGO	non-governmental organization
NIR	national inventory report
NO	not occurring
non-Annex I Party	Party not included in Annex I to the Convention
non-ETS sectors	sectors not covered by the European Union Emissions Trading System
N ₂ O	nitrous oxide
ODA	official development assistance
PaMs	policies and measures
PFC	perfluorocarbon
reporting guidelines for supplementary information	“Guidelines for the preparation of the information required under Article 7 of the Kyoto Protocol, Part II: Reporting of supplementary information under Article 7, paragraph 2”
SF ₆	sulfur hexafluoride
UNFCCC reporting guidelines on BRs	“UNFCCC biennial reporting guidelines for developed country Parties”
UNFCCC reporting guidelines on NCs	“Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part II: UNFCCC reporting guidelines on national communications”
WAM	‘with additional measures’
WEM	‘with measures’
WOM	‘without measures’

I. Introduction and summary

A. Introduction

1. This is a report on the in-country technical review of the NC7 of Luxembourg. The review was coordinated by the secretariat in accordance with 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”, particularly “Part V: UNFCCC guidelines for the technical review of national communications from Parties included in Annex I to the Convention” (annex to decision 13/CP.20), and the “Guidelines for review under Article 8 of the Kyoto Protocol” (annex to decision 22/CMP.1 and annex I to decision 4/CMP.11).¹

2. In accordance with the same decisions, a draft version of this report was transmitted to the Government of Luxembourg, which provided comments that were considered and incorporated, as appropriate, into this final version of the report.

3. The review was conducted from 12 to 17 November 2018 in Luxembourg City by the following team of nominated experts from the UNFCCC roster of experts: Mr. Roberto Acosta (Cuba), Mr. Matjaž Česen (Slovenia), Ms. Marjorie Doudnikoff (France), Ms. Olga Gavrilova (Estonia) and Mr. Shengmin Yu (China). Mr. Acosta and Mr. Česen were the lead reviewers. The review was coordinated by Mr. James Howland and Mr. Davor Vesligaj (UNFCCC secretariat).

B. Summary

4. The ERT conducted a technical review of the information reported in the NC7 of Luxembourg in accordance with the UNFCCC reporting guidelines on NCs (decision 4/CP.5) and the reporting guidelines for supplementary information, in particular the supplementary information required under Article 7, paragraph 2, and on the minimization of adverse impacts under Article 3, paragraph 14, of the Kyoto Protocol (annex to decision 15/CMP.1 and annex III to decision 3/CMP.11).

1. Timeliness

5. The NC7 was submitted on 11 February 2018, after the deadline of 1 January 2018 mandated by decision 9/CP.16.

6. Luxembourg did not inform the secretariat about its difficulties with making a timely submission. In accordance with decisions 13/CP.20 and 22/CMP.1, a Party should inform the secretariat thereof by the due date of the submission, in order to facilitate the arrangement of the review process. The ERT noted with concern the delay in the submission and recommended that Luxembourg make its next submission on time.

2. Completeness, transparency of reporting and adherence to the reporting guidelines

7. Issues and gaps identified by the ERT related to the reported information are presented in table 1. The information reported by Luxembourg in its NC7, including the supplementary information under the Kyoto Protocol, mostly adheres to the UNFCCC reporting guidelines on NCs.

¹ At the time of the publication of this report, Luxembourg had submitted its instrument of acceptance of the Doha Amendment; however, 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.

Table 1

Assessment of completeness and transparency of mandatory information reported by Luxembourg in its seventh national communication, including supplementary information under the Kyoto Protocol

<i>Section of NC</i>	<i>Completeness</i>	<i>Transparency</i>	<i>Reference to description of recommendations</i>	<i>Supplementary information under the Kyoto Protocol</i>	<i>Completeness</i>	<i>Transparency</i>	<i>Reference to description of recommendations</i>
Executive summary	Complete	Transparent		National system	Mostly complete	Transparent	Issue 1 in table 6
National circumstances	Complete	Transparent		National registry	Complete	Transparent	
GHG inventory	Complete	Transparent		Supplementarity relating to the mechanisms pursuant to Articles 6, 12 and 17	Complete	Transparent	
PaMs	Complete	Mostly transparent	Issue 2 in table 9	PaMs in accordance with Article 2	Complete	Transparent	
Projections and the total effect of PaMs	Mostly complete	Mostly transparent	Issues 3, 4, 6 and 11 in table 15 Issues 1 and 2 in table 17	Domestic and regional programmes and/or arrangements and procedures	Mostly complete	Mostly transparent	Issues 1 and 2 in table 7
Vulnerability assessment, climate change impacts and adaptation measures	Complete	Mostly transparent	Issue 1 in table 22	Information under Article 10 ^a	Mostly complete	Transparent	
Financial resources and transfer of technology	Mostly complete	Transparent	Issue 1 in table 19	Financial resources	Complete	Transparent	
Research and systematic observation	Mostly complete	Transparent	Issues 1 and 2 in table 23	Minimization of adverse impacts in accordance with Article 3, paragraph 14	Complete	Transparent	
Education, training and public awareness	Complete	Transparent					

Note: A list of recommendations pertaining to the completeness and transparency issues identified in this table is included in chapter III below. The assessment of completeness and transparency by the ERT in this table is based only on the “shall” reporting requirements.

^a The assessment refers to information provided by the Party on the provisions contained in Article 4, paragraphs 3, 5 and 7, of the Convention reported under Article 10 of the Kyoto Protocol, which is relevant to Parties included in Annex II to the Convention only. Assessment of the information provided by the Party on the other provisions of Article 10 of the Kyoto Protocol is provided under the relevant substantive headings under the Convention, for example research and systematic observation.

3. Summary of reviewed supplementary information under the Kyoto Protocol

8. The supplementary information under Article 7, paragraph 2, of the Kyoto Protocol is incorporated in different sections of the NC7, and the supplementary information under Article 7, paragraph 1, of the Kyoto Protocol is reported in the NIR of the 2018 annual submission. Table 2 provides references to where the information is reported. The technical assessment of the information reported under Article 7, paragraphs 1 and 2, of the Kyoto Protocol is contained in the relevant sections of this report.

Table 2

Overview of supplementary information under the Kyoto Protocol reported by Luxembourg

<i>Supplementary information</i>	<i>Reference to section of NC7</i>
National registry	Chapter III, section 2
National system	Chapter III, section 3
Supplementarity relating to the mechanisms pursuant to Articles 6, 12 and 17	Chapter V, section 6
PaMs in accordance with Article 2	Chapter IV, section 3
Domestic and regional programmes and/or legislative arrangements and enforcement and administrative procedures	Chapter IV, section 2
Information under Article 10	Chapter III, section 2; chapter IV, section 2; chapter VII, section 7; chapter VIII; chapter IX
Financial resources	Chapter VII
Minimization of adverse impacts in accordance with Article 3, paragraph 14	Chapter IV, section 3.6

II. Technical review of the information reported in the seventh national communication, including the supplementary information under the Kyoto Protocol

A. Information on national circumstances and greenhouse gas emissions and removals

1. National circumstances relevant to greenhouse gas emissions and removals

(a) Technical assessment of the reported information

9. The national circumstances of Luxembourg explain the relationship between its historical and future emission trends and the climate change policy agenda. The changing nature of those circumstances defines the factors that affect the climate policy development and implementation of the Convention. The NC7 contains key data on legislation, population trends, geography and land use, climate and climate change, economic developments, energy, transport, the buildings sector, industry, trade, the services sector, agriculture, forestry, resource efficiency, waste and wastewater.

10. The ERT noted that during the period 1990–2016 Luxembourg's GDP per capita increased by 68.4 per cent, while GHG emissions per GDP unit and GHG emissions per capita decreased by 21.6 per cent, respectively. Table 3 illustrates the national circumstances of Luxembourg by providing some indicators relevant to emissions and removals.

11. Luxembourg reported three main drivers of the changes in its GHG emissions: significant economic growth, leading to increases in population and in the number of cross-border commuters; the overall increase in road transport flows; and the shift from blast to electric arc furnaces in iron and steel industry that occurred between 1994 and 1998. The economic growth was driven mostly by financial intermediation (banking and insurance), real estate and business-to-business services (NC7, table II.5–1). Nevertheless, Luxembourg estimated that GHG emissions from fuel combustion in the commercial and institutional sector slightly decreased over the reporting period, from 638.9 kt CO₂ eq in 1990 to 474.9 kt CO₂ eq in 2015. Rapid economic growth led to an increase in the country's total number of inhabitants from 384,400 in 1990 to 576,200 in 2016 (NC7, table II.4–1), which led to growth in the number of households (by 44.1 per cent between 1990 and 2011) and to an increase in GHG emissions from the residential sector (from 678.6 kt CO₂ eq in 1990 to 1,050.7 kt CO₂ eq in 2016). The total number of cross-border workers increased from 56,900 to 177,200 in 2016, at an average annual growth rate of 5.6 per cent, which resulted in an increase in fuel consumption for travel to work and for leisure. Luxembourg estimated and reported separately GHG emissions from fuel consumption used for transport for residents and non-residents, which show 97.4 per cent (NC7, figure II.4–6, and CRF table 1.A.3.a) and 135.2 per cent increases between 1990 and 2015 (NC7, figure II.4–6, and CRF table 1.A.3.b), respectively.

Table 3

Indicators relevant to greenhouse gas emissions and removals for Luxembourg for the period 1990–2016

Indicator						Change (%)	
	1990	2000	2010	2015	2016	1990–2016	2015–2016
GDP per capita (thousands 2011 USD using purchasing power parity)	57.62	81.69	91.74	95.31	97.02	68.4	1.8
GHG emissions without LULUCF per capita (t CO ₂ eq)	12 785.97	9 666.67	12 167.35	10 274.56	10 028.28	–21.6	–2.4
GHG emissions without LULUCF per GDP unit (kg CO ₂ eq per 2011 USD using purchasing power parity)	0.58	0.27	0.26	0.19	0.18	–69.5	–6.3

Sources: (1) GHG emission data: Luxembourg's 2018 GHG inventory submission, version 1; (2) population and GDP: World Bank.

Note: The ratios per capita and per GDP unit are calculated relative to GHG emissions without LULUCF; the ratios are calculated using the exact (not rounded) values and may therefore differ from a ratio calculated with the rounded numbers provided in the table.

(b) Assessment of adherence to the reporting guidelines

12. The ERT assessed the information reported in the NC7 of Luxembourg and recognized that the reporting is complete, transparent and adhering to the UNFCCC reporting guidelines on NCs. There were no issues raised during the review relating to the topics discussed in this chapter of the review report.

2. Information on greenhouse gas inventory arrangements, emissions, removals and trends

(a) Technical assessment of the reported information

13. Total GHG emissions² excluding emissions and removals from LULUCF decreased by 21.6 per cent between 1990 and 2016, whereas total GHG emissions including net emissions or removals from LULUCF decreased by 25.7 per cent over the same period.

Table 4 illustrates the emission trends by sector and by gas for Luxembourg.

Table 4

Greenhouse gas emissions by sector and by gas for Luxembourg for the period 1990–2016

	GHG emissions (kt CO ₂ eq)					Change (%)		Share (%)	
	1990	2000	2010	2015	2016	1990–2016	2015–2016	1990	2016
<i>Sector</i>									
1. Energy	10 263.87	8 029.97	10 672.86	8 823.18	8 538.41	–16.8	–3.2	80.3	85.1
A1. Energy industries	35.64	120.17	1 205.97	457.59	252.37	608.0	–44.8	0.3	2.5
A2. Manufacturing industries and construction	6 265.38	1 396.63	1 263.08	1 097.10	1 125.43	–82.0	2.6	49.0	11.2
A3. Transport	2 584.67	4 817.63	6 464.14	5 650.86	5 479.75	112.0	–3.0	20.2	54.6
A4. and A5. Other	1 358.79	1 665.56	1 685.71	1 583.03	1 649.06	21.4	4.2	10.6	16.4
B. Fugitive emissions from fuels	19.39	29.98	53.96	34.60	31.80	64.0	–8.1	0.2	0.3
C. CO ₂ transport and storage	NO	NO	NO	NO	NO	–	–	–	–
2. IPPU	1 640.25	779.35	675.55	627.51	652.06	–60.2	3.9	12.8	6.5
3. Agriculture	773.50	748.82	719.75	736.26	752.06	–2.8	2.1	6.0	7.5
4. LULUCF	48.33	–702.01	–153.17	–406.62	–491.05	–1 115.9	20.8	NA	NA
5. Waste	108.35	108.53	99.19	87.61	85.75	–20.9	–2.1	0.8	0.9
6. Other	NO	NO	NO	NO	NO	NA	NA	NA	NA
<i>Gas^a</i>									
CO ₂	11 812.04	8 672.87	11 154.29	9 259.66	9 002.96	–23.8	–2.8	92.4	89.8
CH ₄	631.40	623.56	630.52	620.71	625.05	–1.0	0.7	4.9	6.2
N ₂ O	341.65	338.73	322.22	317.89	325.27	–4.8	2.3	2.7	3.2
HFCs	0.00	29.58	53.46	67.42	65.77	–	–2.4	–	0.7
PFCs	NO	NO	NO	NO	NO	–	–	–	–
SF ₆	0.88	1.93	6.87	8.89	9.23	953.7	3.9	0.0	0.1
NF ₃	NO	NO	NO	NO	NO	–	–	–	–
Total GHG emissions without LULUCF	12 785.97	9 666.67	12 167.35	10 274.56	10 028.28	–21.6	–2.4	100.0	100.0
Total GHG emissions with LULUCF	12 834.30	8 964.66	12 014.19	9 867.94	9 537.23	–25.7	–3.4	NA	NA

Source: GHG emission data: Luxembourg's 2018 annual submission, version 1.

^a Emissions by gas without LULUCF and without indirect CO₂.

² In this report, the term “total GHG emissions” refers to the aggregated national GHG emissions expressed in terms of CO₂ eq excluding LULUCF, unless otherwise specified. Values in this paragraph are calculated on the basis of the Party's 2018 annual submission, version 1.

14. Overall, the emission profile by gas of the country remained the same from 1990 to 2016: of the total GHG emissions, CO₂ accounted for 92.4 per cent in 1990 and 89.8 per cent in 2016; CH₄ for 4.9 per cent in 1990 and 6.2 per cent in 2016; N₂O for 2.7 per cent in 1990 and 3.2 per cent in 2016; and F-gases for 0.01 per cent in 1990 and 0.7 per cent in 2016. The overall decrease in emissions is mainly attributable to CO₂ emissions, which decreased by 23.8 per cent. Emissions of other gases decreased as well, with CH₄ emissions decreasing by 1.0 per cent and N₂O by 4.8 per cent. Emissions of F-gases increased by 8,459.4 per cent.

15. The decrease in total GHG emissions was driven mainly by factors such as technological changes in iron and steel industry between 1994 and 1998 (which resulted in a decrease in GHG emissions from fuel combustion in that sector from 4,067.15 kt CO₂ eq in 1994 to 310.75 kt CO₂ eq in 1998), and the decrease in related industrial process emissions in metal industry (from 770.83 kt CO₂ eq in 1994 to 140.69 kt CO₂ eq in 1998). However, there was significant growth in fuel consumption by local residents and cross-border commuters, which resulted in an increase in emissions (from 2,584.67 kt CO₂ eq in 1990 to 5,479.75 kt CO₂ eq in 2016).

16. Between 1990 and 2016, GHG emissions from the energy sector decreased by 16.8 per cent (1,725.46 kt CO₂ eq), owing largely to the decline in GHG emissions from manufacturing industries (see para. 15 above). However, a significant increase in GHG emissions occurred in the electricity and heat generation sector in 2002–2012, owing mainly to the installation and further operation of the TWINerg gas power plant (in 2006, the TWINerg power plant was responsible for more than 80 per cent of the emissions from the electricity and heat generation sector). However, the operations of the TWINerg power plant were progressively decreased from 2012 until its final shutdown in 2016. Moreover, Luxembourg reported an increase in GHG emissions from the transport sector of 112.0 per cent (2,895.08 kt CO₂ eq) between 1990 and 2016.

17. Luxembourg reported that overall final energy consumption increased by 17.8 per cent between 1990 and 2015, from 144,043 TJ in 1990 to 169,703 TJ in 2015 (NC7, table II.6–2). However, significant changes occurred in the energy mix: final consumption of solid fuels declined by more than 94.0 per cent over the reporting period; while final consumption of natural gas increased by 43.3 per cent, driven by the extension of the natural gas network in Luxembourg. The consumption of liquid fuels (including kerosene) increased by 64.4 per cent because of the intensive development of the transport sector in Luxembourg.

18. Between 1990 and 2016, GHG emissions from IPPU decreased by 60.2 per cent (988.19 kt CO₂ eq), owing mainly to the changes that occurred in iron and steel industry with the shift from blast to electric arc furnaces starting in 1994 and being finalized in 1998. Between 1990 and 2016, GHG emissions from the agriculture sector decreased by 2.8 per cent (21.44 kt CO₂ eq), owing mainly to changes in livestock numbers. The LULUCF sector was a net sink in Luxembourg for the entire reporting period, with the exception of 1990, when, owing to heavy storms that felled many trees, the LULUCF sector was a net source of GHG emissions of 48.33 CO₂ eq; emissions from (natural) deforestation exceeded the amount of CO₂ sequestered by forest biomass.

19. To reflect the most recently available data, Luxembourg's 2018 annual submission (version 1) was used as the basis for the discussion herein. The ERT noted that those data are different from the 2017 annual submission data used by Luxembourg for its NC7. The ERT also noted that there are no substantive differences between the trends presented in the latest version of the GHG inventory and those reported in the NC7.

20. The ERT noted that Luxembourg used different units in reporting and describing its GHG emission trends. The ERT also noted that the Party could improve transparency by using units consistently when reporting and explaining changes in GHG emissions and trends.

(b) Assessment of adherence to the reporting guidelines

21. The ERT assessed the information reported in the NC7 of Luxembourg and identified issues relating to transparency and adherence to the UNFCCC reporting guidelines on NCs. The findings are described in table 5.

Table 5

Findings on greenhouse gas inventory information from the review of the seventh national communication of Luxembourg

No.	<i>Reporting requirement, issue type and assessment</i>	<i>Description of the finding with recommendation or encouragement</i>
1	Reporting requirement specified in paragraph 10 Issue type: transparency Assessment: encouragement	The Party reported summary information from the national GHG inventory in its NC7. However, the ERT noted that the Party reported some GHG emissions from IPPU (category 2.C.1) and some GHG emissions from energy consumption (category 1.A.2.a) under an “iron and steel” sector that is not in its NIR. The ERT noted that this is not in accordance with the UNFCCC reporting guidelines on NCs. During the review, Luxembourg acknowledged that the emissions were aggregated under an “iron and steel” sector to help readers to understand the full impacts of changes in that industry. The ERT encourages the Party to report in its next NC GHG emissions from energy consumption and manufacturing processes consistently with the reporting in its NIR.
2	Reporting requirement specified in paragraph 12 Issue type: transparency Assessment: encouragement	The Party provided in its NC7 diagrams for the GHG emissions reported in the summary tables, along with a description of the driving factors underlying emission trends for all sectors, except the LULUCF sector. The ERT noted that this is not in accordance with the UNFCCC reporting guidelines on NCs. During the review, Luxembourg acknowledged that the information for the LULUCF sector was missing and indicated that it intends to provide the information in its next NC. The ERT encourages the Party to provide in its next NC diagrams for the GHG emission trends occurring in the LULUCF sector and to provide a description of the driving factors underlying emission trends in the LULUCF sector.

Note: Paragraph number listed under reporting requirement refers to the relevant paragraph of the UNFCCC reporting guidelines on NCs. The reporting on the requirements not included in this table is considered to be complete, transparent and adhering to the UNFCCC reporting guidelines on NCs.

3. National system for the estimation of anthropogenic emissions by sources and removals by sinks

(a) Technical assessment of the reported information

22. Luxembourg provided in the NC7 a description of how its national system for the estimation of anthropogenic emissions by sources and removals by sinks of all GHGs not controlled by the Montreal Protocol is performing the general and specific functions defined in the annex to decision 19/CMP.1. The description includes most of the elements mandated by paragraph 30 of the annex to decision 15/CMP.1.

23. The NC7 also contains a reference to the description of the national system provided in the report mandated by decision 2/CMP.8, submitted in the NIR of the 2017 annual submission.

24. Luxembourg reported that its Environment Agency is responsible for completing the GHG emissions inventory, but the Department of the Environment of MSDI acts as the national focal point and officially submits the inventories and related reports to the secretariat and the EU. Luxembourg reported a list of institutions and agencies involved in the preparation of its GHG emissions inventory: the Agriculture Technical Services Administration, the Agriculture Economic Service, the National Statistical Institute, the Nature and Forestry Administration, the Water Management Agency and the Technical Vehicle Inspection Administration.

25. Luxembourg reported an improvement plan developed to enhance quality assurance/quality control procedures for inventory preparation in the future (NC7, p.126). However, the ERT noted that the improvement activities listed as to be implemented in the next few years were not explained in any detail. The ERT also noted that it would be helpful to provide supplementary information on the planned improvement activities (e.g. which steps are planned under strengthening the implementation of sector-specific quality

assurance/quality control procedures and which are for strengthening the implementation of the quality system management in general).

(b) Assessment of adherence to the reporting guidelines

26. The ERT assessed the information reported in the NC7 of Luxembourg and identified an issue relating to completeness. The finding is described in table 6.

Table 6

Findings on the national system for the estimation of anthropogenic emissions by sources and removals by sinks from the review of the seventh national communication of Luxembourg

No.	Reporting requirement, issue type and assessment	Description of the finding with recommendation or encouragement
1	Reporting requirement specified in paragraph 30	Luxembourg did not report in its NC7 the name and contact information of the national entity and its designated representative with overall responsibility for the national inventory.
	Issue type: completeness	During the review, Luxembourg acknowledged that the information was not reported and indicated that it intends to provide the information in its next NC.
	Assessment: recommendation	The ERT recommends that Luxembourg report in its next NC the name and contact information of the national entity and its designated representative with overall responsibility for the national inventory.

Note: Paragraph number listed under reporting requirement refers to the relevant paragraph of the reporting guidelines for supplementary information. The reporting on the requirements not included in this table is considered to be complete and transparent.

4. National registry

(a) Technical assessment of the reported information

27. In the NC7 Luxembourg provided information on how its national registry performs the functions in accordance with the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1 and complies with the requirements of the technical standards for data exchange between registry systems. The ERT took note of the review of the changes to the national registry reflected in the report on the individual review of the 2017 annual submission of Luxembourg.

28. Luxembourg described the changes that had occurred, specifically those due to the centralized changes in the database structure of the EU registry in accordance with decision 15/CMP.1, annex, paragraph 32(c), and the change regarding conformance with technical standards completed to meet the requirements of decision 15/CMP.1, annex, paragraph 32(d).

(b) Assessment of adherence to the reporting guidelines

29. The ERT assessed the information reported in the NC7 of Luxembourg and recognized that the reporting is complete and transparent. No issues relating to the topics discussed in this chapter of the review report were raised during the review.

B. Information on policies and measures and institutional arrangements

1. Domestic and regional programmes and/or legislative arrangements and procedures related to the Kyoto Protocol

(a) Technical assessment of the reported information

30. For the second commitment period of the Kyoto Protocol, from 2013 to 2020, Luxembourg committed to contributing to the joint EU effort to reduce GHG emissions by 20 per cent below the base-year level.

31. The majority of Luxembourg's strategies are linked to EU climate policy, in particular the EU 2020 climate and energy package. In order to meet the targets set under the Kyoto Protocol and EU climate policy, MSDI initiated the development of the second national "Action Plan for reducing CO₂ emissions", which was adopted in 2013. Moreover, MSDI

promoted the development of other strategic plans aimed at mitigating GHG emissions and adapting to climate change, known as the Climate Package (“Paquet Climat”) and the Climate Plan.

32. The Climate Package, developed by the Department of the Environment within MSDI, which consists of a synthesis document summarizing the work of ministries in partnership, was adopted in May 2011 to facilitate the achievement of the second national “Action Plan for reducing CO₂ emissions”. The Climate Package includes 35 priority measures, including the Climate Agreement (“Pacte Climat”), aimed at cooperation with the municipalities to offer a legal, technical and financial reference framework that should help them to take action against climate change. The Climate Agreement focuses on the development and implementation of a financial support scheme for municipalities to undertake projects relating to the environment, and the development of a certification system to acknowledge their progress (see para. 40 below). Luxembourg indicated that the National Adaptation Strategy on Climate Change contributes to, among other things, the development and application of a legal framework for the promotion of agroforestry and the optimization of carbon storage in forest and cultivated land.

33. Luxembourg reported that the third national Climate (Action) Plan, which was under consideration at the time of the review, is intended to be an overall strategy for Luxembourg’s climate change policy up to 2030, but also beyond (up to 2050). The plan will include a long-term policy strategy to meet targets set under the Paris Agreement and will specify economic opportunities for GHG mitigation policy. It is meant to provide strategic guidance for the draft national energy and climate plan that Luxembourg has to elaborate in accordance with EU regulation 2018/1999 on the governance of the energy union and climate action.

34. Luxembourg reported that the overall responsibility for climate change policymaking lies with the Department of the Environment within MSDI, and a number of national institutions are involved in policy implementation.

35. Luxembourg also reported that the Department of the Environment conducts regular awareness-raising and information campaigns on environmental issues, with biodiversity, waste, climate change and energy saving being the most recurrent themes. In addition, the Department of the Environment organizes stakeholder events and consultations (e.g. Climate Policy Lab and Policy Innovation Lab), which bring together representatives from scientific and professional areas, as well as citizens and youth, in order to collect ideas on societal innovation for climate change mitigation and to enhance society’s involvement in the formulation of climate change policy.

(b) Assessment of adherence to the reporting guidelines

36. The ERT assessed the information reported in the NC7 of Luxembourg and identified issues relating to completeness and transparency. The findings are described in table 7.

Table 7

Findings on domestic and regional programmes and/or legislative arrangements and procedures related to the Kyoto Protocol from the review of the seventh national communication of Luxembourg

No.	Reporting requirement, issue type and assessment	Description of the finding with recommendation or encouragement
1	Reporting requirement specified in paragraph 37 Issue type: transparency Assessment: recommendation	The Party reported on the domestic and regional legislative arrangements and enforcement and administrative procedures established pursuant to the implementation of the Kyoto Protocol but provided only limited information on the roles and responsibilities of the various ministries involved. During the review, Luxembourg acknowledged that the information was not reported and indicated its intention to provide the information in its next NC. The ERT reiterates the recommendation made in the previous review report that Luxembourg enhance the transparency of its reporting on the domestic and regional legislative arrangements and enforcement and administrative procedures established pursuant to the implementation of the Kyoto Protocol by providing information on the roles and responsibilities of the various ministries.

No.	<i>Reporting requirement, issue type and assessment</i>	<i>Description of the finding with recommendation or encouragement</i>
2	Reporting requirement specified in paragraph 38 Issue type: completeness Assessment: recommendation	<p>The Party did not report in its NC7 a description of national legislative arrangements and administrative procedures that seek to ensure that the implementation of activities under Article 3, paragraph 3, of the Kyoto Protocol also contributes to the conservation of biodiversity and the sustainable use of natural resources. The ERT noted that this is not in accordance with the reporting guidelines for supplementary information.</p> <p>During the review, Luxembourg explained that no specific arrangements have been established. However, it stated that the Nature Preservation Law (articles 13, 14, 17, 31 and 33) and the National Plan for Nature Preservation include measures and actions that indirectly contribute to the conservation of biodiversity and the sustainable use of natural resources.</p> <p>The ERT recommends that Luxembourg report in its next NC on how the implementation of activities under Article 3, paragraph 3, of the Kyoto Protocol also contributes to the conservation of biodiversity and the sustainable use of natural resources.</p>

Note: Paragraph number listed under reporting requirement refers to the relevant paragraph of the reporting guidelines for supplementary information. The reporting on the requirements not included in this table is considered to be complete and transparent.

2. Policies and measures, including those in accordance with Article 2 of the Kyoto Protocol

(a) Technical assessment of the reported information

37. Luxembourg provided information on its package of PaMs implemented, adopted and planned, by sector and by gas, in order to fulfil its commitments under the Convention and its Kyoto Protocol. Luxembourg reported on its policy context and legal and institutional arrangements in place to implement its commitments and monitor and evaluate the effectiveness of its PaMs. The second national “Action Plan for reducing CO₂ emissions”, adopted in 2013, is Luxembourg’s main tool for compliance with its 2020 target under the ESD. It defines actions for increasing energy efficiency in all sectors and promoting the use of renewable energy sources.

38. Luxembourg provided detailed information on its PaMs, many of which are new compared with those reported in its NC6, particularly in the agriculture, forestry and waste management sectors.

39. Luxembourg gave priority to implementing the PaMs that make the most significant contribution to its emission reduction efforts. The Party provided information on how it believes its PaMs are modifying longer-term trends in anthropogenic GHG emissions and removals in accordance with the objective of the Convention. PaMs that involve long-lasting investment (e.g. low-energy and passive houses, renewable energy supply and charging infrastructure for electric vehicles) are expected to have long-term impact. Luxembourg reported on how it periodically updates its PaMs to reduce greater levels of emissions and on the PaMs that have been discontinued since the previous submission.

40. In order to promote mitigation action at the local level, the State Government established the Climate Agreement with the municipalities, which reinforces their role in the fight against climate change through a legislative, technical and financial framework. The municipalities commit to implementing a quality management system relating to their energy and climate policies and in return the State provides financial and technical assistance. The assistance increases according to the certification level reached by the municipalities, which is defined depending on the measures implemented by the municipalities from a catalogue of 79 measures in six areas: (1) overall strategies and spatial planning; (2) municipal buildings and equipment; (3) supply, procurement and waste management; (4) mobility; (5) internal organization; and (6) communication and cooperation. As at 31 December 2017, all 105 municipalities in the country were engaged in the Agreement.

41. The key overarching related cross-sectoral policy in the EU is the 2020 climate and energy package, adopted in 2009, which includes the revised EU ETS and the ESD. The

package is supplemented by renewable energy and energy-efficiency legislation and legislative proposals on the 2020 targets for CO₂ emissions from cars and vans, the carbon capture and storage directive, and the general programmes for environmental conservation, namely the 7th Environment Action Programme and the clean air policy package.

42. In operation since 2005, the EU ETS is a cap-and-trade system that covers all significant energy-intensive installations (mainly large point emissions sources such as power plants and industrial facilities), which produce 40–45 per cent of the GHG emissions of the EU. It is expected that the EU ETS will guarantee that the 2020 target (a 21 per cent emission reduction below the 2005 level) will be achieved for sectors under the scheme. The third phase of the EU ETS started in 2013 and it now includes activities that were not covered in its previous phases: aircraft operations (since 2012), which are relevant to Luxembourg, as well as N₂O emissions from chemical industry, PFC emissions from aluminium production and CO₂ emissions from some industrial processes, which are not relevant to Luxembourg because the activities and processes do not occur in the country.

43. The ESD became operational in 2013 and covers sectors outside the EU ETS, including transport (excluding domestic and international aviation, and international maritime transport), residential and commercial buildings, agriculture and waste, together accounting for 55–60 per cent of the GHG emissions of the EU. The aim of the ESD is to decrease GHG emissions in the EU by 10 per cent below the 2005 level by 2020 and it includes binding annual targets for each member State for 2013–2020.

44. Luxembourg highlighted the EU-wide mitigation actions that are under development, such as the 2030 climate and energy framework and EU regulation 2018/1999, which requests member States to elaborate integrated national energy and climate plans. Among the mitigation actions that are critical for Luxembourg's contribution to attaining the EU-wide 2020 emission reduction target is the achievement of the country's ESD target of reducing GHG emissions by 20 per cent below the 2005 level, as this is the highest target among the EU member States and emissions under the ESD represent a significant share of Luxembourg's total GHG emissions (83.5 per cent in 2013).

45. Luxembourg introduced national-level policies to achieve its target under the ESD. The key policies reported are the strategy for sustainable mobility MoDu 2.0, the promotion of low-carbon fuels and electric mobility, energy-efficiency standards for new buildings, and the voluntary agreement with industry to improve energy efficiency.

46. Luxembourg highlighted the domestic mitigation actions that are under development over the longer term, such as the third National Climate Plan (successor to the second National Climate Action Plan), which will be the main policy instrument with regard to the country's 2030 GHG-related targets. Among the mitigation actions that provide a foundation for substantial additional actions, the following are significant for Luxembourg to attain its future emission targets: controlling the increase in road transport emissions, increasing the use of renewable sources of energy and improving energy efficiency in the residential and commercial sectors. Table 8 provides a summary of the reported information on the PaMs of Luxembourg.

Table 8
Summary of information on policies and measures reported by Luxembourg

<i>Sector</i>	<i>Key PaMs</i>	<i>Estimate of mitigation impact by 2020 (kt CO₂ eq)</i>	<i>Estimate of mitigation impact by 2030 (kt CO₂ eq)</i>
Policy framework and cross-sectoral measures	Second national "Action Plan for reducing CO ₂ emissions"	NE	NE
	Climate Agreement with the municipalities ("Pacte Climat")	NE	NE
	EU ETS	NE	NE
	ESD	NE	NE
Energy			
Transport	Sustainable mobility strategy (MoDu 2.0)	NE	NE

<i>Sector</i>	<i>Key PaMs</i>	<i>Estimate of mitigation impact by 2020 (kt CO₂ eq)</i>	<i>Estimate of mitigation impact by 2030 (kt CO₂ eq)</i>
	Framework and infrastructure development for low-carbon fuels and electric cars	17.05	NE
	Excise duties on fuel for transport purposes (“Kyoto cent”)	19.75	NE
Renewable energy	Feed-in tariffs for renewable electricity and heat cogeneration	23.18	23.18
	Feed-in tariffs for biogas supply	9.50	9.50
Energy efficiency	Increasing energy-efficiency standards in residential buildings	78.89	142.36
	Increasing energy-efficiency standards in non-residential buildings	20.06	44.55
	Climate Bank, supporting the financing of energy-efficiency renovation projects	10.62	10.62
	Voluntary agreement with industry (FEDIL)	NE	NE
IPPU	F-gas regulation	9.87	87.86
Agriculture	Livestock management	NE	NE
LULUCF	Protection of existing carbon stock in forests	NE	NE
Waste	Reduced landfilling of municipal solid waste	65.50	89.75
	Methane recovery systems	6.66	6.66
	Separate collection and treatment of biowaste	3.18	3.18

Note: The estimates of mitigation impact are estimates of emissions of CO₂ or CO₂ eq avoided in a given year as a result of the implementation of mitigation actions.

47. During the review, Luxembourg provided additional information on a capacity-building work programme initiated in 2017 for improving the reporting of its PaMs and estimating mitigation impact potentials. It consists of the development of an online portal to allow the various administrations in the different sectors to enter and update information on the PaMs that they are responsible for and that have an impact on GHG emissions or removals. It is also envisaged that the portal will be used for following up on energy-related and air quality policies. In addition, the programme included a consultant-led project to quantify the mitigation impacts and costs of PaMs, which resulted in the quantification of the mitigation impacts of 13 PaMs and the costs of 2 PaMs.

(b) Policies and measures in the energy sector

48. **Energy supply and renewable energy sources.** In 2015, final energy consumption in Luxembourg was approximately 18 per cent higher than in 1990. From 1990 to 2015 there was a decrease of 96 per cent in the consumption of carbon-intensive coal. At the same time, there was an increase of over 80 per cent in the consumption of gas and of 67 per cent in the consumption of oil. Oil currently accounts for the largest share of fossil fuel consumption in Luxembourg (74 per cent), followed by natural gas (24 per cent) and solid fuels (1 per cent). The majority of oil and gas consumed is imported (up to 91 per cent of primary energy supply). Following the closure of the TWINerg power plant in 2016, approximately 90 per cent of the country’s electricity is imported. Because of this, Luxembourg does not consider the addition of in-country renewable generation to be a significant mitigation measure, as it would mostly replace electricity generation, and thus emissions, outside of Luxembourg. Luxembourg has established feed-in tariffs to promote the use of renewable sources for the production of electricity and heat, and also the use of biogas as a substitute for natural gas.

49. **Energy efficiency.** As one of the two main pillars of Luxembourg’s first and second national “Action Plan for reducing CO₂ emissions” (published in April 2006 and May 2013, respectively), Luxembourg places high importance on energy-efficiency measures. More than 25 different measures for enhancing energy efficiency in all sectors, with a focus on transport, industry and buildings, are already in place or planned and are the Party’s main tool for compliance with its commitments under the Kyoto Protocol and the EU 2020 climate and energy package. Luxembourg is still working on the capacity-building work programme

initiated in 2017 to develop the reporting of climate PaMs as required under the EU monitoring mechanism regulation (525/2013); the mitigation impact potential of only four energy-efficiency PaMs has been quantified through this work to date. The quantified measures are expected to achieve emission reductions of about 114.18 kt CO₂ eq in 2020. However, Luxembourg informed the ERT that its third National Climate Plan is scheduled to be completed in 2018, in which the structure and content of the PaMs may be rearranged. Also crucial for the reduction of emissions is cooperation with the municipalities, formalized in the Climate Agreement, through which municipalities are encouraged to implement measures covering six areas, including municipal buildings, equipment and mobility.

50. **Residential and commercial sectors.** In its NC7, Luxembourg provided information on a number of PaMs targeting emission reductions in the residential and commercial sectors, many of which overlap with the energy-efficiency PaMs described above. Buildings are an important pillar of the second national “Action Plan for reducing CO₂ emissions”, with around 15 measures. Some examples of building-related PaMs are strengthening energy-efficiency standards for new buildings (for residential buildings, the energy-efficiency standard from 2012 requires near Passive House standard; for non-residential buildings, the standard was strengthened in 2011 and 2015); supporting the use of renewable energy in buildings (via subsidies and also a requirement for the use of renewable energy in new buildings); subsidies and loans (depending on socioeconomic factors and/or building age) through the Climate Bank; supporting the sustainable construction of residential buildings, energy-efficiency renovations and a stronger reliance on renewable energy sources through the LENOZ and PRIME House schemes; a reduced rate of value added tax (3 per cent instead of 17 per cent) being applied to new constructions and existing buildings being renovated; and monitoring the energy consumption of public buildings using smart meters.

51. **Transport sector.** The situation of Luxembourg is particular in that a large share of its road fuel is sold to non-residents owing to the lower road fuel prices compared with those of neighbouring countries and the proportion of road traffic due to commuters and freight crossing the border. Transport is the main emitting sector in Luxembourg, representing 54.6 per cent of total emissions in 2016. Emissions from this sector increased by 112.0 per cent between 1990 and 2016. In its NC7, Luxembourg provided an overview of key measures in the transport sector, including the sustainable mobility strategy MoDu 2.0, which aims at increasing the share of public transport and the use of ‘soft’ transport modes (cycling and walking); the obligation to blend a certain share of biofuels in transport-related fuels; and the promotion of electric mobility through purchase incentives for zero or low-emission vehicles, the development of a charging infrastructure and the mandatory purchase of zero or low-emission vehicles in public fleets.

52. The NC7 includes information on how Luxembourg promotes and implements the decisions of the International Civil Aviation Organization and the International Maritime Organization to limit emissions from aviation and marine bunker fuels. For aviation, Luxembourg supports the resolution on a global market-based measure to address CO₂ emissions from international aviation as of 2021 agreed upon by the International Civil Aviation Organization Assembly in October 2016. Luxembourg’s domestic aviation is included in the EU ETS, and revenue from the auctioning of allowances is added to the Climate and Energy Fund, which finances the use of flexible mechanisms under the Kyoto Protocol. Luxembourg also supports the work undertaken by the International Maritime Organization to develop and adopt an ambitious initial strategy to reduce GHG emissions from ships.

53. **Industrial sector.** The main measures in the industrial sector are the EU ETS and the voluntary agreement of FEDIL, the business federation of Luxembourg, under which the objective is for all the participating companies to annually improve energy efficiency by 1 per cent.

(c) Policies and measures in other sectors

54. **Industrial processes.** In 1990–2016 emissions from the IPPU sector decreased by 60.2 per cent, with steel production being the dominant source of emissions until 1998, when the technological change from blast to electric arc furnaces resulted in a sharp decrease in emissions (by 93.0 per cent) between 1990 and 1998, which remained stable thereafter. The

key measure in the industrial sector is the EU ETS, in which the installations responsible for most of the industrial process emissions (steel production, flat glass production, cement plants) take part. Another important policy in the sector is the F-gas regulation, which aims to limit emissions of HFCs and SF₆ from commercial and industrial refrigeration equipment and stationary and mobile air conditioning.

55. **Agriculture.** Between 1990 and 2016, GHG emissions from the agriculture sector decreased by 2.8 per cent and they accounted for 7.5 per cent of GHG emissions in 2016. The main driver for the emission decrease was the change in livestock numbers. The main PaMs for agriculture in Luxembourg continue to be the EU Common Agricultural Policy and the Rural Development Programme. Other important PaMs implemented in the sector at the national level include reducing GHG emissions from manure storage systems, introducing modern slurry spreading techniques and improving agricultural soils through rationalization of nitrogen fertilizers.

56. **LULUCF.** The LULUCF sector was a net sink of 491.05 kt CO₂ eq in Luxembourg in 2016, while in 1990 it had been a source, accounting for 48.33 kt CO₂ eq. The emission trend is driven mainly by the categories forest land remaining forest land and land converted to settlements. The main PaMs in the LULUCF sector are conserving carbon in existing forest biomass and increasing the carbon stock in forest and agricultural soils. Other important PaMs aim at prohibiting deforestation without authorization and without compensation, establishing subsidies for afforestation activities, enhancing the management of harvest rates for mature forest, and promoting financial support for organic agriculture.

57. **Waste management.** GHG emissions from the waste sector decreased by 20.9 per cent in 1990–2016, accounting for 0.9 per cent of total GHG emissions in 2016. The main contributor to the sectoral emissions is municipal solid waste disposal on land. Luxembourg has one of the highest rates of waste generation per capita in the EU (607 kg/year), owing to some extent to the high number of cross-border commuters (a third of the resident population), but it also has a very high collection and recovery rate of municipal solid waste: 50 per cent of the total generated municipal waste is currently recovered and recycled or incinerated with energy recovery. The overarching policy in this sector is the National Waste and Resources Management Plan, which drives the waste management activities aimed at the recovery and recycling of different waste streams. Most PaMs in the waste sector are regulatory instruments based on EU legislation, in particular the waste framework directive, the landfill directive and the waste incineration directive.

(d) Minimization of adverse impacts in accordance with Article 2 and Article 3, paragraph 14, of the Kyoto Protocol

58. In the NC7 Luxembourg reported information on how it strives to implement PaMs under Article 2 of the Kyoto Protocol in such a way as to minimize adverse effects, including the adverse effects of climate change and effects on international trade and social, environmental and economic impacts on other Parties, especially developing country Parties. As an example, Luxembourg analysed potential measures in its second national “Action Plan for reducing CO₂ emissions” and determined that most of the identified measures had no direct or indirect negative effects on developing countries.

59. Further information on how Luxembourg strives to implement its commitments under Article 3, paragraph 14, of the Kyoto Protocol in such a way as to minimize adverse social, environmental and economic impacts on developing country Parties has been reported in Luxembourg’s NIR since 2013. However, until 2014 it did not report how it gives priority to the actions taken in implementing its commitments under Article 3, paragraph 14, of the Kyoto Protocol, including in the version of the NC6 submitted on 28 February 2014. Luxembourg has since included this information annually in its NIR, such as in its most recently submitted NIR in 2018.

60. In the NC7 Luxembourg presented information on initiatives aimed at minimizing negative impacts on developing country Parties, such as establishing procedures to evaluate such impacts as well as the sustainability of cooperation projects; ensuring that project-based mechanisms that it uses are in line with sustainability criteria (e.g. purchasing Gold Standard certified emission reductions, ‘high-quality certificates’ in the Adaptation Fund, as explained

by the Party during the review); following the EU directives to ensure that biofuels are imported in accordance with the principles of sustainable development (i.e. when the fuel is produced without competing with food production or causing degradation of valuable ecosystems); and promoting the use of second-generation biodiesel. In addition, Luxembourg reported that its international cooperation is focused on the least developed countries. It also reported that its climate finance for cooperation with developing countries is additional to ODA.

(e) Assessment of adherence to the reporting guidelines

61. The ERT assessed the information reported in the NC7 of Luxembourg and identified issues relating to completeness, transparency and adherence to the UNFCCC reporting guidelines on NCs. The findings are described in table 9.

Table 9

Findings on policies and measures, including those in accordance with Article 2 of the Kyoto Protocol, from the review of the seventh national communication of Luxembourg

No.	<i>Reporting requirement, issue type and assessment</i>	<i>Description of the finding with recommendation or encouragement</i>
1	Reporting requirement specified in paragraph 21 Issue type: completeness Assessment: encouragement	<p>The Party reported that it has set up a capacity-building work programme to improve the reporting of its PaMs, and that through this work mitigation impact potentials of 10 PaMs were quantified. However, Luxembourg did not describe the way in which progress with PaMs to mitigate GHG emissions is monitored and evaluated over time, or the institutional arrangements for monitoring GHG mitigation policy.</p> <p>During the review, Luxembourg provided more information on the capacity-building work programme set up to improve the follow-up on, reporting and evaluation of its PaMs. It consists of the development of an online portal to allow the various administrations to enter and update information on their PaMs for mitigating GHG emissions, as well as of a project to quantify the mitigation impacts of some PaMs.</p> <p>The ERT reiterates the encouragement made in the previous review report that Luxembourg improve the completeness of its reporting by providing a description of the way in which progress with PaMs to mitigate GHG emissions is monitored and evaluated over time, and in this context report information on the institutional arrangements involved in the monitoring and evaluation of PaMs.</p>
2	Reporting requirement specified in paragraph 22 Issue type: transparency Assessment: recommendation	<p>The ERT noted some omissions, inconsistencies between the text of the NC7 and the CTF tables, and inconsistencies between categorization and description in the information reported on PaMs related to the GHGs affected, the start year of implementation, the implementation status and the type of instrument.</p> <p>During the review, Luxembourg acknowledged that it made some errors when reporting information on its PaMs and provided a table with the information corrected.</p> <p>The ERT recommends that Luxembourg improve the transparency of its reporting on PaMs by accurately reporting information on the GHGs affected, the start year of implementation, the implementation status and the type of instrument.</p>
3	Reporting requirement specified in paragraph 23 Issue type: transparency	<p>The ERT noted that the Party has made progress since its NC6 by providing in its NC7 quantitative estimates of the impacts on GHG emissions for some individual PaMs. However, this information was not provided for all PaMs, and the use of the notation keys “NE” and “IE” for some of the PaMs that were not evaluated is unclear (several individual measures were reported as “IE”, indicating that their impacts were included with those of another, aggregated measure, but the aggregated</p>

No.	<i>Reporting requirement, issue type and assessment</i>	<i>Description of the finding with recommendation or encouragement</i>
	Assessment: encouragement	<p>measure was reported as “NE”). The NC7 explained that the work on estimating the impacts of PaMs was ongoing when the document was being drafted and would continue in 2018.</p> <p>During the review, Luxembourg confirmed that it is building its capacity to evaluate its PaMs, and acknowledged the lack of clarity regarding the use of the notation keys “NE” and “IE” for some of the PaMs that were not evaluated.</p> <p>The ERT reiterates the encouragement made in the previous review report that Luxembourg provide quantitative estimates of the impacts of its individual PaMs, or clearly explain why it may not be feasible to provide such information due to its national circumstances.</p>
4	Reporting requirement specified in paragraph 24 Issue type: completeness Assessment: encouragement	<p>Luxembourg did not report information about the costs of PaMs, or information about the non-GHG benefits of PaMs and how PaMs interact with each other at the national level.</p> <p>During the review, Luxembourg provided a report containing information on the costs of two of its PaMs in the energy supply sector.</p> <p>The ERT reiterates the encouragement made in the previous review report that Luxembourg report in its next NC information about the costs of PaMs, and information about the non-GHG benefits of PaMs and how PaMs interact with each other at the national level.</p>

Note: Paragraph number listed under reporting requirement refers to the relevant paragraph of the UNFCCC reporting guidelines on NCs. The reporting on the requirements not included in this table is considered to be complete, transparent and adhering to the UNFCCC reporting guidelines on NCs.

C. Projections and the total effect of policies and measures, including information on complementarity relating to the mechanisms pursuant to Articles 6, 12 and 17 of the Kyoto Protocol

1. Projections overview, methodology and results

(a) Technical assessment of the reported information

62. Luxembourg reported updated projections for 2020, 2025, 2030 and 2035 relative to actual inventory data for 2015 under the WEM scenario. The WEM scenario reported by Luxembourg includes implemented and adopted PaMs until 31 December 2016.

63. In addition to the WEM scenario, Luxembourg reported the WAM scenario. The WAM scenario does not include planned PaMs but rather an assumption that road fuel sales to non-residents will reduce by 2 per cent each year from 2019 onward. Luxembourg provided some information on the definition of its scenarios, explaining that its WEM scenario was based on different assumptions, but the ERT noted that a clear connection to the PaMs presented in the PaMs section is missing. The definitions indicate that the scenarios were not prepared completely according to the UNFCCC reporting guidelines on NCs.

64. The projections are presented on a sectoral basis, using different sectoral categories from those used in the reporting on mitigation actions. They are not presented on a gas-by-gas basis for CO₂, CH₄, N₂O, PFCs, HFCs and SF₆ (grouping PFCs and HFCs together) but only as total GHG emissions in CO₂ eq using global warming potential values from the IPCC Fourth Assessment Report. They are presented together with actual data for 2005–2015.

65. Luxembourg did not report emission projections for indirect GHGs such as carbon monoxide, nitrogen oxides, non-methane volatile organic compounds or sulfur oxides.

66. Emission projections related to fuel sold to ships (insignificant and relating only to river transport) and aircraft engaged in international transport were not reported separately and were not included in the totals. Luxembourg provided some information on factors and activities affecting emissions for each sector, but more detailed information is needed to

better understand the projected emission trends, as well as more information on the connection between the PaMs and the projected emission trends.

(b) Methodology, assumptions and changes since the previous submission

67. The methodology used for the preparation of the projections is very similar to that used for the preparation of the emission projections for the NC6. Luxembourg reported supporting information explaining the methodologies and the changes made since the NC6. For the projections in the NC7 the Party used (1) updated GHG inventory and other input data; (2) updated 2015 results from the ECONOTEC EPM model; (3) outcomes from the revised 2017 transportation study prepared for Luxembourg by Komobile; (4) the latest results from STATEC models; (5) the PRIMES reference scenario from July 2016 (Capros et al., 2016).

68. For the projections in the energy sector, Luxembourg used a combination of models: ECONOTEC EPM, a bottom-up simulation model for energy and emission projections (for public electricity and heat production, excluding 2016 and households); STATEC-NEAM, a bottom-up empirical model used in conjunction with LuxGem, Luxembourg's computable general equilibrium economic model (for public electricity and heat production in 2016, fuel combustion in industry and the services sector); and GEORG and NEMO, bottom-up road and off-road transportation models (for road transport, rail transport, domestic navigation, fuel combustion in agriculture and other). The results from the EU PRIMES and GAINS models were also used as a basis for projecting emissions from international aviation, agriculture and biological treatment of solid waste. During the review, the Party briefly presented descriptions of the models used for making projections for the industrial processes sector and for other sources of emissions in the waste and LULUCF sectors: essentially the methodologies used are the same as those used in preparing the emissions inventory.

69. To prepare its projections, Luxembourg relied on the following key underlying assumptions: population in the period 2015–2035 rising by 38 per cent, and in the same period the number of households increasing by 50 per cent, and activity in passenger transport increasing by 24 per cent and in freight transport by 46 per cent. These variables and assumptions were reported in CTF table 5. The assumptions were updated on the basis of the most recent economic and other developments known at the time of the preparation of the projections. GDP is not included among the key assumptions because Luxembourg's GDP is mostly driven by finance-related activities and transport activity is mostly affected by the GDP of neighbouring countries.

70. Luxembourg provided information in its NC7 and in CTF table 5 on the key variables and assumptions used in the preparation of the projection scenarios. Luxembourg did not provide information on changes to the assumptions in the NC7 or information on sensitivity analysis.

(c) Results of projections

71. The projected emission levels under different scenarios and information on the Kyoto Protocol targets and the quantified economy-wide emission reduction target are presented in table 10 and the figure below. Luxembourg's national emission reduction target, as well as projected emissions and AEAs under the ESD, are also presented in the figure below.

Table 10

Summary of greenhouse gas emission projections for Luxembourg

	<i>GHG emissions (kt CO₂ eq per year)</i>	<i>Changes in relation to base-year^a level (%)</i>	<i>Changes in relation to 1990 level (%)</i>
Kyoto Protocol base year ^b	13 141.25	NA	NA
Quantified emission limitation or reduction commitment under the Kyoto Protocol (2013–2020) ^c	NA	NA	NA

	<i>GHG emissions (kt CO₂ eq per year)</i>	<i>Changes in relation to base-year^a level (%)</i>	<i>Changes in relation to 1990 level (%)</i>
Quantified economy-wide emission reduction target under the Convention ^d	NA	NA	NA
Inventory data 1990 ^e	12 730.46		
Inventory data 2015 ^e	10 268.94	–21.9	–19.3
WEM projections for 2020 ^f	9 797.28	–25.4	–23.0
WAM projections for 2020 ^f	9 628.27	–26.7	–24.4
WEM projections for 2030 ^f	9 503.61	–27.7	–25.3
WAM projections for 2030 ^f	8 516.82	–35.2	–33.1

^a “Base year” in this column refers to the base year used for the target under the Kyoto Protocol, while for the target under the Convention it refers to the base year used for that target.

^b The Kyoto Protocol base-year level of emissions is provided in the initial review report, contained in document FCCC/IRR/2016/LUX.

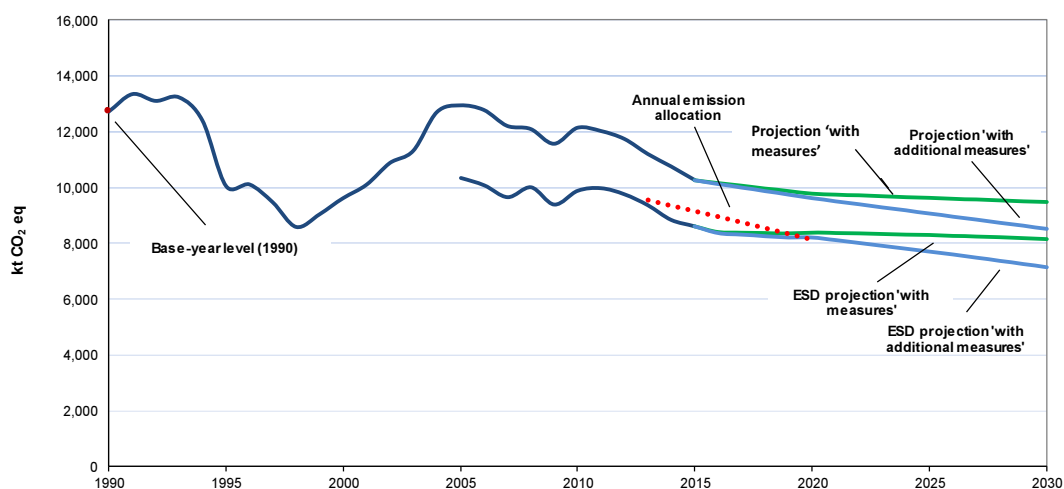
^c The Kyoto Protocol target for the second commitment period (2013–2020) is a joint target of the EU and its 28 member States and Iceland. The target is to reduce emissions by 20 per cent compared with the base-year (1990) level by 2020. The target for non-ETS sectors is a 20 per cent reduction for Luxembourg under the ESD. The value presented in this line is based on annex II to European Commission decision 2013/162/EU and as adjusted by Commission implementing decision 2013/634/EU that established the assigned amount for the EU member States and divided by eight years to calculate the annual emission level.

^d The quantified economy-wide emission reduction target under the Convention is a joint target of the EU and its 28 member States. The target is to reduce emissions by 20 per cent compared with the base-year (1990) level by 2020.

^e From Luxembourg’s BR3 CTF table 6.

^f From Luxembourg’s NC7.

Greenhouse gas emission projections reported by Luxembourg



Sources: (1) data for the years 1990–2015: Luxembourg’s 2017 annual submission, version 1.2; total GHG emissions excluding LULUCF; (2) data for the years 2015–2030: Luxembourg’s NC7 and BR3; total GHG emissions excluding LULUCF.

72. During the review, Luxembourg reported updated projections that were prepared on the basis of 2016 inventory data and proxy emissions for 2017. According to those data, in 2016 the decrease in emissions slowed, while in 2017 emissions started to increase again. Updated projections were provided for the WEM scenario.

73. Luxembourg's Kyoto Protocol target for the second commitment period (2013–2020) is a joint target of the EU and its 28 member States and Iceland. The target is to reduce emissions by 20.0 per cent in the period 2013–2020 compared with the Kyoto Protocol base-year level. Under the Convention, Luxembourg's target is also a joint target of the EU and its 28 member States: a 20.0 per cent reduction by 2020 compared with the 1990 level. The EU targets are split between emissions under the EU ETS and under the ESD (non-ETS sectors).

74. Luxembourg's total GHG emissions excluding LULUCF in 2020 and 2030 are projected to be 9,797.28 and 9,503.61 kt CO₂ eq, respectively, under the WEM scenario, which represents a decrease of 23.0 and 25.3 per cent, respectively, below the 1990 level. Under the WAM scenario, emissions in 2020 and 2030 are projected to be lower than those in 1990 by 24.4 and 33.1 per cent, and amount to around 9,628.27 and 8,516.82 kt CO₂ eq, respectively. The 2020 projections suggest that Luxembourg will continue contributing to the achievement of the EU target under the Convention (see paras. 42 and 43 above).

75. Luxembourg's target for non-ETS sectors is to reduce its emissions by 20.0 per cent below the 2005 level by 2020 (see para. 44 above). Luxembourg's AEAs, which correspond to its national emission target for non-ETS sectors, change linearly from 9,539.56 kt CO₂ eq in 2013 to 8,116.94 kt CO₂ eq for 2020. According to the projections under the WEM scenario, emissions from non-ETS sectors are estimated to reach 8,381.86 kt CO₂ eq in 2020. Under the WAM scenario, Luxembourg's emissions from non-ETS sectors in 2020 are projected to be 8,212.86 kt CO₂ eq. The projected level of emissions under the WEM and WAM scenarios is 3.3 and 1.2 per cent, respectively, above the AEAs for 2020. The ERT noted that this suggests that Luxembourg may face challenges in meeting its 2020 target. However, owing to emission surpluses generated in the beginning of the 2013–2020 period when emissions were below the AEAs, Luxembourg's projected cumulative emissions for the whole period 2013–2020 based on the information in the NC7 are lower than the cumulative AEAs and thus under the ESD target.

76. Luxembourg presented the WEM and WAM scenarios in its NC7 by sector for 2020 and 2030, but used different sectors to those used for reporting PaMs. Sectoral projection information aligned with the PaMs was provided in BR3 CTF table 6, as summarized in table 11.

Table 11

Summary of greenhouse gas emission projections for Luxembourg presented by sector

Sector	GHG emissions and removals (kt CO ₂ eq)					Change (%)			
	1990	2020		2030		1990–2020		1990–2030	
		WEM	WAM	WEM	WAM	WEM	WAM	WEM	WAM
Energy (not including transport)	7 679.20	2 821.83	2 821.83	2 608.57	2 608.57	–63.3	–63.3	–66.0	–66.0
Transport	2 584.67	5 636.17	5 467.16	5 685.44	4 698.65	118.1	111.5	120.0	81.8
Industry/industrial processes	1 640.25	597.91	597.91	466.09	466.09	–63.5	–63.5	–71.6	–71.6
Agriculture	714.41	658.26	658.26	666.27	666.27	–7.9	–7.9	–6.7	–6.7
LULUCF	48.33	–334.14	–334.14	–337.47	–337.47	–791.4	–791.4	–798.3	–798.3
Waste	111.92	83.11	83.11	77.24	77.24	–25.7	–25.7	–31.0	–31.0
Other (specify)									
Total GHG emissions without LULUCF	12 730.46	9 797.28	9 628.27	9 503.61	8 516.82	–23.0	–24.4	–25.3	–33.1

Source: Luxembourg's BR3 CTF table 6.

77. According to the projections reported for 2020 under the WEM scenario, the most significant emission reductions are expected to occur in the energy sector (excluding transport) and the IPPU sector, amounting to projected reductions of 4,857.37 kt CO₂ eq (63.3

per cent) and 1,042.34 kt CO₂ eq (63.5 per cent) between 1990 and 2020, respectively. Some reductions are also expected to occur in the agriculture and waste sectors, amounting to 56.15 kt CO₂ eq (7.9 per cent) and 28.81 (25.7 per cent) between 1990 and 2020, respectively. An increase in emissions of 3,051.50 kt CO₂ eq (118.1 per cent) between 1990 and 2020, due mainly to growth in the 1995–2005 period, was projected for the transport sector.

78. The pattern of projected emissions reported for 2030 under the same scenario remains the same. The decrease in emissions from the energy sector (excluding transport) continues, with the projected emissions from the sector decreasing by a further 213.26 kt CO₂ eq from 2020, owing to energy-efficiency measures in the buildings sector, resulting in a projected decrease in emissions from the energy sector of 5,070.63 kt CO₂ eq (66.0 per cent) in 2030 compared with the 1990 level. Emissions from the IPPU sector are projected to decrease by 131.82 kt CO₂ eq between 2020 and 2030. Emissions from the transport sector are projected to increase by 49.27 kt CO₂ eq between 2020 and 2030.

79. If additional measures are considered (i.e. under the WAM scenario), the patterns of emission reductions for 2020 presented by sector and by gas remain largely the same, because the additional measures in Luxembourg's WAM scenario only have an effect on emissions from the transport sector, which is the only sector where growth of emissions was observed in the 1990–2020 period. Under the WAM scenario, the projected emission increase in the transport sector between 1990 and 2020 drops to 2,882.49 kt CO₂ eq. Between 2020 and 2030, emissions from transport under the WAM scenario are projected to decrease by 768.51 kt CO₂.

80. Luxembourg did not present the WEM and WAM scenarios in its NC7 by gas for 2020 and 2030. This information was provided in its BR3 CTF table 6, as summarized in table 12.

Table 12

Summary of greenhouse gas emission projections for Luxembourg presented by gas

Gas	GHG emissions and removals (kt CO ₂ eq)					Change (%)			
	1990	2020		2030		1990–2020		1990–2030	
		WEM	WAM	WEM	WAM	WEM	WAM	WEM	WAM
CO ₂	11 812.05	8 869.93	8 703.14	8 595.28	7 623.31	–24.9	–26.3	–27.2	–35.5
CH ₄	634.97	596.39	596.42	595.98	596.05	–6.1	–6.1	–6.1	–6.1
N ₂ O	282.56	254.07	251.82	268.83	253.94	–10.1	–10.9	–4.9	–10.1
HFCs	0.00	67.36	67.36	37.90	37.90	–	–	–	–
PFCs	NO	NO	NO	NO	NO	–	–	–	–
SF ₆	0.88	9.53	9.53	5.62	5.62	983.0	983.0	538.6	538.6
NF ₃	NO	NO	NO	NO	NO	–	–	–	–
Total GHG emissions without LULUCF	12 730.46	9 797.28	9 628.27	9 503.61	8 516.82	–23.0	–24.4	–25.3	–33.1

Source: Luxembourg's BR3 CTF table 6.

81. For 2020 the most significant reductions are projected for CO₂ emissions: 2,942.12 kt CO₂ eq (24.9 per cent) between 1990 and 2020; while for the 1990–2030 period CO₂ emission reductions in the amount of 3,216.77 kt CO₂ eq (27.2 per cent) are projected.

82. If additional measures are considered (i.e. under the WAM scenario), the patterns of emission reductions for 2020 presented by sector and by gas remain the same, with CO₂ emission reduction in the period 1990–2020 being 3,108.91 kt CO₂ eq (26.3 per cent) and 4,188.74 kt CO₂ eq (35.5 per cent) in the period 1990–2030.

83. Luxembourg's emissions are heavily characterized by the fact that it is a small country, meaning that the opening or closing of a single plant or industrial site can strongly influence emissions, and its emissions are very sensitive to changes in the amount of fuel sold to foreign vehicles. This has been observed in the past: when steel production technology changed,

when an electricity generating unit came on- and offline, and when the amount of fuel sold to foreign vehicles increased. In the projections, no such events have been assumed, in line with common practice in projection methodologies.

(d) Assessment of adherence to the reporting guidelines

84. The ERT assessed the information reported in the NC7 of Luxembourg and identified issues relating to completeness, transparency and adherence to the UNFCCC reporting guidelines on NCs. The findings are described in table 13.

Table 13

Findings on greenhouse gas emission projections reported in the seventh national communication of Luxembourg

No.	<i>Reporting requirement, issue type and assessment</i>	<i>Description of the finding with recommendation or encouragement</i>
1	Reporting requirement specified in paragraph 28 Issue type: transparency Assessment: encouragement	The ERT noted that Luxembourg did not report a WOM scenario. The ERT also noted that, according to the UNFCCC reporting guidelines on NCs, Parties are required to report WEM projections and may report WOM and WAM projections. To enhance the transparency of the reporting, the ERT encourages Luxembourg in its next NC to report a WOM scenario or information on why it cannot do so.
2	Reporting requirement specified in paragraph 29 Issue type: transparency Assessment: encouragement	Luxembourg reported WAM projections in its NC7. The ERT noted that the definition of the projections is not in accordance with the UNFCCC reporting guidelines on NCs. The scenario assumed a 2.0 per cent linear decrease in emissions per year from sales of fuel to non-residents, reflecting a possible narrowing of the road fuel price differential between Luxembourg and its neighbouring countries, which is not a measure planned by the Luxembourg Government, but the UNFCCC reporting guidelines on NCs define the WAM scenario as encompassing planned PaMs. The narrowing of fuel prices was not presented in the PaMs chapter as a planned measure. During the review, Luxembourg acknowledged that the WAM scenario is not in accordance with the definition in the UNFCCC reporting guidelines on NCs and was designed to explore the impact of potential future PaMs. The ERT encourages Luxembourg to provide WAM projections in its next NC that encompass planned PaMs.
3	Reporting requirement specified in paragraph 34 Issue type: transparency Assessment: recommendation	Luxembourg presented projections in its NC7 for all sectors, including LULUCF, but using a different sectoral aggregation to that used in the PaMs section. During the review, Luxembourg explained that it decided to adopt a different sectoral presentation because it provided a more logical presentation of the results for identifying the primary sources of emissions, and noted that a detailed sectoral breakdown of the projections was provided. The ERT recommends that Luxembourg present in its next NC projections on a sectoral basis, to the extent possible, using the same sectoral categories used in the PaMs section. The ERT suggests that the Party use the same sectors in the PaMs and projections sections of the NC as in CTF table 6.
4	Reporting requirement specified in paragraph 35 Issue type: completeness Assessment: recommendation	Luxembourg did not report in its NC7 projections by gas. During the review, Luxembourg provided detailed projections on a gas-by-gas basis. The ERT reiterates the recommendation made in the previous review report that Luxembourg report in its next NC projections on a gas-by-gas basis.
5	Reporting requirement specified in paragraph 35	Luxembourg did not report in its NC7 projections for indirect GHGs. During the review, Luxembourg acknowledged that indirect GHGs were not reported.

No.	<i>Reporting requirement, issue type and assessment</i>	<i>Description of the finding with recommendation or encouragement</i>
	Issue type: completeness Assessment: encouragement	The ERT encourages Luxembourg to improve completeness and report projections of indirect GHGs in its next NC.
6	Reporting requirement specified in paragraph 36 Issue type: completeness Assessment: recommendation	Luxembourg did not report projections related to fuel sold to ships and aircraft engaged in international transport in its NC7. It described the methodology used for the projection of emissions from international transport but the projections were not presented or included in the totals. During the review, Luxembourg explained that projections related to fuel sold to aircraft engaged in international transport are available and provided them to the ERT. International transport using ships occurs only on the Moselle river in Luxembourg. The ERT reiterates the recommendation made in the previous review report that Luxembourg report in its next NC projections for fuel sold to ships and aircraft engaged in international transport, to the extent possible, separately and not included in the totals, including reporting zero figures.
7	Reporting requirement specified in paragraph 37 Issue type: transparency Assessment: encouragement	Luxembourg reported projections for 2005, 2010, 2015, 2020, 2025, 2030 and 2035 in its NC7 in tabular format, but they were not presented together with actual data for the period 1990–2000 or the latest year available. During the review, the Party provided additional data covering the period 1990–2000. The ERT encourages Luxembourg to present in its next NC projections in tabular format together with actual data for the period 1990–2000 or the latest year available.
8	Reporting requirement specified in paragraph 38 Issue type: transparency Assessment: encouragement	The ERT noted that Luxembourg provided projections in diagrams for 2005–2035, thus additional to the reporting requirement, but not for the period from 1990 (or another base year, as appropriate) to 2020. During the review, the Party provided additional diagrams covering the period from 1990. The ERT encourages Luxembourg to also present in its next NC diagrams showing unadjusted inventory data and WEM projections for the period from 1990 (or another base year, as appropriate) to 2020.
9	Reporting requirement specified in paragraph 43 Issue type: transparency Assessment: encouragement	Luxembourg presented in its NC7 the different models used for making projections for the energy sector, but not for the agriculture, industrial processes, LULUCF and waste sectors. During the review, the Party made available additional information regarding the models used for the non-energy sectors as well as for the energy sector, which helped the ERT to understand the projections. The ERT encourages Luxembourg to report in its next NC all information according to the UNFCCC reporting guidelines on NCs for each model used for the projections.
10	Reporting requirement specified in paragraph 46 Issue type: transparency Assessment: encouragement	Luxembourg presented in its NC7 qualitatively the sensitivity of its projections for each sector, not just for the total emissions. According to the UNFCCC reporting guidelines on NCs, sensitivity should also be addressed quantitatively where possible. During the review, Luxembourg acknowledged that a quantitative sensitivity analysis is not available for the projections and that it was therefore not reported. The ERT reiterates the encouragement made in the previous review report for Luxembourg to include in its next NC a quantitative sensitivity analysis where possible. The ERT noted that one possible way to accomplish this would be to make different assumptions on the amount of transport fuel sold to non-residents based on different assumed circumstances.

No.	Reporting requirement, issue type and assessment	Description of the finding with recommendation or encouragement
11	Reporting requirement specified in paragraph 48 Issue type: completeness Assessment: recommendation	Luxembourg did not present relevant information on factors and activities for each sector to provide the reader with an understanding of emission trends. During the review, Luxembourg provided some additional information, such as on the multiple drivers of transport emissions, that enabled the ERT to understand the trends, but more information would be helpful to understand the trends and connection between the PaMs and the projections. The ERT reiterates the recommendation made in the previous review report that Luxembourg include in its next NC relevant information on factors and activities for each sector to help the reader to understand the projected emission trends.

Note: Paragraph number listed under reporting requirement refers to the relevant paragraph of the UNFCCC reporting guidelines on NCs. The reporting on the requirements not included in this table is considered to be complete, transparent and adhering to the UNFCCC reporting guidelines on NCs and on BRs.

2. Assessment of the total effect of policies and measures

(a) Technical assessment of the reported information

85. In the NC7 Luxembourg presented the expected total effect of implemented and adopted PaMs. Information is presented in terms of GHG emissions avoided or sequestered, by gas (on a CO₂ eq basis), for 2013–2035.

86. Luxembourg reported that the total estimated effect of its adopted and implemented PaMs in 2020 is 268.9 kt CO₂ eq and in 2030 is 495.5 kt CO₂ eq. According to the information reported in the NC7, PaMs implemented in the energy sector will deliver the largest emission reductions in 2030, followed by PaMs implemented in the industrial processes and waste sectors. The ERT noted that Luxembourg did not include the effects of all the PaMs described in the PaMs section in the estimated total effect of PaMs, so the total effect has been underestimated. Table 14 provides an overview of the total effect of PaMs as reported by Luxembourg.

Table 14

Projected effects of Luxembourg's planned, implemented and adopted policies and measures by 2020 and 2030

Sector	2020	2030
	Effect of implemented and adopted measures (kt CO ₂ eq)	Effect of implemented and adopted measures (kt CO ₂ eq)
Energy (without transport)	146.9	279.6
Transport	36.8	–
Industrial processes	9.9	115.5
Agriculture	–	–
Land-use change and forestry	–	–
Waste management	75.3	100.3
Total	268.9	495.5

Source: Luxembourg's NC7.

Note: The total effect of implemented and adopted PaMs is defined as the sum of the individual effects of the PaMs.

(b) Assessment of adherence to the reporting guidelines

87. The ERT assessed the information reported in the NC7 of Luxembourg and identified issues relating to completeness, transparency and adherence to the UNFCCC reporting guidelines on NCs. The findings are described in table 15.

Table 15

Findings on the assessment of the total effect of policies and measures from the review of the seventh national communication of Luxembourg

No.	<i>Reporting requirement, issue type and assessment</i>	<i>Description of the finding with recommendation or encouragement</i>
1	Reporting requirement specified in paragraph 39 Issue type: transparency Assessment: recommendation	The Party reported the total effect of implemented and adopted PaMs in its NC7, but not all implemented and adopted PaMs were assessed and taken into account so the effect has been underestimated. During the review, Luxembourg explained that only some of the implemented and adopted PaMs were taken into account in the total effect of PaMs because no estimates of the effects were available for the other measures. The ERT recommends that the Party include in its next NC the effect of all implemented and adopted PaMs in the total effect of the PaMs, or clearly explain why this may not be possible due to its national circumstances. The ERT suggests that one way to assist with this could be to build a better national system for monitoring and evaluating the implementation of PaMs and for preparing projections and ex ante estimates of the effects of PaMs.
2	Reporting requirement specified in paragraph 40 Issue type: transparency Assessment: recommendation	Luxembourg reported the total effect of PaMs for 2013–2035 by gas in its NC7, but not for 1995 and 2000. The ERT recommends that Luxembourg include in its next NC information on the total effect of PaMs for 1995 and 2000 and encourages Luxembourg to also report the total effect of PaMs for 2005 and 2010. A similar recommendation was made in the previous review report.
3	Reporting requirement specified in paragraph 41 Issue type: transparency Assessment: encouragement	Luxembourg reported in its NC7 that the total effect of PaMs was estimated by aggregating the effects of individual measures, and also provided information regarding the base year used for the calculation. The ERT noted that the assumed effects were based on different base years. During the review, Luxembourg explained that for some PaMs the start date still needed to be confirmed with the implementing agency. The ERT encourages Luxembourg to report clearly in its next NC from what year onward it was assumed that policies were implemented or not implemented when making the calculations.

Note: Paragraph number listed under reporting requirement refers to the relevant paragraph of the UNFCCC reporting guidelines on NCs. The reporting on the requirements not included in this table is considered to be complete, transparent and adhering to the UNFCCC reporting guidelines on NCs.

3. Supplementarity relating to the mechanisms pursuant to Articles 6, 12 and 17 of the Kyoto Protocol

(a) Technical assessment of the reported information

88. In the NC7 Luxembourg provided information on how its use of the mechanisms under Articles 6, 12 and 17 of the Kyoto Protocol is supplemental to domestic action. Luxembourg explained that in defining supplementary it took into account the total effect of its PaMs compared with the use of Kyoto Protocol mechanisms in 2013–2020. Since the total effect of domestic PaMs (1.4 Mt CO₂ eq) is higher than the expected use of credits from Kyoto Protocol mechanisms (0 Mt CO₂ eq), it concluded that the use of mechanisms under the Kyoto Protocol is supplemental to domestic action.

89. During the review, Luxembourg confirmed that it does not plan to use the market-based mechanisms to meet its 2013–2020 target. During the first commitment period, Luxembourg contracted 15.7 Mt carbon credits from project-based mechanisms (clean development mechanism and joint implementation projects) or by purchasing permits on the international emissions trading market. The clean development mechanism provided about 37 per cent of the emission reductions, and joint implementation and international emissions trading the remaining part. Luxembourg used 14.2 Mt CO₂ eq credits for compliance in the

first commitment period, leaving 1.5 Mt CO₂ eq available for compliance in 2013–2020, if needed.

(b) Assessment of adherence to the reporting guidelines

90. The ERT assessed the information reported in the NC7 of Luxembourg and recognized that the reporting is complete, transparent and adhering to the reporting guidelines for supplementary information. No issues relating to the topics discussed in this chapter of the review report were raised during the review

D. Provision of financial and technological support to developing country Parties, including information under Articles 10 and 11 of the Kyoto Protocol

1. Financial resources, including under Article 11 of the Kyoto Protocol

(a) Technical assessment of the reported information

91. Luxembourg reported information on the provision of financial support required under the Convention and its Kyoto Protocol, including on financial support provided, committed and pledged, allocation channels and annual contributions.

92. Luxembourg indicated what “new and additional” financial resources it has provided and clarified how it has determined such resources as being “new and additional”. Luxembourg’s definition is that resources that it commits to delivering are not taken over from earlier commitments and are thus “new”, and that they are “additional” as they are on top of Luxembourg’s ODA commitments and thus are not double counted or taking away from other resources dedicated to poverty eradication.

93. Luxembourg described how its resources address the adaptation and mitigation needs of non-Annex I Parties. It also described how those resources assist non-Annex I Parties to mitigate and adapt to the adverse effects of climate change, facilitate economic and social response measures, and contribute to technology development and transfer and capacity-building related to mitigation and adaptation. The Party reported that, through its “Strategy for environment and climate change action”, it aims to generate environmental and climatic benefits in developing countries by mainstreaming environment and climate change in its interventions; by supporting the national sustainable development goals and preservation of natural resources of those countries; and by supporting specific activities, including education and public awareness, in the fields of natural resources management, sustainable agriculture, energy and the fight against climate change.

94. Luxembourg reported information on the assistance that it has provided to developing country Parties that are particularly vulnerable to the adverse effects of climate change to help them to meet the costs of adaptation to those adverse effects. In order to maximize its effectiveness and impact, Luxembourg’s development cooperation follows a policy of targeted intervention in a limited number of partner countries, which are chosen primarily by taking into account the composite human development index of the United Nations Development Programme. Luxembourg’s development cooperation with seven partner countries (Burkina Faso, Cabo Verde, Lao People’s Democratic Republic, Mali, Nicaragua, Niger and Senegal) and seven project countries (Afghanistan, El Salvador, Kosovo, Mongolia, Myanmar, State of Palestine and Viet Nam) is carried out through multiannual indicative cooperation programmes. The programmes cover a four- to five-year period, giving the partner countries medium-term budgetary predictability and cover in line with their planning periods. In 2015, Luxembourg disbursed EUR 2 million to the Adaptation Fund to pay off its pledged contribution to fast-start finance for 2010–2012.

95. With regard to the most recent financial contributions aimed at enhancing the implementation of the Convention by developing countries, Luxembourg reported that its climate finance has been allocated on the basis of its “Attribution of international climate finance funds in the fight against climate change” strategy. Luxembourg’s international climate finance pledge concentrates on three main areas: 40 per cent for mitigation (preferential sectors: renewable energy, energy efficiency, transport, waste management,

agriculture); 40 per cent for adaptation (especially in the least developed countries) and small island developing States (preferential sectors: resilience to climate change, reducing vulnerability to climate variability, early warning, adaptation in the agriculture sector); and 20 per cent for REDD-plus.³ However, Luxembourg recognizes that this distribution is only an indication, and that account will be taken of the needs of the host and partner countries.

96. With respect to geographical distribution, Luxembourg's international climate finance programme seeks a balanced distribution of host countries, with, to the extent possible, a minimum amount of 50 per cent of international climate finance for projects in current and former cooperation partner countries (Burkina Faso, Lao People's Democratic Republic, Mali, Niger and Senegal, as well as Cabo Verde, as small island developing States). Table 16 includes some of the information reported by Luxembourg on its provision of financial support.

Table 16

Summary of information on provision of financial support by Luxembourg in 2013–2016

(Millions of United States dollars)

<i>Allocation channel of public financial support</i>	<i>Year of disbursement</i>			
	<i>2013</i>	<i>2014</i>	<i>2015</i>	<i>2016</i>
ODA ^a	38.83	44.19	46.77	56.44
Climate-specific contributions through multilateral channels, including:			13.32	11.07
Adaptation Fund			2.22	
Green Climate Fund			11.10	11.07
Financial institutions, including regional development banks	2.30	1.52	1.12	2.12
World Bank	0.40	0.40	1.11	0.33
Other multilateral financial institutions	1.90	1.12	0.01	1.79
United Nations bodies	4.45	0.33	2.07	1.89
United Nations Development Programme				
United Nations Environment Programme	2.66			
Other	1.79	0.33	2.07	1.89
Climate-specific contributions through bilateral, regional and other channels	32.08	42.34	30.26	41.36

Sources: (1) Query Wizard for International Development Statistics, available at <http://stats.oecd.org/qwids/>; (2) BR3 CTF tables; (3) data for 2013 and 2014 provided by the Party during the review.

(b) Assessment of adherence to the reporting guidelines

97. The ERT assessed the information reported in the NC7 of Luxembourg and identified issues relating to completeness and adherence to the UNFCCC reporting guidelines on NCs. The findings are described in table 17.

³ In decision 1/CP.16, paragraph 70, the Conference of the Parties encouraged developing country Parties to contribute to mitigation actions in the forest sector by undertaking the following activities: reducing emissions from deforestation; reducing emissions from forest degradation; conservation of forest carbon stocks; sustainable management of forests; and enhancement of forest carbon stocks.

Table 17

Findings on financial resources, including under Article 11 of the Kyoto Protocol, from the review of the seventh national communication of Luxembourg

No.	<i>Reporting requirement, issue type and assessment</i>	<i>Description of the finding with recommendation or encouragement</i>
1	Reporting requirement specified in paragraph 52 Issue type: completeness Assessment: recommendation	<p>In its NC7 the Party did not provide detailed information in textual format and with reference to table 5 of the UNFCCC reporting guidelines on NCs (which also was not reported) on the assistance provided for the purpose of assisting developing countries that are particularly vulnerable to the adverse effects of climate change in meeting the costs of adaptation to the adverse effects of climate change. Instead the NC7 provides information on contributions through multilateral, bilateral, regional and other channels in 2016, in euro, by type of support (mitigation, adaptation, cross-cutting and/or other), presented in BR3 CTF table 7 and 7(b).</p> <p>During the review, Luxembourg explained that the Department of the Environment of MSDI will meet with the Directorate for Development Cooperation and Humanitarian Affairs within the Ministry of Foreign and European Affairs to discuss the tables to be reported in NCs (UNFCCC reporting guidelines on NCs, tables 4 and 5) and BRs (CTF tables 7, 8 and 9) and whether it would be possible to identify projects that assist developing country Parties that are particularly vulnerable to the adverse effects of climate change by use of a symbol (e.g. an asterisk in the tables). The Party indicated that this should be feasible once its reporting of CTF table 7(b) has been modified (presentation to be changed to project by project and no longer grouping projects by geographical zones and types of programme).</p> <p>The ERT reiterates the recommendation made in the previous review report that in the next NC Luxembourg provide detailed information on the assistance provided for the purpose of assisting developing countries that are particularly vulnerable to the adverse effects of climate change in meeting the costs of adaptation to the adverse effects of climate change, in textual format and with reference to table 5.</p>
2	Reporting requirement specified in paragraph 53 Issue type: transparency Assessment: encouragement	<p>In its NC7 Luxembourg reported information on its overall financial contributions related to the implementation of the Convention provided through bilateral, regional and other multilateral channels, for 2014, 2015 and 2016, in accordance with table 4 of the UNFCCC reporting guidelines on NCs, but without reference to multilateral scientific, technological and training programmes (hence table 4 is not completely filled in).</p> <p>During the review, Luxembourg explained that it will analyse the feasibility of filling in tables 4 and 5 of the UNFCCC reporting guidelines on NCs. It also indicated that, for table 5, there should be no problem once the reporting of CTF table 7(b) has been modified, but that table 4 would require more work.</p> <p>The ERT encourages Luxembourg to provide a complete table 4 in its next NC.</p>

Note: Paragraph number listed under reporting requirement refers to the relevant paragraph of the UNFCCC reporting guidelines on NCs. The reporting on the requirements not included in this table is considered to be complete, transparent and adhering to the UNFCCC reporting guidelines on NCs.

2. Technology development and transfer, including information under Article 10 of the Kyoto Protocol

(a) Technical assessment of the reported information

98. Luxembourg provided information on steps, measures and activities related to technology transfer, access and deployment benefiting developing countries, including information on activities undertaken by the public and limited information on private sector activities. Luxembourg provided examples of support provided for the deployment and enhancement of the endogenous capacities and technologies of non-Annex I Parties, while highlighting the relevant capacity-building elements in the description of the technology transfer projects. Luxembourg reported activities related to technology transfer, including success and failure stories, using table 6 of the UNFCCC reporting guidelines on NCs.

99. The ERT noted that Luxembourg reported on its PaMs as well as success and failure stories in relation to technology transfer, and in particular on measures taken to promote, facilitate and finance the transfer and deployment of climate-friendly technologies. Examples include the Business Partnership Facility, which has an annual budget of EUR 1 million aimed at encouraging the private sector to engage with partners in developing countries to implement sustainable business projects; the capacity-building activities in Cabo Verde's Energies Training Centres, which aim to create an incentive for private sector investment in clean technologies in the country; and collaboration with the EcoInnovation Cluster to encourage Luxembourg's companies to provide photovoltaic panels and solar container systems, biogas installations and thermosolar boilers to developing countries, specifically in the case of the development of renewable energy sources in Cabo Verde.

100. Luxembourg provided information on steps taken to promote, facilitate and finance the transfer of technology to developing countries and to build their capacity in order to facilitate implementation of Article 10 of the Kyoto Protocol.

(b) Assessment of adherence to the reporting guidelines

101. The ERT assessed the information reported in the NC7 of Luxembourg and identified an issue relating to transparency and adherence to the UNFCCC reporting guidelines on NCs. The finding is described in table 18.

Table 18

Findings on technology development and transfer, including information under Article 10 of the Kyoto Protocol, from the review of the seventh national communication of Luxembourg

No.	<i>Reporting requirement, issue type and assessment</i>	<i>Description of the finding with recommendation or encouragement</i>
1	Reporting requirement specified in paragraph 54 Issue type: transparency Assessment: encouragement	<p>In its NC7 the Party reported limited information on the distinction between activities undertaken by the public and those undertaken by the private sector on measures related to the promotion, facilitation and financing of access to, or transfer of, technology. Although the NC7 provides three brief examples to illustrate how Luxembourg encourages private sector activities, the ERT noted that two of the three examples are the same as reported in the NC6.</p> <p>During the review, Luxembourg explained that the Directorate for Development Cooperation and Humanitarian Affairs of its Ministry of Foreign and European Affairs, as a public administrator primarily concerned with development policies and ODA management, does not have access to information on private sector investment and cannot report on such information. Therefore, all activities described in the NC7 are publicly financed or co-financed to at least 66 per cent in the case of NGO projects. Luxembourg also indicated that for publicly funded (bilateral contributions as well as co-financing and framework agreements with NGO) projects in the field of technology transfer, the Ministry relies on the private sector as a skilled and specialized technical partner. Luxembourg also provided five more examples of how it has encouraged private sector activities.</p> <p>The ERT encourages Luxembourg to provide information and examples, including up-to-date information on how it encourages activities undertaken by the private sector, on the roles of private sector activities in its next NC to convey a clearer picture of how it is meeting its commitments under Article 4, paragraphs 3, 4 and 5, of the Convention.</p>

Note: Paragraph number listed under reporting requirement refers to the relevant paragraph of the UNFCCC reporting guidelines on NCs. The reporting on the requirements not included in this table is considered to be complete, transparent and adhering to the UNFCCC reporting guidelines on NCs.

E. Vulnerability assessment, climate change impacts and adaptation measures

1. Technical assessment of the reported information

102. In the NC7 Luxembourg provided the required information on the expected impacts of climate change in the country; the adaptation policies covering regional, sectoral and cross-

sectoral vulnerabilities; and an outline of the action taken to implement Article 4, paragraph 1(b) and (e), of the Convention regarding adaptation. The NC7 presents a comprehensive identification of impacts and vulnerabilities in relation to vegetation, human health, agriculture and forestry, and a detailed assessment of the vulnerability of water resources and its implications. The information includes a description of the main adaptation actions taken to address these impacts and vulnerabilities for some key sectors and cross-cutting topics. Table 19 summarizes the information on vulnerability and adaptation to climate change presented in the NC7 of Luxembourg.

103. Impetus has been given to addressing adaptation matters with the adoption of a new and more comprehensive version of the National Adaptation Strategy on Climate Change, which includes an action plan for the adaptation responses planned for 2018–2023. During the review, the Party stated that the strategy was approved by the Government in Council on 12 October 2018. In the development of the sector-based strategy, 86 climate impacts were taken into consideration on the basis of their potential threats up until 2050. To address the impacts, 275 actions had been previously elaborated, but the strategy proposes 42 concrete actions for responding to the prioritized climate impacts. The new version of the strategy has important features that the previous version of the strategy, approved in 2011, did not have. For example, it provides indicators for monitoring the implementation of actions and identifies the entities responsible for implementation of the actions.

Table 19

Summary of information on vulnerability and adaptation to climate change reported by Luxembourg

<i>Vulnerable area</i>	<i>Examples/comments/adaptation measures reported</i>
Agriculture and food security	<p><i>Vulnerability:</i> Projected changes in air temperature are likely to induce a modification of the vegetation growing period in Luxembourg and could cause an increased risk of frost damage to vegetation. The projected increase in temperature is also expected to have an impact on the life cycle of insects. Projections also show that the number of dry periods, as well as the days within a dry period, could increase, causing drier conditions. These factors, as well as the fact that Luxembourg has very little agricultural surface area using irrigation, could lead to significant impacts on the agriculture sector. Nevertheless, Luxembourg does not identify climate change as an imminent threat to national food security, as it is already a net importer of food.</p> <p><i>Adaptation:</i> Four specific objectives and measures in this area were defined: to protect against soil degradation and maintain its production potential; to protect animals against heat and potential new diseases; to adapt plant production to climate change; to manage risks through multirisk insurance and the existing rural development policy.</p>
Biodiversity and natural ecosystems	<p><i>Vulnerability:</i> Changing climatic conditions are expected to lead to species range shifts, and a south to north migration of species. Projected temperature changes could also have an impact on the biogeography of flora.</p> <p><i>Adaptation:</i> Vulnerability analysis; establishment of protected areas and green corridors; agroforestry; regional implementation and planning of measures, conservation and restoration of wetlands and permanent grassland; green infrastructure and architecture; monitoring of biodiversity; combating invasive alien species; a study on the economics of ecosystem services and biodiversity. Additionally, the River Basin Management Plan (2009–2015) includes measures to re-establish river morphology and a natural river dynamic that should help to preserve and re-establish biological continuity.</p>
Drought	<p><i>Vulnerability:</i> The projected increase in the number of dry periods and the number of days within a dry period means an increased risk of drought for Luxembourg.</p> <p><i>Adaptation:</i> The Water Agency has identified potential adaptation measures, including the prohibition of certain water uses to guarantee the water supply.</p>
Forests	<p><i>Vulnerability:</i> Projected overall yearly temperature increases could lead to a decline in Luxembourg's forest health owing to the increased risk of the outbreak of diseases and insect or parasite infestation. In addition, as higher temperatures will most likely lead to more extreme storm events in Europe, severe winds could cause considerable damage to forests in Luxembourg.</p> <p><i>Adaptation:</i> Certification, conservation and use of wood as a renewable energy resource, among others. Luxembourg also monitors the health of its forests and is planning to institutionalize this monitoring with legislation. These measures will be integrated into the country's 10-year forest management plans.</p>

<i>Vulnerable area</i>	<i>Examples/comments/adaptation measures reported</i>
Human health	<p><i>Vulnerability:</i> A projected increase in temperature in all seasons and an increase in the number of dry periods and the number of days within a dry period could increase the risk of heatwaves and influence air quality. Changes in the water cycle could increase public health risks related to water quality and water scarcity.</p> <p><i>Adaptation:</i> The National Adaptation Strategy on Climate Change does not currently address the area of human health, although it is planned to include additional sectors, such as health, to the strategy within the next two years.</p>
Water resources	<p><i>Vulnerability:</i> Projections indicate future changes in the water cycle, such as an increase in rainfall with increasing discharges in winter and a decrease in rainfall with reduced run-off in summer by 2050.</p> <p><i>Adaptation:</i> Measures in the water resources sector, such as a monitoring network, riverbank restoration, water retention, water loss reduction, production water recycling, rainwater use and anti-erosion measures, among others.</p>
Infrastructure and economy	<p><i>Vulnerability:</i> The projected increase in rainfall with increasing discharges in winter means that there could be an increase in the frequency of inundations. Luxembourg has participated in a regional study to assess the eventual consequences of climate change for floods and low water flow in the Moselle and Saar catchment areas and to develop adjustment strategies.</p> <p><i>Adaptation:</i> Luxembourg has carried out a preliminary flood risk assessment and has prepared flood hazard and risk maps. The first flood risk management plan was published in December 2015. Luxembourg also has a flood warning service operated by the Water Management Agency. The Agriculture Technical Services Administration of the Ministry of Agriculture, Viticulture and Rural Development monitors the weather through its own network of stations and warns farmers of weather events. The Luxembourg Institute of Science and Technology analyses rainfall.</p>

104. Luxembourg provided information on its regional cooperation on preparing to meet the impacts of climate change, such as the development of integrated plans for water resources, in the context of the International Commission for the Protection of the Rhine. One of the topics covered by the Commission is climate change in the Rhine river catchment area and the effects of climate change on the discharge pattern of the Rhine. In 2015, the Commission adopted a climate change adaptation strategy for the international river basin district of the Rhine. Luxembourg also participates in other regional commissions such as for the protection of the Moselle and the Saar.

105. Luxembourg did not provide in chapter 6 of its NC7 information on cooperation on the development of integrated plans for water resources, agriculture and the protection and rehabilitation of areas, particularly in Africa, affected by drought and desertification, as well as floods, as required by the UNFCCC reporting guidelines on NCs. However, it reported elsewhere in the NC7 (chapter 7) information on relevant bilateral projects that address vulnerability and adaptation in relation to water resources or rehabilitation of areas in developing countries, such as the programmes in Burkina Faso and Viet Nam. Furthermore, during the review, the Party informed the ERT of other similar projects reported in CTF tables 8 and 9, such as those in Cabo Verde and Viet Nam.

2. Assessment of adherence to the reporting guidelines

106. The ERT assessed the information reported in the NC7 of Luxembourg and identified an issue relating to transparency and adherence to the UNFCCC reporting guidelines on NCs. The finding is described in table 20.

Table 20

Findings on vulnerability assessment, climate change impacts and adaptation measures from the review of the seventh national communication of Luxembourg

No.	<i>Reporting requirement, issue type and assessment</i>	<i>Description of the finding with recommendation or encouragement</i>
1	Reporting requirement specified in paragraph 49 Issue type: transparency Assessment: recommendation	<p>Luxembourg provided information on regional cooperation, but did not provide information on its cooperation on the development of integrated plans for water resources, agriculture and the protection and rehabilitation of areas, including with developing countries, particularly in Africa, affected by drought and desertification, as well as floods, in chapter 6 of its NC7. However, this information was reported elsewhere in the NC7 and BR3. The ERT noted that Article 4, paragraph 1(e), of the Convention states that Parties, taking into account their specific national and regional development priorities, objectives and circumstances, shall develop and elaborate appropriate and integrated plans for coastal zone management, water resources and agriculture, and for the protection and rehabilitation of areas, particularly in Africa, affected by drought and desertification, as well as floods; and, according to the UNFCCC guidelines on NCs, may refer, inter alia, to integrated plans for coastal zone management, water resources and agriculture.</p> <p>During the review, Luxembourg acknowledged that some relevant information was provided in chapter 7 of its NC7, namely on projects related to agriculture, adaptation and land rehabilitation in Burkina Faso. Other similar projects were reported in CTF tables 8 and 9 (see para. 105 above).</p> <p>The ERT recommends that Luxembourg either include in chapter 6 of its next NC information on its cooperation on the development of integrated plans for water resources, agriculture and the protection and rehabilitation of areas, including with developing countries, particularly in Africa, affected by drought and desertification, as well as floods, or clarify if these cooperation areas are beyond specific national and regional development priorities and objectives. A similar recommendation was made in the previous review report.</p>

Note: Paragraph number listed under reporting requirement refers to the relevant paragraph of the UNFCCC reporting guidelines on NCs. The reporting on the requirements not included in this table is considered to be complete, transparent and adhering to the UNFCCC reporting guidelines on NCs.

F. Research and systematic observation

1. Technical assessment of the reported information

107. Luxembourg provided detailed information on its research and systematic observation activities at the national and international level, on its general policy and national arrangements for these activities, and on the open exchange of information and data from its atmospheric climate observing systems at the national and international level. Luxembourg reported in detail on its active participation in GCOS and on how the resulting data are used by the World Climate Programme. However, it did not provide information on its provision of support to other international and intergovernmental programmes, such as IGBP and the IPCC, or on its activities to support capacity-building related to research and systematic observation in developing countries.

108. Luxembourg reported detailed information on the climate change research activities that led to the projected estimates of temperature increase, changes in precipitation and other changes as a consequence of climate change. The results were achieved using a downscaling dynamic approach within the framework of the ENSEMBLES Project, which was supported by the European Commission's 6th Framework Programme as a priority. Data from different global climate models were used as input to regional climate models. The Luxembourg Institute of Science and Technology is expected to carry out further studies in the coming years that will enable it to apply bias correction to the data set. There is also a plan to carry out further impact studies using the data provided by the CORDEX Project (the successor to the ENSEMBLES Project) for Luxembourg.

109. Using the results of the above-mentioned research activities, Luxembourg has achieved a comprehensive identification of impacts and vulnerabilities in relation to

vegetation, human health, agriculture and forestry, and water based on modelling studies adapted to national characteristics. Luxembourg reported a detailed assessment of the vulnerability of water resources and its implications. However, it did not report on research activities on socioeconomic analysis, including analysis of the impacts of climate change and response options, or on research and development of mitigation and adaptation technologies. The data resulting from the active participation of Luxembourg in the atmospheric climatic observing system of GCOS are shared and used by several international organizations such as the IPCC, the World Data Center for Meteorology, and the EUMETNET Composite Observing System surface land station network.

110. Luxembourg reported on a broad network of observational sites at the national level: MeteoLux, one of the national weather services in Luxembourg, is focused on aeronautical meteorology and is in charge of the meteorological forecasts and warnings for the general public; the meteorological service of the Agriculture Technical Services Administration, the other national weather service, has 32 stations focused mainly on agricultural meteorology; the Luxembourg Institute of Science and Technology runs a dense network of hydrometeorological stations that is the basis for research projects; and the Water Management Agency is the competent authority for the provision of flood forecasts for all watercourses in the country. These entities work in a coordinated manner, avoiding duplication, share their data and provide free information that is vital for protecting the population and carrying out essential economic activities.

2. Assessment of adherence to the reporting guidelines

111. The ERT assessed the information reported in the NC7 of Luxembourg and identified issues relating to completeness, transparency and adherence to the UNFCCC reporting guidelines on NCs. The findings are described in table 21.

Table 21

Findings on research and systematic observation from the review of the seventh national communication of Luxembourg

No.	Reporting requirement, issue type and assessment	Description of the finding with recommendation or encouragement
1	Reporting requirement specified in paragraph 58 Issue type: completeness Assessment: recommendation	The Party did not report on action taken to support capacity-building related to research and systematic observation in developing countries. During the review, Luxembourg explained that in its international cooperation with developing countries it includes capacity-building as a cross-cutting theme across all sectors and countries, regardless of the type of intervention. The ERT reiterates the recommendation made in the previous review report that Luxembourg include in its next NC information on actions taken to support capacity-building related to research and systematic observation in developing countries.
2	Reporting requirement specified in paragraph 58 Issue type: completeness Assessment: recommendation	The Party did not address in its NC7 both domestic and international activities, such as with IGBP and the IPCC. During the review, Luxembourg provided information on its participation in IPCC activities. The ERT reiterates the recommendation that Luxembourg report in its next NC information on its domestic and international activities.
3	Reporting requirement specified in paragraph 63 Issue type: completeness	The Party did not report on highlights and efforts with regard to socioeconomic analysis, including analysis of the impacts of climate change and response options, or on research and development of mitigation and adaptation technologies. During the review, Luxembourg informed the ERT of its participation in the Climate Risk and Early Warning Systems, which provide support for improving the control

No.	<i>Reporting requirement, issue type and assessment</i>	<i>Description of the finding with recommendation or encouragement</i>
	Assessment: encouragement	<p>and maintenance of the existing drought and flood monitoring network in the least developed countries and small island developing States.</p> <p>The ERT reiterates its encouragement of Luxembourg to include information on highlights and efforts with regard to socioeconomic analysis, including analysis of the impacts of climate change and response options, and on research and development of mitigation and adaptation technologies in its next NC.</p>
4	<p>Reporting requirement specified in paragraph 64</p> <p>Issue type: completeness</p> <p>Assessment: encouragement</p>	<p>Luxembourg did not report information on the current status of plans and programmes for ground- and space-based climate observing systems or on the exchange and archiving of data in the area of support for developing countries to establish and maintain observing systems, and related data and monitoring systems.</p> <p>During the review, Luxembourg informed the ERT that the Luxembourg Institute of Science and Technology measures some atmospheric constituents (e.g. CO₂, particulates) and that it carries out studies with the data resulting from these measurements.</p> <p>The ERT encourages Luxembourg to include in its next NC information on the current status of plans and programmes for ground- and space-based climate observing systems and, on the exchange, and archiving of data in the area of support provided for developing countries to establish and maintain observing systems, and related data and monitoring systems.</p>

Note: Paragraph number listed under reporting requirement refers to the relevant paragraph of the UNFCCC reporting guidelines on NCs. The reporting on the requirements not included in this table is considered to be complete, transparent and adhering to the UNFCCC reporting guidelines on NCs.

G. Education, training and public awareness

1. Technical assessment of the reported information

112. Luxembourg in its NC7 fulfilled nearly all of the reporting requirements on education, training and public awareness. The Party reported on its general policy on education, training and public awareness and its implementation at the domestic and international level. Multiple activities, such as public awareness programmes on climate change and sustainability, activities related to public access to information, and training and education related to climate change, are carried out by the Government, local authorities and civil society. The education, training and public awareness programmes and activities are coordinated by the Department of the Environment of MSDI and the administrations under its authority.

113. The NC7 includes information on multiple activities related to increasing public awareness on climate change matters that have been carried out since the NC6; for example, the continuation and start of several innovative public awareness campaigns organized by a broad range of governmental and local organizations and NGOs, the private sector, schools, and national and regional press, using a broad range of tools and means. The reported campaigns are mainly focused on mitigation, such as increasing household energy saving, increasing energy efficiency at all levels, promoting renewable energy and promoting sustainable mobility through increased use of public transport, bicycles, carpooling and car sharing (e.g. through MoDu 2.0). The public awareness campaigns promoted by myenergy, the national structure for a sustainable energy transition, cover the entire country. The promotion of sustainability more broadly in the country (e.g. in relation to housing and refurbishment) is also a priority of the public awareness campaigns.

114. Luxembourg provided detailed information on its activities for educating schoolchildren on sustainable living and protecting the environment and climate. Numerous training activities were reported in connection with climate change mitigation, such as on energy efficiency, organized by governmental entities, professional associations, NGOs, private enterprises and municipalities. Luxembourg also reported on the active involvement of civil society, including NGOs, in these and others education, training and public awareness activities.

115. The ERT noted that the activities on education, training and public awareness reported in the NC7 relate to mitigation but not to adaptation. During the review the Party informed the ERT of several activities related to adaptation, which are either part of general climate awareness campaigns or more specific education and awareness programmes, such as on invasive species. Luxembourg provided the ERT with relevant information on the National Adaptation Strategy on Climate Change, adopted in October 2018.

2. Assessment of adherence to the reporting guidelines

116. The ERT assessed the information reported in the NC7 of Luxembourg and identified issues relating to completeness and adherence to the UNFCCC reporting guidelines on NCs. The findings are described in table 22.

Table 22

Findings on education, training and public awareness from the review of the seventh national communication of Luxembourg

No.	Reporting requirement, issue type and assessment	Description of the finding with recommendation or encouragement
1	Reporting requirement specified in paragraph 65 Issue type: completeness Assessment: encouragement	The Party did not report in its NC7 on the extent of public participation in the preparation or domestic review of NCs. During the review, Luxembourg informed the ERT that there was no significant public participation in the development or domestic review of the NC7. The ERT encourages Luxembourg to include in its next NC information on the extent of public participation in the preparation or domestic review of NCs.
2	Reporting requirement specified in paragraph 66 Issue type: completeness Assessment: encouragement	The Party did not present information on primary, secondary or higher education and climate change. During the review, Luxembourg informed the ERT that the Interministerial Committee for Education for Sustainable Development has suggested that sustainable development and climate change be included in all school curricula, but the necessary resources and mechanisms still need to be planned. The ERT encourages Luxembourg to include information on primary, secondary and higher education and climate change in its next NC.

Note: Paragraph number listed under reporting requirement refers to the relevant paragraph of the UNFCCC reporting guidelines on NCs. The reporting on the requirements not included in this table is considered to be complete, transparent and adhering to the UNFCCC reporting guidelines on NCs.

III. Conclusions and recommendations

117. The ERT conducted a technical review of the information reported in the NC7 of Luxembourg in accordance with the UNFCCC reporting guidelines on NCs. The ERT concludes that the reported information mostly adheres to the UNFCCC reporting guidelines on NCs and that the NC7 provides an overview of the national climate policy of Luxembourg.

118. The information provided in the NC7 includes most elements of the supplementary information under Article 7 of the Kyoto Protocol, with the exception of information on the national system, domestic and regional programmes and/or arrangements and procedures, and information under Article 10 of the Kyoto Protocol. Supplementary information under Article 7, paragraph 1, of the Kyoto Protocol on the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol was provided by Luxembourg in its 2018 annual submission.

119. Luxembourg's total GHG emissions excluding LULUCF covered by its quantified economy-wide emission reduction target were estimated to be 21.6 per cent below its 1990 level, whereas total GHG emissions including LULUCF were 25.7 per cent below its 1990 level, in 2016. Emission decreases were primarily driven by technological changes that occurred in the iron and steel industry between 1994 and 1998. Those factors outweighed the

significant increase in CO₂ emissions due to fuel consumption by local residents and cross-border commuters. The operation of a gas-fired power plant contributed to the increase in CO₂ emissions between 2002 and 2012.

120. Luxembourg's main policy framework relating to energy and climate change is the second national "Action Plan for reducing CO₂ emissions" and the Climate Agreement, which governs the involvement of municipalities in climate mitigation actions. Further, the EU ETS is one of the main tools used to reduce GHG emissions from industry. The key policies reported are the strategy for sustainable mobility MoDu 2.0, the promotion of low-carbon fuels and electric mobility, energy-efficiency standards for new buildings, and the voluntary agreement with industry to improve energy efficiency.

121. The GHG emission projections provided by Luxembourg in the NC7 correspond to the WEM and WAM scenarios. Under the two scenarios, emissions are projected to be 23.0 and 24.4 per cent below the 1990 level in 2020, respectively. According to the projections under the WEM scenario, emissions from non-ETS sectors are estimated to reach 8,381.86 kt CO₂ eq in 2020. Under the WAM scenario, Luxembourg's emissions from non-ETS sectors in 2020 are projected to be 8,212.86 kt CO₂ eq. These projected levels of emissions under the WEM and WAM scenarios are 3.3 and 1.2 per cent, respectively, above the AEAs for 2020. On the basis of the reported information, the ERT concludes that Luxembourg may face challenges in achieving its 2020 target for non-ETS sectors. However, owing to emission surpluses that were generated in the beginning of the 2013–2020 period when emissions were below the AEAs, Luxembourg's projected cumulative emissions for the whole period 2013–2020, based on the information in the NC7, are lower than the cumulative AEAs, resulting in a 1.98 Mt CO₂ eq surplus. Taking into account updated information reported during the review week, the surplus for the whole period is projected to be 0.82 Mt CO₂ eq. The ERT noted that, according to these figures, Luxembourg will achieve its target under the ESD, but if further growth in emissions were to continue, as seen in 2017, achieving the target could be challenging and the Party would need to use units from the first Kyoto Protocol commitment period to meet it.

122. The NC7 contains information on how Luxembourg's use of the mechanisms under Articles 6, 12 and 17 of the Kyoto Protocol is supplemental to domestic action. Luxembourg is currently not planning to make use of the Kyoto Protocol mechanisms to meet its Kyoto Protocol target.

123. Luxembourg continues to provide climate financing to developing countries in line with its climate finance programmes. Between 2013 and 2016 Luxembourg's contributions increased by 45.4 per cent and its public financial support in 2015 and 2016 totalled USD 46.77 million and USD 56.44 million, respectively. For those years, Luxembourg's support provided for mitigation action was lower than its support provided for adaptation. The biggest share of financial support went to cross-cutting projects, followed by the agriculture sector. Luxembourg reported activities related to technology transfer, including success and failure stories, using table 6 of the UNFCCC reporting guidelines on NCs. The ERT noted that the vast majority of the projects and programmes focus on capacity-strengthening for more effective and efficient use of local and existing technologies rather than on transfer of hard technology.

124. The NC7 presents a comprehensive identification of impacts and vulnerabilities in relation to vegetation, human health, agriculture and forestry, and a detailed assessment of the vulnerability of water resources and its implications. The projected increase in rainfall with increasing discharges in winter means that there could be an increase in the frequency of inundations. Luxembourg has prepared flood hazard and risk maps and has established flood risk management plans with a flood warning service. It has made significant progress in addressing adaptation with the elaboration and adoption of a new and more comprehensive version of the national adaptation strategy, which includes a plan for adaptation responses for the period 2018–2023, including 42 concrete actions for the prioritized climate impacts for 13 key sectors or cross-cutting topics. The strategy provides indicators for monitoring the implementation of actions and identifies the entities responsible for their implementation.

125. Luxembourg carried out climate change research activities that led to the projected estimates of temperature increase, changes in precipitation and other changes as a

consequence of climate change using a downscaling dynamic approach. On that basis, a comprehensive identification of national impacts and vulnerabilities has been achieved. The Party participates actively in the atmospheric activities of GCOS at the national and international level. Luxembourg has a broad network of observational sites at the national level run by four different organizations that work cooperatively, avoiding duplication, share their data and provide free information that is vital for protecting the population and carrying out essential economic activities.

126. The NC7 provided information on multiple target-oriented public awareness campaigns organized by a broad range of governmental and local organizations and NGOs, the private sector, schools, and the national and regional press using a broad range of tools and means. They focus on increasing household energy saving, increasing energy efficiency at all levels and promoting more sustainable mobility through an increase in the use of public transport, bicycles, carpooling and car sharing. The campaigns promoted by myenergy, the national structure for a sustainable energy transition, cover the entire country. The promotion of sustainability in the country is a priority of the public awareness campaigns.

127. In the course of the review, the ERT formulated the following recommendations for Luxembourg to improve its adherence to the UNFCCC reporting guidelines on NCs and its reporting of supplementary information under the Kyoto Protocol:⁴

- (a) To improve the completeness of its reporting by:
 - (i) Providing the name and contact information of the national entity and its designated representative with overall responsibility for the national inventory (see issue 1 in table 6);
 - (ii) Providing information on how the implementation of activities under Article 3, paragraph 3, of the Kyoto Protocol also contributes to the conservation of biodiversity and the sustainable use of natural resources (see issue 2 in table 7);
 - (iii) Reporting projections on a gas-by-gas basis (see issue 4 in table 15);
 - (iv) Reporting projections for fuel sold to aircraft engaged in international transport, to the extent possible, separately and not included in the totals, and projections for fuel sold to ships engaged in international transport (see issue 6 in table 15);
 - (v) Including relevant information on factors and activities for projections and on their connection to PaMs (see issue 11 in table 15);
 - (vi) Reporting how its actions will specifically help particularly vulnerable countries to meet the costs of adaptation, in textual format and with reference to table 5 of the UNFCCC reporting guidelines on NCs (see issue 1 in table 19);
 - (vii) Including information on actions taken to support capacity-building related to research and systematic observation in developing countries (see issue 1 in table 23);
 - (viii) Including information on its participation in activities of international and intergovernmental organizations, such as IGBP and the IPCC (see issue 2 in table 23);
- (b) To improve the transparency of its reporting by:
 - (i) Providing clearer information on the institutional arrangements in place for implementing the national and EU climate change policy and the Kyoto Protocol (see issue 1 in table 7);
 - (ii) Consistently reporting information on PaMs with regard to the GHGs affected, the start year of implementation, the implementation status and the type of instrument (see issue 2 in table 9);
 - (iii) Presenting projections on a sectoral basis, to the extent possible, using the same sectoral categories as used in the PaMs section (see issue 3 in table 15);
 - (iv) Reporting the effect of all implemented and adopted PaMs in the total effect of PaMs (see issue 1 in table 17);

⁴ The recommendations are given in full in the relevant sections of this report.

- (v) Including information on the total effect of PaMs for 1995 and 2000 (see issue 2 in table 17);
- (vi) Including in chapter 6 of its NC information on its cooperation on the development of integrated plans for water resources, agriculture and the protection and rehabilitation of areas, including with developing countries, particularly in Africa, affected by drought and desertification, as well as floods, or clarifying if these cooperation areas are beyond specific national and regional development priorities and objectives (see issue 1 in table 22);
- (c) To improve the timeliness of its reporting by submitting its next NC on time (see para. 5 above).

IV. Questions of implementation

128. During the review the ERT assessed the NC7, including the supplementary information provided under Article 7, paragraph 2, of the Kyoto Protocol, and reviewed the information on the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol with regard to timeliness, completeness and transparency. No questions of implementation were raised by the ERT during the review.

Annex

Documents and information used during the review

A. Reference documents

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Capros P, De Vita A, Tasios N, et al. 2016. *EU Reference Scenario 2016 – Energy, transport and GHG emissions trends to 2050*. European Commission. Available at <https://ec.europa.eu/energy/en/data-analysis/energy-modelling>.

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“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 to decision 24/CP.19. Available at <http://unfccc.int/resource/docs/2013/cop19/eng/10a03.pdf>.

“Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part II: UNFCCC reporting guidelines on national communications”. FCCC/CP/1999/7. Available at <http://unfccc.int/resource/docs/cop5/07.pdf>.

“Guidelines for the preparation of the information required under Article 7 of the Kyoto Protocol”. Annex to decision 15/CMP.1. Available at <http://unfccc.int/resource/docs/2005/cmp1/eng/08a02.pdf>.

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Revisions to the guidelines for review under Article 8 of the Kyoto Protocol. Annex I to
decision 4/CMP.11. Available at

<http://unfccc.int/resource/docs/2015/cmp11/eng/08a01.pdf>.

B. Additional information provided by the Party

Responses to questions during the review were received from Mr. Eric De Brabanter, including additional material. The following documents¹ were provided by Luxembourg:

Aether Ltd. 2018. *Provision of Technical Support in the Field of Climate Policies and Measures*.

European Topic Centre on Air pollution and Climate change mitigation. 2018. *Quality check feedback report PaMs for Luxembourg*.

¹ Reproduced as received from the Party.