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# Report of the in-depth review of the fifth national communication of Luxembourg

Parties included in Annex I to the Convention are requested, in accordance with decision 10/CP.13, to submit a fifth national communication to the secretariat by 1 January 2010. In accordance with decision 8/CMP.3, Parties included in Annex I to the Convention that are also Parties to the Kyoto Protocol shall include in their fifth national communications supplementary information under Article 7, paragraph 2, of the Kyoto Protocol. In accordance with decision 15/CMP.1, these Parties shall start reporting the information under Article 7, paragraph 1, of the Kyoto Protocol with the inventory submission due under the Convention for the first year of the commitment period. This includes supplementary information on the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol. This report presents the results of the in-depth review of the fifth national communication of Luxembourg conducted by an expert review team in accordance with the relevant provisions of the Convention and Article 8 of the Kyoto Protocol.

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# I. Introduction and summary

## A. Introduction

1. For Luxembourg, the Convention entered into force on 7 August 1994 and the Kyoto Protocol on 16 February 2005. Within the burden-sharing agreement of the European Union (EU) for meeting commitments under the Kyoto Protocol, Luxembourg committed itself to reducing its greenhouse gas (GHG) emissions by 28 per cent compared with the base year[1] level during the first commitment period from 2008 to 2012.

2. This report covers the in-country in-depth review (IDR) of the fifth national communication (NC5) of Luxembourg, coordinated by the UNFCCC secretariat, in accordance with the guidelines for review under Article 8 of the Kyoto Protocol (decision 22/CMP.1). The Party indicated that its NC5 is a consolidated national communication covering the second, third, fourth and fifth national communications of Luxembourg. Therefore, the NC5 referred to throughout this report covers the second, third, fourth and fifth national communications of Luxembourg. The review took place from 13 to 18 February 2012 in the city of Luxembourg, Luxembourg, and was conducted by the following team of nominated experts from the UNFCCC roster of experts: Ms. Yamide Dagnet (United Kingdom of Great Britain and Northern Ireland), Mr. Sabin Guendehou (Benin), Ms. Alexa Kleysteuber Labarca (Chile) and Mr. Aurelien Million (France). Ms. Dagnet and Mr. Guendehou were the lead reviewers. The review was coordinated by Ms. Xuehong Wang (UNFCCC secretariat).

3. During the IDR, the expert review team (ERT) examined each section of the NC5. The ERT also evaluated the supplementary information provided by Luxembourg as a part of the NC5 in accordance with Article 7, paragraph 2, of the Kyoto Protocol. In addition, the ERT reviewed the information on the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol, which was provided by Luxembourg in its 2011 annual submission under Article 7, paragraph 1, of the Kyoto Protocol.

4. In accordance with decision 22/CMP.1, a draft version of this report was communicated to the Government of Luxembourg, which provided comments that were considered and incorporated, as appropriate, into this final version of the report.

## B. Summary

5. The ERT noted that Luxembourg's NC5 complies mostly with the "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part II: UNFCCC reporting guidelines on national communications" (hereinafter referred to as the UNFCCC reporting guidelines). As required by decision 15/CMP.1, supplementary information required under Article 7, paragraph 2, of the Kyoto Protocol[2] is provided in the NC5. The Party considered most of the recommendations provided in the report on the in-depth review of the first national communication of Luxembourg.[3] The ERT commends Luxembourg for its improved reporting.

[1] "Base year" refers to the base year under the Kyoto Protocol, which is 1990 for carbon dioxide ($CO_2$), methane ($CH_4$) and nitrous oxide ($N_2O$), and 1995 for perfluorocarbons (PFCs), hydrofluorocarbons (HFCs) and sulphur hexafluoride ($SF_6$). The base year emissions include emissions from sectors/source categories listed in Annex A to the Kyoto Protocol.

[2] Decision 15/CMP.1, annex, chapter II.

[3] FCCC/IDR.1/LUX.

6. The supplementary information on the minimization of adverse impacts referred to in paragraph 3 above is mostly complete and transparent and was provided on time. During the review, Luxembourg provided further relevant information.

### 1. Completeness

7. The NC5 covers all sections required by the UNFCCC reporting guidelines and most of the supplementary information required under Article 7, paragraph 2, of the Kyoto Protocol. However, the NC5 does not include some of the information required by the UNFCCC reporting guidelines, including: description of policies and measures (PaMs) related to the non-energy sectors and PaMs subdivided by gas (see para. 29 below); how Luxembourg believes its PaMs are modifying longer-term trends in anthropogenic GHG emissions and removals consistent with the objective of the Convention (see para. 29 below); GHG projections presented on a gas-by-gas basis (see para. 58 below); emission projections related to fuel sold to ships and aircraft engaged in international transport (see para. 58 below); the steps taken to promote, facilitate and finance the transfer of technology and to support the development and enhancement of the endogenous capacities and technologies of developing countries (see para. 89 below); a description of the 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 (see para. 20 below); and the steps taken to implement the International Civil Aviation Organization (ICAO) and the International Maritime Organization (IMO) decisions to reduce GHG emissions (see para. 47 below). However, during the review, Luxembourg provided sufficient additional information on each missing mandatory element. The ERT recommends that the Party enhance the completeness of its reporting by providing this information in its next national communication.

### 2. Transparency

8. The ERT acknowledged that Luxembourg's NC5, including supplementary information provided under Article 7, paragraph 2, of the Kyoto Protocol, is broadly transparent. The NC5 is structured following the outline contained in the annex to the UNFCCC reporting guidelines and the supplementary information submitted under Article 7, paragraph 2, of the Kyoto Protocol is easily identifiable. In the course of the review, the ERT formulated a number of recommendations that could help Luxembourg to further increase the transparency of its reporting with regard to: PaMs (see paras. 29 and 33 below); projections and the total effect of PaMs (see paras. 58, 59, 63, 64, 68 and 70 below); vulnerability, climate change impacts and adaptation (see para. 81 below); financial resources and technology transfer (see paras. 83 and 84 below); research and systematic observation (see paras. 93 and 94 below); education, training and public awareness (see para. 97 below); information on supplementarity relating to the mechanisms pursuant to Articles 6, 12 and 17 of the Kyoto Protocol (see para. 74 below); and information on the minimization of adverse impacts (see para. 100 below).

### 3. Timeliness

9. The NC5 was submitted on 14 February 2010, after the deadline of 1 January 2010 mandated by decision 10/CP.13.

10. Luxembourg informed the secretariat about its difficulties with regard to the timeliness of the submission of its national communication on 13 January 2010 in accordance with paragraph 139 of decision 22/CMP.1. The ERT noted with concern the delay in the submission of the NC5. The ERT identified that Luxembourg failed to submit its second, third and fourth national communications on time. During the review, the Party

explained that its second, third and fourth national communications were not submitted because of a lack of data and technical capacity. The ERT strongly recommends that Luxembourg submit each future national communication in due time.

# II. Technical assessment of the reviewed elements

## A. National circumstances relevant to greenhouse gas emissions and removals, including legislative arrangements and administrative procedures

11. In its NC5, Luxembourg has provided a concise description of its national circumstances and has elaborated on the framework legislation and key policy documents on climate change. The NC5 and the discussions held during the review also referred to the description of a national system provided in the Party's initial report under Article 7, paragraph 4, of the Kyoto Protocol submitted in 2006[4] and the national inventory report of the 2011 annual submission. Further technical assessment of the institutional and legislative arrangements for the coordination and implementation of PaMs is provided in chapter II.B.1 of this report.

### 1. National circumstances

12. In its NC5, Luxembourg has provided a description of its national circumstances, and information on how these national circumstances affect GHG emissions and removals in Luxembourg and how changes in the national circumstances affect GHG emissions and removals over time. Information was provided on the government structure, population, geography, climate, economy and relevant economic sectors.

13. The ERT identified that the main drivers of emission trends in Luxembourg include: high economic growth driven by development of the service sector; the overall increase in road transportation flows in Europe, combined with a strong increase in the resident population and in cross-border commuters, which has led to an increase in emissions from the transport sector that is further amplified by Luxembourg's policy of low taxation on road fuel; and the technology changes in the industrial sector. The ERT commends Luxembourg for the transparency of the information reported in the NC5 and the additional explanations provided during the review.

14. The following elements characterize the national circumstances of Luxembourg: high population growth driven by immigration; high economic growth driven by development of services; high dependence on oil, gas and electricity imports; being on transit routes for goods and passengers, which results in an increase in transport flows; the small size of the country, with a limited national mitigation potential; an increase in cross-border commuters; an industrial sector characterized by few facilities; and changes in the technology used in the steel production industry from blast furnaces to electric arc furnaces between 1993 and 1998. In addition, Luxembourg has a policy of low taxation on fuel, which explains why Luxembourg is an attractive fuelling station in the region.

15. Table 1 illustrates the national circumstances of Luxembourg by providing some indicators relevant to GHG emissions and removals. Between 1990 and 2009, total GHG emissions without emissions and removals from land use, land-use change and forestry (LULUCF) decreased by 8.9 per cent, while the gross domestic product (GDP) increased

[4] Available at <http://unfccc.int/national_reports/initial_reports_under_the_kyoto_protocol/items/3765.php>.

by 115.8 per cent and the total primary energy supply increased by 14.4 per cent. The high increase in GDP is mainly attributed to the sound functioning of the banking system of Luxembourg and not to an increase in activities in GHG-emitting sectors (e.g. the industrial sector).

Table 1
**Indicators relevant to greenhouse gas emissions and removals for Luxembourg**

| | *1990* | *1995* | *2000* | *2005* | *2009* | *Change 1990–2000 (%)* | *Change 2000–2009 (%)* | *Change 1990–2009 (%)* |
|---|---|---|---|---|---|---|---|---|
| Population (million) | 0.38 | 0.41 | 0.44 | 0.47 | 0.50 | 14.2 | 14.4 | 30.6 |
| GDP (2000 USD billion using PPP) | 14.32 | 17.39 | 23.41 | 27.92 | 30.9 | 63.5 | 32.0 | 115.8 |
| TPES (Mtoe) | 3.41 | 3.15 | 3.32 | 4.28 | 3.9 | –2.6 | 17.5 | 14.4[a] |
| GDP per capita (2000 USD thousand using PPP) | 37.25 | 42.25 | 53.33 | 59.52 | 61.54 | 43.1 | 15.4 | 65.2 |
| TPES per capita (toe) | 8.87 | 7.65 | 7.56 | 9.12 | 7.77 | –14.7 | 2.7 | –12.4 |
| GHG emissions without LULUCF (Tg $CO_2$ eq) | 12.83 | 10.10 | 9.77 | 13.15 | 11.68 | –23.9 | 19.6 | –8.9 |
| GHG emissions with LULUCF (Tg $CO_2$ eq) | 13.17 | 9.86 | 9.38 | 12.77 | 11.39 | –28.8 | 21.4 | –13.6 |
| $CO_2$ emissions per capita (Mg) | 30.88 | 22.19 | 19.98 | 25.91 | 21.33 | –35.3 | 6.8 | –30.9 |
| $CO_2$ emissions per GDP unit (kg per 2000 USD using PPP) | 0.83 | 0.53 | 0.37 | 0.44 | 0.35 | –54.8 | –7.5 | –58.2 |
| GHG emissions per capita (Mg $CO_2$ eq) | 33.37 | 24.55 | 22.25 | 28.04 | 23.27 | –33.3 | 4.6 | –30.3 |
| GHG emissions per GDP unit (kg $CO_2$ eq per 2000 USD using PPP) | 0.90 | 0.58 | 0.42 | 0.47 | 0.37 | –53.4 | –9.4 | –57.8 |

*Sources*: (1) GHG emissions data: Luxembourg's 2011 greenhouse gas inventory submission; (2) Population, GDP and TPES data: International Energy Agency.

*Abbreviations*: GDP = gross domestic product, GHG = greenhouse gas, LULUCF = land use, land-use change and forestry, PPP = purchasing power parity, TPES = total primary energy supply.

[a] Luxembourg's statistics indicate an increase in TPES of around 24–25 per cent between 1990–2009 <http://www.statistiques.public.lu/stat/TableViewer/tableView.aspx?ReportId=2068&IF_Language=fra&MainTheme=1&FldrName=4&RFPath=54>; 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.

16. Luxembourg is a parliamentary democracy in the form of a constitutional monarchy and has a separation of powers between the legislative branch, the executive branch and the judicial branch. Overall responsibility for climate change policymaking lies with the Ministry of Sustainable Development and Infrastructure of Luxembourg and a number of national institutions are involved in the implementation of the policy. The implementation of the Kyoto Protocol is underpinned by the National Strategy for Reducing $CO_2$ Emissions and the National $CO_2$ Emission Reduction Action Plan; some PaMs are deferred to the regional level (municipalities). Further legislative arrangements and administrative procedures, including those for the national system and the national registry, are presented in chapters II.A.2, II.A.3 and II.B of this report.

17. In its NC5, Luxembourg has provided a summary of information on GHG emission trends for the period 1990–2007. This information is consistent with the 2009 annual submission. Summary tables, including trend tables for emissions in carbon dioxide equivalent ($CO_2$ eq) (given in the common reporting format), are also provided in an annex to the NC5. During the review, the ERT assessed the recently submitted 2011 annual submission and has reflected the findings in this report.

18. Total GHG emissions[5] excluding emissions and removals from LULUCF decreased by 8.9 per cent between 1990 and 2009, whereas total GHG emissions including net emissions and removals from LULUCF decreased by 13.6 per cent over the same period. This was mainly attributed to $CO_2$ emissions, which decreased by 9.8 per cent over this period. Emissions of methane ($CH_4$) also decreased by 4.0 per cent, while emissions of nitrous oxide ($N_2O$) decreased by 4.7 per cent. A major part of these decreases was experienced between 1993 and 1998 (trends for 1990–1998: $CO_2$ emissions decreased by 36.0 per cent, $CH_4$ emissions increased by 1.2 per cent, $N_2O$ emissions increased by 1.5 per cent and total GHG emissions decreased by 33.2 per cent). Emissions of fluorinated gases (F-gases) accounted for about 0.2 per cent of total GHG emissions in 1995 and 0.6 per cent in 2009. Trends in total GHG emissions were mostly underpinned by the decrease in $CO_2$ emissions from industrial processes (between 1993 and 1998), owing to the change in the technology used in the steel production industry from blast furnaces to electric arc furnaces, and the increase in $CO_2$ emissions from road transportation (between 1998 and 2005). An analysis of the key drivers of the GHG emission trends in each sector is provided in chapter II.B of this report. Table 2 provides an overview of GHG emissions by sector from the base year to 2009.

Table 2
**Greenhouse gas emissions by sector in Luxembourg, 1990–2009**

| | *GHG emissions (Tg $CO_2$ eq)* | | | | | | *Change (%)* | | *Shares[a] by sector (%)* | |
|---|---|---|---|---|---|---|---|---|---|---|
| *Sector* | *1990* | *1995* | *2000* | *2005* | *2008* | *2009* | *1990–2009* | *2008–2009* | *1990* | *2009* |
| 1. Energy | 10.34 | 8.26 | 8.19 | 11.68 | 10.80 | 10.28 | –0.6 | –4.7 | 80.6 | 88.0 |
| A1. Energy industries | 0.04 | 0.09 | 0.18 | 1.26 | 1.01 | 1.16 | 3 159.0 | 14.6 | 0.3 | 9.9 |
| A2. Manufacturing industries and construction | 6.30 | 3.36 | 1.63 | 1.77 | 1.44 | 1.16 | –81.6 | –19.9 | 49.1 | 9.9 |
| A3. Transport | 2.64 | 3.37 | 4.68 | 6.88 | 6.60 | 6.08 | 130 | –7.8 | 20.6 | 52.0 |
| A4.–A5. Other | 1.35 | 1.41 | 1.67 | 1.74 | 1.70 | 1.84 | 36.7 | 8.5 | 10.5 | 15.8 |
| B. Fugitive emissions | 0.016 | 0.021 | 0.025 | 0.044 | 0.042 | 0.042 | 158.7 | 1.1 | 0.1 | 0.4 |
| 2. Industrial processes | 1.62 | 1.00 | 0.76 | 0.72 | 0.71 | 0.64 | –60.4 | –9.1 | 12.7 | 5.5 |
| 3. Solvent and other product use | 0.023 | 0.020 | 0.016 | 0.017 | 0.017 | 0.016 | –33.0 | –5.2 | 0.2 | 0.1 |
| 4. Agriculture | 0.76 | 0.74 | 0.72 | 0.66 | 0.67 | 0.67 | –9.6 | 0.7 | 5.8 | 5.8 |
| 5. LULUCF | 0.35 | –0.24 | –0.39 | –0.39 | –0.27 | –0.30 | –185.2 | 8.8 | 2.7 | –2.5 |
| 6. Waste | 0.09 | 0.09 | 0.08 | 0.07 | 0.07 | 0.07 | –25.5 | –5.0 | 0.7 | 0.6 |
| 7. Other | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **GHG total with LULUCF** | **13.18** | **9.87** | **9.38** | **12.77** | **11.99** | **11.39** | **–13.6** | **–5.0** | **NA** | **NA** |
| **GHG total without** | **12.83** | **10.10** | **9.77** | **13.15** | **12.26** | **11.68** | **–8.9** | **–4.7** | **100.0** | **100.0** |

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

| Sector | GHG emissions (Tg $CO_2$ eq) | | | | | | Change (%) | | Shares[a] by sector (%) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *1990* | *1995* | *2000* | *2005* | *2008* | *2009* | *1990–2009* | *2008–2009* | *1990* | *2009* |
| **LULUCF** | | | | | | | | | | |

*Note*: The changes in emissions and the shares by sector are calculated using the exact (not rounded) values and may therefore differ from values calculated with the rounded numbers provided in the table.

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

[a] The shares of sectors are calculated relative to GHG emissions without LULUCF; for the LULUCF sector, the negative values indicate the share of GHG emissions that was offset by GHG removals through LULUCF.

## 2. National system

19. In accordance with decision 15/CMP.1, Luxembourg provided in its NC5 a description of how its national system is performing the general and specific functions defined in the guidelines for national systems under Article 5, paragraph 1, of the Kyoto Protocol (decision 19/CMP.1). A more detailed description of the national system is provided in the 2011 annual submission of Luxembourg. The description includes all of the elements as required by decision 15/CMP.1.

20. During the review, Luxembourg provided a description of the national legislative arrangements and administrative procedures that seek to ensure that the implementation of activities under Article 3, paragraph 3, of the Kyoto Protocol[6] also contribute to the conservation of biodiversity and the sustainable use of natural resources. These provisions are addressed in the strategic document on the development of the forestry sector entitled *Programme Forestier National*,[7] which was adopted in 2004 by the National Forest Programme and has a global vision and objectives in line with the United Nations Forum on Forests and the Forest Europe declarations and resolutions.

21. Luxembourg did not demonstrate in the NC5 the capacity of the national system to report information on activities under Article 3, paragraph 3, of the Kyoto Protocol; however, this is addressed in the NIR of the 2011 annual submission. Only limited information was provided on projects and studies that are likely to provide data on afforestation and reforestation and deforestation. During the review, Luxembourg provided information on the arrangements in place for the reporting of activities under Article 3, paragraph 3; for example, new information on afforestation and reforestation and deforestation will be available from the second national forest inventory by the end of 2012 (further details are provided in the 2011 annual submission). The ERT recommends that Luxembourg include, in its next national communication, information on the arrangements in place to report information on activities under Article 3, paragraph 3, of the Kyoto Protocol or make a reference to this information in the annual submission. During the review, the Party confirmed that there have been no changes to the national system since the 2011 annual submission. The ERT reiterates the conclusion of the 2011 ARR that Luxembourg's national system continues to perform its required functions as set out in decision 19/CMP.1.

22. The ERT noted that a limited number of experts are primarily involved in the preparation of the GHG inventory. For example, there is only one expert working on the inventory for one or more sectors, and one expert is coordinating the compilation of the GHG inventory. Luxembourg clarified during the review its intentions to increase the human resources for the preparation of the GHG inventory. The ERT encourages

[6] Luxembourg has not elected any activities under Article 3, paragraph 4, of the Kyoto Protocol.

[7] Available at <http://www.environnement.public.lu/forets/dossiers/pfn/contributions/PFNpublifin.pdf>.

Luxembourg to ensure that the national system continues to properly perform the required functions by allocating sufficient human resources.

### 3. National registry

23. Luxembourg and Belgium maintain a consolidated registry system. In its NC5, Luxembourg has provided information on the national registry, including a description of how its national registry performs the functions defined in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1, and how it complies with the requirements of the technical standards for data exchange between registry systems. A detailed description of the national registry was also provided in the 2011 annual submission.

24. The ERT took note of the conclusion of the standard independent assessment report[8] that the reported information on the national registry is complete and has been submitted in accordance with the annex to decision 15/CMP.1.

25. During the review, in response to questions raised by the ERT Luxembourg provided documents demonstrating how it records the changes related to the national registry and how it maintains these records. The ERT noted that updates of databases and applications, implemented security measures, and changes to the national registry software are documented on a regular basis by nominated responsible staff.

26. During the review, Luxembourg confirmed that there have been no changes to the national registry since the 2010 annual submission. The ERT reiterates the conclusion of the ERT of the 2010 annual submission that the Party's national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1, and continues to adhere to the technical standards for data exchange between registry systems in accordance with decisions 16/CP.10 and 12/CMP.1. The national registry also has adequate security and data safeguards, and disaster recovery measures are in place and its operational performance is adequate.

27. The ERT noted that Luxembourg's registry is one of the registries that will be consolidated into the European Commission registry system in June–July 2012. During the review, the ERT identified that only one expert works on the registry system in Luxembourg. The ERT encourages the Party to make sure that measures are in place to implement the upcoming changes to the national registry system.

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

28. As required by the UNFCCC reporting guidelines, Luxembourg has provided in its NC5 information on its package of PaMs implemented, adopted and planned in order to fulfil its commitments under the Convention and its Kyoto Protocol. However, this information only covers the energy and transport sectors. A textual description of the key PaMs in these sectors has been provided, supplemented by summary tables with information on their status of implementation.

29. The ERT noted that Luxembourg did not provide the following reporting elements required by the UNFCCC reporting guidelines: information on the PaMs adopted to implement its commitments under Article 4, paragraph 2(a) and (b), of the Convention, subdivided by GHG; information on the PaMs related to the non-energy sectors (i.e. industrial processes, agriculture, LULUCF and waste); and information on how

[8] Available at <http://unfccc.int/files/kyoto_protocol/registry_systems/independent_assessment_reports/application/pdf/2011_lux_siar_part_2_v2.0.pdf>.

Luxembourg believes its PaMs are modifying longer-term trends in anthropogenic GHG emissions and removals, consistent with the objective of the Convention. During the review, Luxembourg addressed all these issues and explained that this information had not been included in the NC5, owing to the fact that non-$CO_2$ emissions have a very limited share of total GHG emissions, that the non-energy sectors provide limited abatement potential in Luxembourg and that it is difficult to calculate how the PaMs are modifying longer-term emission trends given the unique national circumstances of Luxembourg (see para. 14 above). The ERT recommends that the Party provide this information in its next national communication.

30. In its NC5, Luxembourg has provided comprehensive information on its PaMs. The National Climate Change Strategy has been developed within the framework of policy decisions on the environment, energy and transport since the early 1990s with the primary aim of stabilizing and reducing $CO_2$ emissions. In 2000, Luxembourg adopted the first National Strategy for Reducing $CO_2$ Emissions, which provided the overall framework for climate policies and identified the key areas for actions in order to achieve $CO_2$ emission reduction potentials (see para. 37 below). The overall policy framework was further elaborated through the first National $CO_2$ Emission Reduction Action Plan adopted by the Government in 2006 in the context of meeting the Kyoto Protocol target (see para. 37 below). Since then, climate policy in Luxembourg has been mainly driven by the EU climate and energy package. At the time of the review, the outcome of a large-scale public consultation held in 2010–2011 through the Environment and Climate Partnership was being considered to inform the second National $CO_2$ Emission Reduction Action Plan, to be adopted in 2012 (see para. 37 below).

31. Within the overall policy framework, sectoral PaMs have been adopted to mitigate GHG emissions both at the national and the regional levels. These sectoral PaMs are outlined in chapters II.B.2 and II.B.3 of this report. Actions in the past decade have mainly been aimed at increasing energy efficiency and promoting renewable energy sources (RES). A combination of regulatory measures, voluntary agreements, fiscal measures and public awareness campaigns has been used to achieve these policy goals. In particular, financial incentives in the form of subsidies have been widely used in areas ranging from thermal building refurbishment to the purchase of low $CO_2$-emitting vehicles and energy-efficient electrical appliances, as well as the special feed-in tariffs for electricity production from RES and cogeneration at combined heat and power plants (CHP).

32. Luxembourg's commitment under the Kyoto Protocol and the EU burden-sharing agreement is a reduction in GHG emissions of 28 per cent compared with the base year level during the first commitment period from 2008 to 2012. According to the Party, the key policy instruments that will help Luxembourg to meet its Kyoto Protocol target during the first commitment period include the EU emissions trading scheme (ETS) through the second national allocation plan, PaMs in the transport and building sectors, and the use of flexibility mechanisms under the Kyoto Protocol.

33. The NC5 provides estimates of the effects of PaMs for the energy, including transport, sector only (see table 5). Limited information has been provided on how the synergies and overlaps among various PaMs were taken into consideration when the effects of the PaMs were estimated. During the review the ERT observed that the Party has either weak or no instruments or arrangements in place to substantiate any ex ante or ex post evaluation of its PaMs or to conduct a thorough analysis of their abatement potential. The ERT is of the view that such a lack of analysis and of evidence-based policymaking could undermine any assessment of the progress made by Luxembourg in meeting its national and international Kyoto Protocol and longer-term targets. The ERT encourages Luxembourg to improve the transparency of its reporting on PaMs by adhering more closely to the

UNFCCC reporting guidelines in the next national communication and by highlighting the PaMs that go beyond those under the EU climate and energy policy framework.

34. During the review, Luxembourg highlighted several pending decisions by the Government not driven by the climate change agenda that could potentially increase GHG emissions. These include: the construction of a second power plant in Luxembourg to increase energy security; an increase in the building of houses to accommodate the increasing population and to reduce the high pressure on land and property prices; modifications to agricultural practices in line with the anticipated revised EU Common Agricultural Policy; and the implementation of new industrial activities in order to diversify the national economy. Luxembourg also indicated that all of the PaMs implemented since the previous national communication are still in place, but some have been adapted over time in order to better achieve their defined goals. Table 3 provides a summary of the reported information on the PaMs of Luxembourg.

Table 3
**Summary of information on policies and measures**

| *Major policies and measures* | *Examples/comments* |
|---|---|
| *Policy framework and cross-sectoral measures* | |
| National Strategy for Reducing $CO_2$ Emissions | The strategy outlines the key areas Luxembourg should work on in order to tap its emission reduction potential |
| National $CO_2$ Emission Reduction Action Plan | The action plan sets out how Luxembourg will meet its emission reduction commitments under the Kyoto Protocol |
| EU emissions trading scheme | The EU emissions trading scheme is facilitated through the national allocation plan 2008–2012 (2.49 Tg $CO_2$ eq in 2009) |
| *Policies and measures by sector* | |
| *Energy* | |
| National Renewable Energy Action Plan | The aim of the action plan is to increase the share of renewable sources in final energy consumption and achieve the EU target for RES by 2020 |
| National Energy Efficiency Action Plan | The action plan aims to achieve the EU target of reducing energy use by 9 per cent below the annual average during the period 2001–2005 by 2016 |
| Financial incentives for the rational use of energy and RES | Financial incentives were introduced through building regulations to renovate existing residential buildings and support the construction of buildings with low energy consumption standards (9.75 Gg $CO_2$ eq in 2010; 20.6 Gg $CO_2$ eq in 2020) |
| New energy efficiency standards | New energy efficiency standards have been applied in order to increase energy efficiency in residential buildings (17 Gg $CO_2$ eq in 2010; 110 Gg $CO_2$ eq in 2020) |
| *Transport* | |
| Excise duties on fuel | The policy aims to reduce road fuel consumption (309 Gg $CO_2$ eq by 2020) |
| EU biofuel directive | The policy aims to increase the use of biofuels (158 Gg $CO_2$ eq/year by 2020) |
| Promotion of $CO_2$-efficient vehicles | The aim of the policy is to further increase the energy efficiency of the vehicle fleet through financial incentives (27.50 Gg $CO_2$ eq by 2020) |
| Vehicle tax reform | The aim of the policy is to further reduce GHG emissions from |

| *Major policies and measures* | *Examples/comments* |
|---|---|
| | vehicles (23.70 Gg $CO_2$ eq/year by 2020) |
| *Industrial processes* | |
| EU F-gas directive | Luxembourg goes beyond this directive by setting a maximum annual rate for F-gas emissions from refrigeration and air-conditioning equipment |
| *Agriculture* | |
| Adaptation strategy | The strategy has indirect mitigation effects and includes measures such as the protection of soil against degradation and the maintenance of arable land |
| Forestry | The main PaMs in this sector include 'close to nature' silviculture, the prohibition of biomass burning and fertilization and liming, and sustainable land-use change required by the Nature Conservation Law |
| Waste | The main PaMs in this sector include the polluter pays principle, the Waste Management Plan and the Waste Management Law |

*Note*: The greenhouse gas emission reduction estimates, given for some measures (in parentheses), are reductions in $CO_2$ or $CO_2$ eq.

*Abbreviations*: EU = European Union, F-gas = fluorinated gas, PaMs = policies and measures, RES = renewable energy sources.

### 1. Policy framework and cross-sectoral measures

35. The overall coordination and implementation of the national climate change policy is the responsibility of the Department of the Environment within the Ministry of Sustainable Development and Infrastructure (MDDI-Env). Responsibility for the implementation and/or delivery of these strategies lies with different ministries and agencies. Limited information was provided in the NC5 on the roles and responsibilities of the various ministries, the overall process for decision-making and implementation, and the mechanisms in place to ensure cooperation among the national government and municipalities. During the review, Luxembourg provided detailed information on the institutional arrangements for climate change policymaking, in particular for the formulation of the most recent policy document, the second National $CO_2$ Emission Reduction Action Plan. The ERT encourages Luxembourg to enhance the transparency of its reporting by providing clearer information on the institutional arrangements in place for the implementation of the EU and national climate change policy in its next national communication.

36. The Government reinforced the role of municipalities in the fight against climate change in 2009, especially in preparation for the implementation of the second National $CO_2$ Emission Reduction Action Plan through the Pacte Climat (Climate Pact). A legislative framework will be established and financial and technical assistance will be provided by the State to promote actions against climate change undertaken by municipalities. The Pacte Climat has been developed on the basis of the European Energy Award, which supports communities to develop sustainable energy policies and urban development through the improvement of energy efficiency and the promotion of RES. Community energy policies and activities are reviewed systematically and awards are given to communities that make visible efforts to improve their energy policies. The Pacte Climat also allows municipalities to share their experiences and expertise.

37. The National Strategy for Reducing $CO_2$ Emissions, adopted in 2000, provides the legal basis for the climate change policy in Luxembourg. It has established six strategic areas for action: renewable energies; energy production efficiency; energy savings; 'green taxation'; transportation; and cooperation with developing countries and countries with

economies in transition. The adoption of the strategy was followed by regulations introducing subsidies for the rational use of energy and the promotion of RES. The first National $CO_2$ Emission Reduction Action Plan, adopted in 2006, identified two major areas to fulfil the Party's Kyoto Protocol emission reduction commitment: (a) limiting dependence on fossil fuels, especially by accelerating their replacement through RES (in particular for thermal energy generation); and (b) seeking energy savings by enhancing the energy efficiency of transportation, industry and buildings. The second National $CO_2$ Emission Reduction Action Plan, to be adopted in 2012, will build on the first action plan as well as on the outcomes of the large-scale stakeholders consultation through the Environment and Climate Partnership that took place in 2010–2011. It will focus on the PaMs that will help to achieve the Party's targets and commitments within the EU framework after 2012 when the first commitment period of the Kyoto Protocol ends. During the review, Luxembourg informed the ERT that the PaMs to be included in the second action plan encompass four main areas: urban development, housing and public buildings; mobility; energy and eco-technologies; and other overarching measures, such as information, awareness-raising and training.

38. The PaMs transposed from various EU directives have played a key role in reducing GHG emissions in Luxembourg. The EU ETS has been an important policy instrument for emission reduction in the energy and industrial sectors. Emissions covered by the EU ETS in Luxembourg accounted for around 18.7 per cent of total GHG emissions in 2009. Within the framework of the EU climate and energy package, Luxembourg has, at the European level, an 11 per cent target of RES in its total final primary energy consumption by 2020, a 10 per cent share of energy from RES in transport by 2020 and a 20 per cent reduction in emissions from sectors not covered by the EU ETS by 2020 compared with the 2005 level. In addition, Luxembourg has implemented the EU energy saving directive, which requires a 9 per cent improvement in energy efficiency compared with the annual average during the period 2001–2005 by 2016. During the review, the Party provided information on the PaMs that will help to achieve these targets; these will be discussed in the following section.

### 2. Policies and measures in the energy sector

39. Between 1990 and 2009, GHG emissions from the energy sector decreased by 0.6 per cent (59.63 Gg $CO_2$ eq), mainly driven by the decrease in emissions from manufacturing industries and construction that was partly off-set by an increase in emissions from other sectors, in particular transport. The trend in GHG emissions from fuel combustion showed notable increases in transport (130.0 per cent or 3,436.07 Gg $CO_2$ eq) and decreases in energy use in other sectors (–45.8 per cent or 3,521.56 Gg $CO_2$ eq). Transport, which was the second largest source of emissions from the energy sector in 1990, became the main source in 2009, owing to the increase in road fuel sales that was driven by an overall increase in road transportation flows in Europe, combined with a strong increase in the resident population and in cross-border commuters, that is further amplified by Luxembourg's policy of low taxation on road fuel (see paras. 13 and 14 above).

40. ***Energy supply***. The total primary energy supply in Luxembourg increased by 14.4 per cent between 1990 and 2009. The Party's energy system is characterized by high dependence on oil, gas and electricity imports. Until 2002, when the gas and power station was built, there was no significant electricity production in Luxembourg, except for a pumping station in Vianden. Despite the increase in generation capacity since 2002, the Party's import dependency remains high, at about 50–65 per cent of total electricity demand. As such, electricity generated from RES in Luxembourg does not substitute generation from fossil fuels, but rather replaces electricity imports. Therefore, the promotion of electricity generation from RES and CHP based on fossil fuels does not directly reduce the GHG emissions in Luxembourg. Instead, the Government aims to

explore actions for the promotion of energy production that could have a positive impact on Luxembourg's GHG balance. According to the Party, these actions could include: (a) the production of heat from RES (wood, biomass, geothermic and solar energy); (b) CHP with heat networks using RES; (c) the introduction of biogas into the natural gas network; (d) the use of forestry resources for energy purposes.

41. ***Renewable energy sources***. Under the EU climate and energy package, Luxembourg will have to increase the share of RES in final energy consumption from 0.9 per cent in 2005 to 11 per cent in 2020. In 2010, the share in Luxembourg was around 2.9 per cent. During the review, the Party elaborated on the National Renewable Energy Action Plan (NREAP) (2010), which has the aim of achieving the EU target for RES by 2020 through the promotion of electricity production from RES and the use of RES in heating and cooling systems, the blending of 'sustainable' biofuels and the promotion of electromobility, and participation in international cooperation projects. The ERT noted that this action plan is yet to be translated into concrete actions and measures and encourages Luxembourg to report on the development and implementation of these in its next national communication.

42. ***Energy efficiency***. The EU energy saving directive sets a target of reducing energy use by 9 per cent below the annual average during the period 2001–2005 by 2016. Luxembourg has taken this further by setting a more ambitious target of reducing its energy use by 14.1 per cent by 2016. The first National Energy Efficiency Action Plan (NEEAP), adopted in 2008, and the second NEEAP, adopted in 2011, both established energy efficiency targets to be achieved by each sector by 2016. NEEAP also identifies the top five measures that have the highest energy efficiency potential: the building regulations of 1996, 2008 and 2011; a voluntary agreement between the Business Federation Luxembourg and the Government; and the promotion of decentralized CHP based mainly on RES.

43. ***Residential and commercial sectors***. The PaMs in the residential and commercial sectors play a key role in helping Luxembourg to achieve its emission mitigation potentials. Financial incentives (such as subsidies) have been introduced into a number of regulations to promote the use of RES in residential buildings, incentivize the renovation of existing residential buildings older than 10 years, and support the construction of residential buildings with low energy consumption standards. Since 2001, the Government has granted around EUR 105 million to households that have invested in energy-efficient houses or in the production and use of RES, such as photovoltaic cells and thermal solar energy. Regulations have also been put in place to introduce more stringent energy efficiency standards in new residential buildings. During the review, Luxembourg informed the ERT that the PaMs in the residential, commercial and institutional sectors are expected to contribute more than half of the emission reductions in order to achieve the Party's energy efficiency target for 2016 set by the EU.

44. ***Transport sector***. Emissions from fuel combustion related to transport have more than doubled since 1990 (see table 2 above). Emissions from transport account for more than 50 per cent of total GHG emissions (6.2 Mt by 2010), which represents 63 per cent of emissions from the sectors not covered by the EU ETS. Fuel prices in Luxembourg are lower than in neighbouring countries, leading to high fuel sales to non-residents (i.e. to passengers cars and trucks transiting via Luxembourg during their journeys – Luxembourg being on one of the main western European transit routes (see para. 14 above)), to the cross-border workforce (see para. 14 above) and to people driving especially to Luxembourg from bordering regions. These road fuel sales to non-residents account for a substantial share of petroleum product sales (around 72 per cent of total road fuel sales) and also contribute substantially to the emissions attributed to the transport sector. Luxembourg has one of the highest shares of new car fleets in Europe, with an annual growth of 5,400 vehicles per year, mainly owing to its fuel exports. This implies a strong traffic growth on

various national routes. The Party foresees an increased demand for mobility of 25–35 per cent, leading to a 20 per cent increase in motorized trips by 2020.

45. Most of the PaMs in the transport sector are fiscal measures, with some research initiatives. These include: an annual car tax based on $CO_2$ emissions (as part of the passenger car tax reform); subsidies for fuel-efficient cars; and the progressive increase in mineral oil taxes. At the time of the review, the Government was examining the road vehicle tax for high-emitting passenger cars and the fiscal arrangements in place for company cars. In addition, MDDI-Env also promotes the further use of biofuels in road transport. In addition to these fiscal measures, Luxembourg has implemented a Mobility Plan to improve the links between regional development and mobility and to promote the alternative use of cars, and is aiming to increase the share of public transport, cycling and walking from 27.5 per cent in 2009 to 44 per cent by 2020. The other set of non-fiscal measures includes the promotion of electromobility, targeting a 10 per cent share of electric vehicles in the national fleet by 2020, which is expected to reduce emissions by 0.1 Mt $CO_2$ eq by 2020.

46. The only PaMs with a longer-term objective up to 2020, 2030 and 2050 are the Strategy for Sustainable Mobility (MoDu) and the Transport Sector Plan (PST) launched in March 2012. MoDu is a sustainable mobility strategy that ensures the integration of existing transport programmes as well as complementarities and consistency between implemented and planned actions. PST, on the other hand, describes the various projects and measures that require a regulatory framework and also sets such a framework.

47. No information was reported in the NC5 on the steps taken to implement decisions by ICAO and IMO aimed at reducing GHG emissions. During the review, Luxembourg updated the ERT on the measures envisaged to implement such decisions. Key measures include the implementation of the third phase of the EU ETS, which will include aviation bunker fuels, and the purchase by the freight airline company Cargolux of one of the most fuel-efficient and quietest aircraft, which will result in a complete fleet changeover within the next seven years. These measures will lead to a 17 per cent reduction in $CO_2$ emissions per tonne-kilometre (or a saving of 400,000 t $CO_2$/year). The ERT recommends that Luxembourg include such information in its next national communication.

48. ***Industrial sector***. Emissions from fuel combustion in the industrial sector decreased by around 30 per cent during the period 1990–2009, mainly owing to a switch to electric arc furnaces in the iron and steel industry and the closure of some companies. Key instruments to reduce GHG emissions in the industrial sector include the EU ETS and a voluntary agreement between the Business Federation Luxembourg and the Government (see para. 42 above).

### 3. Policies and measures in other sectors

49. Between 1990 and 2009, GHG emissions from the industrial processes (including solvent and other product use), agriculture and waste sectors decreased by 44 per cent (1,097 Gg $CO_2$ eq), mainly driven by the decrease in emissions from industrial processes. The trend in GHG emissions from industrial processes showed the largest decrease (60.4 per cent), followed by solvent and other product use (33.0 per cent), waste (25.5 per cent) and agriculture (9.6 per cent).

50. ***Industrial processes***. Between 1990 and 2009, GHG emissions from the industrial processes sector decreased by 60.4 per cent (980.82 Gg $CO_2$ eq), mainly driven by process changes that occurred in the steel industry. There are no specific PaMs for the industrial processes sector at the national level since emissions from fuel combustion in plants are covered by the EU ETS. The EU F-gas directive has been fully implemented, including periodic checks for leakages, recovery and recycling, and reclamation or destruction for

applications reaching the end of their life. Although there is only F-gases consumption in Luxembourg, it has gone beyond the EU directive by setting a maximum annual leakage rate for refrigeration and air-conditioning equipment.

51. ***Agriculture***. The agriculture sector contributes 5.8 per cent of total GHG emissions in Luxembourg. Between 1990 and 2009, GHG emissions from the agriculture sector decreased by 9.6 per cent (7.88 Gg $CO_2$ eq). This trend was mainly driven by a decrease in the use of fertilizers owing to increased prices. During the review, Luxembourg highlighted the fact that the adaptation strategy in the agriculture sector has had indirect mitigation effects. This strategy includes the protection of soil against degradation and the maintenance of the production potential, the protection of grassland against erosion and the maintenance of arable land. These measures have been supported by agri-environmental instruments, research, a consultation service, the use of biogas and the implementation of the EU Common Agricultural Policy.

52. ***LULUCF***. The LULUCF sector was a net removal of 0.30 Tg $CO_2$ in Luxembourg in 2009; net removals have increased by 185.2 per cent since 1990 (when it was a net source). Half of the forest in Luxembourg is public; out of the remaining privately owned forests, only 50 per cent has managed activities. The increase in removals was mainly driven by: 'close to nature' silviculture in public forests since the 1990s; the prohibition of biomass burning, fertilization liming and land-use change; Natura 2000, which has been protecting one third of the total forest area of Luxembourg; and the National Forest Programme. A monitoring programme has also been implemented, which includes a health inventory of trees and the management of public forest inventories.

53. ***Waste management***. Luxembourg ranks fourth in the EU in terms of best waste management practices. Between 1990 and 2009, GHG emissions from the waste sector decreased by 25.5 per cent (22.96 Gg $CO_2$ eq). The waste sector contributes only 0.6 per cent of total GHG emissions. The main driver for the decreasing trend is the implementation of the polluter pays principle, which forces consumers to pay for waste management. The Waste Management Plan, the Waste Prevention Programme and the new Waste Management Law (2012), strengthen the waste management regulations. During the review, Luxembourg informed the ERT of its longer-term plans, which include strengthening of the existing measures outlined above, the use of organic biomass for energy production and the closing of one landfill site in 2014–2016. Luxembourg also explained that industrial waste is managed by private companies and that there is no industrial waste treatment in the country.

### 4. Minimization of adverse effects in accordance with Article 2, paragraph 3, of the Kyoto Protocol

54. In its NC5, Luxembourg has reported some of the 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 environmental and economic impacts, on other Parties, especially developing country Parties. Further information on how Luxembourg strives to implement its commitments under Article 3, paragraph 1, of the Convention in such a way as to minimize adverse social, environmental and economic impacts on developing country Parties, as reported in the 2011 annual submission, is presented in chapter II.I of this report.

55. The NC5 outlines several of the Party's actions that take into account the minimization of the adverse effects of PaMs. These include the selection of clean development mechanism (CDM) and joint implementation (JI) projects in accordance with their compliance with the ecological and social criteria established under the Convention, the promotion of and tax exemption for biofuels that meet ecological and social criteria, and

the objective of eliminating environmentally harmful subsidies and adverse incentives from the tax system.

## C. Projections and the total effect of policies and measures, and supplementarity relating to the Kyoto Protocol mechanisms

56. In its NC5, Luxembourg has provided comprehensive information on its GHG emission projections in line with the Intergovernmental Panel on Climate Change (IPCC) sector and source categories, including a 'with measures' scenario, a 'with additional measures' scenario and a 'without measures' scenario until 2020, presented relative to actual inventory data for 1990 and 2007. During the review, Luxembourg presented a set of updated projections submitted to the EU in 2011.

### 1. Projections overview, methodology and key assumptions

57. The GHG emission projections provided by Luxembourg in the NC5 include a 'with measures' scenario, a 'with additional measures' scenario and a 'without measures' scenario until 2020, presented relative to actual inventory data for 1990, 1995, 2000, 2005 and 2007. The GHG emission projections were presented for the years 2010, 2015 and 2020 on a sectoral basis, using the same sectoral categories used in the PaMs section. In addition to the energy and transport sectors, projections were also provided in the NC5 for the industrial processes, agriculture and waste sectors. The projections were provided in an aggregated format for each sector as well as for a national total, using global warming potential values.

58. The ERT noted that Luxembourg did not provide projections presented on a gas-by-gas basis, but this information was provided in its updated 2011 projections submitted to the EU and presented to the ERT during the review week. The ERT noted that the Party did not provide emission projections related to the fuel sold to ships and aircraft engaged in international transport in the NC5. The ERT also noted that the projections for the LULUCF sector were not reported in the NC5, but were provided during the review. During the review, Luxembourg explained that projections had not been prepared for the LULUCF sector owing to a lack of background analysis and a delay in the availability of data from the national forest inventory. The ERT recommends that Luxembourg report projections for the LULUCF sector in its next national communication.

59. The 'without measures' scenario presented in the NC5 includes the PaMs implemented before the end of 2006. The 'with measures' scenario includes all PaMs adopted and implemented between the end of 2006 and the end of 2009, while the 'with additional measures' scenario includes the PaMs planned or adopted but not yet implemented by the end of 2009. The updated set of scenarios developed in 2011 includes a 'with measures' scenario that takes into account all of the PaMs adopted and implemented between the end of 2006 and the end of 2010 and a 'with additional measures' scenario that includes the PaMs planned but not yet implemented or adopted by the end of 2010. As transparently mentioned in the NC5, the 'without measures' scenario was not defined in line with the UNFCCC reporting guidelines, which recommend a reference year of 1995 or earlier. The ERT encourages the Party to follow the UNFCCC reporting guidelines to define the 'without measures' scenario in its next national communication.

60. Luxembourg has presented in its NC5 projected GHG emissions for the 'without measures' scenario using a combination of a bottom-up energy model for $CO_2$ emissions from the energy and industrial processes sectors and simulations by MDDI-Env for other sectors and gases. To simulate the emissions of other gases from the energy and industrial processes sectors, MDDI-Env uses ratios of the $CO_2$ emissions and the emissions of other

gases based on inventory data over the five previous years. For the other sectors, which represented less than 8 per cent of the total GHG emissions in 2006 (excluding LULUCF), Luxembourg applied some basic assumptions to the projected emission trends, such as a stabilization or quantified linear increase or decrease in emissions relative to the recent inventory data.

61. For the 'with measures' and 'with additional measures' scenarios, Luxembourg aggregated the individual impacts of significant PaMs on $CO_2$ emissions. These impacts were mainly derived by FiFo-Köln (the Institute for Public Economics, University of Cologne) from energy savings evaluated in the first NEEAP. In the NEEAP, mitigation potential calculations were generally made on the basis of price elasticity and technological progress. Other measures were evaluated using the Econotec EPM model or the FiFo-Köln specific analysis. The ERT welcomes the strong methodological improvements made to the projections that have been achieved by Luxembourg since the review of its last national communication.

62. The 2011 updated projections are based on the same model and approaches as those used in the projections provided in the NC5. However, the underlying assumptions for the activity data and energy consumption in the updated projections take into account the effect of the global economic crisis. During the review, Luxembourg also presented the ongoing work on model development with a mix of general equilibrium and bottom-up approaches using the LuxGEM and ETEM models. The ERT analysed this additional information provided during the review and has presented the results in this report.

63. The NC5 presents the assumptions used for the projections in a broadly complete and transparent manner. Assumptions were made with regard to demographic changes, transport growth, the expansion of housing and detailed activity data by sector. No assumptions were made on GDP growth or on specific carbon and energy prices. Furthermore, Luxembourg did not provide information on the assumptions used for each individual PaM when preparing the projections for the 'with measures' and 'with additional measures' scenarios, where the effects of the PaMs were aggregated. The ERT encourages Luxembourg to improve the reporting on the assumptions used for the projections in its next national communication.

64. A very brief qualitative uncertainty analysis was provided in the NC5. Luxembourg explained that the sensitivity analysis can be very complex, owing to the extremely high sensitivity of the projections to internal (e.g. the impact of a single industrial project on emissions) and external (e.g. changes in relative road pricing or value added tax differences compared with neighbouring countries) parameters. The ERT strongly encourages Luxembourg to develop a more elaborated sensitivity analysis for the projections in order to provide a better understanding of the impacts of uncertainty on the outcome of its climate policies.

### 2. Results of projections

65. The Kyoto Protocol target for Luxembourg is, on average, 9.48 Tg $CO_2$ eq per year during the Kyoto Protocol first commitment period (2008–2012). The projections provided in the NC5 for the 'with measures' scenario show that Luxembourg's total emissions without LULUCF are expected to amount to 13.20 Tg $CO_2$ eq in 2010. With additional PaMs, emissions will remain at a similar level of 13.19 Tg $CO_2$ eq in 2010. The projected gap between Luxembourg's actual emissions level and its Kyoto Protocol target, therefore, is an average of 3.71 Tg $CO_2$ eq annually for the period 2008–2012, according to the projections in the NC5. According to the Party, the expected removals from activities under Article 3, paragraph 3, of the Kyoto Protocol are non-existent. Hence, Luxembourg anticipates that the gap will only be offset by the use of Kyoto Protocol mechanisms.

66. According to the updated projections, the average annual emissions for the period 2008–2012 under the 'with measures' and 'with additional measures' scenarios are around 12.08 Tg $CO_2$ eq, which is lower than that reported in the NC5. The updated projections state that the gap in relation to the Kyoto Protocol target is reduced to an average of 2.6 Tg $CO_2$ eq/year during the first commitment period.

67. According to the updated 'with additional measures' scenario, total GHG emissions are expected to amount to 12.085 Tg $CO_2$ eq in 2010, of which $CO_2$, $CH_4$ and $N_2O$ emissions amount to 11.097, 0.022 and 0.001 Tg $CO_2$ eq, respectively. GHG emissions are expected to amount to 13,374 Tg $CO_2$ eq in 2020, of which $CO_2$, $CH_4$ and $N_2O$ emissions are projected to be around 12.334, 0.023 and 0.001 Tg $CO_2$ eq, respectively. This represents an increase of 11.1, 6.6 and 0.2 per cent, respectively, compared with the 2010 levels. The projected emissions of F-gases are expected to increase by 28.9 per cent during the period 2010–2020. The key results of the emission projections are shown in table 4 below and the trends are illustrated in the figure on page 20.

Table 4
**Summary of greenhouse gas emission projections for Luxembourg**

| | *Greenhouse gas emissions (Tg $CO_2$ eq per year)* | *Changes in relation to base year level (%)* | *Changes in relation to 1990 level (%)* |
|---|---|---|---|
| Inventory data 1990[a] | 12.83 | –2.6 | NA |
| Inventory data 2009[a] | 11.68 | –11.3 | –8.9 |
| Kyoto Protocol base year[b] | 13.17 | NA | 2.7 |
| Kyoto Protocol target[b] | 9.48 | –28.0 | –26.1 |
| 'Without measures' projections for 2010[c] | 13.70 | 4.0 | 6.8 |
| 'With measures' projections for 2010[c] | 13.20 | 0.2 | 2.9 |
| 'With additional measures' projections for 2010[c] | 13.19 | 0.2 | 2.9 |
| 'Without measures' projections for 2020[c] | 15.22 | 15.6 | 18.6 |
| 'With measures' projections for 2020[c] | 14.55 | 10.5 | 13.4 |
| 'With additional measures' projections for 2020[c] | 13.81 | 4.9 | 7.6 |
| Updated 'with measures' projections for 2020[d] | 14.12 | 7.2 | 10.0 |
| Updated 'with additional measures' projections for 2020[d] | 13.37 | 1.6 | 4.3 |

[a] *Data source*: Luxembourg's 2011 GHG inventory submission; the emissions are without LULUCF.

[b] *Data source*: Based on the initial review report contained in document FCCC/IRR/2007/LUX.

[c] *Data source*: Luxembourg's fifth national communication.

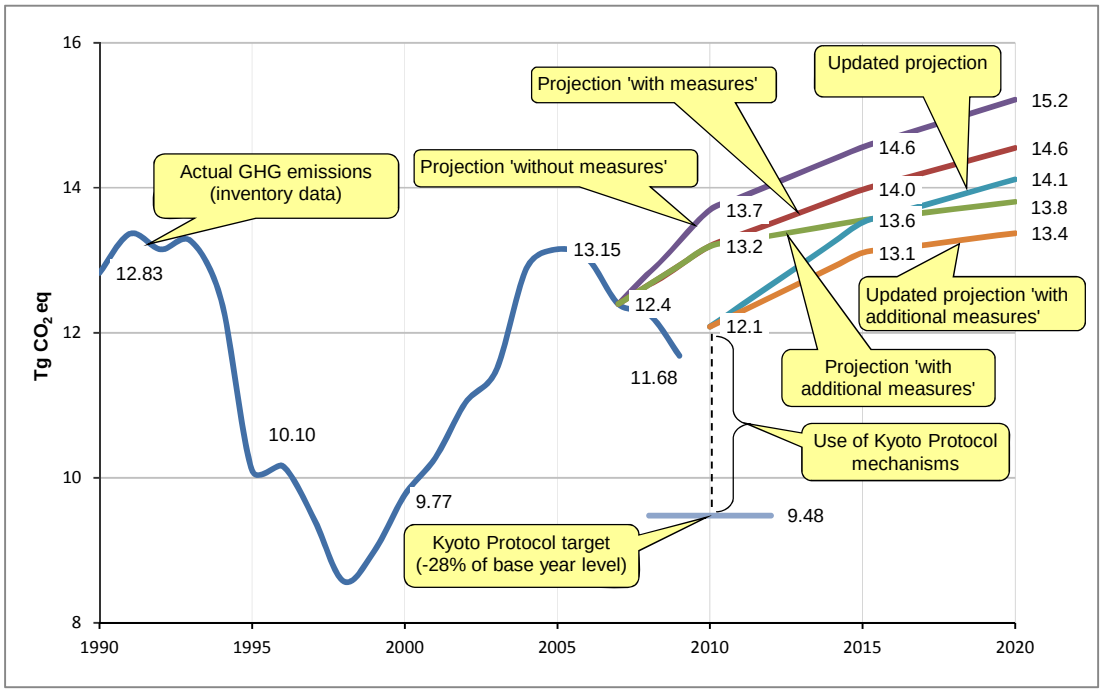
[d] *Data source*: 2011 updated projections, within the framework of the European Union GHG Monitoring Mechanism, provided by the Party during the in-depth review; the projections are for GHG emissions without LULUCF.

*Abbreviation*: GHG = greenhouse gas, LULUCF = land use, land-use change and forestry, NA = not applicable.

68. According to the updated projections, Luxembourg's total emissions in 2020 are expected to amount to 13.37 Tg $CO_2$ eq with additional PaMs. This represents an increase in emissions of around 4 per cent by 2020 compared with the 1990 level. Within the framework of the EU climate and energy package, Luxembourg has a target to reduce its GHG emissions from the sectors not covered by the EU ETS by 20 per cent by 2020

compared with the 2005 level. According to the latest inventory submission to the UNFCCC (dated 5 April 2012), the target for the non-EU ETS sectors for Luxembourg is around 8.28 Tg $CO_2$ eq in 2020. According to the updated 'with additional measures' projections, emissions from the non-EU ETS sectors are expected to amount to 10.10 Tg $CO_2$ eq in 2020, resulting in a 'gap' of 1.82 Tg $CO_2$ eq. This suggests that there is a need for further efforts by the Party to reduce its GHG emissions in the sectors not covered by the EU ETS. The ERT encourages the Party to provide more detailed information on the planned measures and to specify the long-term policy mix to reach the projected level of emissions in its next national communication.

### Greenhouse gas emission projections




*Sources*: (1) Data for the years 1990–2009: Luxembourg's 2011 GHG inventory submission; the emissions are without LULUCF; (2) Data for the years 2007–2020: Luxembourg's fifth national communication; the emissions are without LULUCF; (3) 2011 updated projections, within the framework of the European Union GHG Monitoring Mechanism, provided by the Party during the in-depth review; the projections are for GHG emissions without LULUCF.

*Abbreviation*: GHG = greenhouse gas, LULUCF = land use, land-use change and forestry.

## 3. Total effect of policies and measures

69. In the NC5, Luxembourg has presented the estimated and expected total effect of most of the implemented and adopted PaMs as well as the planned PaMs, mostly in the energy and transport sectors. The Party has also presented an estimate of the total effect of its PaMs, in accordance with the 'with measures' definition, compared with a situation without such PaMs, for 2010, 2015 and 2020. Information is presented in terms of GHG emissions avoided or sequestered (on a $CO_2$ eq basis) for each sector. The NC5 also presents relevant information on factors and activities for each sector for the years 1990–2020.

70. However, the ERT noted that Luxembourg did not provide information on the GHG emissions avoided or sequestered by gas (on a $CO_2$ eq basis). The ERT recommends that Luxembourg present this information in its next national communication. The ERT also

noted that, owing to the definition and the reference year (2006) adopted by Luxembourg for the 'without measures' scenario (see para. 59 above), the Party did not present estimates of the total effect of PaMs in 1995, 2000 and 2005. The ERT recommends that Luxembourg provide these estimates in the next national communication in the light of a modified 'without measures' approach.

71. Luxembourg reported that the total estimated effect of adopted and implemented PaMs is 0.5 Tg $CO_2$ eq in 2010 and 0.6 Tg $CO_2$ eq in 2020. For the planned measures, there will not be any policy effects in 2010 but the estimated effects will amount to 0.7 Tg $CO_2$ eq in 2020. According to the information reported in the NC5, the PaMs implemented in the transport sector will deliver the largest emission reductions, followed by the effect of the PaMs implemented in the residential and commercial sectors. The most effective PaMs and drivers behind the GHG emission reductions are described in chapters II.B.1 and II.B.2 of this report. Table 5 provides an overview of the total effect of PaMs as reported by Luxembourg.

Table 5
**Projected effects of planned, implemented and adopted policies and measures in 2010 and 2020**

| *Sector* | *Effect of implemented and adopted measures (Tg $CO_2$ eq)* | *Relative value (% of 1990 emissions)* | *Effect of planned measures (Tg $CO_2$ eq)* | *Relative value (% of 1990 emissions)* | *Effect of implemented and adopted measures (Tg $CO_2$ eq)* | *Relative value (% of 1990 emissions)* | *Effect of planned measures (Tg $CO_2$ eq)* | *Relative value (% of 1990 emissions)* |
|---|---|---|---|---|---|---|---|---|
| | *2010* | | | | *2020* | | | |
| Energy (without $CO_2$ from transport) | 0.03 | 0.0 | 0.0 | 0.0 | 0.14 | 1.1 | 0.10 | 0.8 |
| Transport – $CO_2$ | 0.47 | 4.0 | 0.0 | 0.0 | 0.52 | 4.1 | 0.63 | 5.0 |
| **Total** | **.50** | **4.0** | **0.0** | **0.0** | **0.66** | **5.2** | **0.73** | **5.8** |

*Source*: Luxembourg's fifth national communication.

*Note*: The total effect of implemented and adopted policies and measures is defined as the difference between the 'without measures' and 'with measures' scenarios; the total effect of planned policies and measures is defined as the difference between the 'with measures' and 'with additional measures' scenarios.

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

72. In its NC5, Luxembourg did not provide sufficient information on how its use of the mechanisms under Articles 6, 12 and 17 of the Kyoto Protocol is supplemental to domestic action. According to the NC5, the gap between the projected emissions in 2010 (taken as the annual average for the period 2008–2012) and the Kyoto Protocol target will be 3.71 Mt $CO_2$ eq/year during the first commitment period, taking into account the effects with additional PaMs. To fill the gap, the Government intends to use carbon credits from the Kyoto Protocol mechanisms, which amount to between 18 and 20 Mt $CO_2$ eq during the first commitment period. This is equivalent to between 3.6 and 4 Mt $CO_2$ eq as an annual average for the first commitment period. This implies that the gap will be almost entirely offset through the use of the Kyoto Protocol mechanisms.

73. During the review, Luxembourg provided further information and clarifications on how its use of the Kyoto Protocol mechanisms in achieving its Kyoto Protocol target is supplemental to domestic action. Given the national circumstances of Luxembourg, the impact of single projects on total GHG emissions as well as the population growth and the

export of road fuels represent a huge challenge for Luxembourg to meet its Kyoto Protocol target. Hence, the Party believes that it has already exhausted its domestic mitigation potential in reducing its GHG emissions.

74. During the review, Luxembourg also provided the results of the updated 2011 projections. Under both the 'with measures' and 'with additional measures' scenarios, emissions would be reduced to an average of 12.08 Mt $CO_2$ eq/year during the first commitment period. This reduces the gap between the annual emissions and the Kyoto Protocol target to 2.6 Mt $CO_2$ eq/year during the first commitment period. Accordingly, Luxembourg plans to use between 13 and 14 Mt $CO_2$ eq (2.6 Mt $CO_2$ eq for 2010) of carbon credits from the Kyoto Protocol mechanisms during the first commitment period. The ERT noted that the intended use of the mechanisms could represent around 100 per cent of the mitigation efforts if this effort is estimated as the gap between the recent 'with measures' projections and the Kyoto Protocol target. However, if Luxembourg chooses the reference level approach to define supplementarity using the 'without measures' projections from the NC5, then the use of 2.6 Mt $CO_2$ eq/year from the flexibility mechanisms represents about 62 per cent[9] of its mitigation efforts estimated as the gap between the 'without measures' projection from the NC5 and the Kyoto Protocol target. The ERT recommends that Luxembourg complete its consideration of how its use of the flexibility mechanisms is supplemental to domestic action and how its domestic action constitutes a significant element of its efforts to meet its Kyoto Protocol target, and that the Party clearly document its decision and report thereon in its next national communication.

75. In accordance with the EU linking directive,[10] companies that are under the EU ETS can meet their emission reduction target by reducing emissions and/or by acquiring emission allowances from the market. Luxembourg's companies can use up to 0.25 Tg $CO_2$ eq/year (1.25 Tg $CO_2$ eq for the period 2008–2012) of carbon credits, which amounts to 10 per cent[11] of its annual cap (2.49 Tg $CO_2$ eq). During the period 2003–2009, the Government has contributed to starting up the market for $CO_2$ credits by allocating approximately EUR 105 million, of which EUR 35 million has already been paid during the same period for the development of CDM and JI projects and the purchase of credits via bilateral projects and participation in various carbon funds. This investment has supported the launch of more than 100 CDM and JI projects in more than 20 countries. The resulting credits should amount to around 8 Tg $CO_2$ eq for the period 2008–2012. However, during the review week, the Party informed the ERT that further planned transactions will have to be concluded in order to meet its Kyoto Protocol commitment.

## D. Vulnerability assessment, climate change impacts and adaptation measures

76. In its NC5, Luxembourg provided qualitative data on the expected impacts in the country and information on the country's intention to prepare a National Climate Change Adaptation Plan to be adopted by the Government by the end of 2011. The Party's reporting is broadly in line with the UNFCCC reporting guidelines. However, the ERT noted that Luxembourg did not provide a quantitative climatic analysis or national projections of future climatic conditions and did not carry out a complete vulnerability

[9] The projected emissions under the 'without measures' scenario in the NC5 amount to 13.70 Mt $CO_2$ eq in 2010 (the average of the period 2008–2012) and the Kyoto Protocol target is 9.48 Mt $CO_2$ eq, resulting in a gap of 4.22 Mt $CO_2$ eq/year during the first commitment period.

[10] Directive 2004/101/EC of the European Parliament and of the Council of 27 October 2004 amending directive 2003/87/EC establishing a scheme for GHG emission allowance trading within the Community, in respect of the Kyoto Protocol's project mechanisms.

[11] Approved JI/CDM limit (per cent of allocation) according to the approved national allocation plan.

assessment. The ERT also noted that Luxembourg did not provide an outline of the specific sectoral action taken to implement Article 4, paragraph 1(b) and (e), of the Convention with regard to adaptation.

77. Nevertheless, the ERT noted that, since submitting its NC5, Luxembourg has generated an extensive amount of information on the expected national impacts of climate change and the country's vulnerability to climate change. During the review, the Party presented detailed information on national projections of future climatic conditions, such as temperature, precipitation, extreme climate events and the evolution of event days. The ensemble modelling that was used to carry out this analysis helps to provide an understanding of the uncertainty of the projections.

78. Luxembourg has also carried out a thorough analysis of national climate change impacts, including the expected impacts on vegetation, agriculture, viticulture, forests, biodiversity and the water cycle. Notably, in June 2011, Luxembourg's Council of Ministers adopted a National Adaptation Strategy on Climate Change, which prioritizes biodiversity, water, agriculture and forestry. Table 6 summarizes the sectoral information on vulnerability and adaptation to climate change.

Table 6
**Summary of information on vulnerability and adaptation to climate change**

| *Vulnerable area* | *Examples/comments/adaptation measures reported* |
|---|---|
| Agriculture and food security | *Vulnerability*: Projected changes in air temperatures are likely to induce a modification of the vegetation 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 has not identified climate change as an imminent threat to national food security, as the country is already a net importer of food<br>*Adaptation*: Luxembourg's National Adaptation Strategy on Climate Change includes the agriculture sector and identifies four specific objectives and measures in this area: (a) to protect against soil degradation and the maintenance of its production potential; (b) to protect animals against heat and potential new diseases; (c) to adapt plant production to climate change; and (d) to manage risks through multirisk insurance and the existing rural development policy |
| Biodiversity and natural ecosystems | *Vulnerability*: Changing climatic conditions are expected to lead to species range shifts, in particular a south to north migration of species. Projected temperature changes could also have an impact on the biogeography of flora<br>*Adaptation*: The National Adaptation Strategy on Climate Change includes the following measures: vulnerability analysis; the establishment of protected areas and green corridors; agroforestry; regional implementation and the planning of measures, conservation and restoration of wetlands and permanent grassland; green infrastructure and architecture; the monitoring of biodiversity; combating invasive alien species; and 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 |
| Drought | *Vulnerability*: A projected increase in the number of dry periods and the number of days within a dry period demonstrates an increased risk of drought for Luxembourg<br>*Adaptation*: The Water Management Agency has identified potential adaptation measures, including the prohibition of certain water uses to guarantee the water supply |
| Forests | *Vulnerability*: 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<br>*Adaptation*: The National Adaptation Strategy on Climate Change specifically targets forests and proposes adaptation measures for forests that include certification, conservation and the use of wood as a renewable energy resource, among others. Luxembourg also monitors the health of forests and is |

| *Vulnerable area* | *Examples/comments/adaptation measures reported* |
|---|---|
| | planning to institutionalize this monitoring with legislation. These measures will be integrated into the country's 10-year forest management plans |
| Human health | *Vulnerability*: 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 have an effect on air quality. Changes in the water cycle could increase public health risks related to water quality and water scarcity<br>*Adaptation*: At this time, the National Adaptation Strategy on Climate Change does not address the area of human health, although Luxembourg intends to include additional sectors, such as health, to the strategy within the next two years. Plans are under way for additional water intake points in emergency cases (by 2024) and the resizing of the drinking water infrastructure |
| Infrastructure and economy | *Vulnerability*: Projections for an increase in rainfall by 0–25 per cent, with increasing discharges in winter, show that there could an increase in the frequency of inundations. Luxembourg is currently participating in a regional study to assess the eventual consequences of climate change for floods and low water flow in the Moselle and Saar catchments and to develop adjustment strategies<br>*Adaptation*: Luxembourg has carried out a preliminary flood risk assessment and has prepared flood hazard maps and flood risk maps, and is planning to establish flood risk management plans by 2015. The country also has a flood warning service operated by the Water Management Agency |
| Water resources | *Vulnerability*: Projections indicate future changes in the water cycle, such as a 0–25 per cent increase in rainfall with increasing discharges in winter and a 5–25 per cent decrease in rainfall with reduced run-off in summer by 2050<br>*Adaptation*: The National Adaptation Strategy on Climate Change includes 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 |

79. National impact studies undertaken by Luxembourg vary in type and in the way in which they are conducted, but are generally based on statistical or biophysiological models. The Party has not yet carried out an analysis of the expected socioeconomic or ecological impacts of climate change.

80. In order to enhance the transparency of its reporting on elements of vulnerability, the ERT recommends that Luxembourg include, in future national communications, more detailed information on the expected impacts of climate change in Luxembourg. The ERT further recommends that the Party provide more information on the methodologies used for assessing the expected impacts of climate change and the country's vulnerability. Luxembourg could make use of the IPCC *Technical Guidelines for Assessing Climate Change Impacts and Adaptations* and the United Nations Environment Programme *Handbook on Methods for Climate Change Impact Assessment and Adaptation Strategies*.

81. Furthermore, in order to enhance the transparency of its reporting on elements of adaptation, the ERT recommends that Luxembourg include, in future national communications, more detailed information on the country's actions taken to implement Article 4, paragraph 1(b) and (e), of the Convention with regard to adaptation. The ERT also encourages Luxembourg to include updated information on the country's National Adaptation Strategy on Climate Change and the measures taken to implement this strategy, in particular the actions carried out in each priority sector and the results of these actions.

## E. Financial resources and transfer of technology, including information under Articles 10 and 11 of the Kyoto Protocol

### 1. Provision of financial resources, including "new and additional" resources and resources under Article 11 of the Kyoto Protocol

82. In its NC5, Luxembourg provided details on the measures taken to fulfil its commitments under Article 4, paragraphs 3, 4 and 5, of the Convention, as required by the UNFCCC reporting guidelines, and under Article 11 of the Kyoto Protocol, as required by the guidelines for the preparation of information required under Article 7 of the Kyoto Protocol. The Party has indicated what "new and additional" financial resources it has provided pursuant to Article 4, paragraph 3, and clarified how it has determined such resources as being "new and additional". Specifically, the NC5 lists "new and additional" resources as Luxembourg's contributions to the Global Environment Facility and to the Least Developed Countries Fund. During the review, Luxembourg presented important information on its approach to and provision of new and additional resources. In particular, the Party indicated that it supports developing countries with climate change related official development assistance (ODA) as well as through its Climate and Energy Fund, which provides additional climate finance to developing countries, including the country's fast-start finance contributions.

83. The NC5 provides some of the information on the assistance provided by Luxembourg to developing country Parties that are particularly vulnerable to the adverse effects of climate change to help them meet the costs of adaptation to those adverse effects, although without much detail. In particular, Luxembourg did not reference table 5, "Bilateral and regional financial contributions related to the implementation of the Convention, 1997", as required by the UNFCCC reporting guidelines, nor did it provide, in textual format, a description of the contributions made to each recipient country in terms of mitigation and adaptation, with subclassifications indicating which sector or activity was targeted. Luxembourg did, however, provide information on financial resources related to the implementation of the Convention provided through regional and other multilateral channels, including the Global Environment Facility, the United Nations and various regional development banks. In order to enhance the completeness and transparency of its reporting, the ERT encourages Luxembourg to complete tables 4 and 5 of the UNFCCC reporting guidelines in its next national communication.

84. Although the NC5 did not provide information on the Party's financial contribution to the Adaptation Fund, established in accordance with decision 10/CP.7, this information was presented to the ERT during the review. Table 7 summarizes information on financial resources and technology transfer, as provided in Luxembourg's NC5. Although Luxembourg did not report in the NC5 any information on climate-related aid in bilateral ODA or on climate-related support programmes, the review revealed that, as of 2010, the Directorate for Development Cooperation of the Luxembourg Ministry of Foreign Affairs began using the Development Assistance Committee of the Organisation for Economic Co-operation and Development horizontal markers for all of its programmes, as well as a desk analysis of certain projects in climate change sectors, facilitating preliminary calculations of climate-related aid in bilateral ODA. The ERT encourages Luxembourg to include information on climate-related aid in bilateral ODA and on climate-related support programmes in its next national communication.

Table 7
**Summary of information on financial resources and technology transfer for 2005–2010**

*(EUR million)*

| *Channel of financial resources* | *Year of disbursement* | | | | | |
|---|---|---|---|---|---|---|
| | *2005* | *2006* | *2007* | *2008* | *2009* | *2010* |
| Official development assistance | 207.39 | 231.51 | 275.14 | 287.68 | NA | NA |
| Contributions to the GEF | NA | NA | 1.92 | 1.74 | NA | NA |
| JI and CDM under the Kyoto Protocol | 0.00 | 0.00 | 2.30 | 2.01 | 10.02 | 25.01 |
| Other – participation in carbon funds | 2.03 | 0.62 | 2.99 | 2.04 | 10.97 | 5.94 |
| Fast-start funding | NA | NA | NA | NA | NA | 3.00 |

*Abbreviations*: CDM = clean development mechanism, GEF = Global Environment Facility, JI = joint implementation, NA = not available.

85. The primary objective of Luxembourg's development cooperation is the eradication of poverty; cooperation programmes have also been implemented in the context of sustainable development. During the review, Luxembourg indicated that, based on the Paris Declaration on Aid Effectiveness, the Accra Agenda for Action and the Code of Conduct on Complementarity and the Division of Labour in Development Policy, the Party has decided, through its development cooperation programme, to take a leadership role in certain sectors, including vocational training and health care.

86. With regard to bilateral aid, Luxembourg follows a policy of targeted intervention in a limited number of partner countries, selected mainly according to their Human Development Indices. As a result, Luxembourg's bilateral cooperation is primarily with the least developed countries. As of 2012, the nine partner countries comprise Burkina Faso, Cape Verde, El Salvador, the Lao People's Democratic Republic, Mali, Nicaragua, Niger, Senegal and Viet Nam. Eight other countries also received bilateral aid. Luxembourg's indicative cooperation programmes involve the partner countries in defining the levels of investment, which lasts for a period of four or five years. Such multi-year planning helps to provide more predictable financial resource flows to partner countries.

87. During the review, Luxembourg indicated that it is committed to providing EUR 9 million through the fast-start finance programme, or EUR 3 million/year in 2010, 2011 and 2012. In particular, these funds will finance activities under the World Food Programme, the Global Facility for Disaster Reduction and Recovery and bilateral programmes, mainly with the nine priority countries identified in paragraph 86 above.

### 2. Activities related to transfer of technology, including information under Article 10 of the Kyoto Protocol

88. In its NC5, Luxembourg provided limited information regarding measures related to the promotion, facilitation and financing of the transfer of, or access to, environmentally sound technologies. In particular, the NC5 failed to clearly distinguish between activities undertaken by the public sector and those undertaken by the private sector. The NC5 also lacks detailed information on activities related to technology transfer, including success stories and failures, as well as on its activities for financing access by developing countries to 'hard' or 'soft' environmentally sound technologies. Furthermore, Luxembourg did not

report in textual format on the steps taken to promote, facilitate and finance transfer of technology, and to support the development and enhancement of the endogenous capacities and technologies of developing countries.

89. Nevertheless, during the review, Luxembourg provided information on the facilitation and financing of the transfer of technologies, on steps taken to support the development and enhancement of capacities and technologies in a number of developing nations and on success stories. The ERT recommends that Luxembourg include all of the above information in its next national communication.

90. Based on the information provided during the review, Luxembourg's priorities for technology transfer include mitigation and capacity-building, with a lesser focus on adaptation. Mitigation projects include support for sustainable building design and vocational training for renewable energies, among others. Adaptation projects include aquaculture and the production of agricultural products.

91. The ERT recommends that the Party enhance its efforts to distinguish between activities undertaken by the public sector and those undertaken by the private sector when reporting on the promotion, facilitation and financing of environmentally sound technologies and to report this information, as it becomes available, in future national communications. The ERT also recommends that Luxembourg provide more detailed information on its activities related to technology transfer, in particular the country's success stories and failures.

## F. Research and systematic observation

92. Luxembourg has provided in its NC5 preliminary information on its actions relating to research and systematic observation and has addressed both domestic and international activities, including its participation in the Global Climate Observing System. The NC5 also states that Luxembourg has not yet taken any action to support capacity-building in developing countries.

93. During the review, the ERT noted with appreciation that the Party has undertaken a significant number of activities related to research and systematic observation since the submission of its NC5. For example, the ERT noted that the Luxembourg Government supports research institutions such as the Public Research Centres Gabriel Lippmann and Henri Tudor, as well as the national statistical institute STATEC, to carry out climate change research related to vulnerability, mitigation and emission projections. The review also revealed that the Party has a dense national network of meteorological stations and hydrological stations, and initiatives for the public dissemination of information. The ERT encourages Luxembourg to report this information in its next national communication.

94. Additionally, the ERT encourages the Party to provide information on efforts made with regard to socioeconomic analysis, including the analysis of both the impacts of climate change and the response options. The ERT also encourages Luxembourg to provide information on efforts made with regard to research and development on mitigation and adaptation technologies, as well as on any future support for developing countries that could enable those countries to participate in research and development.

## G. Education, training and public awareness

95. In the NC5, Luxembourg has provided information on its actions relating to education, training and public awareness at both the domestic and international levels.

Compared with the previous national communication, the Party has provided more extensive information on its activities in this area.

96. Under the interministerial work coordinated by MDDI-Env and with the strong involvement of the ministry, many actions have been developed around the National Sustainable Development Plan and the Environment and Climate Partnership. These include the sending of newsletters, television broadcasting, participation in local initiatives and activities, and the dissemination of information on the objectives of climate protection in Luxembourg, the main measures undertaken, ways for these measures to be implemented and a timeline for their implementation. Education and training for the general public on climate change is also provided through websites run by government agencies. Civil society is also heavily involved in some of the Party's flagship initiatives that help to achieve the goal set by the EU of a 20 per cent reduction in emissions by 2020, compared with 2005, for the sectors not covered by the EU ETS.

97. Through bilateral and multilateral actions, Luxembourg also contributes to education and training activities in developing countries. These include projects on agriculture and energy production led by Lux-Development (Luxembourg's implementing agency for the development cooperation programme). The ERT welcomes the information reported in the NC5 and encourages Luxembourg to report on future developments in this area in its next national communication.

## H. Evaluation of supplementary information under Article 7, paragraph 2, of the Kyoto Protocol

98. Luxembourg has provided most of the supplementary information under Article 7, paragraph 2, of the Kyoto Protocol in its NC5. The supplementary information is placed in different sections of the NC5. Table 8 provides an overview of the supplementary information under Article 7, paragraph 2, of the Kyoto Protocol as well as references to the NC5 chapters in which this information is provided.

99. Luxembourg has not reported the following elements of the supplementary information required under Article 7, paragraph 2, of the Kyoto Protocol: a description of the steps taken to promote and/or implement any decisions of ICAO and IMO in order to limit or reduce GHG emissions not included in the Montreal Protocol from aviation and marine bunker fuels; and a description of the 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. However, the Party provided sufficient information on these reporting elements during the review. The technical assessment of the information reported under Article 7, paragraph 2, of the Kyoto Protocol is contained in the relevant sections of this report. The ERT recommends that Luxembourg include these reporting elements in its next national communication.

Table 8
**Overview of supplementary information under Article 7, paragraph 2, of the Kyoto Protocol**

| *Supplementary information* | *Reference* |
|---|---|
| National registry | Fifth national communication (NC5), chapter III.3 |
| National system | NC5, chapter III.2 |
| Supplementarity relating to the mechanisms pursuant to | NC5, chapter V.5 |

| *Supplementary information* | *Reference* |
|---|---|
| Articles 6, 12 and 17 | |
| Policies and measures in accordance with Article 2 | NC5, chapter IV |
| Domestic and regional programmes and/or legislative arrangements and enforcement and administrative procedures | NC5, chapter IV.2 |
| Information under Article 10 | NC5, chapter VII.6 |
| Financial resources | NC5, chapter VII |

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

100. Luxembourg has reported the information requested in chapter I.H, "Minimization of adverse impacts in accordance with Article 3, paragraph 14", of the annex to decision 15/CMP.1 as a part of its 2011 annual submission. It has not reported, however, information on how it gives priority to the actions taken in implementing its commitments under Article 3, paragraph 14. During the review, Luxembourg provided the ERT with additional information on how it strives to implement its commitments under Article 3, paragraph 1, of the Kyoto Protocol in such a way as to minimize adverse social, environmental and economic impacts on developing country Parties, particularly those identified in Article 4, paragraphs 8 and 9, of the Convention. The ERT considers the reported information to be mostly transparent and complete. The ERT commends Luxembourg for the additional information provided during the review and encourages the Party to continue exploring and reporting on the adverse impacts of the response measures.

101. The 2011 national inventory report of Luxembourg presented the following initiatives of the Party aimed at minimizing adverse impacts: CDM and JI projects should comply with UNFCCC ecological and social criteria; tax exemptions for biofuel should be limited to fuels that meet ecological and social criteria; and the identification of harmful subsidies and adverse incentives in the tax system, leading to the gradual elimination of such incentives.

102. During the review, Luxembourg presented additional initiatives, decision-making processes and projects to minimize adverse impacts, and information on how it gives priority to the actions taken in implementing its commitments under Article 3, paragraph 14, of the Kyoto Protocol. These include: the promotion of flexible mechanism projects that specifically target renewables; the exclusion of projects on palm oil production, HFC-23 and big hydropower plants; the minimization of carbon leakage through the free allocation of allowances for most industrial sectors; support to the EU principles and criteria on sustainable development; and the assessment of negative spillover effects related to the forestry sector, including measures against trade in illegal wood products. In view of the increased demand for biomass, Luxembourg is committed to importing biomass from sustainable sources only.

# III. Conclusions and recommendations

103. The ERT concludes that the Party's NC5 generally provides a good overview of the national climate policy of Luxembourg. The information provided in the NC5 includes most of the mandatory information required by the UNFCCC reporting guidelines and most of the elements of the supplementary information required under Article 7 of the Kyoto Protocol. The ERT also concludes that the information provided in the NC5 is broadly transparent. During the review, Luxembourg provided sufficient information on the missing

elements (see para. 7 above). However, the ERT noted with great concern that Luxembourg failed to submit its second, third and fourth national communications on time and that there was a delay in the submission of the NC5.

104. Luxembourg's emissions for 2009 were estimated to be 8.9 per cent below its 1990 level excluding LULUCF and 13.6 per cent above including LULUCF. The emission reduction was driven by the decrease in emissions from the industrial sector, owing to technological changes. However, the magnitude of this decrease is compensated for by an increase in emissions from the transport sector, mainly as a result of the policy of low taxation on fuel in Luxembourg.

105. In the NC5, Luxembourg has presented GHG projections for the period 2007–2020. Three scenarios were included: the baseline scenario, the 'with measures' scenario and the 'with additional measures' scenario. The projected GHG emissions under both the 'with measures' and 'with additional measures' scenarios in 2010 are 0.2 per cent above the base year level. Thus, the projections indicate that Luxembourg cannot meet its Kyoto Protocol target with domestic action alone. The Party will need to use the Kyoto Protocol mechanisms to achieve its Kyoto Protocol target. The projections also show that GHG emissions will further increase by 2020, mainly owing to an increase in emissions from the transport sector. This implies that more efforts are needed to enable Luxembourg to achieve its 2020 emission reduction targets compared with the 2005 levels for the sectors not covered by the EU ETS.

106. In its NC5, Luxembourg did not provide sufficient information on how its use of the mechanisms under Articles 6, 12 and 17 of the Kyoto Protocol is supplemental to domestic action. During the review, Luxembourg provided further information based on its updated projections. The Party intends to use between 13 and 14 Mt $CO_2$ eq (2.6 Mt $CO_2$ eq for 2010) of carbon credits from the Kyoto Protocol mechanisms during the first commitment period. The ERT noted that the intended use of the mechanisms could represent around 100 per cent of the mitigation efforts if this effort is estimated as the gap between the recent 'with measures' projections and the Kyoto Protocol target, unless the Party chooses the reference level approach to define supplementarity.

107. The National Strategy for Reducing $CO_2$ Emissions provides the overall framework for climate policies in Luxembourg. The overall policy framework was further elaborated through the first National $CO_2$ Emission Reduction Action Plan, adopted by the Government in 2006 in the context of meeting its Kyoto Protocol target. The most important cross-cutting policy in achieving the Kyoto Protocol target in Luxembourg is the EU ETS, the use of the flexibility mechanisms under the Kyoto Protocol and the PaMs in the transport and building sectors. The other key areas of policy intervention include the development of renewables and the promotion of energy efficiency. In order to reach the longer-term national target by 2020, Luxembourg adopted the NREAP and the NEEAP. The second National $CO_2$ Emission Reduction Action Plan will be adopted in 2012, and will enhance the existing PaMs targeted at reaching the Kyoto Protocol and EU targets.

108. Luxembourg indicated that it supports developing countries with climate change related ODA as well as through its Climate and Energy Fund, which provides additional climate finance to developing countries, including the country's fast-start finance contributions, totalling EUR 9 million between 2010 and 2012. Luxembourg has a number of specific projects related to the promotion, facilitation and financing of technology transfer to developing countries, with a focus on countries most vulnerable to climate change.

109. Since submitting its NC5, Luxembourg has carried out a thorough analysis of national climate change impacts, assessed the country's vulnerability to climate change and

prepared its National Adaptation Strategy on Climate Change, which addresses the agricultural and forestry sectors, as well as biodiversity and water resources.

110. Many actions have been taken to enhance the coverage of climate change related topics in schools, the private sector and research centres and to increase public awareness of the impacts of climate change and the role of mitigation. The Government supports a significant amount of climate change research related to vulnerability, mitigation and emissions projections. Luxembourg has a dense network of meteorological stations and hydrological stations throughout the country, with various initiatives for the public dissemination of information.

111. The ERT concluded that Luxembourg's national system continues to perform its required functions as set out in decision 19/CMP.1 and that the national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1, and continues to adhere to the technical standards for data exchange between registry systems in accordance with relevant decisions of the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol.

112. The 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 provided by the Party in its 2011 annual submission is complete and transparent. The ERT encourages Luxembourg to further enhance its reporting on Article 3, paragraph 14, including by indicating the prioritization of the action taken in implementing its commitments under Article 3.

113. In the course of the IDR, the ERT formulated several recommendations relating to the timeliness, completeness and transparency of Luxembourg's reporting under the Convention and its Kyoto Protocol. The key recommendations[12] are that Luxembourg:

(a) Improve the completeness of its reporting by including in the next national communication the following information:

(i) Description of PaMs in non-energy sectors;

(ii) How Luxembourg believes its PaMs are modifying longer-term trends in anthropogenic GHG emissions and removals consistent with the objective of the Convention;

(iii) The steps taken to implement ICAO and IMO decisions to reduce GHG emissions;

(iv) GHG projections presented on a gas-by-gas basis;

(v) Emission projections related to fuel sold to ships and aircraft engaged in international transport;

(vi) The steps taken to promote, facilitate and finance the transfer of technology and to support the development and enhancement of the endogenous capacities and technologies of developing countries;

(vii) A description of the 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;

(viii) The arrangements in place to report information on activities under Article 3, paragraph 3, of the Kyoto Protocol;

[12] The recommendations are given in full in the relevant sections of this report.

(b) Improve the transparency of its reporting by including in the next national communication the following information:

(i) Further details on the definition of supplementarity;

(ii) Further details on the assistance provided to developing country Parties that are particularly vulnerable to climate change in meeting the costs of adaptation;

(iii) A clarification between the activities undertaken by the public sector and those undertaken by the private sector on technology transfer, once the information necessary to do so becomes available;

(iv) More details on Luxembourg's activities related to technology transfer, in particular the country's success stories and failures;

(c) Improve timeliness of reporting by meeting the deadline for submission for future national communications.

114. The ERT encourages Luxembourg to undertake a number of improvements regarding the transparency and completeness of its reporting; the most important of these are that Luxembourg:

(a) Explain how PaMs interact with each other at the national level and the synergies and overlaps among PaMs at the national and regional levels;

(b) Provide ex ante appraisal and ex post evaluation of the impacts of individual policies at the national and regional levels;

(c) Improve the consistency of the background activity data used in the evaluation of the impacts of individual PaMs and in the compilation of the GHG inventory;

(d) Provide further information about the expected impacts of climate change in Luxembourg, the methodologies used for assessing the expected impacts and the country's vulnerability as well as the actions taken by Luxembourg to implement Article 4, paragraph 1(b) and (e), of the Convention regarding adaptation;

(e) Report on activities related to research and systematic research since the submission of its NC5;

(f) Report on education and training activities in developing countries;

(g) Provide further information on the minimization of adverse effects and impacts in accordance with Article 2, paragraph 3, and Article 3, paragraph 14, of the Kyoto Protocol.

# IV. Questions of implementation

115. During the review, the ERT assessed the NC5, including supplementary information provided under Article 7, paragraph 2, of the Kyoto Protocol and reviewed 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 question of implementation was raised by the ERT during the review.

# Annex

## Documents and information used during the review

### A. Reference documents

"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 national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories". 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". Decision 15/CMP.1. Available at <http://unfccc.int/resource/docs/2005/cmp1/eng/08a02.pdf#page=54>.

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

FCCC/SBI/2011/INF.1. Compilation and synthesis of fifth national communications. Executive summary. Note by the secretariat. Available at <http://unfccc.int/resource/docs/2011/sbi/eng/inf01.pdf>.

FCCC/SBI/2011/INF.1/Add.1. Compilation and synthesis of fifth national communications. Note by the secretariat. Addendum. Policies, measures, and past and projected future greenhouse gas emission trends of Parties included in Annex I to the Convention. Available at <http://unfccc.int/resource/docs/2011/sbi/eng/inf01a01.pdf>.

FCCC/SBI/2011/INF.1/Add.2. Compilation and synthesis of fifth national communications. Note by the secretariat. Addendum. Financial resources, technology transfer, vulnerability, adaptation and other issues relating to the implementation of the Convention by Parties included in Annex I to the Convention. Available at <http://unfccc.int/resource/docs/2011/sbi/eng/inf01a02.pdf>.

FCCC/SBI/2011/INF.2. Compilation and synthesis of supplementary information incorporated in fifth national communications submitted in accordance with Article 7, paragraph 2, of the Kyoto Protocol. Note by the secretariat. Available at <http://unfccc.int/resource/docs/2011/sbi/eng/inf02.pdf>.

FCCC/ARR/2009/LUX. Report of the individual review of the annual submission of Luxembourg submitted in 2009. Available at <http://unfccc.int/resource/docs/2010/arr/lux.pdf>.

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

FCCC/IDR.1/LUX. Report on the in-depth review of the first national communication of Luxembourg. Available at <http://unfccc.int/resource/docs/idr/lux01.pdf>.

Second, third, fourth and fifth national communication of Luxembourg. Available at <http://unfccc.int/resource/docs/natc/lux_nc5.pdf>.

2009 GHG inventory submission of Luxembourg. Available at <http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/4771.php>.

2011 GHG inventory submission of Luxembourg. Available at <http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/5888.php>.

## B. Additional information provided by the Party

Responses to questions during the review were received from Mr. Eric De Brabanter (Ministry of Sustainable Development and Infrastructure of Luxembourg), and included additional material on updated policies and measures, greenhouse gas projections, the national registry and recent climate policy developments in Luxembourg. During the review week, a wealth of information was also provided by the experts who participated in the discussions, notably through their electronic presentations/slideshows. The following documents[1] were also provided by Luxembourg:

ECONOTEC Consultants (2000), *Développement du modèle EPM pour l'analyse prévisionelle des émissions atmosphériques*, scientific report to the Belgian Federal Public Service for Scientific, Technical and Cultural Affairs, Mons.

ECONOTEC Consultants (2002), *Modèle EPM : analyse prévisionnelle des émissions de gaz à effet de serre en Belgique en 2010*, final report to the Belgian Federal Public Service for Scientific, Technical and Cultural Affairs, Mons.

ECONOTEC Consultants (2009), *Projections de gaz à effet de serre pour la 5ème Communication Nationale dans le cadre de l'UNFCCC*, final report to the Ministry of the Environment of Luxembourg, Mons.

ECONOTEC Consultants (2009), *Projections de gaz à effet de serre pour la 5ème Communication Nationale dans le cadre de l'UNFCCC, revision du rapport du 20 mai 2009*, final report to the Department of the Environment of Luxembourg, Mons.

ECONOTEC Consultants (2011), *Projections de gaz à effet de serre en vertu de la Décision 280/2004/CE*, final report to the Department of the Environment of Luxembourg, Mons.

ECONOTEC Consultants & VITO (2005), *Characteristics of Models for the Calculation of GHG Scenarios in Belgium*, final report to the Belgian Federal Public Service of Public Health, Food Chain Safety and Environment – DG Environment, Mons and Mol.

FiFo-Köln (2006), *Entwicklung der Treibhausgasemissionen in Luxemburg – Prognosegrundlagen für den Nationalen Allokationsplan 2008-2012*, FiFo-Berichte Nr. 9, Köln. (http://kups.ub.uni-koeln.de/1931/1/FiFo%2DBerichte_Nr_9_2006.pdf).

Ministry of the Economy and Foreign Trade (2008), *Erster Nationaler Energieeffizienzplan Luxemburg, Luxembourg im Rahmen der EU-Richtlinie über „Endenergieeffizienz und Energiedienstleistungen" (2006/32/EG)*, Luxembourg. (http://www.eco.public.lu/documentation/rapports/Erster_Nationaler_Energieeffizienzaktionsplan_Luxemburg_-_Final.pdf) An English version is available here: http://ec.europa.eu/energy/efficiency/doc/end_use/2007_neeap.zip.

Ministry of the Economy and Foreign Trade (2010), *Luxemburger Aktionsplan für erneuerbare Energie in Richtlinie 2009/28/EG des Europäischen Parlaments und des Rates vom 23. April 2009 zur Förderung der Nutzung von Energie aus erneuerbaren Quellen und*

[1] Reproduced as received from the Party.

*zur Änderung und anschließenden Aufhebung der Richtlinien 2001/77/EG und 2003/30/EG (2006/32/EG)*, Luxembourg. (http://www.eco.public.lu/documentation/rapports/Luxemburger_Aktionsplan_f__r_erneuerbare_Energie.pdf). An English version is available here: http://ec.europa.eu/energy/renewables/transparency_platform/doc/dir_2009_0028_action_plan_luxembourg.zip.

Ministry of the Economy and Foreign Trade (2011), *Zweiter Nationaler Energieeffizienzplan Luxemburg, Luxembourg im Rahmen der EU-Richtlinie über „Endenergieeffizienz und Energiedienstleistungen" (2006/32/EG)*, Luxembourg. (http://www.eco.public.lu/documentation/rapports/Zweiter_nationaler_Energieeffizienzaktionsplan_Luxemburg_im_Rahmen_der_EU-Richtlinie___ber_Endenergieeffizienz_und_Energiedienstleistungen__2006-32-EG_.pdf) An English version is available here: http://ec.europa.eu/energy/efficiency/doc/end_use/2011_neeap_translated.zip.

Ministry of the Economy and Foreign Trade, Service Central de la Statistique et des Etudes Economiques – STATEC (2011), *Luxembourg in figures 2011*, Luxembourg. (http://www.statistiques.public.lu/fr/publications/series/lux-chiffres-fr/index.html).

Ministry of Foreign Affairs, Directorate for Development Cooperation (2011), *Rapport Annuel 2010*, Luxembourg. (http://www.cooperation.lu/)

Ministry of Sustainable Development and Infrastructure, Department of the Environment (2010), *Partenariat pour l'Environnement et le Climat – contribuez activement à la protection du climat*, booklet, Luxembourg. A German version is also available.

Ministry of Sustainable Development and Infrastructure, Department of the Environment (2011), *Partenariat pour l'Environnement et le Climat – les mesures prioritaires*, booklet, Luxembourg. A German version is also available.

Ministry of Sustainable Development and Infrastructure, Department of the Environment (2011), *Paquet Climat*, outcomes of the Environment and Climate Partnership, Luxembourg. (http://www.developpement-durable-infrastructures.public.lu/fr/developpement-durable-infrastructures/partenariat/Paquet_Climat_integral.pdf)

Ministry of Sustainable Development and Infrastructure, Department of the Environment (2011), *PNDD Luxembourg – Un Luxembourg durable pour une meilleure qualité de vie*, second national sustainable development plan, Luxembourg. (http://www.calameo.com/read/00072389430ff81e39e8e?authid=Xehrkbm2s3M2) A German version is available here: http://www.calameo.com/read/000723894d90e9e766337?authid=FJ5kQv72eux3.

Ministry of Sustainable Development and Infrastructure, Department of the Environment (2011), *PNDD – notre plan pour demain*, booklet presenting a condensed version of the second national sustainable development plan, Luxembourg. (http://www.calameo.com/read/00072389487260d5af9d3?authid=kEm68andLGXt) A German version is available here: http://www.calameo.com/read/00072389407c91d73331e?authid=xOKgrIoGynzV.

Ministry of Sustainable Development and Infrastructure, Department of the Environment (2011), *Projected Greenhouse Gas Emissions in Luxembourg and Assessment of Policies*

*and Measures*, 2011 submission under Article 3, paragraph 2, of Decision 280/2004/EC of the European Parliament and of the Council, Luxembourg. (http://cdr.eionet.europa.eu/lu/eu/colrmdqvg/colrez6q/envtdvfmq).