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## Report of the technical review of the second biennial report of Liechtenstein

According to decision 2/CP.17, developed country Parties are requested to submit their second biennial reports by 1 January 2016, that is, two years after the due date for submission of a full national communication. This report presents the results of the technical review of the second biennial report of Liechtenstein, conducted by an expert review team in accordance with the “Guidelines for the technical review of information reported under the Convention related to greenhouse gas inventories, biennial reports and national communications by Parties included in Annex I to the Convention”.

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## I. Introduction and summary

### A. Introduction

1. This report covers the centralized technical review of the second biennial report (BR2)<sup>1</sup> of Liechtenstein. The review was organized by the secretariat in accordance with the “Guidelines for the technical review of information reported under the Convention related to greenhouse gas inventories, biennial reports and national communications by Parties included in Annex I to the Convention”, particularly “Part IV: UNFCCC guidelines for the technical review of biennial reports from Parties included in Annex I to the Convention” (annex to decision 13/CP.20). In accordance with the same decision, a draft version of this report was communicated to the Government of Liechtenstein, which provided comments that were considered and incorporated, as appropriate, into this final version of the report.

2. The review took place from 30 May to 4 June 2016 in Bonn, Germany, and was conducted by the following team of nominated experts from the UNFCCC roster of experts: Ms. Buket Akay (Turkey), Ms. María Gutiérrez (Mexico), Ms. María José Lopez (Belgium), Ms. Aglaia Obrekht (Canada), Ms. Anna Romanovskaya (Russian Federation), Mr. Muzaffar Shodmonov (Tajikistan) and Ms. Dalia Streimikiene (Lithuania). Ms. Gutiérrez and Ms. Romanovskaya were the lead reviewers. The review was coordinated by Mr. Daniel Hooper and Mr. Davor Vesligaj (UNFCCC secretariat).

### B. Summary

3. The expert review team (ERT) conducted a technical review of the information reported in the BR2 of Liechtenstein in accordance with the “UNFCCC biennial reporting guidelines for developed country Parties” (hereinafter referred to as the UNFCCC reporting guidelines on BRs). During the review, Liechtenstein provided the following additional relevant information: actions planned or under development aimed at achieving the 2020 emission reduction target; key assumptions, sensitivity analysis, models and approaches used for projections; estimates of mitigation impacts; economic and social consequences of response measures; and administrative arrangements in place to monitor progress towards the target as well as the progress of policies and measures (PaMs).

#### 1. Timeliness

4. The BR2 was submitted on 7 January 2016, after the deadline of 1 January 2016 mandated by decision 2/CP.17. The common tabular format (CTF) tables were submitted on 31 December 2015. The ERT noted the delay in the submission of the BR2.

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

5. Issues and gaps related to the reported information identified by the ERT are presented in table 1 below. The information reported by Liechtenstein in its BR2 is mostly in adherence with the UNFCCC reporting guidelines on BRs as per decision 2/CP.17.

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<sup>1</sup> The biennial report submission comprises the text of the report and the common tabular format (CTF) tables. Both the text and the CTF tables are subject to the technical review.

Table 1  
**Summary of completeness and transparency issues related to mandatory reported information in the second biennial report of Liechtenstein**

<i>Chapter of the biennial report</i>	<i>Completeness</i>	<i>Transparency</i>	<i>Paragraphs with recommendations</i>
Greenhouse gas emissions and trends	Mostly complete	Transparent	7
Assumptions, conditions and methodologies related to the attainment of the quantified economy-wide emission reduction target	Complete	Transparent	
Progress in achievement of targets	Mostly complete	Partially transparent	15, 16, 17, 19, 33, 34
Provision of support to developing country Parties <sup>a</sup>	NA	NA	NA

*Note:* A list of recommendations pertaining to the completeness and transparency issues identified in this table is included in chapter III.

*Abbreviation:* NA = not applicable.

<sup>a</sup> Liechtenstein is not a Party included in Annex II to the Convention and is therefore not obliged to adopt measures and fulfil obligations as defined in Article 4, paragraphs 3, 4 and 5, of the Convention.

## II. Technical review of the reported information

### A. All greenhouse gas emissions and removals related to the quantified economy-wide emission reduction target

6. Liechtenstein has provided a summary of information on greenhouse gas (GHG) emission trends for the period 1990–2013 in its BR2 and CTF tables 1(a)–(d). The BR2 provides brief information on the national inventory arrangements, which are explained in more detail in the national inventory report included in Liechtenstein’s 2015 annual inventory submission (in chapter 1.2). The national inventory arrangements were established in accordance with the reporting requirements related to national inventory arrangements contained in the “Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual greenhouse gas inventories” (hereinafter referred to as the UNFCCC Annex I inventory reporting guidelines) that are required by paragraph 3 of the UNFCCC reporting guidelines on BRs.

7. The BR2 does not include the information required by the UNFCCC reporting guidelines on BRs on changes in the national inventory arrangements since the first biennial report (BR1). During the review, in response to a question raised by the ERT, Liechtenstein clarified that there have been no changes in the national inventory arrangements since the sixth national communication (NC6)/BR1. To improve the completeness of its reporting, the ERT recommends that Liechtenstein report any changes in the national inventory arrangements or lack thereof in its next biennial report (BR).

8. The information reported in the BR2 and CTF table 1 on emission trends is consistent with that reported in the 2015 annual inventory submission of Liechtenstein. To reflect the most recently available data, version 3 of Liechtenstein’s 2016 annual inventory submission has been used as the basis for discussion in chapter II.A of this review report.

9. In 2014, total GHG emissions,<sup>2</sup> excluding emissions and removals from land use, land-use change and forestry (LULUCF) amounted to 205.10 kt of carbon dioxide equivalent (CO<sub>2</sub> eq) and decreased by 10.5 per cent between 1990 and 2014, whereas total GHG emissions including net emissions and removals from LULUCF amounted to 216.55 kt CO<sub>2</sub> eq and decreased by 7.3 per cent over the same period. The decrease in the total GHG emissions can be attributed mainly to carbon dioxide (CO<sub>2</sub>) emissions, which decreased by 18.7 per cent (excluding LULUCF) between 1990 and 2014. Over the same period, emissions of methane (CH<sub>4</sub>) increased by 9.3 per cent, while emissions of nitrous oxide (N<sub>2</sub>O) decreased by 7.0 per cent. The emissions of combined fluorinated gases (F-gases), such as perfluorocarbons (PFCs), hydrofluorocarbons (HFCs) and sulphur hexafluoride (SF<sub>6</sub>), increased from virtually none to 12.3 kt CO<sub>2</sub> eq over the same period. The emission trends were driven mainly by emissions in the energy sector, which in turn were driven by declines in fuel consumption, especially in the residential, commercial and institutional subsectors. Table 2 below illustrates the emission trends by sector and some of the economic indicators relevant to GHG emissions for Liechtenstein.

Table 2

**Greenhouse gas emissions by sector and some indicators relevant to greenhouse gas emissions for Liechtenstein for the period 1990–2014**

Sector	GHG emissions (kt CO <sub>2</sub> eq)					Change (%)		Share by sector (%)	
	1990	2000	2010	2013	2014	1990–2014	2013–2014	1990	2014
	1. Energy	201.06	219.88	194.11	195.87	164.26	–18.3	–16.1	87.8
A1. Energy industries	0.18	2.77	3.26	3.04	2.51	1 329.1	–17.3	0.1	1.2
A2. Manufacturing industries and construction	36.32	36.45	26.12	26.45	27.16	–25.2	2.7	15.9	13.2
A3. Transport	76.75	91.37	78.09	80.00	74.36	–3.1	–7.1	33.5	36.3
A4.–A5. Other	87.45	88.45	85.42	85.13	59.02	–32.5	–30.7	38.2	28.8
B. Fugitive emissions from fuels	0.37	0.83	1.22	1.25	1.21	229.6	–2.9	0.2	0.6
C. CO <sub>2</sub> transport and storage	NO	NO	NO	NO	NO	NA	NA	NA	NA
2. IPPU	0.45	4.46	10.54	12.38	12.50	2 663.6	1.0	0.2	6.1
3. Agriculture	25.50	21.47	24.17	24.01	24.38	–4.4	1.5	11.1	11.9
4. LULUCF	4.58	8.39	14.80	11.72	11.56	152.3	–1.4	NA	NA
5. Waste	2.02	2.05	2.02	2.31	3.95	95.2	71.2	0.9	1.9
6. Other	NO	NO	NO	NO	NO	NA	NA	NA	NA
<b>Total GHG emissions without LULUCF</b>	<b>229.03</b>	<b>247.86</b>	<b>230.84</b>	<b>234.57</b>	<b>205.10</b>	<b>–10.5</b>	<b>–12.6</b>	<b>100.0</b>	<b>100.0</b>
<b>Total GHG emissions with LULUCF</b>	<b>233.61</b>	<b>256.24</b>	<b>245.64</b>	<b>246.29</b>	<b>216.65</b>	<b>–7.3</b>	<b>–12.0</b>	<b>NA</b>	<b>NA</b>

<sup>2</sup> In this report, the term “total GHG emissions” refers to the aggregated national GHG emissions expressed in terms of carbon dioxide equivalent excluding land use, land-use change and forestry, unless otherwise specified. Values in this paragraph are calculated based on the 2016 inventory submission, version 3.

Sector	GHG emissions (kt CO <sub>2</sub> eq)					Change (%)		Share by sector (%)	
	1990	2000	2010	2013	2014	1990–2014	2013–2014	1990	2014
	<i>Indicators</i>								
GDP per capita (thousands 2011 USD using PPP)	NE	NE	NE	NE	NE	NA	NA	NA	NA
GHG emissions without LULUCF per capita (t CO <sub>2</sub> eq)	7.97	7.45	6.36	6.33	5.50	–31.0	–13.1	NA	NA
GHG emissions without LULUCF per GDP unit (kg CO <sub>2</sub> eq per 2011 USD using PPP)	NE	NE	NE	NE	NE	NA	NA	NA	NA

Source: GHG emission data: Liechtenstein's 2016 annual inventory submission, version 3.

Note: The ratios per capita as well as the changes in emissions and the shares by sector are calculated relative to total GHG emissions without LULUCF using the exact (not rounded) values, and may therefore differ from the ratio calculated with the rounded numbers provided in the table.

Abbreviations: GDP = gross domestic product, GHG = greenhouse gas, IPPU = industrial processes and product use, LULUCF = land use, land-use change and forestry, NA = not applicable, NE = not estimated, NO = not occurring, PPP = purchasing power parity.

## B. Assumptions, conditions and methodologies related to the attainment of the quantified economy-wide emission reduction target

10. In its BR2 and CTF tables 2(a)–(f), Liechtenstein reported a description of its target, including associated conditions and assumptions. CTF tables 2(a)–(f) contain the required information in relation to the description of the Party's emission reduction target. Further information on the target and the assumptions, conditions and methodologies related to the target is provided in chapter 3 of the BR2.

11. For Liechtenstein, the Convention entered into force on 20 September 1994. Under the Convention, Liechtenstein made a commitment to reduce its GHG emissions by 20.0 per cent by 2020 below the 1990 level. This target includes GHGs included in the UNFCCC Annex I inventory reporting guidelines, namely CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, HFCs, PFCs and SF<sub>6</sub>. It also includes all Intergovernmental Panel on Climate Change (IPCC) sources and sectors included in the annual GHG inventory. The global warming potential (GWP) values used are those from the IPCC Fourth Assessment Report (AR4). Emissions and removals from the LULUCF sector are included in the target and accounted using a land-based approach.

12. Liechtenstein reported that it plans to make use of units generated from the market-based mechanisms under the Kyoto Protocol and from the new market-based mechanisms under the Convention, as well as units carried over from the first commitment period of the Kyoto Protocol to achieve its target. In CTF table 2(e)I, Liechtenstein provided information on the scale of the contribution from market-based mechanisms and carry-over units for the period 2013–2020, which combined equals 212.98 kt CO<sub>2</sub> eq. In absolute terms and on the basis of the 2016 annual inventory submission, this means that under the Convention,

Liechtenstein has to reduce emissions from 229.03 kt CO<sub>2</sub> eq (in the base year)<sup>3</sup> to 183.23 kt CO<sub>2</sub> eq by 2020.

## **C. Progress made towards the achievement of the quantified economy-wide emission reduction target**

13. This chapter provides information on the review of the reporting by Liechtenstein on the progress made in reducing emissions in relation to the target, mitigation actions taken to achieve its target, and the use of units from market-based mechanisms and LULUCF.

### **1. Mitigation actions and their effects**

14. In its BR2 and CTF table 3, Liechtenstein reported on its progress in the achievement of its target and the mitigation actions implemented and planned to achieve its target. Liechtenstein stated in the BR2 that there have been no new PaMs implemented since its NC6/BR1. CTF table 3 includes information on mitigation actions organized by sector and by gas. Further information on the mitigation actions related to the Party's target is provided in chapter 4 of the BR2 (see table 4-1). The ERT noted that the mitigation actions and their impacts presented in table 4-1 of the BR2 are not consistent with those presented in CTF table 3.

15. In addition, the ERT considers that the information on mitigation impacts presented in CTF table 3 and table 4-1 of the BR2, which includes updated estimates of the mitigation impacts, is not entirely consistent. During the review, in response to a question raised by the ERT, Liechtenstein explained that CTF table 3 includes only the PaMs for which mitigation impacts could be quantified and that they are expressed as a total reduction until 2020. However, it is not clear if these reductions were estimated as a difference between the 'without measures' and the 'with measures' (WEM) scenarios in 2020 or as reductions in 2020 in comparison with the 2008 emission level as reported in table 5-1 of the BR2. The ERT recommends that Liechtenstein improve the transparency of its reporting by providing more detailed and consistent information on the approach and methods used in estimating mitigation impacts for the mitigation actions listed in CTF table 3 and table 4-1 of the BR2, in its next BR.

16. The ERT noted that for most of the mitigation actions reported in table 4-1 of the BR2, Liechtenstein did not provide an estimation of mitigation impacts nor did it provide explanations as to why they were not estimated. During the review, in response to a question raised by the ERT, Liechtenstein explained that these estimates were not provided because target values for PaMs were not defined and that for some PaMs mitigation impacts are considered not to be a primary objective but as a side effect of their implementation. To enhance the transparency of reporting, the ERT recommends that Liechtenstein, in its next BR, estimate the impacts of the mitigation actions that are reported in table 4-1 of the BR2 and include them in CTF table 3, or explain in the BR in more detail the reasons why those impacts could not be estimated, in line with the additional information provided during the review.

17. While the BR2 provides some information on the planned measures required by the UNFCCC reporting guidelines on BRs in the chapter on projections, CTF table 3 does not include the planned measures, such as environmental levies, direct payments for agriculture and others included in the 'with additional measures' (WAM) scenario. To improve the transparency of its reporting, the ERT recommends that Liechtenstein list the planned

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<sup>3</sup> Liechtenstein chose 1990 as the base year for its 2020 target. The emission level in the base year is calculated based on the 2016 annual inventory submission.

measures in CTF table 3 alongside the implemented and adopted measures, and include the corresponding descriptions as well as their emission estimates, if available. The ERT also suggests that Liechtenstein enhance the transparency of its reporting by providing more consistent information between the PaMs and projections chapters of its next BR.

18. The BR2 highlights the information provided during the review of Liechtenstein's NC6/BR1 concerning the Party's domestic institutional arrangements and indicates that no changes were made in its domestic institutional arrangements, including institutional, legal, administrative and procedural arrangements used for domestic compliance, monitoring, reporting, archiving of information and evaluation of the progress made towards its target since the NC6/BR1.

19. However, the ERT noted that the information on institutional arrangements to evaluate the progress made provided in Liechtenstein's NC6/BR1, as well as in the BR2, is not sufficiently transparent. The BR2 indicates that Liechtenstein's main legislative and administrative arrangements for meeting its current commitments under the Kyoto Protocol are to be found in the Emissions Trading Act and the CO<sub>2</sub> Act, but a summary of the key information is not provided, in particular information concerning the responsibilities and roles of the institutions involved in the monitoring, reporting, archiving of information and evaluation of compliance and progress. During the review, in response to a question raised by the ERT, Liechtenstein explained that the Party accounts annually for the annual inventory submission, which serves as a monitoring tool for the progress made in reaching the target. The annual publication of Liechtenstein's energy statistics, provided by the Office of Statistics, serves as a monitoring tool to evaluate the effect of the policies in the energy sector. Based on the Energy Strategy 2020, the Government of Liechtenstein has set up an administrative body responsible for the implementation and monitoring of measures established under the Energy Strategy 2020. The ERT recommends that Liechtenstein improve the transparency of its reporting by providing information on its domestic institutional arrangements, including institutional, legal, administrative and procedural arrangements used for domestic compliance, monitoring, reporting, archiving of information and evaluation of the progress made towards its target, in its next BR.

20. The BR2 does not include the information required by the UNFCCC reporting guidelines on BRs on the assessment of the economic and social consequences of response measures and arrangements and rules for assessment of compliance. During the review, in response to a question raised by the ERT, Liechtenstein explained that the PaMs proposed in the Energy Strategy 2020 were assessed by all ministries which also took into account the economic and social consequences of those mitigation actions. The ERT reiterates the encouragement made in the report of the technical review of the BR1 that Liechtenstein enhance the transparency of its reporting by providing this information, to the extent possible, in its next BR.

21. The BR2 does not include the information required by the UNFCCC reporting guidelines on BRs on the domestic arrangements established specifically for the process of self-assessment of compliance, other than a general explanation of institutional arrangements, or on the progress made in the establishment of national rules for taking local action against non-compliance with emission reduction targets. The ERT encourages Liechtenstein to provide information on domestic arrangements for the process of self-assessment of compliance with emission reductions required by science and national rules for taking local action against non-compliance with emission reduction targets in its next BR, to the extent possible, in order to enhance the completeness of its reporting.

22. The key overarching policy reported in the BR2 is the Energy Strategy 2020, which was adopted by the Government of Liechtenstein in 2012 and has the same objectives as the European Union's climate and energy package from 2008. This strategy sets the framework and direction for future climate policy and is aimed at putting Liechtenstein on



the path towards reaching its emission reduction target for 2020. During the review, Liechtenstein explained that the Energy Strategy 2020 will be updated and evaluated during 2016, subject to a decision by the Government of Liechtenstein. The key objectives of the strategy until 2020 are to: increase the share of renewable energy from 8.0 per cent in 2008 to 20.0 per cent of total energy use in 2020; increase energy efficiency to 20.0 per cent in order to stabilize energy consumption at the 2008 level by 2020; and reduce CO<sub>2</sub> emissions by 20.0 per cent by 2020. The mitigation effect of the Energy Strategy 2020 is the most significant, expected to lead to a reduction in GHG emissions of about 13.0 per cent in 2020 compared with the 1990 level.

23. Two other important existing legal instruments are the Energy Efficiency Act for buildings and the Emissions Trading Act. While Liechtenstein’s legal framework requires its Government to focus on domestic GHG reductions, Liechtenstein intends to use market-based mechanisms to reach its 2020 emission reduction target, as needed.

24. Table 3 below provides a concise summary of the key mitigation actions and some estimates of their mitigation effects reported by Liechtenstein to achieve its target.

Table 3  
**Summary of information on mitigation actions and their impacts reported by Liechtenstein**

<i>Sector affected</i>	<i>List of key mitigation actions</i>	<i>Estimate of mitigation impact by 2020 (kt CO<sub>2</sub> eq)</i>
Energy, including:	Energy Strategy 2020	
Buildings		38.1
Transport		8.2
Processes and machines		11.3
Energy production and supply		4.5

*Note:* The estimates of mitigation impact are estimates of emissions of carbon dioxide equivalent reduced in 2020 compared with the 2008 level as a result of the implementation of Liechtenstein’s Energy Strategy 2020, as reported in CTF table 3.

25. Liechtenstein will use carbon credits generated from the market-based mechanisms of the Kyoto Protocol and from new market-based mechanisms under the Convention in order to achieve its target. Liechtenstein has not yet calculated the exact amount of carbon credits required because the Government first must finalize further estimations and projections based on the effective implementation of policy measures that have been proposed in the Energy Strategy 2020. Also, the ERT noted that Liechtenstein will use a limited amount of its own assigned amount units from the first commitment period of the Kyoto Protocol that are to be carried over to the second commitment period.

26. In April 2015, Liechtenstein submitted its intended nationally determined contribution (INDC), which aims for a 40.0 per cent emission reduction below the 1990 level by 2030, subject to the approval of the Parliament of Liechtenstein. In order to forge the path towards the fulfilment of Liechtenstein’s INDC, the Government passed a revised climate strategy in September 2015 that provides a policy framework for energy, infrastructure, transport, agriculture, forestry and the environment. Based on this framework, new measures will be implemented and existing measures may be extended. Liechtenstein envisages enacting its targets for 2030 into national law and ratifying the

Paris Agreement. Liechtenstein also envisages making use of the mechanisms described in Article 6 of the Paris Agreement to meet its emission reduction target in 2030.

## 2. Estimates of emission reductions and removals and the use of units from the market-based mechanisms and land use, land-use change and forestry

27. Liechtenstein reported in its BR2 and CTF tables 4, 4(a)I, 4(a)II and 4(b) its use of units from market-based mechanisms under the Convention and the contribution of LULUCF to achieving its target. This information was provided for the base year (1990) and each reported year, such as 2010–2013. Further relevant information on emissions and removals and the use of units is provided in chapter 4 of the BR2.

28. For 2013, Liechtenstein reported in CTF table 4 annual total GHG emissions excluding LULUCF of 236.53 kt CO<sub>2</sub> eq, or 3.1 per cent above the 1990 level.

29. On its use of units from LULUCF activities, Liechtenstein reported in CTF tables 4 and 4(a) that in 2012 and 2013 the LULUCF sector resulted in net emissions of 11.75 kt CO<sub>2</sub> eq and 11.73 kt CO<sub>2</sub> eq, thus contributing 4.9 and 4.7 per cent of Liechtenstein's total GHG emissions, respectively. Liechtenstein reported that it intends to use units from market-based mechanisms under the Kyoto Protocol. It reported in CTF tables 4 and 4(b) that it used units from market-based mechanisms in 2012 and 2013 towards the achievement of its 2020 target in the amount of 14.17 and 51.71 kt CO<sub>2</sub> eq, respectively. Table 4 below illustrates Liechtenstein's total GHG emissions, the contribution of LULUCF and the use of units from market-based mechanisms to achieve its target.

Table 4

### Summary of information on the use of units from market-based mechanisms and land use, land-use change and forestry as part of the reporting on the progress made by Liechtenstein towards the achievement of its target

<i>Year</i>	<i>Emissions excluding LULUCF (kt CO<sub>2</sub> eq)</i>	<i>Contribution from LULUCF (kt CO<sub>2</sub> eq)</i>	<i>Emissions including contribution from LULUCF (kt CO<sub>2</sub> eq)</i>	<i>Use of units from market-based mechanisms (kt CO<sub>2</sub> eq)</i>
1990	229.39	4.58	233.97	NA
2010	233.71	14.81	248.52	18.50
2011	220.61	11.55	232.16	4.99
2012	230.31	11.75	242.06	14.17
2013	236.53	11.73	248.26	51.71

*Sources:* Liechtenstein's second biennial report and common tabular format tables 1, 4, 4(a)I, 4(a)II and 4(b).

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

30. To assess the progress towards the achievement of the 2020 target, the ERT noted that Liechtenstein's emission reduction target under the Convention is 20.0 per cent below the 1990 level (see para. 11 above). As discussed in chapter II.B above, in 2013 Liechtenstein's annual total GHG emissions excluding LULUCF were 2.4 per cent (5.54 kt CO<sub>2</sub> eq) above the base year level. In addition, the ERT noted that in 2013 the contribution from LULUCF resulted in net emissions amounting to 11.73 kt CO<sub>2</sub> eq, and the use of market-based mechanisms was 51.71 kt CO<sub>2</sub> eq to achieve the target.

31. The ERT noted that Liechtenstein is making progress towards its emission reduction target by implementing mitigation actions and by using units from the market-based mechanisms under the Convention which were offsetting 21.0 per cent of Liechtenstein's

total GHG emissions including LULUCF in 2013; however, on the basis of the results of the projections (see para. 41 below), the ERT also noted that the Party may face challenges if only existing PaMs are to be implemented by 2020. Concerning this, Liechtenstein indicated in the BR2 that it plans to use units from market-based mechanisms in achieving its emission reduction target.

### 3. Projections

32. Liechtenstein reported in its BR2 and CTF table 6(a) updated projections for 2020 and 2030 relative to actual inventory data for 2013 under the WEM scenario. Projections are presented on a sectoral basis using the same sectoral categories as used in the chapter on mitigation actions and partially on a gas-by-gas basis for the following GHGs: CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, PFCs, HFCs and SF<sub>6</sub> (see para. 34 below). Projections are also provided in an aggregated format for each sector as well as for a Party total, using GWP values from the IPCC AR4. Emission projections related to fuel sold to ships and aircraft engaged in international transport were not reported and were not included in the totals as neither aviation nor maritime transport occur in Liechtenstein. Further information on the projections is provided in chapter 5 of the BR2.

33. The ERT noted that relevant information on factors and activities influencing emissions for each sector was not provided in the BR2 and therefore recommends that Liechtenstein provide this information in its next BR to enhance the completeness of its reporting.

34. The ERT also noted that projections of CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O emissions from LULUCF in CTF table 6(a) were reported as “not estimated” (NE), which consequently resulted in inaccurate total GHG emissions including LULUCF. The ERT also noted that the BR2 in tables 5-2, 5-3 and 5-4 contains information on these emission projections by gas. To enhance the transparency of its reporting, the ERT recommends that Liechtenstein provide emission projections by gas including emissions from LULUCF in CTF table 6(a) for 2020 and 2030 in its next BR.

35. In addition to the WEM scenario, Liechtenstein reported in its BR2 the WAM scenario. The projections are presented by sector and by gas in the same way as for the WEM scenario for the period 1990–2030. The ERT noted that the BR2 and CTF table 5 do not include the information required by the UNFCCC reporting guidelines on BRs on the changes since the submission of the Party’s NC6/BR1 in the assumptions, methodologies, models and approaches used and on the key variables used in the preparation of the projection scenarios. To improve the completeness of its reporting, the ERT encourages Liechtenstein to provide information on all key assumptions, methodologies and models used in the preparation of the projection scenarios and to report information on the sensitivity analysis for the projections in its next BR.

36. During the review, in response to a question raised by the ERT, Liechtenstein provided additional information on its projections, elaborating on the assumptions used in the analysis of historical and projected employment rates. The Party explained that gross domestic product (GDP) and world oil prices are not considered as relevant indicators in the projection analysis, given the fact that about the half of the working population do not reside in Liechtenstein and that electricity is the main source of energy in the country; therefore, GDP and world oil prices do not reflect the country’s actual situation.

37. While Liechtenstein included a WAM scenario in its BR2, it did not include this scenario in CTF table 6(c). To increase the transparency of its reporting, the ERT encourages Liechtenstein to include information on its WAM scenario in CTF table 6(c) in its next BR.

### Overview of projection scenarios

38. The WEM scenario reported by Liechtenstein includes implemented and adopted PaMs up to 2013. The starting point for Liechtenstein's projections is the Energy Strategy 2020, adopted by the Government of Liechtenstein in 2012, which describes three energy scenarios to 2020. Two of these scenarios have been used for Liechtenstein's WEM and WAM emission projections.

### Methodology and changes since the previous submission

39. The methodology used in the BR2 is identical to that used for the preparation of the emission projections for the NC6/BR1. According to the information provided in the NC6/BR1, to prepare its projections, Liechtenstein relied on the latest emission, energy use and population trend data available for Liechtenstein and on the energy scenarios provided by Liechtenstein's Energy Strategy 2020 and emissions avoided resulting from PaMs implemented in the country. In addition, comparisons and analogies with the projections and assumptions developed for Switzerland are used by Liechtenstein in deriving its own emission projections for emissions from other sectors.

### Results of projections

40. Liechtenstein's total GHG emissions excluding LULUCF in 2020 and 2030 are projected to be 194.00 and 177.00 kt CO<sub>2</sub> eq, respectively, under the WEM scenario, which is a decrease of 15.4 and 22.9 per cent, respectively, below the 1990 level. Under the WAM scenario, emissions in 2020 and 2030, amounting to around 161.00 and 141.00 kt CO<sub>2</sub> eq, respectively, are projected to be lower than those in 1990 by 29.8 and 38.6 per cent, respectively.

41. The 2020 projections under the WEM scenario suggest that Liechtenstein may face challenges to achieve its 2020 target under the Convention (see para. 11 above). However, under the WAM scenario, Liechtenstein is expected to meet and exceed the 2020 target, with projected emissions in 2020 being 29.8 per cent lower than in 1990.

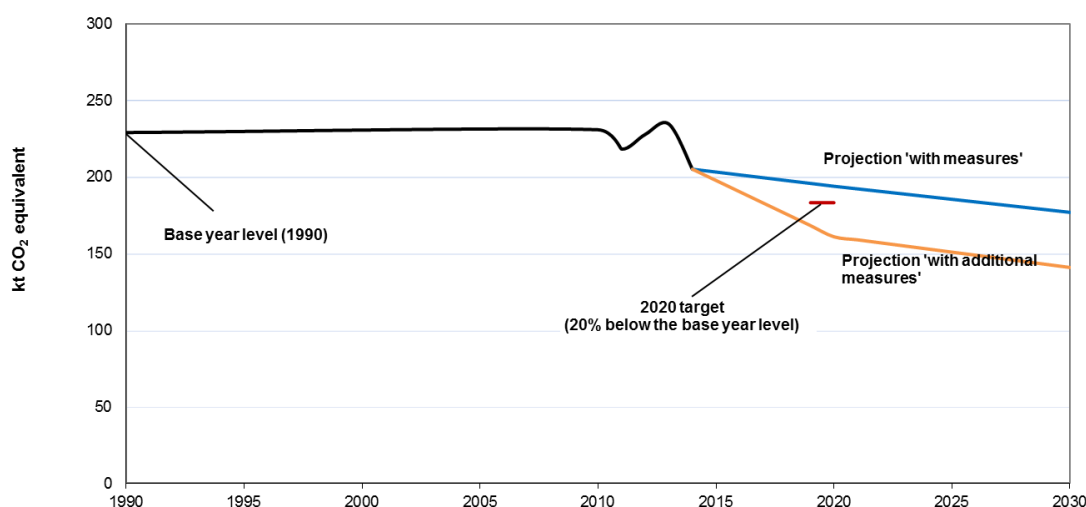
42. According to the projections reported by sector, the most significant GHG emission reductions under the WEM scenario from 1990 to 2020 and 2030 will occur in the energy sector, including transport (41.60 kt CO<sub>2</sub> eq or 20.6 per cent for 2020 and 57.30 kt CO<sub>2</sub> eq or 28.4 per cent for 2030), followed by the agriculture sector (3.20 kt CO<sub>2</sub> eq or 12.5 per cent for both 2020 and 2030). GHG emissions are projected to increase in the industrial processes and product use sector approximately 21-fold by 2020 and 17-fold by 2030 compared with the 1990 level, owing mainly to increasing F-gas emissions.

43. In 2020, under the WEM scenario, the most significant reductions are projected for CO<sub>2</sub>, N<sub>2</sub>O and CH<sub>4</sub> emissions: 41.91 kt CO<sub>2</sub> eq (21.0 per cent), 1.44 kt CO<sub>2</sub> eq (13.2 per cent) and 1.37 kt CO<sub>2</sub> eq (7.2 per cent) between 1990 and 2020, respectively. By 2030, under the same scenario, the most significant reduction below the 1990 level is projected for CO<sub>2</sub> emissions, followed by N<sub>2</sub>O and CH<sub>4</sub>: 57.53 kt CO<sub>2</sub> eq (28.9 per cent), 1.31 kt CO<sub>2</sub> eq (12.0 per cent) and 1.19 kt CO<sub>2</sub> eq (6.2 per cent), respectively.

44. If additional measures are considered (i.e. under the WAM scenario), the patterns of emission reductions by 2020 presented by sector and gas remain the same since the WAM scenario was prepared based on the theoretical potentials of PaMs included in the WEM scenario (a multiplication factor of 1.56 was applied for each individual PaM); the most significant GHG emission reductions will occur in the energy sector, including transport (74.28 kt CO<sub>2</sub> eq or 36.8 per cent), followed by the agriculture sector (3.20 kt CO<sub>2</sub> eq or 12.5 per cent).

45. The projected emission levels under the different scenarios and Liechtenstein's quantified economy-wide emission reduction target are presented in the figure below.

#### Greenhouse gas emission projections by Liechtenstein



Sources: (1) Data for the years 1990–2014: Liechtenstein's 2016 annual inventory submission, version 3; total GHG emissions excluding land use, land-use change and forestry; (2) Data for the years 2014–2030: Liechtenstein's second biennial report; total GHG emissions excluding land use, land-use change and forestry.

Abbreviation: GHG = greenhouse gas.

#### D. Provision of financial, technological and capacity-building support to developing country Parties

46. Liechtenstein is not a Party included in Annex II to the Convention and is therefore not obliged to adopt measures and fulfil obligations as defined in Article 4, paragraphs 3, 4 and 5, of the Convention. However, as reported in its BR2, Liechtenstein provided information on its provision of support to developing country Parties. The ERT commends Liechtenstein for reporting this information and suggests that it continue to do so in future BRs.

47. As reported in the BR2, Liechtenstein has provided more than USD 1.5 million of climate finance since 2011. In 2015, the Parliament of Liechtenstein decided to give permanence to a 2010 climate finance commitment for new and additional funds, and integrated climate finance into the regular budget of its International Humanitarian Cooperation and Development. As a result, Liechtenstein expects to support climate-related projects with at least USD 200,000 annually, starting from 2016. The funds are intended to address both mitigation and adaptation, to reflect developing countries' priorities on an as-needs basis and to focus on the most vulnerable countries.

48. As an Alpine country, Liechtenstein particularly supports technology transfer under the umbrella of the Alpine Convention, partnering in this endeavour with mountainous regions of the Balkans, the Carpathians, the Caucasus and Central Asia.

### III. Conclusions

49. The ERT conducted a technical review of the information reported in the BR2 and CTF tables of Liechtenstein in accordance with the UNFCCC reporting guidelines on BRs. The ERT concludes that the reported information is mostly in adherence with the UNFCCC reporting guidelines on BRs and provides an overview on: emissions and removals related to the Party's quantified economy-wide emission reduction target; assumptions, conditions and methodologies related to the attainment of the target; and progress made by Liechtenstein in achieving its target.

50. Liechtenstein's total GHG emissions excluding LULUCF related to its quantified economy-wide emission reduction target were estimated to be 10.5 per cent below its 1990 level, whereas total GHG emissions including LULUCF were 7.3 per cent below its 1990 level for 2014. The emission decrease was driven mainly by the decrease of fossil fuel consumption, especially in the residential, commercial and institutional subsectors.

51. Under the Convention, Liechtenstein committed itself to achieving a quantified economy-wide emission reduction target of 20.0 per cent by 2020 below the 1990 level. This target covers the following GHGs: CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, HFCs, PFCs and SF<sub>6</sub>, expressed using GWP values from the IPCC AR4, and covers all sources and sectors included in the annual GHG inventory. Emissions and removals from the LULUCF sector are included in the target. Liechtenstein reported that it plans to make use of market-based mechanisms to achieve its target. In absolute terms, this means that under the Convention, Liechtenstein has to reduce emissions from 229.03 kt CO<sub>2</sub> eq (in the base year (1990)) to 183.23 kt CO<sub>2</sub> eq by 2020. Liechtenstein has indicated that it may increase this target to 30.0 per cent subject to other developed countries making comparable emission reduction efforts and the more advanced developing countries taking appropriate mitigation actions. In April 2014, the Government of Liechtenstein decided not to increase its ambition over the communicated commitment of an emission reduction target of 20.0 per cent by 2020 below the 1990 level.

52. Liechtenstein's main policy framework relating to energy and climate change is the Energy Strategy 2020 adopted by the Government of Liechtenstein in 2012. Two other important existing legal instruments are the Energy Efficiency Act for buildings and the Emissions Trading Act. The mitigation actions with the most significant mitigation impact are those in the energy sector, namely: energy efficiency and the use of renewable energy in buildings and industrial processes and machines.

53. For 2013, Liechtenstein reported in CTF table 4 total GHG emissions excluding LULUCF at 236.53 kt CO<sub>2</sub> eq, or 3.1 per cent above the 1990 level. Liechtenstein reported on its use of the units from the market-based mechanisms and on the contribution of LULUCF to achieve its target.

54. The GHG emission projections provided by Liechtenstein in its BR2 include those for the WEM and WAM scenarios. Under these two scenarios, emissions are projected to be 15.4 and 29.8 per cent below the 1990 level in 2020, respectively. On the basis of the reported information, the ERT concluded that Liechtenstein may face challenges to achieve its 2020 target under the WEM scenario and will probably need to make use of market-based mechanisms to do so, while it could surpass the target if additional PaMs are implemented under the WAM scenario.

55. Liechtenstein is not a Party included in Annex II to the Convention and is therefore not obliged to adopt measures and fulfil obligations as defined in Article 4, paragraphs 3, 4 and 5, of the Convention. However, in its BR2, Liechtenstein provided information on its provision of support to developing country Parties. Since 2011, Liechtenstein has provided more than USD 1.5 million of climate finance. Liechtenstein also supports technology

transfer, particularly under the umbrella of the Alpine Convention, partnering in this endeavour with mountainous regions of the Balkans, the Carpathians, the Caucasus and Central Asia.

56. In the course of the review, the ERT formulated the following recommendations for Liechtenstein to improve its adherence to the UNFCCC reporting guidelines on BRs in its next BR:<sup>4</sup>

- (a) Improve the completeness of its reporting by:
  - (i) Reporting any changes in the national inventory arrangements or lack thereof (see para. 7 above);
  - (ii) Providing relevant information on factors and activities influencing emissions for each sector (see para. 33 above);
- (b) Improve the transparency of its reporting by:
  - (i) Providing more detailed and consistent information on the approach and methods used in estimating mitigation impacts for the mitigation actions listed in CTF table 3 and table 5-1 of the BR2 (see para. 15 above);
  - (ii) Estimating the impacts of the mitigation actions that are not reported in table 4-1 of the BR2 and include them in CTF table 3, or providing a detailed explanation of why those impacts could not be estimated (see para. 16 above);
  - (iii) Listing the planned measures in CTF table 3 alongside the implemented and adopted measures, including descriptions as well as emission estimates, if available (see para. 17 above);
  - (iv) Providing further information on its domestic institutional arrangements, including institutional, legal, administrative and procedural arrangements used for domestic compliance, monitoring, reporting, archiving of information and evaluation of the progress made towards the target (see para. 19 above);
  - (v) Providing emission projections by gas including emissions from LULUCF in CTF table 6(a) for 2020 and 2030 (see para. 34 above);
- (c) Improve the timeliness of its reporting by submitting its next BR on time (see para. 4 above).

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<sup>4</sup> The recommendations are given in full in the relevant chapters of this report.

## Annex

### Documents and information used during the review

#### A. Reference documents

“UNFCCC biennial reporting guidelines for developed country Parties”. Annex to decision 2/CP.17. Available at

<<http://unfccc.int/resource/docs/2011/cop17/eng/09a01.pdf#page=4>>.

“Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual greenhouse gas inventories”. Annex to decision 24/CP.19. Available at

<<http://unfccc.int/resource/docs/2013/cop19/eng/10a03.pdf#page=2>>.

“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 technical review of information reported under the Convention related to greenhouse gas inventories, biennial reports and national communications by Parties included in Annex I to the Convention”. Annex to decision 13/CP.20. Available at

<<http://unfccc.int/resource/docs/2014/cop20/eng/10a03.pdf>>.

FCCC/ARR/2014/LIE. Report on the individual review of the annual submission of Liechtenstein submitted in 2014. Available at

<<http://unfccc.int/resource/docs/2015/arr/lie.pdf>>.

FCCC/IDR.6/LIE. Report of the technical review of the sixth national communication of Liechtenstein. Available at <<http://unfccc.int/resource/docs/2015/idr/lie06.pdf>>.

FCCC/TRR.1/LIE. Report of the technical review of the first biennial report of Liechtenstein. Available at <<http://unfccc.int/resource/docs/2015/trr/lie01.pdf>>.

2015 greenhouse gas inventory submission of Liechtenstein. Available at <[http://unfccc.int/national\\_reports/annex\\_i\\_ghg\\_inventories/national\\_inventories\\_submissions/items/8812.php](http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/8812.php)>.

2016 greenhouse gas inventory submission of Liechtenstein. Available at <[http://unfccc.int/national\\_reports/annex\\_i\\_ghg\\_inventories/national\\_inventories\\_submissions/items/9492.php](http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/9492.php)>.

Sixth national communication of Liechtenstein. Available at

<[http://unfccc.int/files/national\\_reports/annex\\_i\\_natcom/submitted\\_natcom/application/pdf/nc6\\_br1\\_lie\[1\].pdf](http://unfccc.int/files/national_reports/annex_i_natcom/submitted_natcom/application/pdf/nc6_br1_lie[1].pdf)>.

First biennial report of Liechtenstein. Available at

<[http://unfccc.int/files/national\\_reports/annex\\_i\\_natcom/submitted\\_natcom/application/pdf/nc6\\_br1\\_lie\[1\].pdf](http://unfccc.int/files/national_reports/annex_i_natcom/submitted_natcom/application/pdf/nc6_br1_lie[1].pdf)>.

Common tabular format tables of the first biennial report of Liechtenstein. Available at

<[http://unfccc.int/files/national\\_reports/biennial\\_reports\\_and\\_iar/submitted\\_biennial\\_report/application/pdf/lie\\_2014\\_v1.0.pdf](http://unfccc.int/files/national_reports/biennial_reports_and_iar/submitted_biennial_report/application/pdf/lie_2014_v1.0.pdf)>.



Second biennial report of Liechtenstein. Available at  
<[http://unfccc.int/files/national\\_reports/biennial\\_reports\\_and\\_iar/submitted\\_biennial\\_reports/application/pdf/br2\\_lie\\_submission.pdf](http://unfccc.int/files/national_reports/biennial_reports_and_iar/submitted_biennial_reports/application/pdf/br2_lie_submission.pdf)>.

Common tabular format tables of the second biennial report of Liechtenstein. Available at  
<[http://unfccc.int/files/national\\_reports/biennial\\_reports\\_and\\_iar/submitted\\_biennial\\_reports/application/pdf/lie\\_2016\\_v3.0\\_formatted.pdf](http://unfccc.int/files/national_reports/biennial_reports_and_iar/submitted_biennial_reports/application/pdf/lie_2016_v3.0_formatted.pdf)>.

## **B. Additional information used during the review**

Responses to questions during the review were received from Ms. Heike Summer (Office of Environment).

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