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Report on the technical review of the fourth biennial report of Liechtenstein

Developed country Parties were requested by decision 2/CP.17 to submit their fourth biennial report to the secretariat by 1 January 2020. This report presents the results of the technical review of the fourth 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". The review took place from 1 to 5 March 2021 remotely.

* Reissued for technical reasons on 17 June 2021.

Contents

Abbreviations and acronyms

Annex II Party	Party included in Annex II to the Convention
AR	Assessment Report of the Intergovernmental Panel on Climate Change
BR	biennial report
CH_4	methane
CO_2	carbon dioxide
CO_2 eq	carbon dioxide equivalent
CTF	common tabular format
ERT	expert review team
GHG	greenhouse gas
GWP	global warming potential
HFC	hydrofluorocarbon
IPPU	industrial processes and product use
LULUCF	land use, land-use change and forestry
NA	not applicable
NC	national communication
NF_3	nitrogen trifluoride
NO	not occurring
N_2O	nitrous oxide
PaMs	policies and measures
PFC	perfluorocarbon
SF_6	sulfur hexafluoride
UNFCCC reporting guidelines on BRs	“UNFCCC biennial reporting guidelines for developed country Parties”
UNFCCC reporting guidelines on NCs	“Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part II: UNFCCC reporting guidelines on national communications”
WAM	‘with additional measures’
WEM	‘with measures’
WOM	‘without measures’

I. Introduction and summary

A. Introduction

1. This is a report on the centralized technical review of the BR4[1] 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).

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

3. The review was conducted together with the review of one other Party included in Annex I to the Convention from 1 to 5 March 2021 remotely[2] by the following team of nominated experts from the UNFCCC roster of experts: Aba Amissah Gyasi (Ghana), Violeta Hristova (Bulgaria), Adriano Santhiago de Oliveira (Brazil), Koen E. L. Smekens (Belgium), Despoina Maria Vlachaki (Greece) and Benon Bibbu Yassin (Malawi). Mr. Santhiago de Oliveira and Mr. Smekens were the lead reviewers. The review was coordinated by Karin Simonson and Sina Wartmann (secretariat).

B. Summary

4. The ERT conducted a technical review of the information reported in the BR4 of Liechtenstein in accordance with the UNFCCC reporting guidelines on BRs (annex I to decision 2/CP.17).

1. Timeliness

5. The BR4 was submitted on 29 December 2019, before the deadline of 1 January 2020 mandated by decision 2/CP.17. The BR4 CTF tables were submitted on 30 December 2019.

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

6. Liechtenstein made efforts to improve its reporting in the BR4 by addressing the recommendations and encouragements from the previous review report. The ERT noted that the Party had improved the completeness of the information on progress in achieving targets related to GHG emission projections by:

(a) Including a WAM scenario;

(b) Presenting emissions from the energy sector excluding transport in CTF tables 6(a) and 6(c);

(c) Providing additional information on models and tools used;

(d) Reporting on the main differences in assumptions, methods and results between the projections reported in the BR4 and those reported in previous submissions.

7. Issues and gaps identified by the ERT related to the reported information are presented in table 1. The information reported by Liechtenstein in its BR4 partially adheres to the UNFCCC reporting guidelines on BRs.

[1] The BR submission comprises the text of the report and the CTF tables, which are both subject to the technical review.

[2] Owing to the circumstances related to the coronavirus disease 2019, the technical review of the BR submitted by Liechtenstein had to be conducted remotely.

Table 1
Summary of completeness and transparency of mandatory information reported by Liechtenstein in its fourth biennial report

Section of BR	*Completeness*	*Transparency*	*Reference to description of recommendation(s)*
GHG emissions and removals	Complete	Transparent	–
Quantified economy-wide emission reduction target and related assumptions, conditions and methodologies	Complete	Transparent	–
Progress in achievement of targets	Mostly complete	Mostly transparent	Issue 2 in table 4 Issues 1–2 in table 6 Issues 1 and 3 in table 10
Provision of support to developing country Parties[a]	NA	NA	NA

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

[a] Liechtenstein is not an Annex II Party and is therefore not obliged to adopt measures and fulfil obligations defined in Article 4, paras. 3–5, of the Convention.

II. Technical review of the information reported in the fourth biennial report

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

1. Technical assessment of the reported information

8. Total GHG emissions[3] excluding emissions and removals from LULUCF decreased by 15.4 per cent between 1990 and 2017, whereas total GHG emissions including net emissions or removals from LULUCF decreased by 13.5 per cent over the same period. Emissions peaked in 2006 and decreased thereafter. The most important drivers were fuel prices and winter temperatures (heating degree days), which influence the sources that contribute a large share of CO_2 emissions from fuel combustion (1.A), that is categories 1.A.2 (manufacturing industries and construction), 1.A.3 (transport) and 1.A.4 (other sectors). The decrease in total emissions was driven mainly by factors such as fuel prices (influenced by, inter alia, the CO_2 levy on fuels) and the intensified efforts to reduce fuel combustion activities in the energy sector, particularly in the categories transport and other sectors.

9. Table 2 illustrates the emission trends by sector and by gas for Liechtenstein. Note that information in this paragraph and table 2 is based on Liechtenstein's 2020 annual submission, version 1.0, which has not yet been subject to review. All emission data in subsequent chapters are based on Liechtenstein's BR4 CTF tables unless otherwise noted. The emissions reported in the 2020 annual submission are the same as those reported in CTF table 1.

[3] 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.

Table 2
Greenhouse gas emissions by sector and by gas for Liechtenstein for 1990–2018

	GHG emissions (kt CO_2 eq)					*Change (%)*		*Share (%)*	
	1990	*2000*	*2010*	*2017*	*2018*	*1990–2018*	*2017–2018*	*1990*	*2018*
Sector									
1. Energy	–201.06	–219.77	–193.34	–158.60	–146.08	–27.3	–11.0	–88.0	–80.7
A1. Energy industries	–0.18	–2.77	–3.26	–2.12	–2.18	1 139.8	–3.0	–0.1	–1.2
A2. Manufacturing industries and construction	–36.32	–36.45	–26.10	–27.79	–24.73	–31.9	–11.6	–15.9	–13.7
A3. Transport	–76.64	–91.29	–77.63	–61.11	–59.30	–22.6	–11.6	–33.6	–32.7
A4. and A5. Other	–87.55	–88.43	–85.21	–66.39	–58.69	–33.0	–	–38.3	–32.4
B. Fugitive emissions from fuels	–0.36	–0.83	–1.13	–1.18	–1.17	–221.6	–0.6	–0.2	–0.6
C. CO_2 transport and storage	NO	NO	NO	NO	NO	–	–	–	–
2. IPPU	–0.65	–4.64	–10.16	–11.09	–10.35	1 484.5	–6.7	–0.3	–5.7
3. Agriculture	–24.91	–20.92	–23.74	–23.29	–23.68	–4.9	–1.7	–10.9	–13.1
4. LULUCF	–6.95	–24.82	–20.25	–10.55	–21.93	–215.5	–107.9	NA	NA
5. Waste	–1.77	–1.79	–1.78	–1.02	–0.97	–45.4	–5.0	–0.8	–0.5
6. Other[a]	NO	NO	NO	NO	NO	–	–	–	–
Gas[b]									
CO_2	–198.97	–216.85	–190.81	–156.28	–143.75	–27.8	–8.0	–87.1	–79.4
CH_4	–19.25	–16.83	–19.11	–17.99	–18.17	–5.6	–1.0	–8.4	–10.0
N_2O	–10.17	–9.22	–9.29	–8.97	–9.13	–10.2	–1.8	–4.5	–5.0
HFCs	–0.00	–4.11	–9.71	–10.69	–9.95	9 520 103.9	–7.0	–0.0	–5.5
PFCs	NO	–0.01	–0.07	–0.02	–0.01	–	–56.2	–	–0.0
SF_6	NO	–0.09	–0.02	–0.05	–0.07	–	–52.5	–	–0.0
NF_3	NO	NO	NO	NO	NO	–	–	–	–
Total GHG emissions excluding LULUCF	**–228.39**	**–247.12**	**–229.02**	**–194.00**	**–181.08**	**–20.7**	**–6.7**	**–100.0**	**–100.0**
Total GHG emissions including LULUCF	**–235.34**	**–271.94**	**–249.27**	**–204.54**	**–203.00**	**–13.7**	**–0.8**	**–**	**–**
Total GHG emissions excluding LULUCF, including indirect CO_2	**NA**	**NA**	**NA**	**NA**	**NA**	**–**	**–**	**–**	**–**
Total GHG emissions including LULUCF, including indirect CO_2	**NA**	**NA**	**NA**	**NA**	**NA**	**–**	**–**	**–**	**–**

Source: GHG emission data: Liechtenstein's 2020 annual submission, version 1.0.
[a] Emissions and removals reported under the sector other (sector 6) are not included in the total GHG emissions.
[b] Emissions by gas without LULUCF. The Party did not report indirect CO_2 emissions.

10. In brief, Liechtenstein's national inventory arrangements were established in accordance with the 2012 Emissions Trading Act, according to which the Office of Environment is responsible for preparing emissions inventories and therefore for all aspects concerning the establishment of the national inventory system under the Kyoto Protocol. This

is also described in the report of the Government to the parliament for ratifying the Kyoto Protocol. There have been no changes in these arrangements since the BR3.

2. Assessment of adherence to the reporting guidelines

11. The ERT assessed the information reported in the BR4 of Liechtenstein and recognized that the reporting is complete, transparent and thus adhering to the UNFCCC reporting guidelines on BRs. No issues relating to the topics discussed in this chapter of the review report were raised during the review.

B. Quantified economy-wide emission reduction target and related assumptions, conditions and methodologies

1. Technical assessment of the reported information

12. For Liechtenstein the Convention entered into force on 20 September 1994. Under the Convention Liechtenstein committed to reducing its GHG emissions by 20 per cent below the 1990 level by 2020. The target includes all GHGs included 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", namely CO_2, CH_4, N_2O, HFCs, PFCs and SF_6. It also includes all Intergovernmental Panel on Climate Change sources and sectors included in the annual GHG inventory. The GWP values used are from the AR4. Emissions and removals from the LULUCF sector are included in the target and are accounted using a land-based approach. Liechtenstein reported that it plans to make use of market-based mechanisms for achieving its target (see para. 33 below). In absolute terms, this means that, under the Convention, Liechtenstein has to reduce its emissions from 232.72 kt CO_2 eq in the base year to 186.18 kt CO_2 eq by 2020.

13. In addition to its 2020 target, Liechtenstein also has a longer-term target of reducing its GHG emissions by 40 per cent below the 1990 level by 2030. This target was enshrined in law as part of the update to the Emissions Trading Act in December 2020. In October 2020, after the submission of its BR4, Liechtenstein published its Climate Vision 2050, which sets out a target of achieving net zero emissions by 2050. It includes mitigation targets for the energy (including transport), IPPU, agriculture, and waste and wastewater sectors. The assumption underpinning the Climate Vision 2050 is that GHGs will continue to be emitted in the IPPU, agriculture, and waste and wastewater sectors, and, as such, will have to be compensated for by removals via carbon sinks and carbon dioxide capture technologies. During the review, Liechtenstein indicated that it plans to establish a climate strategy 2050 to underpin the implementation of its Climate Vision 2050. Furthermore, in October 2020, Liechtenstein published its Energy Strategy 2030, an update of its Energy Strategy 2020 (see para. 20 below), and Energy Vision 2050.

2. Assessment of adherence to the reporting guidelines

14. The ERT assessed the information reported in the BR4 of Liechtenstein and recognized that the reporting is complete, transparent and thus adhering to the UNFCCC reporting guidelines on BRs. No issues relating to the topics discussed in this chapter of the review report were raised during the review.

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

1. Mitigation actions and their effects

(a) Technical assessment of the reported information

15. Liechtenstein provided information on its package of PaMs implemented, adopted and planned, by sector and by gas, in order to fulfil its commitments under the Convention. Liechtenstein reported on its policy context and legal and institutional arrangements in place

for implementing its commitments and monitoring and evaluating the effectiveness of its PaMs.

16. Liechtenstein's set of PaMs is the same as that previously reported. The Party also indicated that there have been no changes since its previous submission to its institutional, legal, administrative and procedural arrangements used for domestic compliance, monitoring, reporting, archiving of information and evaluation of progress towards its target.

17. In its reporting on its PaMs, Liechtenstein provided the estimated emission reduction impacts for some of its PaMs. Where estimated impacts were not provided (i.e. for the transport, agriculture and LULUCF sectors), the Party did not supply an explanation. During the review, Liechtenstein explained that estimated impacts could only be provided for the three PaMs listed in CTF table 3 related to reducing CO_2 emissions from the energy sector. Regarding the LULUCF sector, the mitigation effects of the national ban on deforestation could not be estimated owing to a lack of resources. Regarding the transport sector, Liechtenstein explained that it has around 40,000 workers, with roughly 22,000 of them commuting to the country every day. Therefore, national measures such as the CO_2 levy have limited effects on this sector, which makes it difficult to estimate the impact of mitigation actions therein.

18. Liechtenstein did not describe the general methodology used for estimating the impacts of its PaMs, but explained during the review that this information is contained in its Energy Strategy 2020. The Party also explained that 2008–2010 served as the base years for estimating the impacts of PaMs. In estimating these impacts, expert assumptions and linear extrapolation were used. The impact of the Party's mitigation action related to the steam pipeline was estimated by comparing the emissions before and after the switch to steam in 2009.

19. Liechtenstein did not report on its self-assessment of compliance with its emission reduction targets or national rules for taking action against non-compliance. During the review, the Party explained that there is no legal basis or requirement at the national level for performing such a self-assessment, adding that it would require more time to establish such a legal basis.

20. The key overarching cross-sectoral policy reported by Liechtenstein is the National Climate Strategy (2015), which combines policies relating to the environment, energy, buildings, transport, agriculture and LULUCF. In addition to the Climate Strategy, the Energy Strategy 2020, which has been assessed as having the greatest mitigation effect, provides the framework for future climate policy and for Liechtenstein meeting its emission reduction target for 2020. During the review, Liechtenstein informed the ERT that, owing to the CO_2 levy on fuels, the price of fossil fuels has increased, which will likely lead to lower levels of fuel consumption in the future. However, the Party explained that it was not possible to estimate the impacts of this levy. On a similar note, Liechtenstein added that it was not possible to estimate the impacts of the regulation on emission limits for new vehicles. Other policies that have delivered significant emission reductions are the Emissions Trading Act, which governs the involvement of two industrial facilities in the European Union Emissions Trading System, and the CO_2 Act, under which levies to promote efficient energy consumption have been introduced.

21. Liechtenstein explained during the review that there are no new mitigation actions under development, but additional mitigation impacts may be achieved through the further development of joint mitigation actions between Liechtenstein, the European Union and Switzerland, namely the European Union Emissions Trading System and the Swiss CO_2 Act. Liechtenstein also explained that the revision of its national CO_2 Act was postponed to after the adoption of the Swiss CO_2 Act in September 2020 (set to be confirmed through a referendum in mid-2021). Table 3 provides a summary of the reported information on the PaMs of Liechtenstein.

Table 3
Summary of information on policies and measures reported by Liechtenstein

Sector	*Key PaMs*	*Estimate of mitigation impact in 2020 (kt CO_2 eq)*	*Estimate of mitigation impact in 2030 (kt CO_2 eq)*
Policy framework and cross-sectoral measures	Climate Vision 2050	NA	NA
	National Climate Strategy (2015)	NA	NA
	Environmental Protection Act	NA	NA
	The environmental policy, which includes environmental levies	NA	NA
	Regulations on emission limits	NA	NA
	Emissions Trading Act	NA	NA
	Energy Strategy 2030	NA	NA
	Energy Vision 2050	NA	NA
Energy			
Energy efficiency	Energy Efficiency Act	2.89	NA
	Energy Ordinance	NA	NA
Energy supply and renewables	Energy Strategy 2020	6.89	NA
	Steam pipeline	2.20	NA
	CO_2 Act	NA	NA
	Ordinance on the liberalization of the electricity market including green electricity, hydropower and geothermal measures	NA	NA
	Promotion of photovoltaic systems through a feed-in tariff system	NA	NA
Transport	National transport policy	NA	NA
	Integrated transport planning	NA	NA
IPPU	–	NA	NA
Agriculture	Agriculture Law	NA	NA
LULUCF	Forestry Act and related measures to promote sustainable forest management	NA	NA
Waste	Technical ordinance on waste	NA	NA
	Registration, evaluation, authorization and restriction of chemicals	NA	NA
Other	Building design guidelines and standards for public buildings	NA	NA

Note: The estimates of mitigation impact are estimates of emissions of CO_2 eq avoided in a given year as a result of the implementation of mitigation actions.

(b) Policies and measures in the energy sector

22. **Energy efficiency.** The Energy Efficiency Act and the Energy Ordinance constitute the legal framework for implementing energy efficiency measures. The aim of the Energy Efficiency Act is to reduce energy consumption and promote intelligent, economical use of energy in buildings through measures such as subsidies for refurbishing old buildings, installing solar collectors, and replacing conventional heating systems with heat pumps and systems fired by wood. These national-level measures are complemented by subsidies at the municipal level. Energy efficiency PaMs targeting individual sectors are discussed below.

23. **Energy supply and renewables.** The energy sector is the largest source of GHG emissions in Liechtenstein, accounting for 81.3 per cent of the total national emissions excluding LULUCF. The main source of these emissions is fuel combustion, with fuel prices and winter temperatures being the major drivers. The Energy Strategy 2020, the Party's most important mitigation action, has the aim of establishing a sustainable energy supply. It includes a target of increasing the share of renewable energy in total energy use from 8 per cent in 2008 to 20 per cent in 2020. Among the key PaMs in Liechtenstein's energy sector is replacing fossil fuels used for heat production in the manufacturing industry with steam from the waste incineration plant in the neighbouring town of Buchs in Switzerland.

24. **Residential and commercial sectors.** The main measures in place are subsidies for refurbishing old buildings, installing solar collectors and replacing conventional heating systems, as well as the "Minergie" quality label for new and refurbished low energy consumption buildings and new energy efficiency standards for new buildings.

25. **Transport sector.** Liechtenstein is implementing a national transport policy that includes measures for managing emissions from vehicles, for example imposing an environment (fuel) levy on heavy-duty vehicles and adopting European Union exhaust emission standards to limit CO_2 emissions from passenger vehicles. In addition, the integrated transport planning measure promotes the use of public transport and bicycles. However, Liechtenstein indicated that increasing motorization rates and decreasing use of environmentally friendly transport is contributing to unsustainable development in the area of mobility.

26. **Industrial sector.** This sector is covered by cross-cutting measures such as the CO_2 levy on fuels and the Emissions Trading Act, both of which lead to an increased cost of fuel consumption.

(c) Policies and measures in other sectors

27. **Industrial processes.** Liechtenstein did not report any PaMs specifically aimed at reducing GHG emissions from this sector.

28. **Agriculture.** The key PaMs in this sector are the Agriculture Law and related measures promoting sustainable agricultural practices, such as direct payment systems.

29. **LULUCF.** GHG emissions from the LULUCF sector were 51.8 per cent above the 1990 level in 2017. National forest harvesting rates increased between 2001 and 2008 and stayed at an elevated level until 2012, mainly as a result of increased use of wood for energy. However, harvesting rates started to decline after 2012 owing to domestic and international economic conditions. Although Liechtenstein does not promote reforestation, forest management measures have been put in place. The key PaMs in the LULUCF sector are the Forestry Act and specific measures under this Act designed to promote sustainable forest management.

30. **Waste management.** GHG emissions from the waste sector were 10.7 per cent below the 1990 level in 2017, accounting for just 0.77 per cent of the total national GHG emissions. Municipal solid waste is exported to incineration and composting plants in Switzerland (landfilling ceased in 1974). As a result, wastewater treatment is the main contributor to GHG emissions in the waste sector. Since 2014, all sewage gas has been captured, upgraded (to allow supply to the gas grid) and supplied to the gas grid, resulting in lower GHG emissions from wastewater treatment and discharge. The Environmental Protection Act, the technical ordinance on waste, and procedures governing the registration, evaluation, authorization and restriction of chemicals are the key PaMs in the waste sector. The 2012–2070 Waste Plan is also being implemented.

(d) Response measures

31. Liechtenstein did not report on the assessment of the economic and social consequences of its response measures in its BR4. During the previous review, Liechtenstein explained that no data were available in this regard and that there were no plans to further improve the information provided. During the current review, Liechtenstein confirmed that such data are still not available.

(e) Assessment of adherence to the reporting guidelines

32. The ERT assessed the information reported in the BR4 of Liechtenstein and identified issues relating to completeness and thus adherence to the UNFCCC reporting guidelines on BRs. The findings are described in table 4.

Table 4
Findings on mitigation actions and their effects from the review of the fourth biennial report of Liechtenstein

No.	*Reporting requirement, issue type and assessment*	*Description of the finding with recommendation or encouragement*
1	Reporting requirement specified in paragraph 7 Issue type: completeness Assessment: encouragement	Liechtenstein did not provide information on its self-assessment of compliance with its emission reduction targets. During the review, the Party explained that there is no legal basis or requirement at the national level for performing such a self-assessment. The ERT encourages Liechtenstein to describe, to the extent possible, its domestic arrangements for self-assessment of compliance with its emission reduction targets or the emission reduction levels required by science.
2	Reporting requirement specified in CTF table 3 Issue type: completeness Assessment: recommendation	Liechtenstein provided estimates of mitigation impacts for the energy sector only in its BR4 and CTF table 3. In addition, the Party did not provide a brief description of the reported PaMs or the type of instrument in CTF table 3. During the review, Liechtenstein explained that there are no PaMs targeting sectors other than the energy sector or gases other than CO_2, and that the type of instruments used has not changed since the BR3. The ERT reiterates the recommendation from the previous review report for Liechtenstein to improve completeness by specifying the type of instrument related to the mitigation actions in CTF table 3, and by providing estimates of the impacts of the mitigation actions or an explanation as to why it is not possible to provide these estimates owing to national circumstances.
3	Reporting requirement specified in paragraph 24 Issue type: completeness Assessment: encouragement	Liechtenstein did not include information on the domestic arrangements for its self-assessment of compliance with its emission reduction targets or the emission reduction levels required by science. Further, the BR4 does not include information on progress in establishing national rules for taking local action against domestic non-compliance with emission reduction targets. During the review, Liechtenstein explained that there is currently no legal basis or requirement for establishing such national rules or performing this kind of assessment. The ERT reiterates the encouragement from the previous review report for Liechtenstein to improve the completeness of its reporting by describing the domestic arrangements for its self-assessment of compliance with its emission reduction targets or the emission reduction levels required by science, and report on progress in establishing national rules for taking local action against domestic non-compliance with emission reduction targets, to the extent possible. If it is not possible to provide such information, the ERT encourages Liechtenstein to explain why.

Note: Item listed under reporting requirement refers to the relevant paragraph of the UNFCCC reporting guidelines on BRs or to the CTF table number from the "Common tabular format for 'UNFCCC biennial reporting guidelines for developed country Parties'". The reporting on the requirements not included in this table is considered to be complete, transparent and thus adhering to the UNFCCC reporting guidelines on BRs.

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

(a) Technical assessment of the reported information

33. In assessing the Party's progress towards achieving its 2020 target, the ERT noted that Liechtenstein's emission reduction target under the Convention is 20 per cent below the 1990 level (see para. 12 above). In 2017 Liechtenstein's annual total GHG emissions excluding LULUCF were 15.5 per cent (35.37 kt CO_2 eq) below the base-year level. In addition, the ERT noted that in 2017 the contribution of LULUCF was 10.55 kt CO_2 eq and the use of

market-based mechanisms accounted for 139.78 kt CO_2 eq,[4] resulting in net emissions of 64.39 kt CO_2 eq, or 164.60 kt CO_2 eq below the 2020 target.

34. Table 5 illustrates Liechtenstein's total GHG emissions, contribution of LULUCF and use of units from market-based mechanisms towards achieving its target.

Table 5
Summary of information on the use of units from market-based mechanisms and land use, land-use change and forestry by Liechtenstein for achieving its target

Year	*Emissions excluding LULUCF (kt CO_2 eq)*	*Contribution of LULUCF (kt CO_2 eq)*	*Use of units from market-based mechanisms (kt CO_2 eq)*	*Net emissions including LULUCF and market-based mechanisms (kt CO_2 eq)*
1990	228.99	6.95	NA	235.94
2010	229.46	20.25	0	249.71
2011	216.36	24.05	0	240.41
2012	225.55	24.30	0	249.85
2013	232.13	16.62	0	248.75
2014	200.50	16.51	0	217.01
2015	197.79	11.06	0	208.85
2016	187.68	9.21	54.00	46.57
2017	193.62	10.55	139.78	153.24
2020 target	NA	NA	NA	NA

Source: Liechtenstein's BR4 and BR4 CTF tables 1, 2(a), 4, 4(a)I, 4(a)II, 4(b) and 6(a).

35. The ERT noted that Liechtenstein is making progress towards its emission reduction target by implementing mitigation actions that are delivering significant emission reductions and by using units from the market-based mechanisms under the Convention.

(b) Assessment of adherence to the reporting guidelines

36. The ERT assessed the information reported in the BR4 of Liechtenstein and identified issues relating to completeness, transparency and thus adherence to the UNFCCC reporting guidelines on BRs. The findings are described in table 6.

Table 6
Findings on estimates of emission reductions and removals and on the use of units from market-based mechanisms and land use, land-use change and forestry from the review of the fourth biennial report of Liechtenstein

No.	*Reporting requirement, issue type and assessment*	*Description of the finding with recommendation*
1	Reporting requirement specified in paragraph 9 Issue type: completeness Assessment: recommendation	In CTF table 4 Liechtenstein did not report total emissions excluding LULUCF or the contribution from LULUCF. During the review, the Party explained that it will consider reporting this information in its next BR. The ERT recommends that Liechtenstein improve the completeness of its reporting by including in CTF table 4 information on total GHG emissions excluding LULUCF as well as the contribution from LULUCF.
2	Reporting requirement specified in paragraph 9 Issue type: transparency	In CTF table 4 Liechtenstein reported its units from market-based mechanisms as 0 for 2015, 150.32 for 2016 and 50.93 for 2017. In CTF table 4(b), however, it reported a total of 50,938 Kyoto Protocol units for 2018 and 150,323 for 2017, which are three orders of magnitude higher than those reported in CTF table 4 for 2016–2017. In addition, the value reported in CTF table 4(b) for 2018 is exactly one thousand times higher than that reported in CTF table 4 for 2017. In CTF

[4] During the review, the Party indicated that this amount refers to certificates for market-based mechanisms purchased in 2017 and that a decision on whether to voluntarily cancel some of these certificates is pending.

No.	*Reporting requirement, issue type and assessment*	*Description of the finding with recommendation*
	Assessment: recommendation	table 4 of its BR3, Liechtenstein reported different values for units from market-based mechanisms for 2015–2016, specifying 51.71 units for 2015 and 54.00 units for 2016. Lastly, Liechtenstein did not provide information on units from market-based mechanisms for 2010–2013. During the review, the Party explained that manual data entry errors occurred with regard to the units from market-based mechanisms reported in CTF table 4 for 2015–2017. The Party indicated the amount of market-based mechanisms purchased. Further, it explained that the units from market-based mechanisms used for 2010–2013 related to the first commitment period of the Kyoto Protocol and were thus not reported in CTF table 4. The ERT recommends that Liechtenstein improve the transparency of its reporting by providing correct and consistent information on the use of units from market-based mechanisms in CTF tables 4 and 4(b). The ERT also reiterates the recommendation from the previous review report for Liechtenstein to report the quantity of units from market-based mechanisms for all relevant years in CTF table 4. The ERT notes that Liechtenstein could report "NA" and add an explanatory footnote in cases where units from market-based mechanisms were only used for the first commitment period of the Kyoto Protocol.

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

3. Projections overview, methodology and results

(a) Technical assessment of the reported information

37. Liechtenstein reported updated projections for 2020 and 2030 relative to actual inventory data for 2017 under the WEM scenario. The WEM scenario reported by Liechtenstein includes PaMs implemented and adopted until and beyond 2020.

38. In addition to the WEM scenario, Liechtenstein reported the WAM and WOM scenarios. The WAM scenario includes planned PaMs, while the WOM scenario excludes all PaMs implemented, adopted or planned after 2008. Liechtenstein provided a definition of its scenarios, explaining that its WEM scenario includes currently implemented and adopted PaMs such as renovation of buildings, installation of solar collectors and heat pumps, introduction of new standards for new buildings, promotion of heat recovery in industry and promotion of electric vehicles, while its WAM scenario includes planned PaMs under the Energy Efficiency Act and the Energy Strategy 2020, such as increased replacement of oil and gas heating systems with heat pumps and introduction of efficiency standards for vehicles. The definitions indicate that the scenarios were prepared in accordance with the UNFCCC reporting guidelines on BRs.

39. The projections are presented on a sectoral basis, using the same sectoral categories as those used in the reporting on mitigation actions, and (except for the WOM projections) on a gas-by-gas basis for CO_2, CH_4, N_2O, PFCs, HFCs and SF_6 (treating PFCs and HFCs collectively in each case) for 2020, 2025 and 2030. The projections are also provided in an aggregated format for each sector and for a Party total using GWP values from the AR4. Liechtenstein reported on factors and activities affecting emissions for each sector.

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

40. The methodology used for the preparation of the projections is identical to that used for the preparation of the emission projections for the NC7. Liechtenstein provided information on the changes since the submission of its NC7 in the assumptions, methodologies, models and approaches used for the projection scenarios and reported supporting information further explaining the changes made since the NC7. These changes include the assumptions that the measures related to the "Minergie" quality label for buildings and new standards for new buildings will continue to deliver emission reductions in 2024–2030 under the WEM and WAM scenarios, as indicated by expert judgment. Liechtenstein also revised its WOM scenario on the basis of the WOM scenario from its NC6,

selecting 2008 (instead of 2015) as the starting year to coincide with the year the Energy Efficiency Act was adopted and to take into account the fact that no other quantifiable measures have been implemented in Liechtenstein since 2008. For the revised WOM scenario, fugitive emissions from fuels and the waste sector for 2009–2030 were extrapolated using the emissions reported for 1990–2008 in the 2019 national inventory report. Furthermore, for the revised WOM scenario, the Party assumed that, given that Liechtenstein's circumstances are similar to those in Switzerland (e.g. some identical policies and regulations), emissions from the IPPU and waste sectors will develop similarly, and therefore it applied the annual growth rate assumed under the WOM scenario in Switzerland's NC7.

41. To prepare its projections, Liechtenstein relied on the key underlying assumptions and objectives of the Energy Strategy 2020. During the review, the Party explained that the underlying assumptions in the waste sector are published in the 2012–2070 Waste Plan. Population trends were used as a projection parameter for municipal solid waste. For composting, the development of settlement and building zones was the main parameter, while for wastewater treatment, hydraulic population equivalent[5] and residual water content in sewage systems were used as parameters. The assumptions were not updated on the basis of the most recent economic developments known at the time of the preparation of the projections and Liechtenstein did not report information on key underlying assumptions or values in its BR4 or in CTF table 5.

42. Liechtenstein did not provide information on sensitivity analyses in its BR4. During the review, it explained that sensitivity analyses were not conducted for any of the assumptions owing to resource constraints, but that it will consider including sensitivity analyses in future submissions.

(c) Results of projections

43. The projected emission levels under different scenarios and information on the quantified economy-wide emission reduction target are presented in table 7 and figure 1.

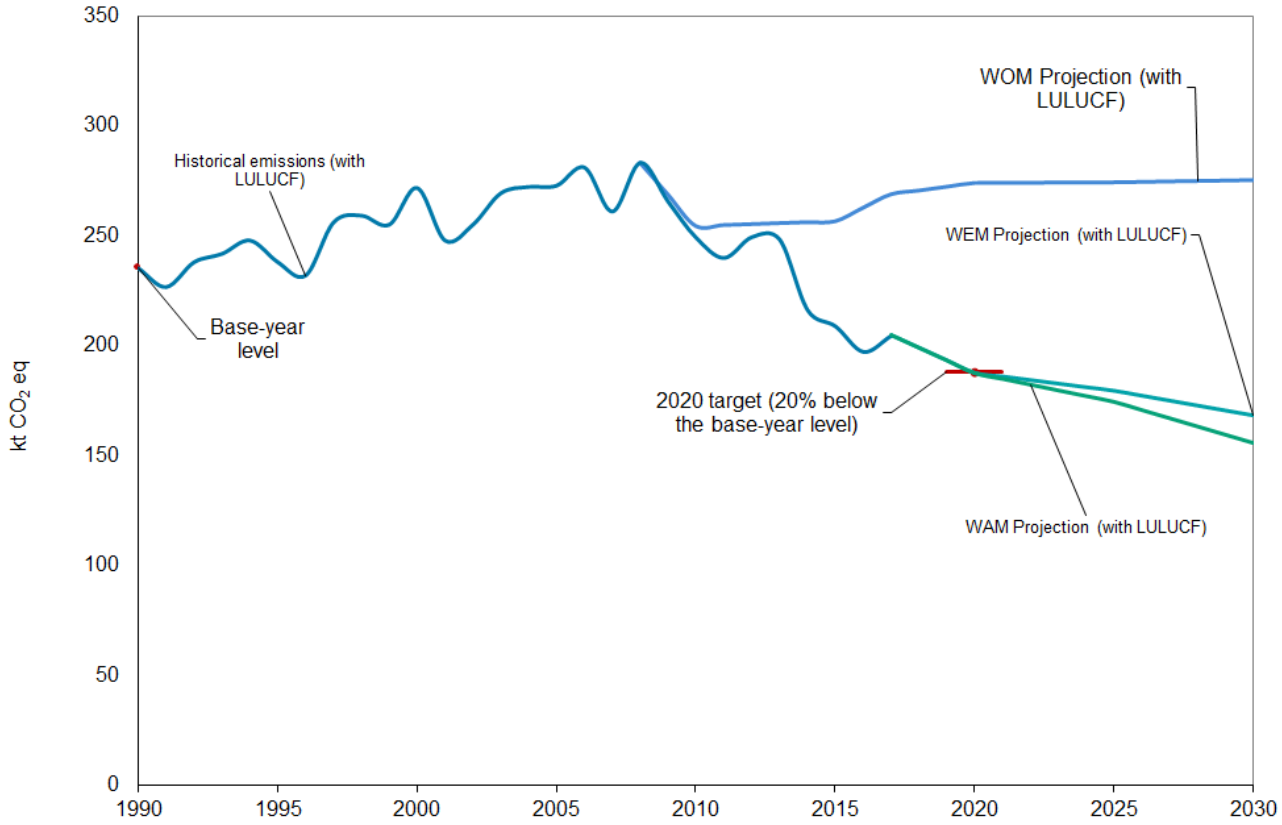
Table 7
Summary of greenhouse gas emission projections for Liechtenstein

	GHG emissions (kt CO_2 eq/year)	*Change in relation to base-year level (%)*
Quantified economy-wide emission reduction target under the Convention	183.20	–20.0
Inventory data 1990 (base year)	229.00	NA
Inventory data 2017	193.62	–15.4
WOM projections for 2020	274.01	19.7
WEM projections for 2020	187.55	–18.1
WAM projections for 2020	187.26	–18.2
WOM projections for 2030	275.32	20.2
WEM projections for 2030	168.43	–26.4
WAM projections for 2030	155.55	–32.1

Source: Liechtenstein's BR4 and BR4 CTF table 6.
Note: The projections are for GHG emissions including LULUCF and excluding indirect CO_2.

[5] Hydraulic population equivalent is the ratio of the pollution load produced by industrial facilities and services over 24 hours to the individual pollution load in household sewage produced by one person over the same time.

Figure 1
Greenhouse gas emission projections reported by Liechtenstein



Source: Liechtenstein's BR4 and BR4 CTF tables 1 and 6 (total GHG emissions including LULUCF).

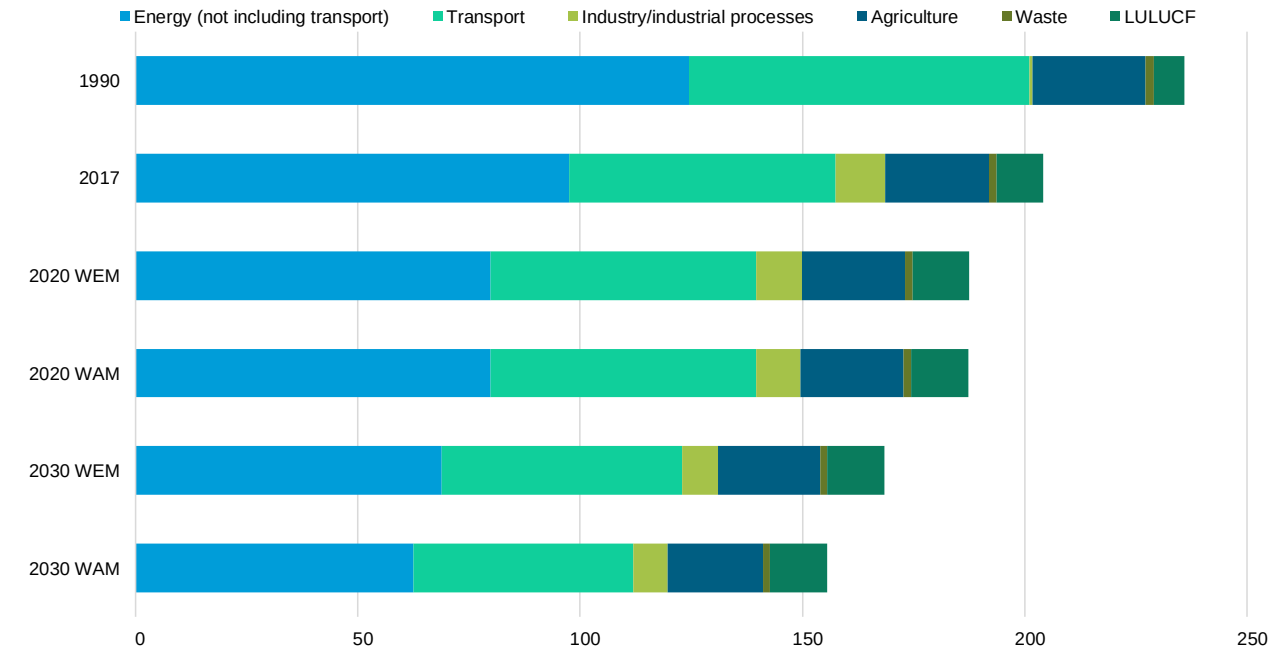
44. Liechtenstein's total GHG emissions excluding LULUCF in 2020 and 2030 are projected under the WEM scenario to decrease by 23.7 and 32.0 per cent, respectively, below the 1990 level. Under the WAM scenario, emissions in 2020 and 2030 are projected to be lower than those in 1990 by 23.8 and 37.7 per cent, respectively.

45. The Party's total GHG emissions including LULUCF in 2020 and 2030 are projected under the WEM scenario to decrease by 20.5 and 28.6 per cent, respectively, below the 1990 level. Under the WAM scenario, emissions in 2020 and 2030 are projected to be lower than those in 1990 by 20.6 and 34.1 per cent, respectively.

46. Liechtenstein's economy-wide target under the Convention is to reduce its total emissions by 20 per cent below the 1990 level by 2020 (see para. 12 above). The 2020 projections suggest that Liechtenstein can be expected to achieve its 2020 target under the Convention without using flexible mechanisms.

47. Liechtenstein presented the WEM and WAM scenarios by sector for 2020 and 2030, as summarized in figure 2 and table 8.

Figure 2
Greenhouse gas emission projections for Liechtenstein presented by sector
(kt CO_2 eq)



Source: Liechtenstein's BR4 CTF table 6.

Table 8
Summary of greenhouse gas emission projections for Liechtenstein presented by sector

	GHG emissions and removals (kt CO_2 eq)					*Change (%)*			
		2020		*2030*		*1990–2020*		*1990–2030*	
Sector	*1990*	*WEM*	*WAM*	*WEM*	*WAM*	*WEM*	*WAM*	*WEM*	*WAM*
Energy (not including transport)	124.42	79.78	79.78	68.91	62.54	–35.9	–35.9	–44.6	–49.7
Transport	76.64	59.73	59.73	54.04	49.44	–22.1	–22.1	–29.5	–35.5
Industry/industrial processes	0.65	10.41	10.11	8.09	7.68	1 501.5	1 455.4	1 144.6	1 081.5
Agriculture	25.51	23.17	23.17	22.93	21.43	–9.2	–9.2	–10.1	–16.0
LULUCF	6.95	12.79	12.79	12.79	12.79	84.0	84.0	84.0	84.0
Waste	1.77	1.67	1.68	1.67	1.68	–5.6	–5.1	–5.6	–5.1
Other	–	–	–	–	–	–	–	–	–
Total GHG emissions excluding LULUCF	**229.00**	**174.77**	**174.48**	**155.64**	**142.76**	**–23.7**	**–23.8**	**–32.0**	**–37.7**
Total GHG emissions including LULUCF	**235.95**	**187.55**	**187.26**	**168.43**	**155.55**	**–20.5**	**–-20.6**	**–28.6**	**–34.1**

Source: Liechtenstein's BR4 CTF table 6.

48. According to the projections reported for 2020 under the WEM scenario, the most significant absolute emission reductions are expected to occur in the energy and transport sectors, amounting to projected reductions of 35.9 and 22.1 per cent between 1990 and 2020, respectively. The pattern of projected emissions reported for 2030 under the same scenario remains the same.

49. If additional measures are considered (i.e. under the WAM scenario), the patterns of emission reductions by 2020 presented by sector remain the same.

50. Liechtenstein presented the WEM and WAM scenarios by gas for 2020 and 2030, as summarized in table 9.

Table 9
Summary of greenhouse gas emission projections for Liechtenstein presented by gas

	GHG emissions and removals (kt CO_2 eq)					*Change (%)*			
		2020		*2030*		*1990–2020*		*1990–2030*	
Gas	*1990*	*WEM*	*WAM*	*WEM*	*WAM*	*WEM*	*WAM*	*WEM*	*WAM*
CO_2[a]	198.97	137.34	137.34	120.90	110.02	–31.0	–31.0	–39.2	–44.7
CH_4	19.12	17.78	17.78	17.57	16.54	–7.0	–7.0	–8.1	–13.5
N_2O	10.91	9.56	9.56	9.33	8.76	–12.4	–12.4	–14.5	–19.7
HFCs	0.00	10.03	9.74	7.80	7.40	–	–	–	–
PFCs	–	0.02	0.02	0.01	0.01	–	–	–	–
SF_6	–	0.04	0.04	0.03	0.03	–	–	–	–
NF_3	–	–	–	–	–	–	–	–	–
Total GHG emissions without LULUCF	**229.00**	**174.77**	**174.48**	**155.64**	**142.76**	**–23.7**	**–23.8**	**–32.0**	**–37.7**
Total GHG emissions with LULUCF	**235.95**	**187.55**	**187.26**	**168.43**	**155.55**	**–20.5**	**–20.6**	**–28.6**	**–34.1**

Source: Liechtenstein's BR4 CTF table 6.
[a] Liechtenstein did not include indirect CO_2 emissions in its projections.

51. For 2020, the most significant absolute reductions are projected for CO_2 and N_2O emissions: 31.0 and 12.4 per cent between 1990 and 2020, respectively, under the WEM scenario. When considering emission reductions by 2030, the patterns presented by gas remain the same.

52. The reduction in CO_2 emissions (excluding LULUCF) under the WEM scenario in 1990–2030 is assumed to amount to 39.2 per cent, mainly attributed to reductions in category 1.A.4 (other sectors) and to the measures in the Energy Strategy 2020: renovation of buildings and increased use of heat pumps. Less pronounced reductions are predicted for the transport sector. Reductions of CH_4 and N_2O emissions under the same scenario in 1990–2030 are assumed to amount to 8.1 and 14.5 per cent, respectively.

53. If additional measures are considered (i.e. under the WAM scenario), the patterns of emission reductions by 2020 presented by gas remain the same. When considering emission reductions under the WAM scenario by 2030, the patterns presented by gas remain the same.

(d) Assessment of adherence to the reporting guidelines

54. The ERT assessed the information reported in the BR4 of Liechtenstein and identified issues relating to completeness, transparency and thus adherence to the UNFCCC reporting guidelines on BRs. The findings are described in table 10.

Table 10
Findings on greenhouse gas emission projections reported in the fourth biennial report of Liechtenstein

No.	*Reporting requirement, issue type and assessment*	*Description of the finding with recommendation or encouragement*
1	Reporting requirement[a] specified in paragraph 29 Issue type: transparency Assessment: recommendation	Liechtenstein reported in the BR4 that the Energy Efficiency Act is factored into its WEM projections, but in CTF table 3 the Party did not indicate that this Act was included in the projections. During the review, the Party explained that there was an error in the reporting in CTF table 3, and that the Energy Efficiency Act should have been reported as included in the WEM projections. The ERT recommends that Liechtenstein improve the transparency of its reporting by ensuring consistency between the information reported in the BR

No.	*Reporting requirement, issue type and assessment*	*Description of the finding with recommendation or encouragement*
		and the CTF tables, and by correctly highlighting in CTF table 3 the mitigation actions that are included in its WEM projections.
2	Reporting requirement[a] specified in paragraph 30 Issue type: completeness Assessment: encouragement	Liechtenstein did not report in its BR4 a sensitivity analysis of its GHG projections or provide a justification for this. During the review, the Party explained that it was not able to conduct sensitivity analyses owing to resource constraints, but that it will consider including a sensitivity analysis in future submissions. The ERT encourages Liechtenstein to improve completeness by reporting the sensitivity analysis for its projections.
3	Reporting requirement[a] specified in paragraph 35 Issue type: transparency Assessment: recommendation	Although WOM projections were reported in the BR4, they were not presented on a gas-by-gas basis. During the review, Liechtenstein stated that it could not provide the WOM projections on a gas-by-gas basis at the time of drafting the BR4 but it will present them in this manner in its next BR. The ERT recommends that Liechtenstein improve transparency by providing WOM projections on a gas-by-gas basis.
4	Reporting requirement[a] specified in paragraph 35 Issue type: completeness Assessment: encouragement	The Party did not report emission projections for indirect GHGs such as carbon monoxide, nitrogen oxides, non-methane volatile organic compounds or sulfur oxides in its BR4. Rather, the BR4 presents emission trends for precursor GHGs and sulfur dioxide; these trends are based on information from the Emission Information System and were not reported in the national inventory report. In its BR4 the Party indicated that, owing to the differences in methodology used in preparing them and in their scope, these estimates could not be used as surrogate data for projections of indirect GHGs. During the review, Liechtenstein explained that it does not have the resources to prepare separate projections for indirect GHG emissions as part of its reporting under the UNFCCC in addition to reporting such information (using a different methodology) under the Convention on Long-Range Transboundary Air Pollution. The ERT reiterates the encouragement from the previous review report for the Party to include projections of indirect GHG emissions.
5	Reporting requirement[a] specified in paragraph 43 Issue type: completeness Assessment: encouragement	The BR4 provides a brief description of the models used for the projections but does not include information for each model or approach used, such as which gases and sectors are covered by each model or approach; the type of model or approach used; the model's strengths and weaknesses; and how the model or approach accounts for any overlap or synergies that may exist between different PaMs. During the review, the Party provided additional information on the models and approaches used in developing its projections. The Party explained that, for fugitive emissions in particular, a simple extrapolation (linear regression) based on historical trends in emissions was used, in part owing to resources for this exercise being limited. Regarding projections for the waste sector under the WEM and WAM scenarios, the Party explained that these were prepared on the basis of Liechtenstein's 2012–2070 Waste Plan, but that, owing to limited resources, the projections for the WOM scenario for the waste sector were prepared using previously reported emission trends. The ERT reiterates the encouragement from the previous review report for the Party to include the following information for each model and approach used for projections: the gases and sectors considered; the type of model used; its strengths and weaknesses; and how it accounts for any overlap or synergies that may exist between different PaMs. The ERT notes that this information is especially important for sectors for which national methods are used.
6	Reporting requirement[a] specified in paragraph 46	In its BR4, Liechtenstein did not report qualitatively or quantitatively on the sensitivity of projections to underlying assumptions.

No.	*Reporting requirement, issue type and assessment*	*Description of the finding with recommendation or encouragement*
	Issue type: completeness Assessment: encouragement	During the review, the Party explained that it was not able to assess and report on the sensitivity of projections to underlying assumptions owing to limited resources, and indicated that it does not expect to be able to provide this information in submissions in the foreseeable future. The ERT reiterates the encouragement from the previous review report for Liechtenstein to provide information on the sensitivity of projections to underlying assumptions, either qualitatively or quantitatively.
7	Reporting requirement[a] specified in paragraph 47 Issue type: completeness Assessment: encouragement	Liechtenstein did not report information in its BR4 about key underlying assumptions and values of variables such as growth in gross domestic product, population growth, tax levels and international fuel prices. During the review, Liechtenstein provided explanations of the assumptions and variables used (see para. 41 above). The ERT encourages Liechtenstein to provide information about key underlying assumptions and values of variables used for GHG emission projections. The ERT notes that it would be helpful if this were done both in the textual part of the BR and in CTF table 5.
8	Reporting requirement[b] specified in paragraph 28 Issue type: transparency Assessment: encouragement	Liechtenstein reported the WOM, WEM and WAM scenarios as part of its projections in the text of the BR4, but did not report the WOM scenario in CTF table 6(b). During the review, Liechtenstein explained that owing to resource limitations it was not possible to include the WOM scenario in CTF table 6(b). The Party indicated that, if more resources are available in the future, it will include this information. The ERT encourages Liechtenstein to improve transparency by reporting the WOM scenario in CTF table 6(b).

Note: The reporting on the requirements not included in this table is considered to be complete, transparent and thus adhering to the UNFCCC reporting guidelines on NCs and on BRs.

[a] Item listed under reporting requirement refers to the relevant paragraph of the UNFCCC reporting guidelines on NCs, as per para. 11 of the UNFCCC reporting guidelines on BRs.

[b] Item listed under reporting requirement refers to the relevant paragraph of the UNFCCC reporting guidelines on BRs.

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

55. Liechtenstein is not an Annex II Party and is therefore not obliged to adopt measures and fulfil obligations defined in Article 4, paragraphs 3–5, of the Convention. However, Liechtenstein provided information in the BR4 on its provision of financial, technology transfer and capacity-building support to developing country Parties. The ERT commends Liechtenstein for reporting this information and suggests that it continue to do so in future BRs.

56. With regard to the regional distribution of climate finance, Liechtenstein reported that its focus lies on the most vulnerable countries. Liechtenstein's adaptation assistance focuses on improving resilience to extreme weather conditions and other hazards by investing in infrastructure that can better withstand climate change impacts and through other practical measures that provide support to local communities for enhancing preparedness. With regard to mitigation of climate change, Liechtenstein focuses on supporting energy efficiency programmes and promoting renewable energy systems in the Caucasus, Central Asia and African countries.

57. Liechtenstein reported that it provides financial, technological and capacity-building support within its framework of international humanitarian cooperation and development, which is based on its Law on International Humanitarian Cooperation and Development of 2007. The Party provided an overview of the most important contributions as part of its international engagement in environmental protection in 2018 and presented an example of its support for technology transfer, namely a project for implementing water- and energy-efficient irrigation technologies in the United Republic of Tanzania.

III. Conclusions and recommendations

58. The ERT conducted a technical review of the information reported in the BR4 and BR4 CTF tables of Liechtenstein in accordance with the UNFCCC reporting guidelines on BRs. The ERT concludes that the reported information mostly adheres to the UNFCCC reporting guidelines on BRs and provides an overview of 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 the progress of Liechtenstein towards achieving its target.

59. Liechtenstein's total GHG emissions excluding LULUCF covered by its quantified economy-wide emission reduction target were estimated to be 15.4 per cent below its 1990 level, whereas total GHG emissions including LULUCF were 13.5 per cent below its 1990 level, in 2017. Emissions peaked in 2006 and decreased thereafter. The changes in total emissions were driven mainly by factors such as fuel prices and winter temperatures (heating degree days).

60. Under the Convention Liechtenstein committed to achieving a quantified economy-wide emission reduction target of 20 per cent below the 1990 level by 2020. The target covers CO_2, CH_4, N_2O, HFCs, PFCs and SF_6, expressed using GWP values from the AR4, and covers 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 for achieving its target. In absolute terms this means that, under the Convention, Liechtenstein has to reduce its emissions from 232.72 kt CO_2 eq (in the base year) to 186.18 kt CO_2 eq by 2020.

61. In addition to its 2020 target, Liechtenstein also has a longer-term target of reducing its GHG emissions by 40 per cent below the 1990 level by 2030. This target was enshrined in law as part of the update to the Emissions Trading Act in December 2020. In October 2020, after the submission of its BR4, Liechtenstein published its Climate Vision 2050, which sets out a target of net zero emissions by 2050 and includes mitigation targets for the energy (including transport), IPPU, agriculture, and waste and wastewater sectors. The assumption underpinning the Climate Vision 2050 is that, in the IPPU, agriculture, and waste and wastewater sectors, GHGs will continue to be emitted and will have to be compensated for by removals via carbon sinks and carbon dioxide capture technologies.

62. Liechtenstein's annual total GHG emissions excluding LULUCF in 2017 were 15.5 per cent (35.37 kt CO_2 eq) below the base-year level. Liechtenstein reported that the contribution of LULUCF was 10.55 kt CO_2 eq in 2017 and the use of market-based mechanisms accounted for 139.78 kt CO_2 eq, resulting in net emissions of 64.39 kt CO_2 eq, or 164.60 kt CO_2 eq below the 2020 target (see para. 33 above).

63. The GHG emission projections provided by Liechtenstein in its BR4 correspond to the WOM, WEM and WAM scenarios. Under the WOM scenario, emissions are projected to be 14.1 per cent above the 1990 level by 2020, and under the WEM and WAM scenarios emissions are projected to be 23.7 and 23.8 per cent below the 1990 level by 2020, respectively. On the basis of the reported information, the ERT concludes that Liechtenstein expects to meet its 2020 target under the WEM and WAM scenarios without using flexible mechanisms.

64. Liechtenstein's main policy framework relating to energy and climate change is the National Climate Strategy (2015), which combines policies relating to the environment, energy, buildings, transport, agriculture and LULUCF. The Party described the mitigation actions that it has implemented to help it achieve its 2020 targets, including the Energy Strategy 2020, which has been assessed as having the most significant mitigation effect. The Strategy provides the framework for future climate policy and is aimed at establishing a sustainable energy supply – in this regard, it includes a target to increase the share of renewable energy in total energy use from 8 per cent in 2008 to 20 per cent in 2020. The Energy Efficiency Act and the Energy Ordinance constitute the legal framework for implementing energy efficiency measures. Among the key PaMs in Liechtenstein's energy sector is replacing fossil fuels used for heat production in the manufacturing industry with steam from the waste incineration plant in the neighbouring town of Buchs in Switzerland.

These PaMs, in conjunction with key PaMs in the other sectors, provide the framework for Liechtenstein meeting its emission reduction target for 2020.

65. Liechtenstein is not an Annex II Party and is therefore not obliged to adopt measures and fulfil obligations defined in Article 4, paragraphs 3–5, of the Convention. However, it provided information on its provision of support to developing country Parties. Liechtenstein reported that its focus lies on the most vulnerable countries. With regard to mitigation of climate change, Liechtenstein focuses on supporting energy efficiency programmes and promoting renewable energy systems in the Caucasus, Central Asia and African countries.

66. 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:

(a) To improve the completeness of its reporting by:

(i) Specifying, when reporting mitigations actions in CTF table 3, the type of instrument, and providing estimates of the impacts of the mitigation actions or an explanation as to why it is not possible to provide these estimates owing to national circumstances (see issue 2 in table 4);

(ii) Including, when reporting on the expected contribution from the LULUCF sector, information in CTF table 4 on total GHG emissions excluding LULUCF as well as the contribution from LULUCF (see issue 1 in table 6);

(b) To improve the transparency of its reporting by:

(i) Providing WOM projections on a gas-by-gas basis (see issue 3 in table 10);

(ii) Providing correct and consistent information on the use of units from market-based mechanisms in CTF tables 4 and 4(b), and reporting the quantity of units from market-based mechanisms for all relevant years in CTF table 4 (see issue 2 in table 6);

(iii) Ensuring, when reporting on its projections, consistency between the information reported in the BR and the CTF tables, and correctly highlighting in CTF table 3 the mitigation actions that are included in its projections (see issue 1 in table 10).

Annex

Documents and information used during the review

A. Reference documents

2020 GHG inventory submission of Liechtenstein. Available at https://unfccc.int/ghg-inventories-annex-i-parties/2020.

BR3 of Liechtenstein. Available at https://unfccc.int/documents/198257.

BR4 of Liechtenstein. Available at https://unfccc.int/BRs.

BR4 CTF tables of Liechtenstein. Available at https://unfccc.int/BRs.

"Common tabular format for 'UNFCCC biennial reporting guidelines for developed country Parties'". Annex to decision 19/CP.18. Available at https://unfccc.int/resource/docs/2012/cop18/eng/08a03.pdf.

"Compilation of economy-wide emission reduction targets to be implemented by Parties included in Annex I to the Convention". FCCC/SBSTA/2014/INF.6. Available at http://unfccc.int/resource/docs/2014/sbsta/eng/inf06.pdf.

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

"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.

Report on the individual review of the annual submission of Liechtenstein submitted in 2018. FCCC/ARR/2018/LIE. Available at https://unfccc.int/sites/default/files/resource/ARR2018_LIE.pdf.

Report on the technical review of the BR3 of Liechtenstein. FCCC/TRR.3/LIE. Available at https://unfccc.int/sites/default/files/resource/trr.3_LIE.pdf.

"UNFCCC biennial reporting guidelines for developed country Parties". Annex I to decision 2/CP.17. Available at http://unfccc.int/resource/docs/2011/cop17/eng/09a01.pdf.

B. Additional information provided by the Party

Responses to questions during the review were received from Heike Summer (Office of Environment of Liechtenstein), including additional material. The following documents[1] were provided by Liechtenstein:

Regierung des Fuerstentums Liechtenstein, Ministerium fuer Inneres, Bildung und Umwelt, 2020. *Klimavision 2050*. Available at https://www.llv.li/files/au/klimavision2050.pdf.

"Liechtensteiner Abfallplanung 2012-2070", Government of Liechtenstein. 2011. Available at https://www.llv.li/inhalt/11139/amtsstellen/liechtensteiner-abfallplanung-2070.

"Liechtensteiner Abfallplanung 2012–2070", Government 2011. Available at https://www.llv.li/inhalt/11139/amtsstellen/liechtensteiner-abfallplanung-2070.

[1] References reproduced as received from the Party.