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Report on the technical review of the eighth national communication and the technical review of the fifth biennial report of Liechtenstein

Parties included in Annex I to the Convention were requested by decision 6/CP.25 to submit their eighth national communication to the secretariat by no later than 31 December 2022. According to decision 15/CMP.1, Parties included in Annex I to the Convention that are also Parties to the Kyoto Protocol are required to include in their national communications supplementary information under Article 7, paragraph 2, of the Kyoto Protocol. This report presents the results of the technical review of the eighth national communication and relevant supplementary information under the Kyoto Protocol 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" and the "Guidelines for review under Article 8 of the Kyoto Protocol".

Developed country Parties were requested by decision 6/CP.25 to submit their fifth biennial report to the secretariat by no later than 31 December 2022. This report presents the results of the technical review of the fifth 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 of these submissions took place in Vaduz from 15 to 19 April 2024.

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
CFC	chlorofluorocarbon
CH_4	methane
CHF	Swiss franc
CO	carbon monoxide
CO_2	carbon dioxide
CO_2 eq	carbon dioxide equivalent
CTF	common tabular format
EEA	European Environment Agency
ERT	expert review team
EU	European Union
EU ETS	European Union Emissions Trading System
Eurostat	statistical office of the European Union
F-gas	fluorinated gas
GHG	greenhouse gas
GWP	global warming potential
HFC	hydrofluorocarbon
IE	included elsewhere
IPCC	Intergovernmental Panel on Climate Change
IPPU	industrial processes and product use
LULUCF	land use, land-use change and forestry
N_2O	nitrous oxide
NA	not applicable
NC	national communication
NF_3	nitrogen trifluoride
NMVOC	non-methane volatile organic compound
NO	not occurring
NO_X	nitrogen oxides
PaMs	policies and measures
PFC	perfluorocarbon
reporting guidelines for supplementary information	“Guidelines for the preparation of the information required under Article 7 of the Kyoto Protocol. Part II: Reporting of supplementary information under Article 7, paragraph 2”
SF_6	sulfur hexafluoride
SO_X	sulfur oxides
UNFCCC reporting guidelines on BRs	“UNFCCC biennial reporting guidelines for developed country Parties”
UNFCCC reporting guidelines on NCs	“Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part II: UNFCCC reporting guidelines on national communications”
WAM	‘with additional measures’
WEM	‘with measures’
WOM	‘without measures’

I. Introduction and summary

A. Introduction

1. This is a report on the in-country technical review of the NC8 and BR5 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" and "Part V: UNFCCC guidelines for the technical review of national communications from Parties included in Annex I to the Convention" (annex to decision 13/CP.20), and the "Guidelines for review under Article 8 of the Kyoto Protocol" (annex to decision 22/CMP.1 and annex I to decision 4/CMP.1).

2. In accordance with decision 13/CP.20, a draft version of this report was transmitted to the Government of Liechtenstein, which provided comments that were considered and incorporated into this final version of the report.

3. The review was conducted from 15 to 19 April 2024 in Vaduz by the following team of nominated experts from the UNFCCC roster of experts: Marzena Anna Chodor (Poland), Christopher Dore (United Kingdom of Great Britain and Northern Ireland), Ngozi Eze (Nigeria), Laine Lupkina (Latvia) and Nagmeldin Mahmoud (Sudan). Christopher Dore and Nagmeldin Mahmoud were the lead reviewers. The review was coordinated by Claudia do Valle and Andrea Nuesse (secretariat).

B. Summary

4. The ERT conducted a technical review of the information reported in the NC8 of Liechtenstein in accordance with the UNFCCC reporting guidelines on NCs,[1] the reporting guidelines for supplementary information, in particular the supplementary information required under Article 7, paragraph 2, and on the minimization of adverse impacts under Article 3, paragraph 14, of the Kyoto Protocol[2] and of the information reported in the BR5 of Liechtenstein in accordance with the UNFCCC reporting guidelines on BRs.[3]

1. Timeliness

5. The NC8 was submitted on 10 January 2023, after the deadline of 31 December 2022 mandated by decision 6/CP.25.

6. Liechtenstein informed the secretariat on 15 December 2022 about its difficulties with making a timely NC8 submission. The ERT noted with concern the delay in the submission and recommended that Liechtenstein make its next submission on time.

7. The BR5 was submitted on 10 January 2023, after the deadline of 31 December 2022 mandated by decision 6/CP.25. The CTF tables were submitted on 23 January 2024. The CTF tables were resubmitted on 17 April 2024 to address issues raised during the review. The resubmission included changes and additions to CTF tables 2(b), 2(c), 3, 4 and 4(b). Detailed information on improvements related to the resubmission is provided in paragraph 13 below. Unless otherwise specified, the information and values from the latest submission are used in this report.

8. Liechtenstein informed the secretariat on 15 December 2022 about its difficulties with making a timely BR5 submission. The ERT noted with concern the delay in the submission and recommended that Liechtenstein make its next submission on time.

[1] Decision 6/CP.25, annex.
[2] Decision 15/CMP.1, annex, and decision 3/CMP.11, annex III.
[3] Decision 2/CP.17, annex.

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

9. Issues and gaps identified by the ERT related to the information reported by Liechtenstein in its NC8 are presented in tables 1–2. The information reported, including the supplementary information under the Kyoto Protocol, mostly adheres to the UNFCCC reporting guidelines on NCs. The ERT concludes that the issue of a mandatory nature related to supplementary information under the Kyoto Protocol does not influence the Party's ability to fulfil its commitments for the second commitment period of the Kyoto Protocol.

10. The ERT noted that Liechtenstein made improvements to the reporting in its NC8 compared with that in its NC7, including by addressing many recommendations and encouragements from the previous review report in the areas of GHG inventory information; PaMs; projections and the total effects of PaMs; vulnerability assessment, climate change impacts and adaptation measures; and supplementary information related to the Kyoto Protocol.

Table 1
Assessment of completeness and transparency of mandatory information reported by Liechtenstein in its eighth national communication

Section of NC	*Completeness*	*Transparency*	*Reference to description of recommendation*
Executive summary	Complete	Transparent	–
National circumstances relevant to GHG emissions and removals	Complete	Transparent	–
GHG inventory	Complete	Transparent	–
PaMs	Mostly complete	Mostly transparent	Issues 4–5 in table I.1
Projections and the total effect of PaMs	Mostly complete	Transparent	Issue 1 in table I.2
Vulnerability assessment, climate change impacts and adaptation measures	Complete	Mostly transparent	Issue 1 in table I.3
Financial resources and transfer of technology[a]	NA	NA	NA
Research and systematic observation	Mostly complete	Transparent	Issue 1 in table I.4
Education, training and public awareness	Complete	Transparent	–

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

Table 2
Assessment of completeness and transparency of mandatory supplementary information under the Kyoto Protocol reported by Liechtenstein in its eighth national communication

Supplementary information under the Kyoto Protocol	*Completeness*	*Transparency*	*Reference to description of recommendation*
National system	Complete	Transparent	–
National registry	Complete	Transparent	–
Supplementarity relating to the mechanisms pursuant to Articles 6, 12 and 17	Complete	Transparent	–
PaMs in accordance with Article 2	Complete	Mostly transparent	Issue 1 in table I.6
Domestic and regional programmes and/or arrangements and procedures	Complete	Transparent	–
Information under Article 10[a]	NA	NA	NA
Financial resources[b]	NA	NA	NA

Supplementary information under the Kyoto Protocol	*Completeness*	*Transparency*	*Reference to description of recommendation*
Minimization of adverse impacts in accordance with Article 3, paragraph 14	Complete	Transparent	NA

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

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

[b] Liechtenstein is not an Annex II Party and is therefore not obliged to provide information on financial resources under Article 11 of the Kyoto Protocol, including on "new and additional" resources.

11. Issues and gaps identified by the ERT related to the information reported by Liechtenstein in its BR5 are presented in table 3. The information reported mostly adheres to the UNFCCC reporting guidelines on BRs.

12. The ERT noted that Liechtenstein made improvements to the reporting in its BR5 compared with that in its BR4, by addressing many recommendations and encouragements from the previous review report in the areas of its quantified economy-wide emission reduction target and related assumptions, conditions and methodologies; progress in achievement of quantified economy-wide emission reduction targets and relevant information; and projections.

Table 3
Summary of completeness and transparency of mandatory information reported by Liechtenstein in its fifth biennial report

Section of BR	*Completeness*	*Transparency*	*Reference to description of recommendation*
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	Issues 1 and 3 in table II.1
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 annex II. 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.

13. The resubmission of CTF tables made during the review improved:

(a) The information reported on the Party's quantified economy-wide emission reduction target and related assumptions, conditions and methodologies by including the base year for NF_3 in CTF table 2(b) and the GWP value for NF_3 in CTF table 2(c);

(b) The information reported on PaMs by differentiating in CTF table 3 between the Energy Strategy 2020 and the Energy Strategy 2030 and the respective quantitative estimates of mitigation impacts;

(c) The information reported on progress in achievement of quantified economy-wide emission reduction targets and relevant information by correcting the quantity of units used from market-based mechanisms under the Convention for 2017–2019 in CTF table 4 and the corresponding number of certified emission reductions for 2019 in CTF table 4(b).

II. Technical review of the information reported in the eighth national communication and fifth biennial report

A. National circumstances relevant to greenhouse gas emissions and removals

1. Technical assessment of the reported information

14. The NC8 contains key data on legislation, population trends, geography and land use, climate and climate change, economic developments, energy, transport, the buildings sector, industry, trade, the services sector, agriculture, forestry, resource efficiency and wastewater. Liechtenstein provided a detailed description of its national circumstances. The information provided in the NC8 and BR5 explains the drivers affecting Liechtenstein's GHG emission and removal trends over time, as well as the factors affecting the development of its climate change PaMs.

15. Liechtenstein collaborates closely with Switzerland through numerous bilateral agreements, the most important being the Customs Treaty, which, together with other agreements, ensures an open border between Liechtenstein and Switzerland for goods and services, as well as passenger traffic. Liechtenstein joined the EEA Agreement in 1995, which ensures free movement of goods, services, persons and capital with EU member countries. Many of Liechtenstein's climate-related legislative arrangements, policies and programmes are therefore developed and implemented in accordance with policies and programmes implemented in the EU and Switzerland. For example, through the Customs Treaty with Switzerland, Liechtenstein is bound to adopt and implement the joint CO_2 Act, which establishes a CO_2 levy on vehicles and a tax on fuel imports. In addition, the Customs Treaty has led to legal alignment and harmonization in economic and social law, extending beyond the Treaty's scope. This integration is evident in various agreements, including on social security, vocational training, transport, indirect taxes and police cooperation. Under the EEA Agreement, EU legislation and environmental standards need to be incorporated into Liechtenstein's legislation; for example, the Party participates in the EU ETS and is obliged to regularly update the national Emissions Trading Act.

16. The energy sector represented 78.1 per cent (144.31 kt CO_2 eq) of the Party's total emissions in 2020 (184.85 kt CO_2 eq, including LULUCF). Liechtenstein has no fossil fuel resources of its own and imports a large share of its energy. In 2020, 13 per cent of total final energy consumption was sourced domestically. Liechtenstein's own energy supply is limited to firewood, waste heat, solar thermal heat and electricity (which is produced by hydroelectric power plants, photovoltaic systems and combined heat and power plants using biogas and imported natural gas). Natural gas and electricity are the main energy sources consumed in the country. In 2020, electricity consumption accounted for 33 per cent of total energy consumption, and 74 per cent of this electricity was imported. Natural gas represented about 22 per cent of total energy consumption, followed by diesel (11 per cent), district heating from waste (10.9 per cent) and heating oil (9 per cent).

17. The transport sector represented 36.6 per cent of the total emissions in the energy sector in 2020. Over the last 30 years, the number of motor vehicles in Liechtenstein has almost doubled. In 2021, a total of 30,538 automobiles were registered, compared with 30,434 in 2020. However, Liechtenstein noted that the proportion of fuel-efficient light-duty vehicles and vehicles using alternative fuels (natural gas, hybrid, electric) has begun to increase significantly, a trend that appeared to continue in 2022. Liechtenstein is also committed to following the path established by the EU regulation on setting emission performance standards for new passenger cars (regulation 443/2009/EC). Liechtenstein collaborates closely with its neighbouring countries (Austria and Switzerland) in developing and implementing its transport policy.

18. The residential, commercial and institutional sectors represented around 43.5 per cent of the total emissions in the energy sector in 2020. The main energy sources in these sectors are natural gas and oil consumed for residential/commercial heating and district heating. Emissions from these sectors decreased by about 31.1 per cent between 2009 and 2020, even

though the number of residential buildings increased to 10,870 by 2020, up from 6,044 in 1980, mainly owing to an increase in the use of biomass. Liechtenstein has been developing legal instruments to improve the framework for implementing energy efficiency measures, for example, by establishing the Bureau of Energy Consumption and Conservation within the Office of Economic Affairs to advise municipalities and the private sector on all areas of and opportunities for energy conservation.

19. The agriculture sector represented 13.4 per cent of the Party's total emissions in 2020. Liechtenstein's agriculture sector relies primarily on animal husbandry, which generates 70 per cent of agricultural revenue. The latest agricultural policy report for 2022, which was under public review until recently, is now available and introduces climate change mitigation and adaptation measures and complements the Climate Strategy 2050. Forests cover an area of around 6,700 ha (43 per cent of the country's territory). The main goals of the Forestry Act (1991) include the qualitative and quantitative preservation of forest stocks (including the prohibition of clearing) and the promotion of nature-friendly forest management. In June 2001, Liechtenstein launched the National Forest Programme in response to international obligations to promote sustainable forest management.

2. Assessment of adherence to the reporting guidelines

20. The ERT assessed the information reported in the NC8 of Liechtenstein and recognized that the reporting is complete and transparent, and thus adheres to the UNFCCC reporting guidelines on NCs. There were no issues raised during the review relating to the topics discussed in this chapter of the review report.

B. Greenhouse gas inventory information[4]

1. Technical assessment of the reported information

21. Liechtenstein reported information in its BR5 and NC8 on its historical GHG emissions and inventory arrangements using GWP values from the AR4. More recent information on GHG emissions was reported in Liechtenstein's 2023 inventory submission, which used GWP values from the AR5. Total GHG emissions[5] excluding emissions and removals from LULUCF, as reported in Liechtenstein's 2023 inventory submission, decreased by 21.2 per cent between 1990 and 2020, while total GHG emissions including net emissions or removals from LULUCF decreased by 21.7 per cent over the same period. Emissions peaked in 2006 and decreased thereafter. The changes in total emissions were driven mainly by factors such as fuel prices, heating degree days and fuel consumption in road transportation, fluctuations in the number of livestock and an increase in the productivity of dairy cattle. Emissions were also influenced by the replacement of CFCs with HFCs. The increase in HFC emissions is related to the increasing population, number of households, number of persons employed in the industrial and service sectors and number of registered cars. In 2020 emissions decreased further because of the effects of the coronavirus disease 2019 pandemic, particularly in the transport sector, which experienced an 8.0 per cent decrease compared with the 2019 level. Emissions excluding emissions and removals from LULUCF increased in 2021 compared with 2020 as a result of the easing of restrictions imposed during the pandemic.

22. Table 4 illustrates the emission trends by sector and by gas for Liechtenstein. The emissions reported in the 2023 inventory submission differ from the data reported in CTF table 1 in that the values in CTF table 1 were reported using GWP values from the AR4, whereas the values in the 2023 inventory submission were reported using GWP values from the AR5. In addition, recalculations were performed for the 2023 inventory submission for the transport sector owing to updated CH_4 and N_2O emission factors, as well as for non-

[4] GHG emission data in this section, which use GWP values from the AR5, are based on Liechtenstein's 2023 inventory submission, version 6, which has not yet been subject to review. All emission data in subsequent chapters are based on Liechtenstein's BR5 CTF tables, which use GWP values from the AR4 unless otherwise noted.

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

energy products from fuels and solvent use owing to updated emission factors for lubricants, and for the IPPU and waste sectors owing to updated activity data. These recalculations resulted in an increase in the estimated total emissions without LULUCF of 0.5 per cent for 1990 and 2020. For the estimated total emissions with LULUCF, the increase was 0.5 and 0.4 per cent for 1990 and 2020 respectively. The emissions reported in CTF table 1 are the same as those reported in the 2022 annual submission.

Table 4
Greenhouse gas emissions by sector and by gas for Liechtenstein for 1990–2021

	GHG emissions (kt CO_2 eq)					*Change (%)*		*Share (%)*	
	1990	*2000*	*2010*	*2020*	*2021*	*1990–2020*	*2020–2021*	*1990*	*2021*
Sector									
1. Energy	201.27	220.05	193.53	144.41	148.42	–28.3	2.8	87.6	80.7
A1. Energy industries	0.17	2.77	3.26	2.44	2.58	1 329.2	5.6	0.1	1.4
A2. Manufacturing industries and construction	36.28	36.40	26.07	22.84	23.21	–37.0	1.6	15.8	12.6
A3. Transport	76.86	91.53	77.74	52.73	56.09	–31.4	6.4	33.5	30.5
A4. and A5. Other	87.55	88.43	85.20	65.06	65.18	–25.7	0.2	38.1	35.4
B. Fugitive emissions from fuels	0.41	0.93	1.26	1.33	1.36	225.1	2.7	0.2	0.7
C. CO_2 transport and storage	NO	NO	NO	NO	NO	–	–	–	–
2. IPPU	0.60	4.03	8.69	8.92	8.29	1 377.8	–7.1	0.3	4.5
3. Agriculture	26.04	21.86	24.88	25.91	25.53	–0.5	–1.4	11.3	13.9
4. LULUCF	7.53	25.10	20.96	4.79	0.29	–36.4	–94.0	NA	NA
5. Waste	1.73	1.69	1.73	1.64	1.66	–5.1	1.2	0.8	0.9
6. Other[a]	NO	NO	NO	NO	NO	–	–	–	–
Gas[b]									
CO_2	198.97	216.86	190.83	141.93	145.88	–28.7	2.8	86.6	79.3
CH_4	21.54	18.70	21.38	22.08	21.81	2.5	–1.2	9.4	11.9
N_2O	9.13	8.45	8.25	8.18	8.16	–10.4	–0.2	4.0	4.4
HFCs	0.00	3.52	8.28	8.63	7.99	8 982 846.7	–7.4	0.0	4.3
PFCs	NO	0.01	0.05	0.00	0.00	–	–4.5	–	0.0
SF_6	NO	0.09	0.02	0.06	0.05	–	–3.8	–	0.0
NF_3	NO	NO	NO	NO	NO	–	–	–	–
Total GHG emissions excluding LULUCF	**229.64**	**247.63**	**228.83**	**180.87**	**183.90**	**–21.2**	**1.7**	**100.0**	**100.0**
Total GHG emissions including LULUCF	**237.18**	**272.73**	**249.79**	**185.67**	**184.19**	**–21.7**	**–0.8**	**NA**	**NA**

Source: GHG emission data: Liechtenstein's 2023 inventory submission, version 6.
[a] Emissions and removals reported under the sector other (sector 6) are not included in total GHG emissions.
[b] Emissions by gas without LULUCF. The Party did not report indirect CO_2 emissions.

23. In brief, Liechtenstein's national inventory arrangements were established in accordance with its Emissions Trading Act. The Office of Environment is responsible for preparing Liechtenstein's GHG inventories on behalf of the Government of Liechtenstein. In addition, the Office of Economic Affairs, the Office of Statistics and the Office of Building Construction and Spatial Planning participate directly in compiling the GHG inventory. Several other administrative offices and private sector institutions are also involved in inventory preparation. There have been no changes in these arrangements since the BR4.

2. Assessment of adherence to the reporting guidelines

24. The ERT assessed the information reported in the NC8 and BR5 of Liechtenstein and recognized that the reporting is complete and transparent, and thus adheres to the UNFCCC reporting guidelines on NCs and 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.

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

(a) Technical assessment of the reported information

25. Liechtenstein provided in the NC8 a description of how its national system for the estimation of anthropogenic emissions by sources and removals by sinks of all GHGs not controlled by the Montreal Protocol is performing the general and specific functions defined in the annex to decision 19/CMP.1 in conjunction with decisions 3/CMP.11 and 4/CMP.11. The description includes all the elements mandated by paragraph 30 of the annex to decision 15/CMP.1. There were no changes to the national system reflected in the NC8 or in the report on the individual review of the 2022 annual submission of Liechtenstein.

(b) Assessment of adherence to the reporting guidelines

26. The ERT assessed the information reported in the NC8 of Liechtenstein and recognized that the reporting is complete and transparent, and thus adheres to the reporting guidelines for supplementary information. No issues relating to the topics discussed in this chapter of the review report were raised during the review.

4. National registry

(a) Technical assessment of the reported information

27. In its NC8 Liechtenstein provided information on how its national registry performs the functions in accordance with the annex to decision 13/CMP.1 in conjunction with decision 3/CMP.11 and the annex to decision 5/CMP.1 and complies with the requirements of the technical standards for data exchange between registry systems. The ERT took note of the changes to the national registry made in 2021, as reflected in the report on the individual review of the 2022 annual submission of Liechtenstein.

(b) Assessment of adherence to the reporting guidelines

28. The ERT assessed the information reported in the NC8 of Liechtenstein and recognized that the reporting is complete and transparent, and thus adheres to the reporting guidelines for supplementary information. No issues relating to the topics discussed in this chapter of the review report were raised during the review.

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

1. Technical assessment of the reported information

29. Liechtenstein reported information on its economy-wide emission reduction target in its BR5. 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, SF_6 and NF_3. It also includes all IPCC 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 using a land-based accounting approach. Although Liechtenstein reported its intention to make use of market-based mechanisms to achieve its target, it explained during the review that it has met its 2020 target through domestic measures alone (see para. 49 below). In absolute terms this means that,

under the Convention, Liechtenstein has to reduce its emissions from 236.04 kt CO_2 eq (in 1990)[6] to 188.83 kt CO_2 eq by 2020.

30. In addition to its 2020 target, Liechtenstein revised its Emissions Trading Act in 2021, which sets the general framework for fulfilling its obligations under the Kyoto Protocol and the Paris Agreement, including a long-term goal of reaching climate neutrality by 2050 and an interim target of reducing GHG emissions by 40 per cent below the 1990 level by 2030. Liechtenstein also adopted the Energy Strategy 2030, which sets targets to increase the share of renewable energy from 22 per cent in 2019 to 30 per cent in 2030, and to increase energy efficiency in order to reduce final energy demand by 20 per cent below the 2008 level by 2030. In December 2022, Liechtenstein also adopted the Climate Strategy 2050, which includes a target of reducing emissions by 55 per cent below the 1990 level by 2030 and covers all sectors, including the phasing-out of fossil fuels in heating systems.

2. Assessment of adherence to the reporting guidelines

31. The ERT assessed the information reported in the BR5 of Liechtenstein and recognized that the reporting is complete and transparent, and thus adheres 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.

D. Information on policies and measures

1. Technical assessment of the reported information

32. Liechtenstein provided in its NC8 and BR5 information on its PaMs[7] implemented, adopted and planned to fulfil its commitments under the Convention. Liechtenstein's set of PaMs reported in the NC8 is similar to that reported in the NC7. Two new PaMs were reported in the BR5 compared with the BR4. In BR5 CTF table 3 three overarching policies were reported, namely the Energy Strategy 2020, the Energy Strategy 2030 and the Climate Strategy 2050, whereas in BR4 CTF table 3 the Party reported the three overarching policies as the Energy Strategy 2020, the Energy Efficiency Act and the installation of a steam pipeline, which enabled Liechtenstein to acquire steam from a waste incineration plant in Switzerland. During the review, Liechtenstein explained that the Energy Efficiency Act was one of the measures implemented under the Energy Strategy 2030, while the action related to the steam pipeline was integrated into the baseline (WOM scenario) when developing the Energy Strategy 2030.

33. 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. Liechtenstein also indicated that there have been no changes to its institutional, legal, administrative and procedural arrangements used for domestic compliance, monitoring, reporting, archiving of information and evaluation of progress towards its target. The overall responsibility for climate change policymaking lies with the Ministry of Home Affairs, Economy and Environment, which is the coordinating authority with respect to execution of the national Climate Strategy and Climate Vision 2050 and the implementation of national climate policy. The ministries take the lead in the policymaking process, while the administrative offices tasked with executing sectoral measures are responsible for monitoring the effects of individual PaMs. For example, the Ministry of Interior is in charge of developing transport policy, but transport sector measures are implemented by the Office of Building Construction and Spatial Planning. The administrative offices responsible for implementing PaMs provide annual reports on their activities to Parliament, which are also made publicly available. Liechtenstein has legislative arrangements and administrative procedures in place to make information on PaMs publicly accessible.

[6] The emission level in 1990 was calculated on the basis of the data provided in CTF tables 1 and 4.

[7] The UNFCCC reporting guidelines on BRs use the term "mitigation actions", whereas the UNFCCC reporting guidelines on NCs use the term "policies and measures". The terms are used interchangeably in this report to refer to the relevant information in either the NC or BR.

34. Liechtenstein reported that its actions to identify and review its own policies and practices that encourage activities that lead to greater levels of emission reductions are implemented through annual tracking of sustainable development in the country using an indicator-based system similar to those used in Switzerland and the EU (Eurostat). During the review, the Party explained that annual information on GHG emissions is based on data collected by the Office of Statistics.

35. In its reporting on PaMs in the NC8, Liechtenstein did not provide estimated mitigation impacts for most of its PaMs, reporting "NA" instead. Where estimated impacts were not provided, the Party supplied an explanation applicable to all PaMs. During the review, Liechtenstein clarified that while estimates of emission reductions were provided for sectoral strategies, they were not provided for the PaMs implemented under those strategies since they are policy instruments designed to achieve various other measures and goals as part of the sectoral strategies, and their impacts were not separately quantified.

36. The key overarching cross-sectoral policy reported by Liechtenstein is the Climate Strategy adopted in 2007. It was replaced by the Climate Strategy 2050, which provides the framework for future climate policy. One of the core elements of Liechtenstein's PaMs is their linkage with energy conservation across sectors. Since the energy sector is responsible for 80 per cent of Liechtenstein's GHG emissions, the Energy Strategy 2020 was the key policy in achieving the Party's 2020 emission reduction goal. Other policies that have delivered significant emission reductions are the CO_2 Act and the Emissions Trading Act. The CO_2 Act was reported as the most comprehensive legislative measure across Liechtenstein's economy and is considered one of the country's key legal acts for reducing GHG emissions. It is aimed at reducing CO_2 emissions from energy-related use of fossil fuels through a combination of measures, including a CO_2 levy on thermal fuels, efficiency standards for passenger cars and obligations for fuel importers to offset CO_2 emissions. The Emissions Trading Act establishes the general framework for fulfilling Liechtenstein's international emission reduction obligations under the Kyoto Protocol (until 2020) and the Paris Agreement. The ERT identified Liechtenstein's waste-to-energy policy as a mitigation action of particular interest because it simultaneously deals with the problem of municipal waste disposal and provides energy for district heating. Liechtenstein continues to extend its district heating network. The main network connects both residential and industrial end users in the municipalities of Vaduz and Schaan to waste heat streams from the waste incineration plant in neighbouring Switzerland, which incinerates all of Liechtenstein's non-recyclable and non-compostable municipal waste.

37. Under the Customs Treaty between Liechtenstein and Switzerland, cross-border measures and bilateral execution of various Swiss legal acts related to sustainability and the environment are directly applicable in Liechtenstein, such as the CO_2 Act. In addition, Liechtenstein's close economic ties with the EU, through the EEA Agreement, mean that EU environmental standards need to be incorporated into national legislation; for example, in the application of the Emissions Trading Act (see paras. 15 and 36 above).

38. Liechtenstein highlighted the mitigation actions under development, such as the Climate Strategy 2050, which was planned at the time of preparing the NC8 but has since been adopted, in December 2022, and will support the implementation of additional measures in the energy sector such as the phasing-out of fossil fuel-based heating systems for new buildings. Table 5 provides a summary of the reported information on the PaMs of Liechtenstein.

Table 5
Summary of information on policies and measures reported by Liechtenstein

Sector	*Key PaMs*[a]	*Estimated mitigation impact in 2020 (kt CO_2 eq)*	*Estimated mitigation impact in 2025 (kt CO_2 eq)*
Policy framework and cross-sectoral measures	Climate Strategy[b]	NA	NA
	Climate Strategy 2050[c]	NA	8.31
Energy			
Energy supply and renewable energy	Liechtenstein Energy Strategy 2020	2.56	NA
	Liechtenstein Energy Strategy 2030[d]	NA	3.49

Sector	*Key PaMs*[a]	*Estimated mitigation impact in 2020 (kt CO_2 eq)*	*Estimated mitigation impact in 2025 (kt CO_2 eq)*
Energy efficiency	Environmental Protection Act	NA	NA
Transport	CO_2 Act	NA	NA
IPPU	Swiss Ordinance on Chemical Risk Reduction	NA	NA
Agriculture	Ecological equalisation payments in agriculture	NA	NA
LULUCF	Forestry Regulation	NA	NA
	Cultivation regulations in the Forestry Act	NA	NA
Waste	Environmental Protection Act	NA	NA

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

[a] Names of PaMs reproduced as reported in Liechtenstein's NC8 and BR5.
[b] Implemented in 2007, revised in 2015 and completed in 2020
[c] Implemented in 2007, revised in 2015 and completed in 2020.
[d] Replaced the Liechtenstein Energy Strategy 2020.

2. Assessment of adherence to the reporting guidelines

39. The ERT assessed the information reported in the NC8 and BR5 of Liechtenstein and identified issues relating to completeness and transparency, and thus adherence to the UNFCCC reporting guidelines on NCs and the UNFCCC reporting guidelines on BRs. The findings are described in tables I.1 and II.1.

3. Domestic and regional programmes and legislative arrangements and procedures related to the Kyoto Protocol

(a) Technical assessment of the reported information

40. In its NC8 Liechtenstein reported that the implementation of the Kyoto Protocol is underpinned by the Emissions Trading Act 2012 (revised in 2021), which sets the general framework for implementing Liechtenstein's obligations under the Kyoto Protocol and the Paris Agreement. In the revised version of the Emissions Trading Act, Liechtenstein adopted a long-term goal of reaching climate neutrality by 2050 and an interim target of reducing GHG emissions by 40 per cent below the 1990 level by 2030. In addition, Liechtenstein considers the CO_2 Act (2013) as the most comprehensive legislative measure across its economy and the key instrument for reducing GHG emissions. The CO_2 Act is aimed at reducing GHG emissions from energy-related use of fossil fuels through a CO_2 levy on thermal fuels, efficiency standards for passenger cars and obligations for fuel importers to offset CO_2 emissions. The overall responsibility for climate change policymaking lies with the Ministry of Home Affairs, Economy and Environment and the Office of Environment, which are responsible for the overall coordination of the execution of climate-related strategies. Other national institutions involved in climate-related policy implementation include the Office of Economic Affairs, the Office of Building Construction and Spatial Planning, the National Gas Utility Company and the National Electric Power Company.

41. For the second commitment period of the Kyoto Protocol, from 2013 to 2020, Liechtenstein committed to reducing its GHG emissions by 84 per cent below the base-year level. This is in line with the Party's economy-wide emission reduction target of reducing its GHG emissions by 20 per cent below the 1990 level by 2020 (see para. 29 above).

42. Liechtenstein has arrangements and enforcement procedures to meet its commitments under the Kyoto Protocol, including procedures for addressing non-compliance, in accordance with its national circumstances. During the review, the Party provided information on the key measures that include provisions for enforcement and evaluation of domestic non-compliance. These measures encompass the CO_2 Act, the Emissions Trading Act, negotiated reduction commitments, CO_2 emissions regulation for newly registered vehicles, and partial compensation for CO_2 emissions from motor fuel use. Non-compliance, enforcement and administrative procedures are addressed on a case-by-case basis, and violations of the law can result in penalties. The Office of Environmental Protection may sanction responsible individuals with fines up to CHF 30,000 in accordance with article 89,

paragraph 1, and article 73 of the Environmental Protection Act. The Party also explained that it intends to include more detailed information on the rules for domestic non-compliance in its next submission.

43. Liechtenstein has provisions in place to make information on legislative arrangements and administrative procedures related to compliance and enforcement publicly accessible, such as processes for public consultation and popular voting on climate- and environment-related PaMs.

44. Liechtenstein has national legislative arrangements and administrative procedures in place that seek to ensure that the implementation of activities under Article 3, paragraph 3, and any elected activities under Article 3, paragraph 4, of the Kyoto Protocol also contributes to the conservation of biodiversity and the sustainable use of natural resources. For example, the Forest Act and the associated Forestry Ordinance (1995) stipulate that forests should fulfil various functions. As a Party to the Convention on Biological Diversity, Liechtenstein has also signed the Bratislava Ministerial Declaration (2021), which commits signatories, inter alia, to ensuring the preservation of forest biodiversity.

(b) Assessment of adherence to the reporting guidelines

45. The ERT assessed the information reported in the NC8 of Liechtenstein and recognized that the reporting is complete and transparent, and thus adheres to the reporting guidelines for supplementary information. No issues relating to the topics discussed in this chapter of the review report were raised during the review.

4. Policies and measures in accordance with Article 2 and minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol

(a) Technical assessment of the reported information

46. In the NC8 Liechtenstein reported limited information on how it strives to implement PaMs under Article 2 of the Kyoto Protocol in such a way as to minimize adverse effects, including the adverse effects of climate change and effects on international trade and social, environmental and economic impacts on other Parties, especially developing country Parties. The Party reported that the Energy Strategy 2030 addresses the need to minimize adverse effects of its PaMs in accordance with Article 2, paragraph 3, of the Kyoto Protocol, and that the proposed set of measures was checked for compatibility with economic and social requirements.

47. Further information on how Liechtenstein strives to implement its commitments under Article 3, paragraph 14, of the Kyoto Protocol in such a way as to minimize adverse social, environmental and economic impacts of its climate policy and measures on developing country Parties was reported in the 2022 annual submission. The Party reported on the minimization of the effects on international trade and of the social, environmental and economic impacts on other Parties. Liechtenstein reported that, despite being a small country with a relatively small share in international trade, it has implemented various instruments aimed at minimizing potential adverse impacts of its climate change response measures in all sectors and for different gases. The PaMs are compatible and consistent with those of the EU in order to avoid trade distortion and non-tariff barriers to trade, and to set similar incentives. The tax exemption for biofuels applied in Switzerland and consequently in Liechtenstein through the tax agreement is limited to fuels that meet certain ecological and social criteria, with conditions designed to ensure that biofuels do not compete with food production or cause degradation of rainforests or other valuable ecosystems. When Liechtenstein purchases emission reduction units, these must have ecological value and demonstrate social and ethical eligibility requirements to benefit the people of the host country. In addition, projects that lead to these emission reductions must align with the principles of the International Humanitarian Cooperation and Development.

(b) Assessment of adherence to the reporting guidelines

48. The ERT assessed the information reported in the NC8 of Liechtenstein and identified an issue relating to transparency and thus adherence to the reporting guidelines for supplementary information. The finding is described in table I.6.

E. Estimates of emission reductions and removals and the use of units from market-based mechanisms and land use, land-use change and forestry and progress in achieving the quantified economy-wide emission reduction target

1. Technical assessment of the reported information

49. On its use of units from LULUCF activities, Liechtenstein reported in CTF tables 4 and 4(a) that in 2019 and 2020 it did not use any units from LULUCF activities. Liechtenstein reported its intention to use units from market-based mechanisms under the Convention; however, it did not use these units towards achieving its 2020 target, which was met using domestic measures alone. Therefore, although the Party has units from market-based mechanisms in its holding account, it reported units used from market-based mechanisms as "0" in CTF tables 4 and 4(b). Table 6 illustrates Liechtenstein's total GHG emissions, contribution of LULUCF and use of units from market-based mechanisms towards achieving its target.

Table 6
Summary of information on greenhouse gas emissions, use of units from market-based mechanisms and land use, land-use change and forestry by Liechtenstein
(kt CO_2 eq)

Year	*Emissions excluding LULUCF*	*Contribution of LULUCF*	*Use of units from market-based mechanisms*	*Net emissions including LULUCF and market-based mechanisms*
1990	228.47	7.57	NA	236.04
2010	228.17	21.01	NA	249.18
2011	215.32	24.73	NA	240.05
2012	224.51	25.01	NA	249.52
2013	230.73	17.56	0	248.29
2014	199.73	17.48	0	217.21
2015	198.15	12.21	0	210.36
2016	187.76	10.43	0	198.19
2017	193.46	11.72	0	205.18
2018	181.27	22.39	0	203.66
2019	187.67	12.40	0	200.07
2020	180.01	4.84	0	184.85
			2020 target	188.83

Sources: Liechtenstein's BR5 and BR5 CTF tables 1, 4, 4(a)I, 4(a)II and 4(b), information provided by the Party during the review and Liechtenstein's 2022 annual submission, version 3, which use GWP values from the AR4.

2. Assessment of adherence to the reporting guidelines

50. The ERT assessed the information reported in the NC8 and BR5 of Liechtenstein and recognized that the reporting is complete and transparent, and thus adheres to the UNFCCC reporting guidelines on NCs and 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.

3. Assessment of achievement of the quantified economy-wide emission reduction target

51. In assessing the Party's achievement of its 2020 target on the basis of the information reported in its BR5, the ERT noted that Liechtenstein committed to reducing its emissions to

20 per cent below the 1990 level by 2020 (see para. 29 above). In 2020 Liechtenstein's annual total GHG emissions excluding LULUCF were 180.01 kt CO_2 eq. The ERT noted that the contribution of LULUCF is included in the Party's base year and target year and that Liechtenstein did not use units from market-based mechanisms towards the achievement of its 2020 target. The ERT noted that in 2020 the contribution of LULUCF was 4.84 kt CO_2 eq, resulting in emissions of 184.85 kt CO_2 eq (21.7 per cent) below the emission level corresponding to the 2020 target (see table 6). The ERT concluded that, on the basis of the information reported in the BR5 and provided during the review, the total GHG emissions including the contribution of LULUCF do not exceed the emission level corresponding to the 2020 target, and thus that the target has been achieved.

F. Projections

1. Projections overview, methodology and results

(a) Technical assessment of the reported information

52. Liechtenstein reported in its BR5 and NC8 updated projections for 2025–2035 relative to actual inventory data for 2020 under the WEM scenario, using GWP values from the AR4. The WEM scenario reported by Liechtenstein includes PaMs implemented and adopted until 2020.

53. 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 policies such as the Climate Strategy (revised in 2015), the Emissions Trading Act (adopted in 2020), Climate Vision 2050 (adopted in 2020, defining the Party's 2050 climate-neutrality target) and the Energy Strategy 2030 (adopted in 2020), while its WAM scenario includes the Climate Strategy 2050 (which was adopted by Parliament in December 2022). The definitions indicate that the scenarios were prepared in accordance with the UNFCCC reporting guidelines on BRs.

54. The projections are presented on a sectoral basis, using the same sectoral categories as those used in the reporting on mitigation actions, and on a gas-by-gas basis for CO_2, CH_4, N_2O, PFCs, HFCs and SF_6 for 2025–2035. NF_3 was reported as "NO" for all years. 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 limited information on factors and activities affecting emissions for each sector.

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

55. The methodology used for the preparation of the projections is different from that used for the preparation of the emission projections for the NC7. Liechtenstein provided information on changes since the submission of its NC7 in the assumptions, methodologies, models and approaches used for the projection scenarios. For the WEM scenario, improvements were made to the calculation of F-gas projections by using proxy data on F-gas emissions from the IPPU sector in Switzerland (instead of total GHG emissions from the IPPU sector), and by no longer using outdated information from the national Waste Plan. Similar improvements were made to the WOM scenario, as well as improvements to the emission projection calculations for the agriculture sector. For the WAM scenario, emission projections for the IPPU, agriculture and waste sectors were calculated on the basis of the Climate Strategy 2050, while expert judgment was used to estimate the expected impacts on the energy sector of the implementation of measures under the Climate Strategy 2050.

56. To prepare its projections, Liechtenstein relied on key underlying assumptions, which primarily assume that the trends in projected emissions are identical to those in Switzerland. This approach was used because very little information is available in Liechtenstein on the projections of economic indicators or other similar data sets. The most up-to-date data available on Switzerland's emission projections were used in calculating Liechtenstein's emission projections.

57. Sensitivity analyses were conducted for the WEM scenario for a number of important assumptions, such as the share of new buildings replacing old buildings, the rate of building retrofits and the rate of replacing heating systems in buildings, as well as the share of electric vehicles versus hybrid vehicles. The results of the sensitivity analyses indicate that, in 2035, total GHG emissions may deviate by –25 or +17 per cent compared with the reference emissions projected under the WEM scenario, as reported in NC8 figure 5-12.

(c) Results of projections

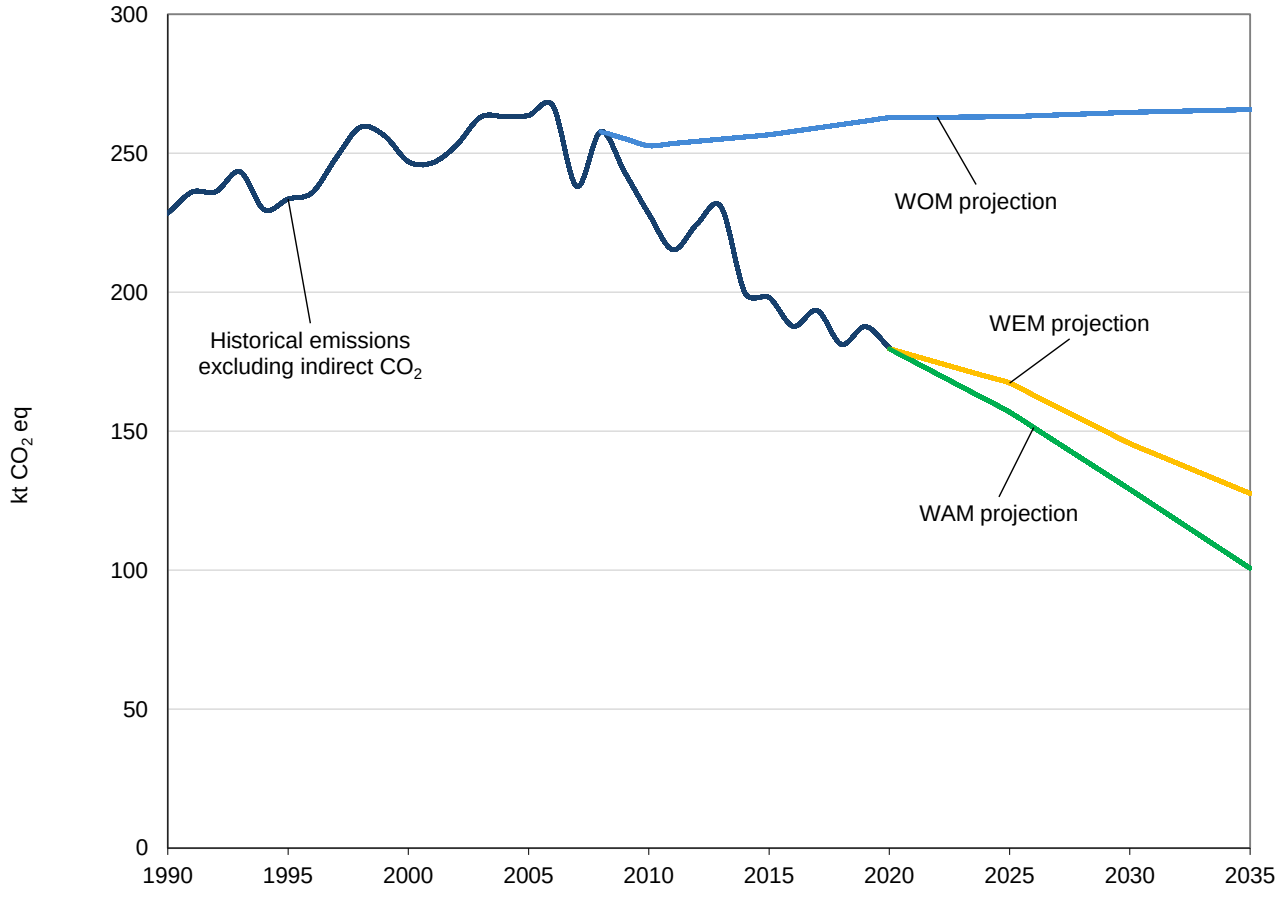
58. The projected emission levels under different scenarios are presented in table 7 and figure 1.

Table 7
Summary of greenhouse gas emission projections for Liechtenstein

	GHG emissions (kt CO_2 eq/year)	*Change in relation to 1990 level (%)*	*Change in relation to 2020 level (%)*
Inventory data 1990	228.47	NA	NA
Inventory data 2020	180.01	–21.2	NA
WOM projections for 2030	264.76	15.9	0.7
WEM projections for 2030	145.56	–36.3	–19.1
WAM projections for 2030	129.10	–43.5	–28.3
WOM projections for 2035	265.75	16.3	1.12
WEM projections for 2035	127.63	–44.1	–29.1
WAM projections for 2035	100.72	–55.9	–44.0

Sources: Liechtenstein's BR5 CTF table 6 (for 1990, 2020 and 2030) and NC8 (for 2035), which use GWP values from the AR4.
Note: The projections are of GHG emissions excluding LULUCF and excluding indirect CO_2.

Figure 1
Greenhouse gas emission projections reported by Liechtenstein

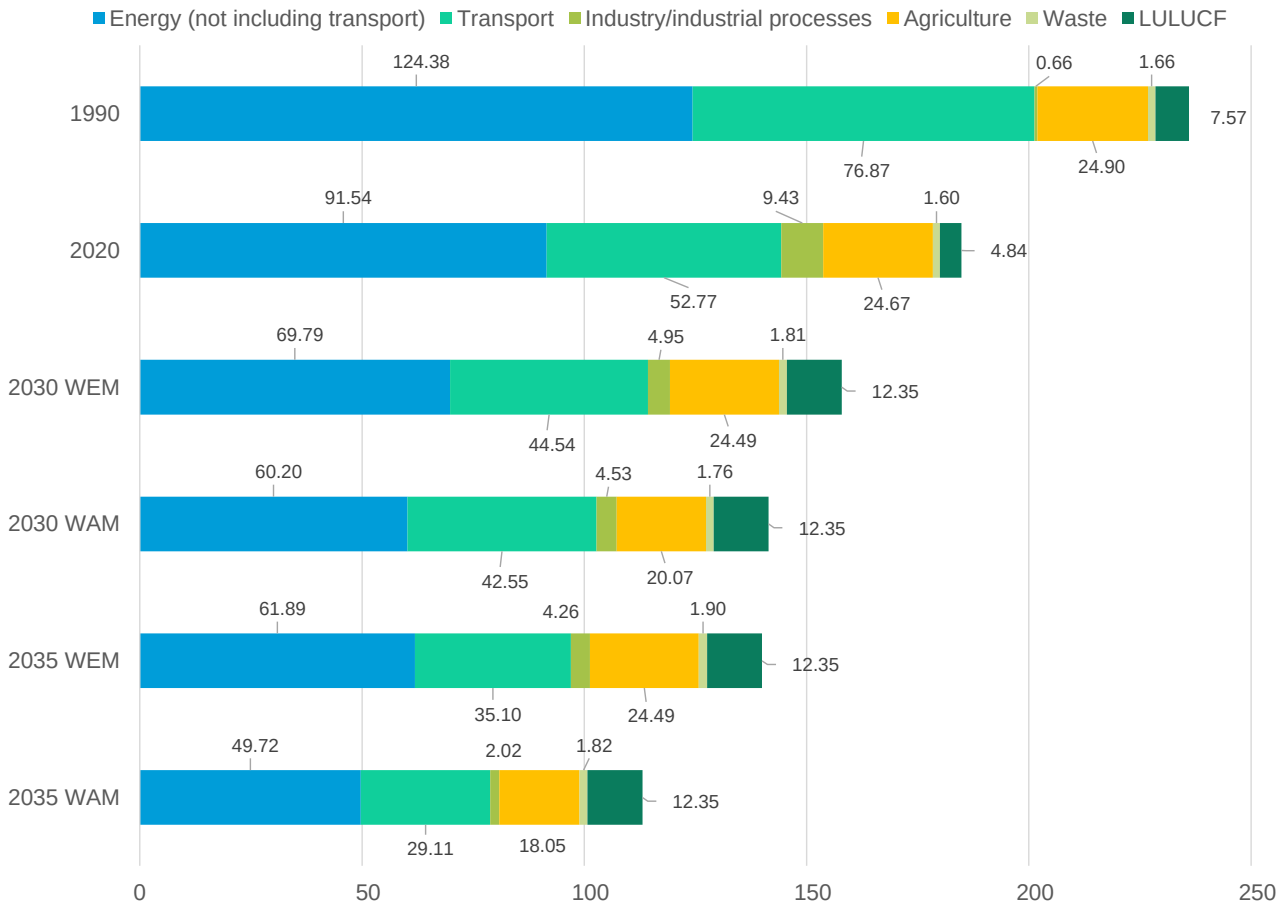


Sources: Liechtenstein's NC8 and BR5 CTF tables 1 and 6 (total GHG emissions excluding LULUCF), which use GWP values from the AR4.

59. Liechtenstein's total GHG emissions excluding LULUCF are projected under the WEM scenario to decrease by 36.3 and 44.1 per cent below the 1990 level in 2030 and 2035 respectively. When including LULUCF, total GHG emissions are projected under the WEM scenario to decrease by 33.1 and 40.7 per cent below the 1990 level in 2030 and 2035 respectively. Under the WAM scenario, emissions including LULUCF in 2030 and 2035 are projected to be lower than those in 1990 by 40.1 and 52.1 per cent respectively.

60. Liechtenstein presented the WEM and WAM scenarios by sector for 2030 and 2035, as summarized in figure 2 and table 8.

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



Sources: Liechtenstein's NC8 and BR5 CTF table 6, which use GWP values from the AR4.

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

	GHG emissions and removals (kt CO_2 eq)					*Change (%)*			
		2030		*2035*		*1990–2030*		*1990–2035*	
Sector	*1990*	*WEM*	*WAM*	*WEM*	*WAM*	*WEM*	*WAM*	*WEM*	*WAM*
Energy (not including transport)	124.38	69.79	60.20	61.89	49.72	–43.9	–51.6	–50.2	–60.0
Transport	76.87	44.54	42.55	35.10	29.11	–42.1	–44.6	–54.3	–62.1
Industry/industrial processes	0.66	4.95	4.53	4.26	2.02	650.0	586.4	545.5	206.1
Agriculture	24.90	24.49	20.07	24.49	18.05	–1.6	–19.4	–1.6	–27.5
LULUCF	7.57	12.35	12.35	12.35	12.35	63.1	63.1	63.1	63.1

	GHG emissions and removals (kt CO_2 eq)					*Change (%)*			
		2030		*2035*		*1990–2030*		*1990–2035*	
Sector	*1990*	*WEM*	*WAM*	*WEM*	*WAM*	*WEM*	*WAM*	*WEM*	*WAM*
Waste	1.66	1.81	1.76	1.90	1.82	9.0	6.0	14.5	9.6
Other	–	–	–	–	–	–	–	–	–
Total GHG emissions excluding LULUCF	**228.47**	**145.56**	**129.10**	**127.63**	**100.72**	**–36.3**	**–43.5**	**–44.1**	**–55.9**
Total GHG emissions including LULUCF	**236.04**	**157.92**	**141.45**	**139.98**	**113.07**	**–33.1**	**–40.1**	**–40.7**	**–52.1**

Sources: Liechtenstein's NC8 and BR5 CTF table 6, which use GWP values from the AR4.

61. According to the projections reported for 2030 under the WEM scenario, the most significant absolute emission reductions are expected to occur in the energy sector (not including transport), amounting to projected reductions of 43.9 per cent between 1990 and 2030. The pattern of projected emissions reported for 2035 under the same scenario is significantly different owing to a further reduction in emissions from the energy (not including transport) and transport sectors due to the ongoing impact of PaMs included in the WEM scenario. Emission reductions for other sectors between 2030 and 2035 are small by comparison.

62. Liechtenstein presented the WEM and WAM scenarios by gas for 2030 and 2035, 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 (%)*			
		2030		*2035*		*1990–2030*		*1990–2035*	
Gas[a]	*1990*	*WEM*	*WAM*	*WEM*	*WAM*	*WEM*	*WAM*	*WEM*	*WAM*
CO_2	198.97	112.17	100.69	95.00	76.98	–43.6	–49.4	–52.3	–61.3
CH_4	19.24	19.62	16.48	19.63	15.05	2.0	–14.3	2.0	–21.8
N_2O	10.27	8.96	7.53	8.86	6.73	–12.8	–26.7	–13.7	–34.5
HFCs	0.00	4.78	4.37	4.11	1.95	–	–	–	–
PFCs	NO	0.00	0.00	0.00	0.00	–	–	–	–
SF_6	NO	0.03	0.03	0.02	0.01	–	–	–	–
NF_3	NO	NO	NO	NO	NO	–	–	–	–
Total GHG emissions excluding LULUCF	**228.47**	**145.56**	**129.10**	**127.63**	**100.72**	**–36.3**	**–43.5**	**–44.1**	**–55.9**
Total GHG emissions including LULUCF	**236.04**	**157.92**	**141.45**	**139.98**	**113.07**	**–33.1**	**–40.1**	**–40.7**	**–52.1**

Sources: Liechtenstein's NC8 and BR5 CTF table 6, which use GWP values from the AR4.
[a] Liechtenstein did not include indirect CO_2 emissions in its projections.

63. The WEM scenario emission projections presented in the NC8 and BR5 have been improved compared with those presented in the NC7 and BR4 by using more directly applicable proxy data from Switzerland for calculating the emission projections for the IPPU sector and by updating the projections for the waste sector, as some of the underlying assumptions used in the NC7 and BR4 are now outdated. The WAM scenario emission projections presented in the NC8 and BR5 have also been improved compared with those presented in the NC7 and BR4 by calculating the emission projections for the IPPU, agriculture and waste sectors on the basis of the Climate Strategy 2050 and by using expert judgment to estimate the expected impact of measures included in the Climate Strategy 2050

on the energy sector. Liechtenstein also included information on sensitivity analyses conducted for the WEM scenario in its NC8.

(d) Assessment of adherence to the reporting guidelines

64. The ERT assessed the information reported in the NC8 and BR5 of Liechtenstein and identified issues relating to completeness and transparency, and thus adherence to the UNFCCC reporting guidelines on NCs and the UNFCCC reporting guidelines on BRs. The findings are described in tables I.2 and II.2.

2. Assessment of the total effect of policies and measures

(a) Technical assessment of the reported information

65. In its NC8 Liechtenstein presented the estimated and expected total effect of implemented and adopted PaMs and an estimate of the total effect of its PaMs, in accordance with the WEM scenario, compared with a situation without such PaMs. Information is presented in terms of GHG emissions avoided or sequestered, by gas (on a CO_2 eq basis), in 2025, 2030 and 2035.

66. Liechtenstein reported that the total estimated effect of its implemented and adopted PaMs is –119.2 kt CO_2 eq in 2030 and –138.1 kt CO_2 eq in 2035. According to the information reported in its NC8, PaMs implemented in the energy sector (including transport) will deliver the largest emission reductions. The additional estimated effect of Liechtenstein's planned PaMs is –10.4 kt CO_2 eq in 2025, –16.5 kt CO_2 eq in 2030 and –26.9 kt CO_2 eq in 2035. Table 10 provides an overview of the total effect of PaMs as reported by Liechtenstein.

Table 10
Projected effects of Liechtenstein's planned, implemented and adopted policies and measures in 2030 and 2035
(kt CO_2 eq)

	2030		*2035*	
Sector	*Effect of implemented and adopted measures*	*Effect of planned measures*	*Effect of implemented and adopted measures*	*Effect of planned measures*
Energy (including transport)	–110.13	–11.58	–127.69	–18.16
Industry/industrial processes	–8.70	–0.42	–10.05	–2.24
Agriculture	–0.06	–4.42	–0.06	–6.44
Land-use change and forestry	0	0	0	0
Waste management	–0.29	0.05	–0.31	–0.08
Total	**–119.18**	**–16.47**	**–138.11**	**–26.92**

Sources: Liechtenstein's NC8 and BR5, which use GWP values from the AR4.
Note: The total effect of implemented and adopted PaMs is defined as the difference between the WOM and the WEM scenarios; the total effect of planned PaMs is defined as the difference between the WEM and the WAM scenarios.

(b) Assessment of adherence to the reporting guidelines

67. The ERT assessed the information reported in the NC8 of Liechtenstein and identified an issue relating to completeness and transparency, and thus adherence to the UNFCCC reporting guidelines on NCs. The findings are described in table I.1.

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

(a) Technical assessment of the reported information

68. In the NC8 Liechtenstein reported that it plans to use market-based mechanisms to meet its Kyoto Protocol target. However, during the review the Party resubmitted its CTF tables and explained that it will not make use of market-based mechanisms and that its target

was achieved through domestic measures only (see para. 49 above). The ERT notes that reporting on the supplementarity of such mechanisms is therefore not relevant for Liechtenstein.

(b) Assessment of adherence to the reporting guidelines

69. The ERT assessed the information reported in the NC8 of Liechtenstein and recognized that the reporting is complete and transparent, and thus adheres to the reporting guidelines for supplementary information. No issues relating to the topics discussed in this chapter of the review report were raised during the review.

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

70. 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 its NC8 on its provision of financial support to developing country Parties in 2019–2021. The ERT commends Liechtenstein for reporting this information and suggests that it continue to do so in future NCs.

71. Liechtenstein provided a total of CHF 11.72 million in financial support to developing countries in 2019–2021, consisting of CHF 4.19 million, CHF 3.61 million and CHF 3.92 million in 2019, 2020 and 2021 respectively. Of the total amount provided in 2019–2021, 95.3 per cent was contributed through bilateral, regional and other channels. The largest share of support (86.9 per cent) was allocated to adaptation projects in 2019–2021. Cross-cutting and other projects received 6.9 and 6.2 per cent of support respectively. All financial support was provided through grants. Liechtenstein reported that the projects it supports through bilateral channels often have a component of technology development and transfer, as well as capacity-building; however, it does not currently report separately on these components.

H. Vulnerability assessment, climate change impacts and adaptation measures

1. Technical assessment of the reported information

72. In its NC8 Liechtenstein provided information on the expected impacts of climate change in the country; the adaptation policies covering regional, sectoral and cross-sectoral vulnerabilities and considerations; and an outline of the action taken to implement Article 4, paragraph 1(b), of the Convention with regard to adaptation. Liechtenstein is highly vulnerable to the risk of increased frequency and intensity of natural hazards such as flooding and drought due to changes in precipitation patterns, and therefore prioritizes measures to manage these risks across sectors. The Party reported that it has conducted a national risk assessment for natural hazards, which it updates regularly, and has also established natural hazard maps and an early warning system for flood risk management. Other priority areas are the agriculture, forestry and tourism sectors, for which Liechtenstein has formulated adaptation measures such as promoting sustainable agricultural practices, conserving biodiversity and bolstering climate-resilient tourism. Liechtenstein also collaborates with other countries in the Alpine region on sustainable development, including by planning and implementing adaptation measures through the International Commission for the Protection of the Alps, which is headquartered in Liechtenstein.

73. Liechtenstein has addressed adaptation matters through the adoption of the Climate Adaptation Strategy (2016), which provided further direction to government agencies on enhancing preparedness for climate change. During the review, the Party explained that it plans to update the Climate Adaptation Strategy for 2024–2025 and is planning to submit a national adaptation plan by the end of 2025. Liechtenstein also plans to report the findings from ongoing research on the expected socioeconomic and ecological impacts of climate change in future NCs. Table 11 summarizes the information on vulnerability and adaptation to climate change presented in the NC8 of Liechtenstein.

Table 11
Summary of information on vulnerability and adaptation to climate change reported by Liechtenstein

Vulnerable area	*Examples/comments/adaptation measures reported*
Agriculture, forestry and biodiversity	Vulnerability: Rising temperatures promote the proliferation of non-native and invasive species, as well as pests and disease infestations, posing a risk to biodiversity and crop yields in the agriculture and forestry sectors. In addition, extreme events such as prolonged droughts, flooding and forest fires, exacerbated by climate change, could lead to water stress, resulting in diminished crop yields and adverse effects on forest vegetation.
	Adaptation: Liechtenstein has conducted a general risk assessment for natural hazards and regularly updates its natural hazard maps. The Party has also established an early warning system, which relies on data from the Swiss Federal Office for the Environment and the Swiss Federal Food Safety and Veterinary Office for predicting discharge and water levels along the Rhine river and preventing the spread of disease among livestock respectively. Plans for more sustainable agricultural irrigation are in progress. Forest service plans define forest management activities at the local level, while the updated National Forest Development Plan 2030+ addresses future forest management at the national level.
Energy	Vulnerability: An increase in cooling degree days means an increase in energy demand for cooling, putting a strain on the power grid and infrastructure. Changes in the run-off regime (reduced run-off in summer months) as a result of precipitation and snowmelt changes will affect overall annual hydroelectric power production from run-of-river power plants despite winter gains.
	Adaptation: Liechtenstein's adaptation strategy for the power sector focuses on passive cooling through building improvements and planning measures while restricting the use of cooling devices to mitigate energy consumption and GHG emissions. The Samina hydroelectric power plant has been transformed into a pumped-storage facility to enhance power production flexibility and enable adaptation to anticipated climate-induced changes in the run-off regime.
Tourism	Vulnerability: Declining profitability due to a shorter ski season, rising costs for artificial snow production and reduced number of tourists amid uncertain snow conditions.
	Adaptation: Liechtenstein is exploring alternative tourism options beyond seasonal activities and promoting different forms of sustainable tourism to reduce dependence on weather-sensitive attractions.
Water resources	Vulnerability: Liechtenstein relies on Alpine watersheds for freshwater supply, which are sensitive to changes in precipitation patterns and glacier melt. Impacts include flooding due to more intense rainfall, resulting in an increased risk of damage to buildings and infrastructure along the Rhine river, and water scarcity across water-reliant sectors due to more frequent and prolonged dry spells. Melting glaciers in the Alps and less snow in winter are leading to reduced run-off into rivers and streams that feed Liechtenstein's water supply in summer, impacting water quality, ecosystems and health. Increased evapotranspiration rates could reduce soil moisture and groundwater recharge, while warmer watercourses and lakes resulting from increasing temperatures could cause stress to aquatic organisms.
	Adaptation: Liechtenstein prioritizes flood risk management and actively collaborates with neighbouring countries in the Alpine region, particularly those traversed by the Rhine river, through the Alpine Rhine: Catchment Area and Cooperation initiative (see www.alpenrhein.net), which includes projects on dam rehabilitation and river widening and on biodiversity and resilience. Other adaptation measures include urban drainage and water supply planning, a network for continuous monitoring of water temperatures and impacts on aquatic biodiversity, assessment of groundwater temperatures and implementation of an integrated water utilization plan in certain regions of Liechtenstein.

74. Liechtenstein provided a detailed description of international adaptation activities, including the EU-funded cooperation project Capitalising Climate Change Knowledge for Adaptation in the Alpine Space (C3-Alps) (2007–2013); the Alpine Rhine: Catchment Area and Cooperation initiative to manage flooding and enhance biodiversity along the Rhine river; and cooperation with the Swiss Federal Office for the Environment and the Swiss Federal Food Safety and Veterinary Office regarding data used as input for Liechtenstein's

early warning system for flood risk management along the Rhine river and livestock disease control.

75. Liechtenstein also provided information on bilateral cooperation with developing countries on adaptation initiatives in NC8 annex 3 (for 2019 and 2020) and table 7-3 (for 2021), such as projects on food security in northern Mozambique (funding of CHF 858,410 in 2021), access to drinking water in rural communities of Mozambique (funding of CHF 224,657 in 2021) and food security of the rural population in six regions of Senegal (funding of CHF 544,925 in 2021), as well as an integrated food security programme in the Matabeleland South province of Zimbabwe (funding of CHF 114,925 in 2021).

2. Assessment of adherence to the reporting guidelines

76. The ERT assessed the information reported in the NC8 of Liechtenstein and identified issues relating to transparency and thus adherence to the UNFCCC reporting guidelines on NCs. The findings are described in table I.3.

I. Research and systematic observation

1. Technical assessment of the reported information

77. In its NC8 Liechtenstein provided information on its activities and funding relating to research and systematic observation and both domestic and international activities, including contributions to the Global Climate Observing System and the IPCC.

78. Liechtenstein has implemented and planned international and domestic policies and programmes on climate change research, systematic observation and climate modelling that aim to advance capabilities to predict and observe the physical, chemical, biological and human components of the Earth's system over space and time. Owing to its small size, Liechtenstein focuses on domestic and regional research initiatives. Two institutes at the University of Liechtenstein actively contribute to the examination of sustainable and ecological developments within their specific fields of activity: the Institute of Architecture and Planning focuses on recycling building materials, sustainable mobility and spatial planning, while the Institute of Finance investigates environmental and social aspects of financial markets, with a focus on sustainable investments.

79. Liechtenstein actively contributes to the Swiss National Science Foundation and the Austrian Science Fund, providing CHF 250,000 in contributions to each in 2021, and participates in European research programmes under the EEA (excluding Horizon Europe). Other research collaborations include the Interreg research projects for Alpine countries under the European Regional Development Fund, annual contributions of around CHF 500,000 (CHF 515,993 in 2021) to the RhySearch research and innovation centre for the development of new energy systems for small and medium-sized enterprises based in the neighbouring Buchs municipality in Switzerland, and the provision of financial support (CHF 1,490,000 in 2020–2021) to the Eastern Switzerland University of Applied Sciences, where Liechtenstein's students have access to the same research opportunities as Swiss nationals.

80. In terms of activities related to systematic observation, Liechtenstein reported on national plans, programmes and support for ground- and space-based climate observing systems, including satellite and non-satellite climate observation. Liechtenstein also reported on challenges related to the maintenance of a consistent and comprehensive observation system. Owing to its limited resources, Liechtenstein relies on neighbouring countries such as Switzerland for data on research and systematic observation, which are used as input to the Party's early warning system for flood risk management and for livestock disease control. Liechtenstein actively collects climate data through its measuring stations, as well as through interregional collaboration, which are fed into the Global Climate Observing System. Since 1974, Vaduz has hosted the country's largest measuring station, recording meteorological data, including on air pressure, temperature, humidity, wind direction, precipitation and sunshine duration. Liechtenstein also monitors snow depth, water quality and air pollutants through various initiatives, including the joint OSTLUFT network for air pollutant

measurements with cantons in eastern Switzerland. However, owing to its small size and limited resources, Liechtenstein's engagement in international research and systematic observation remains limited.

2. Assessment of adherence to the reporting guidelines

81. The ERT assessed the information reported in the NC8 of Liechtenstein and identified issues relating to completeness and transparency, and thus adherence to the UNFCCC reporting guidelines on NCs. The findings are described in table I.4.

J. Education, training and public awareness

1. Technical assessment of the reported information

82. In its NC8 Liechtenstein provided information on its actions relating to education, training and public awareness at the domestic and international level. The Party provided information on the general policy on education, training and public awareness; primary, secondary and higher education; public information campaigns; training programmes; education materials; resource or information centres; the involvement of the public and non-governmental organizations; and its participation in international activities.

83. Since 2005, environmental education has been an official part of Liechtenstein's educational curriculum covering six subject areas, including nature, humans and society, where students discuss topics such as climate change and energy production. This approach, guided by the principle of education for sustainable development, ensures that environmental education influences content across subjects in the educational curriculum. In addition, environmental initiatives such as Climate Day, Young Energy and Looping are conducted at various schools. In 2022, students from Liechtenstein achieved remarkable success by securing first and second place in the "Der Grüne Zweig" (The Green Branch) awards organized by the eastern Swiss office of the World Wildlife Fund. The winning projects, which included the theme of experiencing, shaping and learning from nature, exemplify Liechtenstein's commitment to environmental education and action. The Ministry of Foreign Affairs, Education and Sport oversees the school education system on these matters, including the implementation of relevant legislative measures.

84. Liechtenstein's students participate in international events such as the Youth Parliament to the Alpine Convention (since 2006) and the annual World Environment Day events held in June.

85. Public outreach and targeted stakeholder engagement in Liechtenstein are conducted by administrative offices such as the Office of Environment, the Office for Foreign Affairs and the Office of Justice, as well as by the Ministry of Foreign Affairs, Education and Sport and the Ministry of Social Affairs and Culture, and with the involvement of external institutions and support from non-governmental organizations. The Government supports environmental initiatives, including the Constructive Alps awards for sustainable architecture. In addition, research results inform the development of knowledge materials such as thematic brochures, an annual environmental protection calendar and specialized excursions, which contribute to raising public awareness and providing training on environmental and climate change issues in the country. Since 2012, the LIFE Climate Foundation Liechtenstein has received regular financial support from the Government for its work aimed at actively shaping climate protection efforts through market-based instruments, supporting innovative projects developed by local small and medium-sized enterprises and fostering public awareness through events and workshops. Other institutions in Liechtenstein, such as the Liechtenstein Environmental Protection Society, the Solar Society and the Liechtenstein Transport Association, also contribute to environmental education and information.

2. Assessment of adherence to the reporting guidelines

86. The ERT assessed the information reported in the NC8 of Liechtenstein and identified an issue relating to completeness and thus adherence to the UNFCCC reporting guidelines on NCs. The finding is described in table I.5.

III. Conclusions and recommendations

87. The ERT conducted a technical review of the information reported in the NC8 of Liechtenstein in accordance with the UNFCCC reporting guidelines on NCs. The ERT concluded that the reported information mostly adheres to the UNFCCC reporting guidelines on NCs and that the NC8 provides an overview of the national climate policy of Liechtenstein.

88. The information provided in the NC8 includes all elements of the supplementary information under Article 7, paragraph 2, of the Kyoto Protocol. Liechtenstein reported on the national system, the national registry, supplementarity relating to the mechanisms pursuant to Articles 6, 12 and 17 of the Kyoto Protocol, domestic and regional programmes and/or legislative arrangements and enforcement and administrative procedures, information under Article 10 of the Kyoto Protocol, and financial resources provided to developing country Parties, and reported limited information on PaMs in accordance with Article 2 of the Kyoto Protocol. Supplementary information under Article 7, paragraph 1, of the Kyoto Protocol on the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol was provided by Liechtenstein in its 2022 annual submission.

89. The ERT conducted a technical review of the information reported in the BR5 and BR5 CTF tables of Liechtenstein in accordance with the UNFCCC reporting guidelines on BRs. The ERT concluded that the reported information mostly adheres to the UNFCCC reporting guidelines on BRs and that the BR5 and its CTF tables provide 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.

90. In its NC8 Liechtenstein reported on its key national circumstances related to GHG emissions and removals, including updated data and information on legislation, population trends, geography and land use, climate and climate change, economic developments, energy, transport, the buildings sector, industry, trade, the services sector, agriculture, forestry, resource efficiency and wastewater.

91. Liechtenstein's total GHG emissions excluding LULUCF were estimated to be 21.2 per cent below its 1990 level, while total GHG emissions including LULUCF decreased by 21.7 per cent over the same period, using GWP values from the AR5. Emissions peaked in 2006 and decreased thereafter. Emissions excluding LULUCF in 2021 increased compared with 2020. The changes in total emissions were driven mainly by factors such as fuel prices, changes in heating degree days and fuel consumption in road transportation, fluctuations in the number of livestock, an increase in the productivity of dairy cattle, and an increase in the use of HFCs.

92. As reported in the BR5, 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 covered CO_2, CH_4, N_2O, HFCs, PFCs, SF_6 and NF_3, expressed using GWP values from the AR4, and covered all sources and sectors included in the annual GHG inventory. Emissions and removals from the LULUCF sector were included in the target. Liechtenstein reported its intention to make use of market-based mechanisms, but did not use this provision for achieving its 2020 target. In absolute terms, this means that under the Convention Liechtenstein had to reduce its emissions from 236.04 kt CO_2 eq (in the base year) to 188.83 kt CO_2 eq by 2020, including the contribution of LULUCF.

93. In addition to its 2020 target, Liechtenstein also reported on its longer-term targets established in the Climate Strategy 2050, adopted in December 2022, including a target of reducing emissions by 55 per cent below the 1990 level by 2030, with 40 per cent to be

reduced through domestic actions alone, covering all sectors including the phasing-out of fossil fuel use in heating systems.

94. Liechtenstein's annual total GHG emissions excluding LULUCF in 2020 (180.01 kt CO_2 eq) were 21.2 per cent below the base-year level. Liechtenstein reported that the contribution of LULUCF was 4.84 kt CO_2 eq in 2020, resulting in net emissions of 184.85 kt CO_2 eq, or 3.98 kt CO_2 eq below the 2020 target. The ERT concluded that the total GHG emissions excluding LULUCF of Liechtenstein including the contribution of LULUCF do not exceed the emission level corresponding to the 2020 target, and therefore that the target has been achieved.

95. The GHG emission projections provided by Liechtenstein in its NC8 and BR5 correspond to the WEM, WOM and WAM scenarios. Under the WEM scenario, emissions including LULUCF in 2030 are projected to be 33.1 per cent below the 1990 level and 14.6 per cent below the 2020 level. Under the WAM scenario, emissions including LULUCF in 2030 are projected to be 40.1 per cent below the 1990 level and 23.5 per cent below the 2020 level.

96. Liechtenstein's main policy framework relating to energy and climate change is the Climate Strategy (implemented from 2007 until 2020 and replaced by the Climate Strategy 2050, adopted in December 2022). The Party described the mitigation actions implemented to help it achieve its 2020 and longer-term targets, which include the Energy Strategy 2020 and legal frameworks such as the CO_2 Act and the Emissions Trading Act. These PaMs target GHG emissions from the energy and transport sectors, which together are responsible for almost 80 per cent of Liechtenstein's total GHG emissions. They also support the regional integration of Liechtenstein's climate policy with those of its neighbouring countries, in particular Switzerland and the EU.

97. 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 in its BR5 and NC8 on its provision of financial support to developing country Parties. Liechtenstein provided a total of CHF 11.72 million in financial support to developing countries in 2019–2021, with 95.3 per cent of the total amount contributed through bilateral, regional and other channels, while 86.9 per cent of support was allocated to adaptation projects.

98. In its NC8 Liechtenstein provided information on the expected impacts of climate change in the country; the adaptation policies covering regional, sectoral and cross-sectoral vulnerabilities and considerations; and an outline of the action taken to implement Article 4, paragraph 1(b), of the Convention with regard to adaptation. Despite its small size and limited economic resources, Liechtenstein actively conducts thorough vulnerability and climate change impact assessments and implements adaptation measures in collaboration with neighbouring countries such as Switzerland and other Alpine nations through initiatives including the International Commission for the Protection of the Alps, the Capitalising Climate Change Knowledge for Adaptation in the Alpine Space (C3-Alps) project (2007–2013) and the Alpine Rhine: Catchment Area and Cooperation initiative. In addition, Liechtenstein regularly updates its national risk assessment for natural hazards, maintains natural hazard maps and operates an early warning system for flood risk management.

99. In its NC8 Liechtenstein provided information on its activities relating to research and systematic observation. Owing to its unique national circumstances, Liechtenstein focuses its international contributions on key climate and research initiatives, including participation in the Global Climate Observing System, collaboration with the IPCC and engagement in regional projects such as those supported by the Swiss National Science Foundation and the Austrian Science Fund. Notably, Liechtenstein allocates a significant portion of its research budget to the areas of sustainable building materials, mobility, spatial planning and sustainable finance. The country's monitoring stations track essential parameters such as air pressure, temperature, humidity, wind direction, precipitation and sunshine duration. In addition, Liechtenstein monitors snow depth, water quality and air pollutants through the joint OSTLUFT regional network with cantons in eastern Switzerland.

100. In its NC8 Liechtenstein provided information on its actions relating to education, training and public awareness. The Ministry of Foreign Affairs, Education and Sport oversees

educational matters, including the implementation of relevant legislation. Public outreach and stakeholder engagement related to climate change are coordinated by administrative offices such as the Office of Environment, the Office for Foreign Affairs and the Office of Justice, with support from the Ministry of Foreign Affairs, Education and Sport and the Ministry of Social Affairs and Culture, and with the involvement of non-governmental organizations and external trade associations. Climate change and sustainability are integral components of the school curriculum. In 2022, projects by students from Liechtenstein, including on the theme of experiencing, shaping and learning from nature, secured first and second place in the "Der Grüne Zweig" (the Green Branch) awards organized by the eastern Swiss office of the World Wildlife Fund. These achievements underscore Liechtenstein's dedication to environmental education and action.

101. In the course of the review, the ERT formulated the following recommendations for Liechtenstein to improve its adherence to the UNFCCC reporting guidelines on NCs in its next NC:

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

(i) Including a brief description of the methods used for the quantitative estimation of the mitigation impacts of PaMs (see issue 5 in table I.1);

(ii) Providing projections on a gas-by-gas basis for the WOM scenario, if a WOM scenario is reported (see issue 1 in table I.2);

(iii) Providing information on action taken to support capacity-building related to systematic observation in developing countries (see issue 1 in table I.4);

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

(i) Explaining why it is not possible to provide quantitative estimates of the impacts of PaMs owing to the national circumstances (see issue 4 in table I.1);

(ii) Providing transparent information on its implementation of Article 4, paragraph 1(e), of the Convention, for example, by including a reference to the relevant adaptation projects it supports in the section of the NC on vulnerability assessment, climate change impacts and adaptation measures (see issue 1 in table I.3);

(c) To improve the timeliness of its reporting by submitting its next NC on time (see para. 5 above).

102. In the course of the review of Liechtenstein's NC8, the ERT formulated the following recommendation relating to adherence to the reporting guidelines for supplementary information, namely to improve the transparency of its reporting by providing information required under Article 2 of the Kyoto Protocol on its efforts to implement PaMs in such a way as to minimize adverse effects, including the adverse effects of climate change and effects on international trade and social, environmental and economic impacts on other Parties, especially developing country Parties (see issue 1 in table I.6).

103. In the course of the review of Liechtenstein's BR5, the ERT formulated the following recommendations relating to adherence to the UNFCCC reporting guidelines on BRs:

(a) To improve the completeness of its reporting by providing information on all relevant mitigation actions, including PaMs implemented or planned since the previous BR (see issue 1 in table II.1);

(b) To improve the transparency of its reporting by providing the estimated mitigation impact of its Climate Strategy 2050 for a particular year rather than the cumulative amount (see issue 3 in table II.1);

(c) To improve the timeliness of its reporting by submitting its next BR on time (see para. 7 above).

Annex I

Assessment of adherence to the reporting guidelines for the eighth national communication of Liechtenstein

Tables I.1–I.6 summarize the ERT assessment of adherence to the UNFCCC reporting guidelines on NCs for Liechtenstein's NC8.

Table I.1
Findings on policies and measures from the review of the eighth national communication of Liechtenstein

No.	*Reporting requirement, issue type and assessment*	*Description of the finding with recommendation or encouragement*
1	Reporting requirement specified in paragraph 10 Issue type: completeness Assessment: encouragement	Liechtenstein did not indicate in its NC8 the PaMs that are innovative and/or effectively replicable by other Parties. During the review, the Party explained that owing to the small size of the country and the non-applicability of its PaMs to larger countries, such information was omitted from the NC8. However, it identified two activities that could be considered innovative and replicable, namely a low-carbon solution to cover the gap in energy demand in winter; and the proposed subsidies for the installation of photovoltaic systems through mandatory building standards. These two measures were approved by Parliament but not adopted as they were rejected in a referendum. They were therefore not included in the PaMs reported in the NC8. The ERT encourages Liechtenstein to indicate in its next NC the PaMs that are innovative and/or effectively replicable by other Parties.
2	Reporting requirement specified in paragraph 13 Issue type: completeness Assessment: encouragement	Liechtenstein did not provide detailed information on the assessment of the economic and social consequences of response measures in its NC8. During the review, Liechtenstein explained that data on the assessment of the economic and social consequences of response measures are not available. The Party provided some related information, including on the public consultation and voting process for climate- and environment-related issues, and on regional collaboration and the bilateral treaty with Switzerland on environmental levies (e.g. the CO_2 levy). Liechtenstein further explained that Switzerland assesses the economic impacts of the CO_2 Act, which applies equally to Liechtenstein and, therefore, an independent assessment conducted by Liechtenstein would not add any further value to the assessment conducted by Switzerland, as both countries apply the same legislation under the CO_2 Act and have a similar social and economic context. The ERT considers that the Party could use available information or information from assessments conducted by Switzerland in cases where similar PaMs are applied in the two countries to report on the assessment of the economic and social consequences of response measures. The ERT encourages Liechtenstein to provide, to the extent possible, detailed information on the assessment of the economic and social consequences of response measures in its next NC.
3	Reporting requirement specified in paragraph 19 Issue type: transparency Assessment: encouragement	In its NC8 Liechtenstein reported information for each policy or measure following the subject headings listed in the UNFCCC reporting guidelines on NCs. However, the Party did not use the prescribed terminology for the type of instrument, but instead used terms such as "infrastructure measure", "investment measure", "institutional measure" and "operational planning". In addition, the quantitative estimate of the mitigation impact of the Climate Strategy 2050 was reported as a cumulative amount, rather than for that particular year. During the review, Liechtenstein explained that it intends to follow the terminology suggested in the UNFCCC reporting guidelines on NCs in the next submission. Furthermore, the Party informed the ERT that the quantitative estimate of the mitigation impact of the Climate Strategy 2050 for 2025 was erroneously reported as the cumulative amount over a five-year period (22.77 kt CO_2 eq) instead of the amount for 2025 (8.31 kt CO_2 eq). The ERT encourages the Party to report in its next NC, for each policy or measure, the type of instrument using the terms listed in the UNFCCC reporting guidelines on NCs, to the extent possible, namely economic, fiscal, voluntary agreement, regulatory,

No.	*Reporting requirement, issue type and assessment*	*Description of the finding with recommendation or encouragement*
		information, education, research or other. Furthermore, the ERT encourages the Party to report the estimated mitigation impact for a particular year, not as a cumulative amount.
4	Reporting requirement specified in paragraph 20	In its NC8 Liechtenstein reported quantitative estimates of the impacts of 2 of its 43 PaMs. For all other PaMs, the Party noted that these estimates are not available, without providing a further explanation.
	Issue type: transparency Assessment: recommendation	During the review, Liechtenstein explained that for PaMs in the energy sector, mitigation impacts are quantified and reported as part of the strategy-level PaMs (e.g. the Energy Strategy 2030 and the Climate Strategy 2050). Mitigation impacts are not quantified for PaMs consisting of laws and regulations that provide the legal basis for implementing the range of measures contained in the strategy documents (e.g. the Environmental Protection Act, the CO_2 Act and the Energy Efficiency Act). PaMs in the non-energy sectors are not primarily aimed at reducing GHG emissions and mainly have an indirect, non-quantifiable effect on GHG emissions.
		The ERT reiterates the recommendation from the previous review report that Liechtenstein improve the transparency of its next NC. This can be done by explaining why it is not possible to provide quantitative estimates of the impacts of PaMs owing to the national circumstances. When the impact of a measure is included in the impact reported for another measure, the Party may report the quantitative impact as "IE" and indicate under which other measure the impact is included.
5	Reporting requirement specified in paragraph 20	In its NC8 Liechtenstein did not provide a brief description of the methods used for the quantitative estimation of the impact of the PaMs for which quantitative estimates were provided (Energy Strategy 2030 and Climate Strategy 2050).
	Issue type: completeness Assessment: recommendation	During the review, Liechtenstein provided a description of the methods used for the quantitative estimation of the impact of the two overarching PaMs. The values represent the sum of the impact of all measures in the respective strategies. The Party also described the method used for the quantitative estimation of the impact of replacing fossil fuel heating systems with a renewable energy alternative in buildings.
		The ERT recommends that Liechtenstein provide a brief description of the methods used for the quantitative estimation of the impact of PaMs in its next NC.
6	Reporting requirement specified in paragraph 21	Liechtenstein did not provide information on the costs of each policy or measure and on non-GHG mitigation benefits, such as reduced emissions of other pollutants or health benefits.
	Issue type: completeness Assessment: encouragement	During the review, Liechtenstein explained that the costs of renewable energy and building efficiency measures, in the form of subsidies provided to building owners who install these types of technologies, are tracked and were reported in the NC8. For non-energy measures, the costs of their impact on GHG emissions cannot be estimated because they do not primarily target GHG mitigation. The Party further explained that it will assess whether annual reporting on these costs is feasible and whether the costs of these measures could be reliably estimated on the basis of these values.
		The ERT encourages Liechtenstein to provide information on the costs of each policy or measure and on non-GHG mitigation benefits in its next NC.

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

Table I.2
Findings on projections including aggregate effects of policies and measures reported in the eighth national communication of Liechtenstein

No.	*Reporting requirement, issue type and assessment*	*Description of the finding with recommendation or encouragement*
1	Reporting requirement specified in paragraph 32	Liechtenstein did not report GHG emission projections for the WOM scenario on a gas-by-gas basis in its NC8. The ERT noted that the Party reported this information in its BR5.
	Issue type: completeness	During the review, the Party explained that reporting the emission projections for the WOM scenario on a gas-by-gas basis was not considered a top priority and therefore only aggregated results were included in the NC8.

No.	*Reporting requirement, issue type and assessment*	*Description of the finding with recommendation or encouragement*
	Assessment: recommendation	The ERT recommends that Liechtenstein report the emission projections for the WOM scenario on a gas-by-gas basis in its next NC.
2	Reporting requirement specified in paragraph 32 Issue type: completeness Assessment: encouragement	Liechtenstein did not report projections of indirect GHGs such as CO, NO_X, NMVOCs and SO_X, although it did report historical emissions for these gases in its NC8. During the review, the Party explained that reporting projections of indirect GHGs is a relatively low priority for Liechtenstein, and it does not plan to report them in future submissions unless data are available from submissions under the Convention on Long-range Transboundary Air Pollution. The ERT reiterates the encouragement from the previous review report for Liechtenstein to include in its next NC projections of indirect GHGs (CO, NO_X, NMVOCs and SO_X) to improve the completeness of its reporting.
3	Reporting requirement specified in paragraph 39 Issue type: transparency Assessment: encouragement	In the NC8 the Party did not sufficiently explain the underlying methods, models and assumptions used for calculating the emission projections. In particular, very limited information was provided on emission factors and how these are assumed to evolve across the time series, key underlying activity data (except for population projections) were not included, and an explanation was not provided of how the calculations avoid the double counting of PaMs and/or account for synergies between multiple PaMs. During the review, Liechtenstein explained that the method for modelling emissions is not very complex, and that emission projections for the energy sector are not calculated against a baseline, but rather as an increase or decrease per year compared with the preceding year. The Party provided the emission factors used to quantify the impact of each measure in the energy sector and described the approaches used for other sectors, for which data from Switzerland were used, and noted that any overlap between PaMs is expected to be small and confined to the building sector. The ERT reiterates the encouragement from the previous review report for Liechtenstein to include further information in the next NC on the models used, in particular information on the methods and key variables applied in the approach used by Switzerland and on how such methods and variables have been adapted to compile the emission projections for Liechtenstein.
4	Reporting requirement specified in paragraph 40 Issue type: transparency Assessment: encouragement	Liechtenstein reported in its NC8 that proxy data from Switzerland were used for calculating the emission projections. However, the Party did not provide information on the strengths and weaknesses of this approach. Furthermore, Liechtenstein explained in its NC8 that the projections are based on the total CO_2 eq emissions and that sectoral-level scaling factors derived from the 2022 annual submission were calculated to split the total CO_2 eq emission projections by gas. The ERT noted that some of the assumptions used in the methodology could significantly impact the accuracy of the emission projections, and that no information was included in the description of the methodology on the potential strengths and weaknesses of the current approach. During the review, the Party explained the similarities between Liechtenstein and Switzerland and provided details of the data underpinning the emission inventories and calculation of projections (e.g. comparable legislation, technologies and economic structures), but provided limited information on the strengths and weaknesses of the current approach. The Party further explained that more source-specific data demonstrating that the emissions sources, trends and impacts of the two countries' PaMs are comparable could be included in future reporting on stationary combustion and on the road transportation and agriculture sectors. The Party also confirmed that the factors used for splitting the projections by gas were derived from the ratios for 2020 and applied to all years in the time series of projections (i.e. the total CO_2 eq emissions for all projected years were assumed to have the same percentage contributions from individual GHGs as in 2020), and that this approach does not allow the gas-specific nature of the impact of PaMs to be taken into account when calculating the emission projections. To improve transparency and explain the strengths and weaknesses of the current methodology used, the ERT encourages Liechtenstein to include information in the next NC on sector-specific comparisons between Liechtenstein and Switzerland and information that explains the underlying assumptions currently used in the projection calculations to split the total CO_2 eq emissions into individual GHGs.

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

Table I.3
Findings on vulnerability assessment, climate change impacts and adaptation measures from the review of the eighth national communication of Liechtenstein

No.	*Reporting requirement, issue type and assessment*	*Description of the finding with recommendation or encouragement*
1	Reporting requirement specified in paragraph 46 Issue type: transparency Assessment: recommendation	Liechtenstein reported information on its provision of public financial support to developing countries including Mozambique, Senegal and Zimbabwe for adaptation initiatives in NC8, annex 3 (for 2019–2020) and table 7-3 (for 2021). However, no reference to annex 3 or table 7-3 was included in NC8 section 6 to outline the action taken to implement Article 4, paragraph 1(e), of the Convention to demonstrate the Party's cooperation in preparing for adaptation to the impacts of climate change. During the review, Liechtenstein confirmed that the activities listed in NC8 table 7-3 and annex 3 that support adaptation are part of Liechtenstein's action to implement Article 4, paragraph 1(e), of the Convention and that it will consider including a reference to this information in section 6 of its next NC. The ERT reiterates the recommendation from the previous review report that Liechtenstein provide transparent information on its implementation of Article 4, paragraph 1(e), of the Convention, for example, by including a reference to the relevant adaptation projects it supports in the section on vulnerability assessment, climate change impacts and adaptation measures in its next NC.
2	Reporting requirement specified in paragraph 46 Issue type: transparency Assessment: encouragement	It was not clear to the ERT from the information reported in the NC8 (section 6.2) how Liechtenstein adapted Switzerland's assessment of vulnerability and climate change impacts to account for local specificities, including Liechtenstein's unique ecological, social, economic and infrastructural factors, or whether these are comparable to Switzerland's circumstances. The ERT noted that almost identical impacts and vulnerabilities appear to have been assumed. During the review, the Party explained that when preparing its Climate Adaptation Strategy, Switzerland's climate change impacts and vulnerabilities were carefully assessed by experts from different sectors to ensure their relevance to the national circumstances of Liechtenstein. The Party acknowledged that information on this process and a detailed explanation of how the national circumstances of Liechtenstein relate to those of Switzerland were omitted from the NC8. The ERT encourages Liechtenstein to provide information demonstrating that the methodology applied by the Party, for which Swiss data are used, is a relevant methodology for assessing climate change impacts and vulnerability in Liechtenstein.

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

Table I.4
Findings on research and systematic observation from the review of the eighth national communication of Liechtenstein

No.	*Reporting requirement, issue type and assessment*	*Description of the finding with recommendation or encouragement*
1	Reporting requirement specified in paragraph 61 Issue type: completeness Assessment: recommendation	In its NC8 (section 8) Liechtenstein reported information on national and international activities on research and systematic observation, including collaboration with countries within the EU. However, the Party did not provide information on actions taken to support related capacity-building in developing countries. During the review, Liechtenstein reported on its action to support capacity-building in developing countries and explained that it continues to provide funding and has promoted capacity-building projects that include research and systematic observation components through its International Humanitarian Cooperation and Development office. Examples include the provision of financial support for a Red Cross Red Crescent Climate Centre project to enhance climate information and knowledge services for resilience in five Pacific Island countries in 2020–2021.

No.	*Reporting requirement, issue type and assessment*	*Description of the finding with recommendation or encouragement*
		The ERT reiterates the recommendation from the previous review report that Liechtenstein provide information in its next NC on action taken to support capacity-building related to systematic observation in developing countries.
2	Reporting requirement specified in paragraph 64	Liechtenstein did not provide information on its general policy on research and systematic observation, such as the overall institutional arrangements for managing activities and contributions related to research and systematic observation.
	Issue type: completeness	During the review, Liechtenstein acknowledged that it did not clearly describe existing policies and overall arrangements for coordinating its domestic and international research and systematic observation activities in the NC8.
	Assessment: encouragement	The ERT encourages Liechtenstein to provide information on its general policy on research and systematic observation in its next NC.
3	Reporting requirement specified in paragraph 65	Liechtenstein reported in the NC8 information on how it leverages partnerships with countries within the EU to exchange data on research and systematic observation. However, the Party did not report information on any barriers to free and open international exchange of data it may have faced and on how it overcame such barriers.
	Issue type: completeness	During the review, the Party explained that the barriers the country has faced concerning free and open international exchange of data are due to its small size and limited resources, which limit its participation in larger international research projects. However, Liechtenstein explained that it has managed these challenges through cooperation agreements with neighbouring countries that have well-integrated research systems such as Austria and Switzerland, thereby ensuring free and open access to data on climate-related research and systematic observation and equal research opportunities for students from Liechtenstein. Liechtenstein also explained that it receives significant support from EU countries regarding the exchange of data, which it in turn reciprocates.
	Assessment: encouragement	The ERT reiterates the encouragement from the previous review report for Liechtenstein to report information in its next NC on any barriers it has faced concerning free and open international exchange of data and information on research and systematic observation and how the country has managed such challenges.
4	Reporting requirement specified in paragraph 66	Although Liechtenstein made reference to a number of domestic and international cooperation activities related to research and systematic observation in its NC8, the information presented does not provide a clear understanding of how these activities contribute to climate process and climate system studies; modelling and prediction; research on the impacts of climate change; socioeconomic analysis; and research and development of mitigation and adaptation approaches.
	Issue type: transparency	During the review, Liechtenstein explained that it has engaged in activities and provided funding for projects and research that could be considered to contribute to the five above-mentioned areas of research and systematic observation, but that the information reported in its NC8 does not demonstrate this connection.
	Assessment: encouragement	The ERT encourages Liechtenstein to provide information in its next NC on highlights, innovations and significant efforts made with regard to climate process and climate system studies; modelling and prediction; research on the impacts of climate change; socioeconomic analysis; and research and development of mitigation and adaptation approaches.
5	Reporting requirement specified in paragraph 67	Liechtenstein provided information on its activities related to systematic observation in its NC8 but did not report on the support provided to developing countries to establish and maintain observing systems and related data and monitoring systems.
	Issue type: transparency	During the review, Liechtenstein clarified that the funding provided to five Pacific Island countries in 2020–2021, as reported in NC8 tables 7-2–7-3 (section 7.1.2), was used to establish early warning systems in those countries. The Party recognized that such information should be included or referenced under the chapter on research and systematic observation.
	Assessment: encouragement	The ERT encourages Liechtenstein to provide information in its next NC on the support provided to developing countries to establish and maintain observing systems and related data and monitoring systems, for example, by including a reference to the relevant support and/or funding it provides in the chapter of the NC on research and systematic observation.

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

Table I.5
Findings on education, training and public awareness from the review of the eighth national communication of Liechtenstein

No.	*Reporting requirement, issue type and assessment*	*Description of the finding with recommendation or encouragement*
1	Reporting requirement specified in paragraph 68 Issue type: completeness Assessment: encouragement	Liechtenstein did not report information on the extent of public participation in the preparation or domestic review of the NC. During the review, Liechtenstein explained that national legislation establishes the requirement for public consultation on all new policies. Therefore, all the policies reported in the NC have undergone public consultation. The ERT reiterates the encouragement from the previous review report for Liechtenstein to include in its next NC information on public participation in the preparation and review of its NCs.

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

Table I.6
Findings on minimization of adverse impacts and supplementary information related to the Kyoto Protocol reported in the eighth national communication of Liechtenstein

No.	*Reporting requirement, issue type and assessment*	*Description of the finding with recommendation*
1	Reporting requirement specified in paragraph 36 Issue type: transparency Assessment: recommendation	Liechtenstein reported limited information on how it strives to implement PaMs under Article 2 of the Kyoto Protocol in such a way as to minimize adverse effects, including the adverse effects of climate change and effects on international trade and social, environmental and economic impacts on other Parties, especially developing country Parties. During the review, Liechtenstein explained that data are not available to evaluate the minimization of adverse effects and that it plans to further improve the information provided in for future NCs. The Party also clarified that given the size of its country and its share in international trade (mainly with Switzerland and the EU), its climate change policies are not expected to have any significant adverse economic, social or environmental impacts on developing countries. The Party also indicated that international emission reduction projects are required to support sustainable development in the respective partner country. Liechtenstein further explained that it applies strict standards to market-based mechanism projects (in accordance with article 2a, paragraph 2, of the CO_2 Act), which have to be carefully reviewed by the Office of Foreign Affairs and the Office of Environment prior to their selection to ensure compliance with legal standards. The ERT reiterates the recommendation from the previous review report that Liechtenstein provide in its next submission the information required under Article 2 of the Kyoto Protocol on how it strives to implement PaMs in such a way as to minimize adverse effects, including the adverse effects of climate change and effects on international trade and social, environmental and economic impacts on other Parties, especially developing country Parties. The ERT concludes that this potential problem of a mandatory nature does not influence the Party's ability to fulfil its commitments for the second commitment period of the Kyoto Protocol.

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

Annex II

Assessment of adherence to the reporting guidelines for the fifth biennial report of Liechtenstein

The BR5 of Liechtenstein is the final BR under the measurement, reporting and verification system established under the Convention.[1] Nevertheless, ERTs continue to provide recommendations and encouragements to the Parties on completeness, transparency and adherence to the UNFCCC reporting guidelines on BRs. Parties may find these recommendations and encouragements relevant, as appropriate, when preparing their initial biennial transparency report under the enhanced transparency framework of the Paris Agreement. Tables II.1–II.2 summarize the ERT assessment of adherence to the UNFCCC reporting guidelines on BRs for Liechtenstein's BR5.

Table II.1
Findings on mitigation actions and their effects from the review of the fifth biennial report of Liechtenstein

No.	*Reporting requirement and issue type*	*Description of the finding with recommendation or encouragement*
1	Reporting requirement specified in paragraph 6 Issue type: completeness Assessment: recommendation	Liechtenstein reported information in CTF table 3 on its two overarching mitigation strategies, namely the Energy Strategy 2030 and the Climate Strategy 2050. The Party did not report information on the individual measures contained in those two overarching strategies. During the review, Liechtenstein explained that it listed only mitigation measures that have a quantifiable impact on GHG emissions in CTF table 3. Other PaMs are either aimed at implementing legislation that is relevant to GHG emissions but do not have an impact on emissions, or have only an indirect impact on GHG emissions. The ERT recommends that Liechtenstein provide information in its next submission on all relevant mitigation actions, including PaMs implemented or planned since its previous BR.
2	Reporting requirement specified in paragraph 8 Issue type: completeness Assessment: encouragement	Liechtenstein did not report in its BR5 detailed information on the assessment of the economic and social consequences of response measures. During the review, Liechtenstein explained that data on the assessment of the economic and social consequences of response measures are not available and that there are no plans to further improve the information provided. In its response, the Party provided some related information, including on the public consultation and popular voting process for climate- and environment-related issues, and on regional collaboration and the bilateral treaty with Switzerland on environmental levies (e.g. the CO_2 levy). Liechtenstein further explained that Switzerland assesses the economic impacts of the CO_2 Act, which applies equally to Liechtenstein and, therefore, an independent assessment conducted by Liechtenstein would not add any further value to the assessment conducted by Switzerland, as both countries apply the same CO_2 Act and have a similar social and economic context. The ERT considers that the Party could use available information or information from assessments conducted by Switzerland in cases where similar PaMs are applied in the two countries to report on the economic and social consequences of response measures. The ERT encourages Liechtenstein to report on the economic and social consequences of its PaMs, for example, on international trade and the social, environmental and economic impacts on other Parties, especially developing country Parties.
3	Reporting requirement specified in CTF table 3	In CTF table 3, Liechtenstein reported the quantitative estimate of the mitigation impact of the Climate Strategy 2050 for 2025 as a cumulative amount over a five-year period, rather than for that particular year.

[1] The Conference of the Parties, by decision 1/CP.24, decided that the final BRs shall be those submitted to the secretariat no later than 31 December 2022 and reaffirmed that, for Parties to the Paris Agreement, following the submission of the final BR, the modalities, procedures and guidelines contained in the annex to decision 18/CMA.1 will supersede the measurement, reporting and verification system established under decision 1/CP.16, paras. 40–47 and 60–64, and decision 2/CP.17, paras. 12–62.

No.	*Reporting requirement and issue type*	*Description of the finding with recommendation or encouragement*
	Issue type: transparency Assessment: recommendation	During the review, the Party informed the ERT that the quantitative estimate of the mitigation impact of its Climate Strategy 2050 for 2025 was erroneously reported as the cumulative amount for 2021–2025 (22.77 kt CO_2 eq) instead of the amount for 2025 (8.31 kt CO_2 eq). The ERT recommends that Liechtenstein report in its next submission the estimated mitigation impact of its Climate Strategy 2050 for a particular year and not as a cumulative amount.
4	Reporting requirement specified in paragraph 24 Issue type: completeness Assessment: encouragement	Liechtenstein did not report in its BR5 information on domestic arrangements established for the process of the self-assessment of compliance with emission reductions in comparison with emission reduction commitments. During the review, the Party provided information on the process currently under way to establish domestic arrangements for self-assessment of compliance with emission reductions. The Party indicated that sector-specific interim targets have been defined in the Climate Strategy 2050 but have not yet been enshrined in legislation across all main sectors. The Party also explained that the foundation of self-assessment is based on monitoring information by sector and noted that a report on the energy sector is already being issued on an annual basis and submitted to Parliament. Selected indicators from the reporting on the energy sector will be used to measure progress against the nationally determined contributions in future. The ERT reiterates the encouragement from the previous review report for Liechtenstein to provide, in its next submission, information on domestic arrangements established for the process of the self-assessment of compliance with emission reductions in comparison with emission reduction commitments.
5	Reporting requirement specified in paragraph 24 Issue type: completeness Assessment: encouragement	Liechtenstein did not report in its BR5 information on the progress made in establishing national rules for taking local action against domestic non-compliance with emission reduction targets. During the review, Liechtenstein explained that its main emission reduction instrument is the CO_2 Act, which contains provisions on enforcement and evaluation of domestic non-compliance. In addition, Liechtenstein participates in the activities of the EEA and is obliged to adopt EU legislation considered relevant to the EEA. Therefore, rules for local action against domestic non-compliance mainly derive from the CO_2 Act and EU legislation. The Party provided information on the key measures that contain provisions on enforcement and evaluation of domestic non-compliance, namely the EU ETS and the Emissions Trading Act; emission reduction units; CO_2 emissions regulation for newly registered vehicles; and partial compensation for CO_2 emissions from motor fuel use. The Party also explained that it intends to include more detailed information on the rules for domestic non-compliance in its next submission. The ERT reiterates the encouragement from the previous review report for Liechtenstein to include in its next submission information on progress made in establishing national rules for taking local action against domestic non-compliance with emission reduction targets.

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 and transparent, and thus adheres to the UNFCCC reporting guidelines on BRs.

Table II.2
Findings on projections reported in the fifth biennial report of Liechtenstein

No.	*Reporting requirement and issue type*	*Description of the finding with recommendation or encouragement*
1	Reporting requirement specified in paragraph 32 Issue type: completeness Assessment: encouragement	In the BR5 Liechtenstein did not include emission projections of CO, NO_X, NMVOCs and SO_X. During the review, the Party explained that reporting projections of indirect GHGs is a relatively low priority for Liechtenstein, and it does not plan to report them in future submissions unless data are available from submissions under the Convention on Long-range Transboundary Air Pollution.

No.	*Reporting requirement and issue type*	*Description of the finding with recommendation or encouragement*
		The ERT reiterates the encouragement from the previous review report for Liechtenstein to include in its next submission projections of indirect GHGs (CO, NO_X, NMVOCs and SO_X) to improve the completeness of its reporting.
2	Reporting requirement specified in paragraph 39 Issue type: transparency Assessment: encouragement	In the BR5 Liechtenstein did not sufficiently explain the underlying methods, models and assumptions used for calculating the emission projections. In particular, very limited information was provided on emission factors and how these are assumed to evolve across the time series, key underlying activity data (other than population projections) were not included, and an explanation was not provided of how the calculations avoid the double counting of PaMs and/or account for synergies between multiple PaMs. During the review, Liechtenstein explained that the method for modelling emissions is not very complex, and that emission projections for the energy sector are not calculated against a baseline, but rather as an increase or decrease per year compared with the preceding year. The Party provided the emission factors used to quantify the impact of each measure in the energy sector and described the approaches used for other sectors, for which data from Switzerland were used, and noted that any overlap between PaMs is expected to be small and confined to the building sector. The ERT reiterates the encouragement from the previous review report for Liechtenstein to include further information in the next submission on the models used, in particular information on the methods and key variables applied in the approach used by Switzerland and on how such methods and variables have been adapted to compile the emission projections for Liechtenstein.
3	Reporting requirement specified in paragraph 40 Issue type: transparency Assessment: encouragement	In its BR5 Liechtenstein referred to methodological information included in its NC8 on the use of proxy data from Switzerland for calculating the emission projections. The BR5 also refers to the NC8 for a description of how the emission projections are calculated, which explains that the projections are based on the total CO_2 eq emissions and that sectoral-level scaling factors derived from the 2022 annual submission were calculated to split the total CO_2 eq emission projections by gas. The factors for each gas were presented in NC8 tables 5-16–5-17 (section 5.3.1). During the review, the Party explained the similarities between Liechtenstein and Switzerland and provided details of the data underpinning the emission inventories and calculation of projections (e.g. comparable legislation, technologies and economic structures), but provided limited information to explain the strengths and weaknesses of the current approach. The Party further explained that more source-specific data demonstrating that the emissions sources, trends and impacts of the two countries' PaMs are comparable could be included in future reporting on stationary combustion and on the road transportation and agriculture sectors. The Party also confirmed that the factors used for splitting the projections by gas were derived from the ratios for 2020 and applied to all years in the time series of projections (i.e. the total CO_2 eq emissions for all projected years were assumed to have the same percentage contributions from individual GHGs as in 2020), and that this approach does not allow the gas-specific nature of the impact of PaMs to be taken into account when calculating the emission projections. To improve transparency and explain the strengths and weaknesses of the current methodology used, the ERT encourages Liechtenstein to include information in the next submission on sector-specific comparisons between Liechtenstein and Switzerland and information that explains the underlying assumptions currently used in the projection calculations to split the total CO_2 eq emissions into individual GHGs.

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

Annex III

Documents and information used during the review

A. Reference documents

2022 GHG annual submission of Liechtenstein.
Available at https://unfccc.int/ghg-inventories-annex-i-parties/2022.

2023 GHG inventory submission of Liechtenstein.
Available at https://unfccc.int/ghg-inventories-annex-i-parties/2023.

BR5 CTF tables of Liechtenstein. Available at https://unfccc.int/BR5.

BR5 of Liechtenstein. Available at https://unfccc.int/BR5.

"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 II: UNFCCC reporting guidelines on national communications". FCCC/CP/2019/13/Add.1. Available at https://unfccc.int/documents/210471.

"Guidelines for the preparation of the information required under Article 7 of the Kyoto Protocol". Annex to decision 15/CMP.1. Available at https://unfccc.int/documents/4253.

"Guidelines for the preparation of the information required under Article 7 of the Kyoto Protocol". Annex III to decision 3/CMP.11. Available at https://unfccc.int/documents/9101.

"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.

NC8 of Liechtenstein. Available at https://unfccc.int/NC8.

Report on the individual review of the annual submission of Liechtenstein submitted in 2022. FCCC/ARR/2022/LIE. Available at https://unfccc.int/documents/626010.

Report on the technical review of the BR4 of Liechtenstein. FCCC/TRR.4/LIE. Available at https://unfccc.int/documents/278874.

"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 Karin Jehle (Office of Environment of Liechtenstein), including additional material.