



**Framework Convention on  
Climate Change**

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**Report of the in-depth review of the fifth national  
communication of Liechtenstein**

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

## Contents

	<i>Paragraphs</i>	<i>Page</i>
I. Introduction and summary .....	1–10	3
A. Introduction .....	1–4	3
B. Summary .....	5–10	3
II. Technical assessment of the reviewed elements .....	11–76	5
A. National circumstances relevant to greenhouse gas emissions and removals, including legislative arrangements and administrative procedures .....	11–22	5
B. Policies and measures, including those in accordance with Article 2 of the Kyoto Protocol .....	23–46	9
C. Projections and the total effect of policies and measures, and supplementarity relating to the Kyoto Protocol mechanisms .....	47–60	14
D. Vulnerability assessment, climate change impacts and adaptation measures	61–63	18
E. Financial resources and transfer of technology, including information under Articles 10 and 11 of the Kyoto Protocol .....	64–67	19
F. Research and systematic observation .....	68–70	20
G. Education, training and public awareness .....	71–72	21
H. Evaluation of supplementary information under Article 7, paragraph 2, of the Kyoto Protocol .....	73–74	21
I. Minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol .....	75–76	22
III. Conclusions and recommendations .....	77–88	22
IV. Questions of implementation .....	89	25
Annex		
Documents and information used during the review.....		26

## I. Introduction and summary

### A. Introduction

1. For Liechtenstein the Convention entered into force on 20 September 1994 and the Kyoto Protocol on 16 February 2005. Under the Kyoto Protocol, Liechtenstein committed itself to reducing its greenhouse gas (GHG) emissions by 8 per cent compared with the base year<sup>1</sup> level during the first commitment period from 2008 to 2012.

2. This report covers the centralized in-depth review (IDR) of the fifth national communication (NC5) of Liechtenstein, coordinated by the UNFCCC secretariat, in accordance with the guidelines for review under Article 8 of the Kyoto Protocol (decision 22/CMP.1). The review took place from 2 to 7 May 2011 in Bonn, Germany, and was conducted by the following team of nominated experts from the UNFCCC roster of experts: Mr. Imran Habib Ahmad (Pakistan), Mr. Luis Caceres Silva (Ecuador), Mr. James Davey (United Kingdom of Great Britain and Northern Ireland), Ms. Laura Dawidowski (Argentina), Ms. Medea Inashvili (Georgia), Ms. Natalya Parasyuk (Ukraine) and Mr. Simon Wear (New Zealand). Ms. Inashvili and Mr. Wear were the lead reviewers. The review was coordinated by Ms. Xuehong Wang and Ms. Ruta Bubniene (UNFCCC secretariat).

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

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

### B. Summary

5. The ERT noted that Liechtenstein's NC5 complies mostly with the "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part II: UNFCCC reporting guidelines on national communications" (hereinafter referred to as the UNFCCC reporting guidelines). As required by decision 15/CMP.1, supplementary information required under Article 7, paragraph 2, of the Kyoto Protocol<sup>2</sup> is provided in the NC5. Liechtenstein considered most of the recommendations provided in the report of the centralized IDR of the fourth national communication (NC4) of Liechtenstein.<sup>3</sup> The ERT commended Liechtenstein for its improved reporting.

6. The supplementary information on the minimization of adverse impacts referred to in paragraph 3 above is generally complete and transparent and was provided on time.

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<sup>1</sup> "Base year" refers to the base year under the Kyoto Protocol, which is 1990 for carbon dioxide, methane and nitrous oxide, and 1995 for perfluorocarbons, hydrofluorocarbons and sulphur hexafluoride. The base year emissions include emissions from sectors/source categories listed in Annex A to the Kyoto Protocol.

<sup>2</sup> Decision 15/CMP.1, annex, chapter II.

<sup>3</sup> FCCC/IDR.4/LIE.

## 1. Completeness

7. The NC5 covers all sections required by the UNFCCC reporting guidelines and most of the supplementary information under Article 7, paragraph 2, of the Kyoto Protocol, except for: information on the minimization of adverse impacts under Article 2, paragraph 3, of the Kyoto Protocol; the identification of steps taken to promote and/or implement any decisions taken by the International Civil Aviation Organization (ICAO) and the International Maritime Organization (IMO) in order to limit or to reduce GHG emissions not controlled by the Montreal Protocol from aviation and marine bunker fuels; and a description of national legislative arrangements and administrative procedures 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. Most of this information was provided during the review.

8. The NC5 does not include some information required by the UNFCCC reporting guidelines, namely: information on how Liechtenstein believes its policies and measures (PaMs) are modifying longer-term trends in anthropogenic GHG emissions and removals; the estimated and expected total effect of implemented and adopted PaMs for sectors other than energy; an estimate of the total effect of Liechtenstein's PaMs, in accordance with the 'with measures' definition, compared with a situation without such PaMs, presented in terms of GHG emissions avoided or sequestered, by gas (on a carbon dioxide equivalent (CO<sub>2</sub> eq) basis) in 1995 and 2000; relevant information on factors and activities for each sector for the years 1990 to 2020; information on international activities relating to research and systematic observation (RSO); and information on actions taken to support capacity-building in RSO in developing countries. The ERT recommends that Liechtenstein enhance the completeness of its reporting by providing this information in its next national communication. Most of the information was provided during the review.

## 2. Transparency

9. The ERT acknowledged that Liechtenstein's NC5, including supplementary information provided under Article 7, paragraph 2, of the Kyoto Protocol, is broadly transparent. The ERT noted that the NC5 is structured following the outline contained in the annex to the UNFCCC reporting guidelines and supplementary information submitted under Article 7, paragraph 2, of the Kyoto Protocol is easily identifiable. In the course of the review, the ERT formulated a number of recommendations that could help Liechtenstein to further increase the transparency of its reporting with regard to national circumstances (see para. 12 below), PaMs (see paras. 24, 27, 28 and 45 below), projections and total effects of PaMs (see paras. 51, 52, 56 and 57 below), vulnerability, climate change impacts and adaptation (see para. 63 below), RSO (see para. 68 below), education, training and public awareness (see para. 71 below), the description of the national system (see paras. 17 and 18 below), the description of the national registry (see paras. 20 and 21 below), information on supplementarity relating to the mechanisms pursuant to Articles 6, 12 and 17 of the Kyoto Protocol (see para. 60 below) and information on the minimization of adverse impacts (see para. 46 below).

## 3. Timeliness

10. The NC5 was submitted on 25 January 2010, after the deadline of 1 January 2010 mandated by decision 10/CP.13. However, the ERT noted that the submission was made within six weeks after the due date (before 15 February 2010).

## **II. Technical assessment of the reviewed elements**

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

11. In its NC5, Liechtenstein has provided a concise description of the national circumstances and has elaborated on the framework legislation and key policy documents on climate change. The NC5 also referred to the description of the national system provided in the national inventory report (NIR) of the Party's 2009 annual submission. Further technical assessment of the institutional and legislative arrangements for the coordination and implementation of PaMs is provided in chapter II.B.1 below.

#### **1. National circumstances**

12. In its NC5, Liechtenstein has provided a description of its national circumstances, information on how these national circumstances affect GHG emissions and removals in the country and information on how changes in these national circumstances affect GHG emissions and removals over time in Liechtenstein. Information was provided on the government structure, population, geography, climate, economy and relevant economic sectors. Liechtenstein is a very small economy and had a total population of 35,356 by the end of 2007. It has no fossil fuel resources of its own and imports more than 90 per cent of its energy. From 1990 to 2009, total GHG emissions in Liechtenstein slightly increased and the emission trend has been fluctuating. The ERT noted that the main drivers of the generally increasing emission trends in Liechtenstein include population growth (22 per cent increase between 1990 and 2009) and the corresponding increase in energy consumption, especially in the transport, residential and commercial sectors. The ERT encourages Liechtenstein to report in more detail on the main drivers of emissions from each of these sectors in its next national communication. Table 1 illustrates the national circumstances of the country by providing some indicators relevant to GHG emissions and removals.

13. The Principality of Liechtenstein is a constitutional hereditary monarchy on a democratic and parliamentary basis, with the Reigning Prince as the Head of State. The Government consists of five ministries, with 40 subordinated offices and 50 commissions and advisory councils supporting the work of the administration. There are 11 municipalities in Liechtenstein, headed by elected mayors. Liechtenstein has a very close relationship with neighbouring Switzerland, and the relationship is heavily influenced by the Customs and Currency Treaty between the two countries. Liechtenstein has implemented a large amount of European Union (EU) legislation since it joined the European Economic Area in 1995. The overall responsibility for climate change policymaking lies within the Ministry of Environment. The Office of Environmental Protection (OEP) and a number of national institutions are involved in the implementation of this policy. Further legislative arrangements and administrative procedures, including those for the national system and the national registry, are presented in chapters II.A.2, II.A.3 and II.B below.

Table 1  
Indicators relevant to greenhouse gas emissions and removals for Liechtenstein

	1990	1995	2000	2005	2008	Change 1990–2000 (%)	Change 2000–2008 (%)	Change 1990–2008 (%)
Population (thousand)	29.00	31.00	33.00	35.00	36.00	13.8	9.1	24.1
GDP (2000 USD thousand using PPP)	NA	NA	204.77	197.82	217.60	NA	6.3	NA
TPES (Mtoe)	0.09	0.09	0.11	0.12	0.12	12.9	11.6	26.1
GDP per capita (2000 USD thousand using PPP)	NA	NA	6.21	5.65	6.04	NA	-2.7	NA
TPES per capita (toe)	3.27	3.01	3.24	3.38	3.32	-0.8	2.3	1.6
GHG emissions without LULUCF (Tg CO <sub>2</sub> eq)	229.57	235.62	254.89	271.35	263.40	11.0	3.3	14.7
GHG emissions with LULUCF (Tg CO <sub>2</sub> eq)	221.35	227.26	251.64	265.30	257.28	13.7	2.2	16.2
CO <sub>2</sub> emissions per capita (Mg)	7.00	6.76	6.90	6.86	5.95	-1.5	-13.7	-15.1
CO <sub>2</sub> emissions per GDP unit (kg per 2000 USD using PPP)	NA	NA	2.18	2.38	2.38	NA	9.2	NA
GHG emissions per capita (Mg CO <sub>2</sub> eq)	7.92	7.60	7.72	7.75	7.32	-2.4	-5.3	-7.6
GHG emissions per GDP unit (kg CO <sub>2</sub> eq per 2000 USD using PPP)	NA	NA	2.44	2.69	2.38	NA	-2.74	NA

Sources: (1) GHG emissions data: Liechtenstein's 2010 greenhouse gas inventory submission; (2) Population, GDP and TPES data: International Energy Agency.

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

Abbreviations: GDP = gross domestic product, GHG = greenhouse gas, LULUCF = land use, land-use change and forestry, NA = not available, PPP = purchasing power parity, TPES = total primary energy supply.

14. In the NC5, Liechtenstein has provided a summary of information on GHG emission trends for the period 1990–2007. This information is broadly consistent with the Party's 2009 national GHG inventory submission. Summary tables, including trend tables for emissions in CO<sub>2</sub> eq (given in the common reporting format), are also provided in an annex to the NC5. During the review, the ERT assessed the Party's recently submitted 2011 annual submission and it has reflected the findings in this report.

15. Total GHG emissions excluding emissions and removals from land use, land-use change and forestry (LULUCF) increased by 7.8 per cent between the base year and 2009, whereas total GHG emissions including net emissions or removals from LULUCF increased by 9.0 per cent. This was mainly attributed to carbon dioxide (CO<sub>2</sub>) emissions, which increased by 5.5 per cent over this period. Emissions of methane (CH<sub>4</sub>) also increased (by 9.5 per cent), while emissions of nitrous oxide (N<sub>2</sub>O) decreased by 0.5 per cent. A major part of the emission increases was experienced from 1990 to 2005 (the trends during this period were as follows: CO<sub>2</sub>, +20.0 per cent; CH<sub>4</sub>, +4.4 per cent; N<sub>2</sub>O, -2.4 per cent; and total GHG emissions excluding LULUCF, +18.2 per cent). The share of fluorinated gases (F-gases) in Liechtenstein's total GHG emissions was negligible in the base year and 2.2 per cent in 2009. Trends in the country's total GHG emissions were

mostly underpinned by GHG emission trends in the energy sector, which were driven by fuel consumption, especially in the transport, residential, commercial and institutional subsectors. The decrease in emissions during the 2008–2009 period was due mainly to increased prices for gas oil, which limited fuel consumption in 2009. Analysis of drivers for GHG emission trends in each sector is provided in chapter II.B below. Table 2 provides an overview of GHG emissions by sector in Liechtenstein from the base year to 2009.

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

Sector	GHG emissions (Tg CO <sub>2</sub> eq)						Change (%)		Shares <sup>a</sup> by sector (%)	
	1990	1995	2000	2005	2008	2009	1990–2009	2008–2009	1990	2009
1. Energy	203.5	210.7	229.5	242.0	232.1	216.3	6.3	–6.8	88.6	87.4
A1. Energy industries	0.2	2.0	2.7	3.1	2.9	2.9	1 570.0	1.9	0.1	1.2
A2. Manufacturing industries and construction	35.3	34.4	34.3	36.2	33.0	23.8	–6.6	–28.0	15.4	9.6
A3. Transport	76.4	81.7	95.9	85.5	91.0	84.8	11.0	–6.8	33.3	34.3
A4.–A5. Other	91.3	92.1	95.8	116.2	104.7	103.8	13.7	–0.3	39.8	42.0
B. Fugitive emissions	0.3	0.5	0.7	1.0	1.1	1.0	223.1	–5.7	0.1	0.4
2. Industrial processes	0.0	0.4	2.4	4.7	5.5	5.5	58 305.7	0.4	0.0	2.2
3. Solvent and other product use	1.9	1.6	1.2	1.0	1.0	1.0	–49.9	0.0	0.9	0.4
4. Agriculture	22.6	21.4	20.0	21.8	22.9	22.8	1.1	–0.4	9.8	9.2
5. LULUCF	–8.2	–8.4	–3.3	–6.1	–6.1	–6.1	–25.2	0.4	–3.6	–2.5
6. Waste	1.5	1.7	1.7	1.9	1.9	1.7	13.3	–10.9	0.7	0.7
7. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
<b>GHG total with LULUCF</b>	<b>221.4</b>	<b>227.3</b>	<b>251.6</b>	<b>265.3</b>	<b>257.3</b>	<b>241.3</b>	<b>9.0</b>	<b>–6.2</b>	<b>NA</b>	<b>NA</b>
<b>GHG total without LULUCF</b>	<b>229.6</b>	<b>235.6</b>	<b>254.9</b>	<b>271.4</b>	<b>263.4</b>	<b>247.4</b>	<b>7.8</b>	<b>–6.1</b>	<b>100.0</b>	<b>100.0</b>

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

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

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

## 2. National system

16. In accordance with decision 15/CMP.1, Liechtenstein provided in its NC5 a description of how its national system is performing the general and specific functions defined in the guidelines for national systems under Article 5, paragraph 1 (decision 19/CMP.1). The Party also provided a reference to its 2009 annual submission, which contains a more detailed description of the national system. The description includes all the elements as required in decision 15/CMP.1.

17. In the NC5, Liechtenstein provided a general description of its activities under Article 3, paragraph 3, of the Kyoto Protocol.<sup>4</sup> However, the ERT noted that Liechtenstein did not provide a description of national legislative arrangements and administrative procedures that seek to ensure that the implementation of activities under Article 3, paragraph 3, also contributes to the conservation of biodiversity and the sustainable use of natural resources. The ERT recommends that Liechtenstein include such a description in its next national communication as required by the UNFCCC reporting guidelines.

18. The ERT took note of the recommendations made in the report of the individual review of the 2010 annual submission of Liechtenstein<sup>5</sup> (2010 ARR). During the review, the ERT learned that the Party has made some efforts to further develop its country-specific capacity for inventory planning and preparation. The ERT encourages Liechtenstein to improve transparency in the description of the inventory preparation process. The ERT also encourages Liechtenstein to further improve its quality assurance/quality control (QA/QC) procedure, create and implement a system of QA/QC management and report on the progress made in its next national communication. The ERT concluded that the national system continued to perform its required functions as set out in decision 19/CMP.1.

### **3. National registry**

19. In its NC5, Liechtenstein has provided information on the national registry, including a description of how its national registry performs the functions defined in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1 and how it complies with the requirements of the technical standards for data exchange between registry systems. During the review, the Party made a reference to its 2011 annual submission for more details on the national registry.

20. Also during the review, Liechtenstein provided additional information on the measures put in place to safeguard, maintain and recover registry data, the security measures employed in the registry to prevent unauthorized data manipulations, the measures put in place to protect the registry against security compromises, the test procedures related to the performance of the national registry and the recording of the changes and discrepancies in the national registry. In response to questions raised by the ERT, Liechtenstein provided documents demonstrating how it records the changes related to the national registry and how it maintains these records. The ERT noted that the documents on security measures taken against viruses and hackers were not available in English. The ERT recommends that Liechtenstein provide all the documents in English for future reviews.

21. The ERT took note of the conclusion of the standard independent assessment report that some required information was not available on the public users' interface (i.e. representative identifier, and data on projects under Article 6 of the Convention). To address this issue, the Party provided the missing information in its 2011 inventory submission. The ERT also took note of the recommendations made in the 2010 ARR. During the review, the ERT learned that the Party had addressed the recommendation made in the 2010 ARR and provided a list of an address for the publicly available information. The ERT recommends that Liechtenstein report this information in its next national communication.

22. The ERT concluded that Liechtenstein's national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1,

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<sup>4</sup> Liechtenstein did not elect any activities under Article 3, paragraph 4, of the Kyoto Protocol during the first commitment period.

<sup>5</sup> FCCC/ARR/2010/LIE.

and continues to adhere to the technical standards for data exchange between registry systems in accordance with decisions 16/CP.10 and 12/CMP.1.

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

23. As required by the UNFCCC reporting guidelines, Liechtenstein has provided in its NC5 detailed and well-organized information on its package of PaMs implemented, adopted and planned in order to fulfil its commitments under the Convention and its Kyoto Protocol. Each sector has its own textual description of the principal PaMs, supplemented by summary tables on PaMs by sector. The NC5 contains a similar set of PaMs to those in the NC4.

24. However, the ERT noted that Liechtenstein did not provide the following mandatory elements required by the UNFCCC reporting guidelines: information on how Liechtenstein believes its PaMs are modifying longer-term trends in anthropogenic GHG emissions and removals, consistent with the objective of the Convention. The ERT recommends that Liechtenstein include this information in its next national communication.

25. Liechtenstein provided in its NC5 detailed information on PaMs at the national level. The key framework climate and energy policy is the 2007 Climate Protection Strategy, which requires a coordinated approach to the drafting of sectoral legislation by the competent ministries. Owing to the Customs Treaty and the bilateral agreements between Liechtenstein and Switzerland, most policies in Liechtenstein are very closely linked to the Swiss policy, including the implementation of several environmental levies (such as levies under the CO<sub>2</sub> Act).

26. The assigned amount of Liechtenstein for the first commitment period of the Kyoto Protocol (2008–2012) is equivalent to 211.99 Gg CO<sub>2</sub> eq/year, which reflects the target for Liechtenstein inscribed in Annex B to the Kyoto Protocol of an emission reduction of 8 per cent below the 1990 level (229.48 Gg CO<sub>2</sub> eq). Liechtenstein has not elected any activities under Article 3, paragraph 4, of the Kyoto Protocol in the first commitment period. Key PaMs for Liechtenstein to meet its target under the Kyoto Protocol include participation in the EU emissions trading scheme (EU ETS) and the introduction of a levy on fossil fuel consumption through the CO<sub>2</sub> Act.

27. The NC5 provides qualitative estimates of the effects of Liechtenstein's PaMs by sector and by gas. For the majority of the PaMs, quantified estimates of emission savings are not reported. It is not clear from the NC5 how the effectiveness of PaMs is monitored and evaluated over time in the country. During the review, Liechtenstein informed the ERT that the effectiveness of PaMs is monitored on a sector-by-sector basis. For the energy sector, publications of the annual energy statistics constitute the monitoring tool to measure the effects of PaMs. Indicators for sustainable development have also been developed to determine the progress made towards achieving sustainable development objectives. The ERT encourages Liechtenstein to report in more detail on quantified emission reduction estimates for individual PaMs, and on how the effectiveness of PaMs is monitored and evaluated, in its next national communication.

28. Some information on the cost of PaMs is reported in the NC5, particularly in relation to PaMs targeted at improving energy efficiency in buildings. However, no information is provided in the NC5 on PaMs that could potentially increase emissions. The ERT encourages Liechtenstein to report this information in its future national communications. Table 3 provides a summary of the reported information on the PaMs of Liechtenstein.

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

<i>Major policies and measures</i>	<i>Examples/comments</i>
<i>Policy framework and cross-sectoral measures</i>	
Climate Protection Strategy	Definition of a clear and transparent strategy for climate policy in Liechtenstein
European Union emissions trading scheme	Acquisition of steam from a waste incineration plant in Buchs (Switzerland) to replace the use of fossil fuel by industries in Liechtenstein (17.5; 2.2)
CO <sub>2</sub> Act	Establishment of a levy on fossil fuel consumption covering the sectors of economy as well as private households
<i>Policies and measures by sector</i>	
<i>Energy</i>	
Energy efficiency improvements	Promotion of energy efficiency through the Energy Efficiency Act (2.9; 2.9) and the Energy Concept 2013; energy saving in the building sector through heating and heating insulation regulations and the MINERGIE standard for public buildings; energy labelling programme for energy-efficient office appliances; promotion of heat insulation and ‘residential technical installations’
Renewable energy sources (RES)	Promotion of photovoltaic systems of private entities, with 80 cents /kWh being paid for energy generated from certified photovoltaic systems from 2004 to 2009; use of heating pumps based on heat from thermal aquifers for production of electricity and heating; extension of hydropower in 2013; use of solar energy and demonstration facilities
Participation of municipalities in the “Energy City” labelling programme	Reduction of CO <sub>2</sub> emissions at the level of the municipalities by increased use of RES and highly energy-efficient technologies in all buildings
<i>Transport</i>	
Mobiles Liechtenstein 2015	Implementation of a national transport policy that covers a number of projects, including the promotion of public transportation, subsidies for electric scooters and electric bicycles, and tax exemptions for solar, hybrid, electric and natural gas vehicles, etc.
Heavy-vehicle fee	Differentiation of fees according to distance driven and the total weight of the vehicle, which contributes to large-scale shift in heavy goods transportation from road to rail
Motor vehicle tax	Imposition of tax based on vehicle emissions in order to provide incentives for the purchase of low-emission vehicles
Promotion of the use of natural gas and biogas	Conversion of diesel-fuelled buses to natural gas fuelled buses used in public transport; construction and operation of three public natural gas filling stations; supply of biogas to natural gas filling station
<i>Agriculture</i>	
Agriculture Law 2008	Promotion of environmentally friendly and animal-friendly agriculture and strict regulations on use of

<i>Major policies and measures</i>	<i>Examples/comments</i>
	fertilizers and pesticides
Water Protection Act	Cap on the number of cattle and horses permitted per land area
<i>Forestry</i>	
Forestry Act	Sustainable cultivation of forests
Forest Inventory 1998 and National Forest Programme (2002–2012)	Binding specifications for future use of forests; development of a Forest Inventory 2010
<i>Waste</i>	
Environmental Protection Act	Provision of legal basis for all regulations and ordinances, especially with respect to air pollution and waste treatment
Restriction, Evaluation, Authorisation and Restriction of Chemicals	Requirement for manufacturers and importers to gather information on the properties of chemical substances, which will allow safe handling, and to register the information in a central database run by the European Chemicals Agency

*Note:* The greenhouse gas reduction estimates, given for some measures (in parentheses), are reductions in Gg CO<sub>2</sub> or CO<sub>2</sub> eq for 2010 and 2020.

## 1. Policy framework and cross-sectoral measures

29. The 2007 Climate Protection Strategy, coordinated by the Ministry of Environment and OEP, ensures a coordinated approach in the development of climate policies in the fields of environment, energy, buildings, transportation, agriculture and forestry. Liechtenstein's Ministry of Environment and OEP are the coordinating authorities with respect to the implementation of the Climate Protection Strategy. The municipalities are particularly involved in activities, funded from the municipal budgets, that lead to improvements in energy efficiency in buildings.

30. The document setting out the overall direction for Liechtenstein's environmental policy is the 2008 Environmental Protection Act. However, the NC5 does not clearly describe how climate change issues are being addressed by this Act. During the review, the Party informed the ERT that the Act forms the legal basis for setting limits on emissions, for example on small combustion installations used by industry and households.

31. The legislative and administrative arrangements for Liechtenstein to meet its Kyoto Protocol target are outlined in the Emission Trading Act and the CO<sub>2</sub> Act. In accordance with the Emission Trading Act, the country's priority in meeting its Kyoto Protocol target is set on emission reductions delivered through domestic measures, and where these fall short the Government may acquire credits from clean development mechanism (CDM) or joint implementation projects and/or international emissions trading under the Kyoto Protocol. The CO<sub>2</sub> Act lays down a target to reduce CO<sub>2</sub> emissions from energy-related use of fossil energy sources by at least 10 per cent below the 1990 level by 2010. It promotes the economical use of fossil fuels by establishing a levy on fossil fuel consumption covering the sectors of economy as well as private households. The levy rates were 12 Swiss francs (CHF)/t CO<sub>2</sub> in 2008 and 2009, which increased to CHF 36 in 2010. No qualitative description of Liechtenstein's long-term climate strategy and related targets is provided in the NC5.

32. The EU ETS covers two industrial installations in Liechtenstein. As a result of the emission cap set for these installations, fossil fuel used for heat production has been replaced by steam supplied via a pipeline from Switzerland. A total of 89,715 EU emission

allowances<sup>6</sup> were allocated to the installations in Liechtenstein for the period 2008–2012. If emissions from these installations exceed this level, additional units will have to be purchased by the installation owners.

## 2. Policies and measures in the energy sector

33. Between 1990 and 2009, GHG emissions from the energy sector increased by 6.3 per cent (12.8 Gg CO<sub>2</sub> eq), driven mainly by increased emissions from the transport sector and from the residential, commercial and institutional sectors (the sector other). The trend in GHG emissions from fuel combustion showed notable increases in transport (by 11.0 per cent, or 8.4 Gg CO<sub>2</sub> eq) and energy use in the sector other (by 13.7 per cent, or 12.5 Gg CO<sub>2</sub> eq). Between 1990 and 2009, the total number of registered vehicles (passenger cars and heavy-duty vehicles) increased from 21,233 to 35,291.

34. **Renewable energy sources (RES).** The Energy Concept 2013 strategy adopted by Liechtenstein in 2004 focuses on the promotion of energy efficiency, the use of RES, and energy saving. The goal is to increase the share of RES in total energy use from 8 per cent to 10 per cent by 2013. Additional goals seek to triple the use of solar energy through thermal solar panels and to increase the production of electricity from solar energy through photovoltaic systems by a factor of 2.5. In addition, the use of biomass (woodchips) for heat production is increasing in Liechtenstein. The use of solar panels for both hot water supply and electricity production is directly subsidized by the Government. Feasibility studies on the potential use of geothermal energy have been carried out.

35. **Energy efficiency.** Energy saving in buildings is a central concern in Liechtenstein's energy policy. The Energy Efficiency Act and the relevant Ordinance as well as the Energy Ordinance of the Construction Act constitute the legal framework for improving energy efficiency in buildings, through insulation and improving energy performance, and improving energy efficiency throughout the economy, through advisory guidance and awareness-raising. Financial support is provided for the renovation of old buildings, installations, district heating plants and solar collectors.

36. **Residential and commercial sectors.** The MINERGIE quality label is used for new and renovated buildings in Liechtenstein. Its goal is to achieve energy consumption in these buildings that is lower by a factor of 3 than in conventional buildings. The Bureau of Energy Consumption and Conservation within the Office of Economic Affairs is the certification authority for MINERGIE buildings in Liechtenstein. Subsidies are provided to improve the insulation of older buildings and all new administrative buildings must be built to a MINERGIE standard. Subsidies are also available for 'residential technical installations' (heat pumps, solar heating and/or biomass heating) in buildings that already meet a minimum insulation standard. The total subsidies directed to each of these areas in 2008 are set out in the NC5.

37. **Transport sector.** Liechtenstein's national transport policy (Mobiles Liechtenstein 2015) seeks to reduce emissions from the use of private passenger vehicles through the promotion of public transportation, the expansion of the Liechtenstein Bus Authority, the promotion/use of the "Liechtenstein Takt" regional train schedule, preferential treatment of buses at traffic lights, subsidies provided for electric scooters and electric bicycles, tax exemptions for solar, hybrid, electric and natural gas fuelled vehicles, the implementation of security measures along the way to schools, mobility campaigns and the medium-term expansion of the railway. At the moment the Government is considering introducing a link between vehicle taxation and emissions from vehicles. In addition, buses have been converted to run on natural gas. Further, emissions from goods vehicles are being targeted via a goods transport policy, which also plays an important role in reducing emissions.

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<sup>6</sup> 1 EU emission allowance is equivalent to 1 t CO<sub>2</sub> emissions.

Liechtenstein introduced a heavy-vehicle fee, differentiated according to distance driven and the total weight of the vehicle. This has the dual effect of both increasing the productivity of road traffic and shifting heavy goods traffic from road to rail.

38. Liechtenstein does not report in its NC5 on measures to reduce emissions from international aviation or marine bunker fuels. According to the NIR of Liechtenstein's 2011 annual submission, marine bunkers are not a source of emissions, while international aviation bunkers generated emissions of 0.89 Gt CO<sub>2</sub> eq in 2009. The ERT noted that Liechtenstein has no international airport.

39. **Industrial sector.** The most important industries in Liechtenstein are mechanical engineering, electrical machinery, vehicle components, dental technology, food products and construction work. GHG emissions from the industrial sector decreased by 24.8 per cent between 1990 and 2009, partly as a result of the inclusion of two industrial units in the EU ETS.

### 3. Policies and measures in other sectors

40. Between 1990 and 2009, GHG emissions from industrial processes (including solvent and other product use), agriculture and waste increased by 19.1 per cent (5.0 Gg CO<sub>2</sub> eq), driven mainly driven by an increase in the consumption of F-gases in the industrial processes sector, especially the use of hydrofluorocarbons (HFCs). There were small increases in emissions from the waste and agriculture sectors.

41. **Industrial processes.** Between 1990 and 2009, GHG emissions from the industrial processes sector increased from nearly zero to 5.5 Gg CO<sub>2</sub> eq, driven entirely by an increase in the consumption of F-gases. The latter increase is a result mainly of Liechtenstein's commitments under the Montreal Protocol to eliminate the consumption of chlorofluorocarbons and replace it with the consumption of HFCs. The use of F-gases in the country is regulated by the Ordinance on Dangerous Substances (2005), which bans the use of several substances, especially in fire extinguishers and spray cans.

42. **Agriculture.** Between 1990 and 2009, GHG emissions from the agriculture sector increased by 1.1 per cent (0.3 Gg CO<sub>2</sub> eq). Measures are in place to promote environmentally friendly farming methods through payments to farmers and to protect soil and water quality through regulations.

43. **LULUCF.** The LULUCF sector was a net sink of 6.1 Gg CO<sub>2</sub> eq in Liechtenstein in 2009. Net GHG removals have decreased by 2.1 Gg since 1990. This decreasing trend was driven mainly by an increase in emissions from grassland. About 43 per cent of the territory of Liechtenstein is covered by forest. The current Forestry Act (1991) places emphasis on both maintaining the quality and preserving the stock volume of forests. The National Forest Programme (2002-2012) further promotes sustainable forest management in line with Liechtenstein's international obligations. Liechtenstein will use activities under Article 3, paragraph 3, of the Kyoto Protocol to enable it to meet its emission reduction target under the Kyoto Protocol. No activities under Article 3, paragraph 4, of the Kyoto Protocol were selected by Liechtenstein.

44. **Waste management.** Between 1990 and 2009, GHG emissions from the waste sector increased by 13.3 per cent (0.2 Gg CO<sub>2</sub> eq), driven mainly by an increase in CH<sub>4</sub> emissions from open-air composting. The EU regulation on the Registration, Evaluation, Authorisation and Restriction of Chemicals is intended to improve the way in which chemicals are handled, with a view to reducing dangerous waste. The Environmental Protection Act promotes recycling where appropriate. Waste is incinerated at the waste incineration plant in Buchs, Switzerland, and used for energy production.

45. In summary, the ERT considers the PaMs section to be clearly set out in the NC5, providing a detailed description of Liechtenstein's PaMs. The ERT encourages Liechtenstein to quantify the estimated impacts of its PaMs on its emissions and to report thereon in its future national communications. The ERT also encourages Liechtenstein to report on how the effectiveness of its PaMs is monitored and evaluated.

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

46. In its NC5, Liechtenstein has not reported information on how it strives to implement PaMs under Article 2 of the Kyoto Protocol in such a way as to minimize adverse effects, including the adverse effects of climate change and effects on international trade and social, environmental and economic impacts, on other Parties, especially developing country Parties. During the review, at the request of the ERT, Liechtenstein made a reference to the information reported under Article 3, paragraph 14, of the Kyoto Protocol contained in its 2011 annual submission. The ERT recommends that Liechtenstein provide this information in its next national communication. Further information on how Liechtenstein strives to implement its commitments under Article 3, paragraph 1, of the Kyoto Protocol in such a way as to minimize adverse social, environmental and economic impacts on developing country Parties, as reported in its 2011 annual submission, is presented in chapter II.I below.

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

47. In its NC5, Liechtenstein has provided projections for all direct GHG emissions, following the Intergovernmental Panel on Climate Change (IPCC) sectors and source categories, under a 'with measures' scenario. No information on updated projections prepared since the submission of the NC5 was provided during the review week.

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

48. The GHG emission projections provided by Liechtenstein in the NC5 include a 'with measures' scenario until 2020, presented relative to actual inventory data for 1990, 1995, 2000, 2005 and 2007. Projections are presented on a sectoral basis, using the same sectoral categories used in the PaMs section of the NC5, and on a gas-by-gas basis for the following GHGs: CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, HFCs and sulphur hexafluoride. In Liechtenstein there are no perfluorocarbons (PFCs) or precursors emitted. Projections are also provided in an aggregated format for each sector as well as for a national total, using global warming potential values. Emission projections related to fuel sold to aircraft (helicopters) engaged in international transport were reported separately and not included in the totals.

49. Liechtenstein does not have comprehensive emission projections at its disposal, owing to its small size and limited capacity to develop a modelling framework of its own. The projections presented for 2010, 2015 and 2020 rely on the latest emission and energy use data available for Liechtenstein and on projections calculated by the Bureau of Energy Consumption and Conservation of emission reductions derived from PaMs implemented in the country. In addition, comparisons and analogies with the projections and assumptions developed for Switzerland are used by Liechtenstein in deriving its own emission projections.

50. The 'with measures' scenario includes most of the measures reported in the NC5, implemented or adopted before the NC5 was submitted, with the exception of the CO<sub>2</sub> levy on heating fuel, agreements with car importers to enhance energy efficiency and reduce

CO<sub>2</sub> emissions, the heavy-vehicle fee and the promotion of the MINERGIE standard, owing to the difficulty of quantifying the effect of these measures.

51. Compared with the very simple approach used to prepare the projections reported in the NC4, the methodology has been improved for the projections reported in the NC5. While the NC4 contained only projections for 2003 to 2010 linearly interpolated, the data used for the projections reported in the NC5 are much more sophisticated. The projections for the energy sector are based mainly on Liechtenstein's energy statistics. For the transport sector, the projections derived using the Swiss traffic model have been fully adapted. Emission projections for the transport sector until 2020 are assumed to be proportional to Switzerland's corresponding emission projections. While emissions from the waste sector and solvent and other product use have been projected assuming that they remain in constant proportion to the size of the population, emissions from agriculture are assumed to remain constant until 2020. The F-gas projections are based on a bottom-up model used in Switzerland. Liechtenstein's emission projections are estimated proportional to the emissions reported by Switzerland, using specific indicators such as number of households, number of employees, number of cars, etc. Projections for the LULUCF sector are based on a linear extrapolation of the data for the period 1984–2002. No further information about the models used has been reported in the NC5, but a reference was made to the NC5 of Switzerland for further details. The ERT recommends that Liechtenstein improve the transparency of its reporting by including clearer descriptions of the models used for making projections for the different sectors, especially for the energy and agriculture sectors.

52. The sensitivity of the results analysed using different input parameters is not discussed in the NC5. The main modelling parameters and assumptions have been given in the NC5, which include growth rates for population, gross domestic product, energy efficiency improvements, industrial output, transport trends, cattle stock, etc. The impact of a variation in these parameters on the projected GHG emissions was not discussed in the NC5 and no resulting uncertainty ranges were provided. The ERT encourages Liechtenstein to include in its future national communications the results of its sensitivity and uncertainty analyses.

## 2. Results of projections

53. Key results of Liechtenstein's GHG emission projections are provided in table 4 and the emission trends illustrated in the figure below. Liechtenstein is on track to meet its Kyoto Protocol target of an 8 per cent emission reduction compared with the base year level by a combination of domestic efforts and the use of the Kyoto Protocol mechanisms.

54. Liechtenstein's base year emissions were fixed at 229.48 Gg CO<sub>2</sub> eq during the initial review. The Kyoto Protocol target for Liechtenstein is, on average, 211.99 Gg CO<sub>2</sub> eq per annum over the Kyoto Protocol first commitment period (2008–2012). According to the projections presented in the NC5, under the 'with measures' scenario the country's GHG emissions will amount to 232.05 Gg CO<sub>2</sub> eq in 2010 (as an average for the period 2008–2012), which means a gap to achieving its Kyoto Protocol target of 20.06 Gg CO<sub>2</sub> eq. In 2007 the Government decided to make use of the Kyoto Protocol mechanisms and to acquire about 230,000 t CO<sub>2</sub> eq worth of units within the period 2008–2012, mainly through the CDM. According to the NC5, Liechtenstein will make use of the Kyoto Protocol mechanisms to fill the gap to its Kyoto Protocol target, with its use of the Kyoto Protocol mechanisms amounting to 46,000 t CO<sub>2</sub> eq per annum. No information on the use of credits generated from activities under Article 3, paragraph 3, of the Kyoto Protocol is provided in the NC5.

55. According to the NC5, CO<sub>2</sub> emissions in 2020 are projected to be 207.64 Gg CO<sub>2</sub> eq under the 'with measures' scenario, which is 9.5 per cent lower than the base year level.

Under the ‘with measures’ scenario, the relative contributions of the different gases to the country’s total GHG emissions (in CO<sub>2</sub> eq) are 86.0 per cent for CO<sub>2</sub> in 2010, slightly decreasing to 85.0 per cent in 2020; 6.4 per cent for CH<sub>4</sub> in 2010, slightly increasing to 7.1 per cent in 2020; 5.6 per cent for N<sub>2</sub>O in 2010, increasing to 6.3 per cent in 2020; and 2.0 per cent for F-gases in 2010, slightly decreasing to 1.7 per cent in 2020. GHG removals are projected to remain constant between 2010 and 2020, at 6.57 Gg CO<sub>2</sub> eq per annum.

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

	<i>Greenhouse gas emissions (Gg CO<sub>2</sub> eq per year)</i>	<i>Changes in relation to base year level (%)</i>	<i>Changes in relation to 1990 level (%)</i>
Inventory data 1990 <sup>a</sup>	229.57	0.04	NA
Inventory data 2009 <sup>a</sup>	247.4	7.8	7.8
Kyoto Protocol base year <sup>b</sup>	229.48	NA	0.0
Kyoto Protocol target <sup>b</sup>	211.99	8.0	-8.5
‘With measures’ projections for 2010 <sup>c</sup>	232.05	1.1	1.1
‘With measures’ projections for 2020 <sup>c</sup>	207.64	-9.5	-9.6

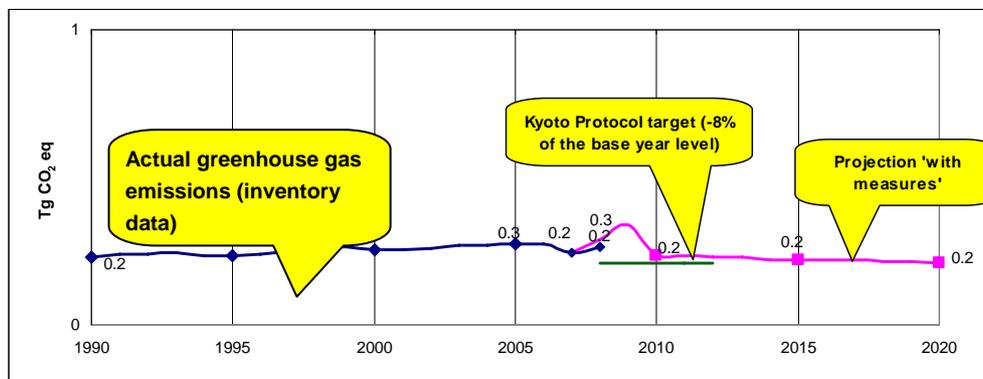
Abbreviation: NA = not available.

<sup>a</sup> Data source: Liechtenstein’s 2011 greenhouse gas inventory submission; the emissions are without land use, land-use change and forestry.

<sup>b</sup> Data source: Based on the initial review report contained in document FCCC/IRR/2007/LIE.

<sup>c</sup> Data source: Liechtenstein’s fifth national communication.

### Greenhouse gas emission projections



Sources: (1) Data for the years 1990–2009: Liechtenstein’s 2011 greenhouse gas inventory submission; the emissions are without land use, land-use change and forestry; (2) Data for the years 2010–2020: Liechtenstein’s fifth national communication; the emissions are without land use, land-use change and forestry.

### 3. Total effect of policies and measures

56. In the NC5, Liechtenstein presents the estimated and expected total effect of implemented and adopted PaMs for the energy sector only and an estimate of the total effect of its PaMs, in accordance with the ‘with measures’ definition, compared with a situation without such PaMs (albeit in graphical format only). The ERT encourages

Liechtenstein to report ‘with measures’ and ‘without measures’ projections for each sector in tabular format in its future national communications.

57. The ERT noted that Liechtenstein did not provide the following reporting elements required by the UNFCCC reporting guidelines: the estimated and expected total effect of implemented and adopted PaMs for sectors other than energy; an estimate of the total effect of its PaMs, in accordance with the ‘with measures’ definition, compared with a situation without such PaMs, presented in terms of GHG emissions avoided or sequestered, by gas (on a CO<sub>2</sub> eq basis) in 1995 and 2000; and relevant information on factors and activities for each sector for the years 1990 to 2020. The ERT recommends that Liechtenstein improve the completeness of its reporting by providing all reporting elements required by the UNFCCC reporting guidelines in its next national communication.

58. Liechtenstein reported that the total estimated effect of adopted and implemented PaMs in the energy sector is 25.2 Gg CO<sub>2</sub> eq and 54.5 Gg CO<sub>2</sub> eq in 2010 and 2020, respectively. The most effective PaMs and drivers behind GHG emission reductions are described in chapters II.B.1 and II.B.2 above. Table 5 provides an overview of the total effect of PaMs as reported by Liechtenstein.

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

Sector	<i>Effect of implemented and adopted measures (Gg CO<sub>2</sub> eq)</i>	<i>Relative value (% of 1990 emissions)</i>	<i>Effect of planned measures (Gg CO<sub>2</sub> eq)</i>	<i>Relative value(% of 1990 emissions)</i>	<i>Effect of implemented and adopted measures (Gg CO<sub>2</sub> eq)</i>	<i>Relative value (% of 1990 emissions)</i>	<i>Effect of planned measures (Gg CO<sub>2</sub> eq)</i>	<i>Relative value(% of 1990 emissions)</i>
	2010				2020			
Energy (without CO <sub>2</sub> from transport)	25.18	10.9	NA	NA	54.50	23.7	NA	NA
<b>Total</b>	<b>25.18</b>	<b>10.9</b>	<b>NA</b>	<b>NA</b>	<b>54.50</b>	<b>23.7</b>	<b>NA</b>	<b>NA</b>

Source: Liechtenstein’s fifth national communication.

Abbreviation: NA = not available.

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

59. Liechtenstein, in its NC5, provides implicit information on how its use of the mechanisms under Articles 6, 12 and 17 of the Kyoto Protocol is supplemental to domestic action. To ensure that the use of the Kyoto Protocol mechanisms is supplemental to domestic action, the Parliament incorporated a respective regulation in the Emission Trading Act (2007), which stipulates that the main focus of reduction measures in Liechtenstein shall be domestic action. Only when the reduction potential of all domestic actions is exhausted can Liechtenstein consider the purchase of carbon credits through the Kyoto Protocol mechanisms.

60. According to the NC5, domestic action constitutes a significant element of the efforts made by Liechtenstein to meet its Kyoto Protocol target. However, there is insufficient information provided in the NC5 for the ERT to conclude whether the use of the Kyoto Protocol mechanisms is supplemental to domestic action. In 2007 the Government decided to make use of the Kyoto Protocol mechanisms and to acquire about 230,000 t CO<sub>2</sub> eq worth of units through the CDM during the first commitment period of the Kyoto Protocol (2008–2012). This total amount over the five-year period implies an

annual amount of 46,000 t CO<sub>2</sub> eq. Based on the projections made by Liechtenstein, the gap to achieving its Kyoto Protocol target under the ‘with measures’ scenario will be 20,060 t CO<sub>2</sub> eq in 2010. The 46,000 t CO<sub>2</sub> eq to be acquired per annum under the Kyoto Protocol mechanisms far exceeds the gap to the Kyoto Protocol target and no information is provided in the NC5 as to how much of the 46,000 t CO<sub>2</sub> eq will be used to fill the gap. In addition, no explicit information is provided on whether and to what extent this gap will be filled using additional PaMs and/or credits from activities under Article 3, paragraph 3, of the Kyoto Protocol. The ERT therefore recommends that Liechtenstein provide more explicit information on complementarity relating to the Kyoto Protocol mechanisms in its next national communication.

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

61. In its NC5, Liechtenstein has provided information on the expected impacts of climate change in the country and on adaptation options. Because of the small size of the country, this information is provided on the basis primarily of studies carried out for the country’s alpine region. The ERT noted, however, that Liechtenstein did not provide a detailed outline of the actions taken to implement Article 4, paragraph 1(b) and (e), of the Convention with regard to adaptation, especially concerning the formulation and implementation of measures to facilitate adequate adaptation to climate change and concerning cooperation with developing countries in their adaptation efforts. Table 6 summarizes the information on vulnerability and adaptation to climate change presented in the Party’s NC5.

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

<i>Vulnerable area</i>	<i>Examples/comments/adaptation measures reported</i>
Agriculture	<i>Vulnerability:</i> The projected increase in precipitation intensity and the longer drought periods will lead to long-term negative effects on crop productivity. There is potential conflicts in water use because of an increase in the irrigation of agricultural fields, especially during longer drought periods <i>Adaptation:</i> Use of appropriate corn provenances
Ecosystems	<i>Vulnerability:</i> The increase in temperature will change the composition of forest vegetation. Additional weather instability (e.g. storms and avalanches) may have a further negative effect on forest vegetation
Tourism	<i>Vulnerability:</i> The winter tourism sector will be negatively affected by higher temperatures and the rise of the freezing level. As a result, the skiing period will be shorter <i>Adaptation:</i> Measures are under consideration and will be defined shortly. The focus will be on the promotion of ‘gentle tourism’
Forests	<i>Vulnerability:</i> The increase in drought periods, with consequential damage caused by insects, pathogens, fires or storms, will lead to a decrease in the forests’ protective capacity <i>Adaptation:</i> Conversion of spruce and fir stocks into mixed deciduous and coniferous forest
Human health	<i>Vulnerability:</i> More frequent heatwaves will increase mortality and morbidity. The effects on health will be intensified by

<i>Vulnerable area</i>	<i>Examples/comments/adaptation measures reported</i>
	changes in the environmental conditions for pathogens. Tropical diseases will increase and existing diseases will spread to areas at higher elevations
Water cycles and soil	<i>Vulnerability:</i> The increase in weather instability may lead to floods in winter and droughts in summer <i>Adaptation:</i> Protective measures such as rockfall barriers and watercourse corrections

*Note:* The vulnerability and adaptation assessment outlined in the table is for Liechtenstein's alpine region in general.

62. In its NC5, Liechtenstein has provided information on observed and expected changes in temperature, cryosphere, precipitation, the hydrological cycle and water resources, extreme events and natural hazards, natural ecosystems and biodiversity. Projections indicate that, by 2050, the northern side of the Alps will experience an increase in temperature (of 1.8 °C in winter and 2.1 °C in summer), a reduction in precipitation in summer and an increase in precipitation in winter.

63. Because of the small size of the country, available climate models cannot predict the specific climate change impacts on Liechtenstein. Hence, the NC5 has briefly introduced the general expected effects of climate change on health, ecosystems, water cycles, soil, tourism and other economic sectors such as agriculture and forestry, as well as some response measures for these expected effects. In addition, in its NC5 Liechtenstein has provided information on adaptation measures in the areas of natural hazards, agriculture, forestry and tourism. During the review, Liechtenstein informed the ERT about its plan to set up the Integrated Plan for Water Resources and Agriculture. However, the ERT noted a lack of detail on vulnerability and adaptation assessment in the NC5. The ERT encourages Liechtenstein to include more detailed information on vulnerability and adaptation assessment in its next national communication.

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

64. Liechtenstein is not a Party included in Annex II to the Convention and is therefore not obliged to adopt measures and fulfil obligations as defined in Article 4, paragraphs 3, 4 and 5, of the Convention. However, its NC5 did include some relevant information and additional information was provided during the review. The ERT assessed this information and its findings are reflected in this report.

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

65. In the NC5, Liechtenstein has provided detailed information on its assistance to developing country Parties that are mainly affected by disasters and armed conflicts through its International Humanitarian Cooperation and Development programme. Furthermore, Liechtenstein has provided information on financial resources related to the implementation of the Convention provided through bilateral, regional and other multilateral channels.

66. Liechtenstein has also provided information on its financial contributions during the period 2005–2008 to the Adaptation Fund established in accordance with decision 10/CP.7. With regard to the fast-track financing under the Copenhagen Accord, Liechtenstein

committed itself, on 26 February 2011, to providing a financial contribution in an amount to be approved by the Liechtenstein Parliament. Table 7 summarizes the reported information on financial resources.

Table 7

**Summary of information on financial resources**

<i>Channel of financial resources</i>	<i>Total amount (million Swiss francs)</i>
Official development assistance (ODA) for 2008	25.98
Climate-related aid in bilateral ODA	NA
Climate-related support programmes	NA
Contributions to the GEF (USD million)	NA
Pledge for GEF replenishment	NA
JI and CDM under the Kyoto Protocol (2008–2012)	7.92
Other (bilateral/multilateral)	NA

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

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

67. In its NC5, Liechtenstein has provided information on its activities related to transfer of technology. Liechtenstein has reported its provision of CHF 439,632 to the project “CO<sub>2</sub> Neutral Coffee Production” in Costa Rica, through which the improved processes of fermentation and biogas digester technology have been transferred.

**F. Research and systematic observation**

68. Liechtenstein has provided in its NC5 information on its actions relating to RSO and has addressed domestic activities and activities relating to the Global Climate Observing System. However, the ERT noted that Liechtenstein did not provide the following reporting elements required by the UNFCCC reporting guidelines: information on its actions relating to RSO addressing international activities, including the World Climate Programme, the International Geosphere–Biosphere Programme and the IPCC; and information on action taken to support related capacity-building in developing countries. The ERT recommends that Liechtenstein include this information in its next national communication.

69. According to the NC5, Liechtenstein cooperates with its neighbouring States and with international bodies on RSO. Liechtenstein has reported on its participation in the Alpine Convention III B Alpine Space programme, European research programmes and the GLOBE Programme, as well as on its annual contributions to the Austrian Science Fund and the Swiss National Science Foundation. In addition, Liechtenstein has provided information about the main research activities undertaken in the country by the Liechtenstein University of Applied Sciences and the Interstate University of Applied Sciences and Technology, Buchs.

70. In its NC5, Liechtenstein has provided information on the collection of a wide range of data relating to climate from its own measuring stations and through interregional cooperation, especially with Switzerland. Vaduz is the largest measuring station in the country, established in 1974. Liechtenstein has also provided information about the initiative of OEP for the establishment of a unified data structure system for environmental data, named LUIS (Liechtenstein Umweltinformationssystem).

## G. Education, training and public awareness

71. In the NC5, Liechtenstein has provided information on its actions relating to education, training and public awareness at the domestic level. Information on education in schools, public outreach and the involvement of the public and non-governmental organizations has been reported. As noted in the previous review report, Liechtenstein is encouraged to report on its efforts to promote capacity-building in developing countries.

72. The Ministry of Education is responsible for the coordination of education in the country. The Education Act and the Vocational Training Act are relevant legislative provisions. Environmental education forms a part of Liechtenstein's all-encompassing educational programme and is based on the official curriculum of the Principality of Liechtenstein (2005, second edition). The Government also provides financial support to several projects to raise public awareness with respect to climate change issues. Among others, projects such as LIFE Climate Foundation Liechtenstein (2008) and the implementation of a personal carbon footprint programme within the framework of a social networking platform received such support. Public events are organized by local authorities. Many non-governmental institutions are also engaged in public information dissemination and education.

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

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

74. Liechtenstein has not reported the following elements of the supplementary information required under Article 7, paragraph 2, of the Kyoto Protocol: identification of steps taken to promote and/or implement any decisions taken by ICAO and IMO in order to limit or to reduce GHG emissions not controlled by the Montreal Protocol from aviation and marine bunker fuels; information on what efforts Liechtenstein is making to implement PaMs in such a way as to minimize adverse effects, including the effects of climate change, effects on international trade, and social, environmental and economic impacts on other Parties, particularly those identified in Article 4, paragraphs 8 and 9, of the Convention; and a description of national legislative arrangements and administrative procedures that seek to ensure that the implementation of activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol also contributes to the conservation of biodiversity and the sustainable use of natural resources. During the review, additional information was provided to the ERT. The technical assessment of the information reported under Article 7, paragraph 2, is contained in the relevant sections of this report. The ERT recommends that the Party include the above-mentioned missing reporting elements in its next national communication.

Table 8

### Overview of supplementary information under Article 7, paragraph 2, of the Kyoto Protocol

<i>Supplementary information</i>	<i>Reference</i>
National registry	NC5 chapters 1.2 and 3.5
National system	NC5 chapters 1.2 and 3.4

<i>Supplementary information</i>	<i>Reference</i>
Supplementarity relating to the mechanisms pursuant to Articles 6, 12 and 17	NC5 chapter 5.3
Policies and measures in accordance with Article 2	NA
Domestic and regional programmes and/or legislative arrangements and enforcement and administrative procedures	NC5 chapter 4.2
Information under Article 10	NC5 chapters 6–9
Financial resources	NC5 chapter 7

*Abbreviations:* NA = not available, NC5 = Liechtenstein’s fifth national communication.

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

75. Liechtenstein reported the information requested in section H, “Minimization of adverse impacts in accordance with Article 3, paragraph 14”, of the annex to decision 15/CMP.1 as a part of its 2011 annual submission. It has not reported, however, how it gives priority to the actions taken in implementing its commitments under Article 3, paragraph 14. The ERT considers the reported information to be generally complete and transparent. The ERT encourages Liechtenstein to continue exploring and reporting on the adverse impacts of its response measures.

76. Liechtenstein’s 2011 NIR presented several initiatives of the Party aiming to minimize adverse impacts. Liechtenstein implements climate change response measures in all sectors and for different gases. 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. Tax exemptions for biofuels are limited to fuels that meet ecological and social criteria. In particular, conditions are set out in such a way that biofuels do not compete with food production or cause degradation of rainforests or other valuable ecosystems. In addition, Liechtenstein aligns itself with Switzerland in assessing possible conflicts and synergies between the expansion of renewable energy production and land management in order to avoid potential adverse effects, such as those of increased hydroelectricity generation on natural water flows and of renewable energy systems on natural landscapes and ecosystems.

### **III. Conclusions and recommendations**

77. The ERT concludes that the NC5 in general provides a good overview of the national climate policy of Liechtenstein. The information provided in the NC5 includes most of the mandatory information required by the UNFCCC reporting guidelines and most elements of the supplementary information under Article 7 of the Kyoto Protocol, with the exception of information on how Liechtenstein believes its PaMs are modifying longer-term trends in anthropogenic GHG emissions and removals, PaMs in accordance with Article 2 of the Kyoto Protocol, etc. (see paras. 7 and 8 above). During the review, Liechtenstein provided additional information on the above-mentioned missing elements. The ERT also concludes that the information provided in the NC5 is broadly transparent, and it noted that the submission of the NC5 was made within six weeks after the deadline of 1 January 2010 mandated by decision 10/CP.13.

78. Liechtenstein’s emissions for 2009 were estimated to be 7.8 per cent above its 1990 level excluding LULUCF and 9.0 per cent above including LULUCF. Emission increases

were driven by population growth and the corresponding increase in energy consumption, especially in the transport, residential and commercial sectors. These factors outweighed the effect of improvements in energy efficiency and the development of RES.

79. In the NC5, Liechtenstein presents GHG emission projections for 2010, 2015 and 2020 relative to actual inventory data for 1990, 1995, 2000, 2005 and 2007. Projections were made for a 'with measures' scenario. The projected GHG emissions under the 'with measures' scenario are higher than the annual average Kyoto Protocol target (211.99 Gg CO<sub>2</sub> eq) by 9.5 per cent for 2010 and lower than the target by 2.1 per cent for 2020. Thus, the projections indicate that Liechtenstein cannot meet its Kyoto Protocol target (which is an 8 per cent emission reduction compared with the base year level) by domestic action alone. This implies that additional PaMs and the use of the Kyoto Protocol mechanisms are essential for Liechtenstein to meet its Kyoto Protocol target.

80. The NC5 contains some information on how Liechtenstein's use of the mechanisms under Articles 6, 12 and 17 of the Kyoto Protocol is supplemental to domestic action. In 2007 the Government decided to purchase 230,000 t CO<sub>2</sub> eq of Kyoto units through the CDM during the first commitment period of the Kyoto Protocol (2008–2012), which is equivalent to 46 Gg CO<sub>2</sub> eq per annum. However, how this annual amount will be used to fill the gap of 20.06 Gg CO<sub>2</sub> eq per annum to the Kyoto Protocol target during the first commitment period is not elaborated in the NC5. Hence, it remains unclear to the ERT whether the use of the Kyoto Protocol mechanisms by Liechtenstein will meet the supplementarity criteria.

81. Owing to the Customs Treaty and the bilateral agreements between Liechtenstein and Switzerland, most policies in Liechtenstein are very closely linked to the Swiss policy, including the implementation of several environmental levies. Key PaMs of Liechtenstein for it to meet its Kyoto Protocol target include participation in the EU ETS and the introduction of a levy on fossil fuel consumption through the CO<sub>2</sub> Act covering the sectors of economy as well as private households. As a major proportion of emission increases have occurred in the residential, commercial and institutional sectors, energy conservation in buildings through energy efficiency measures and the promotion of RES is a central concern in Liechtenstein's energy policy.

82. The ERT commends Liechtenstein for its reporting on financial resources and transfer of technology.

83. Liechtenstein provided in its NC5 information on observed and expected changes in temperature, cryosphere, precipitation, the hydrological cycle and water resources, extreme events and natural hazards, natural ecosystems and biodiversity at the alpine regional level. Because of the small size of the country, this information is provided on the basis primarily of studies carried out for the country's alpine region. During the review, Liechtenstein informed the ERT about its plan to set up the Integrated Plan for Water Resources and Agriculture. However, the ERT noted a lack of detail on vulnerability and adaptation assessment in the NC5.

84. Environmental education forms a part of Liechtenstein's all-encompassing educational programme and is based on the official curriculum of the Principality of Liechtenstein (2005, second edition). Many non-governmental institutions are engaged in public information dissemination and education. Liechtenstein participates in research activities under the Alpine Convention III B Alpine Space programme, European research programmes and the GLOBE Programme, as well as contributing to the Austrian Science Fund and the Swiss National Science Foundation. It collects a wide range of data relating to climate from its own measuring stations and through interregional cooperation, especially with Switzerland.

85. The ERT concluded that Liechtenstein's national system continues to perform its required functions as set out in decision 19/CMP.1; and that the national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1, and continues to adhere to the technical standards for data exchange between registry systems in accordance with relevant decisions of the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol. The ERT noted that updates of databases and applications, implemented security measures and changes to the national registry software are documented on a regular basis by nominated responsible persons. However, documents on security measures taken against viruses and hackers were not available to the ERT in English.

86. Supplementary information under Article 7, paragraph 1, of the Kyoto Protocol on the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol provided by the Party in its 2011 annual submissions is generally complete and transparent. The ERT encourages Liechtenstein to further enhance the reporting on Article 3, paragraph 14, including by indicating the prioritization of the actions taken in implementing its commitments under Article 3.

87. In the course of the IDR, the ERT formulated several recommendations relating to the completeness and transparency of Liechtenstein's reporting under the Convention and its Kyoto Protocol. The key recommendations<sup>7</sup> are that Liechtenstein:

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

- (i) Information on how it believes its PaMs are modifying longer-term trends in anthropogenic GHG emissions and removals;
- (ii) The estimated and expected total effect of implemented and adopted PaMs for sectors other than energy;
- (iii) Information on actions taken to support capacity-building in RSO in developing countries;
- (iv) Information on the minimization of adverse impacts under Article 2, paragraph 3, of the Kyoto Protocol;
- (v) A description of national legislative arrangements and administrative procedures that seek to ensure that the implementation of activities under Article 3, paragraph 3, also contributes to the conservation of biodiversity and the sustainable use of natural resources;
- (vi) Information on steps taken to promote and/or implement any decisions taken by ICAO and IMO in order to limit or to reduce GHG emissions not controlled by the Montreal Protocol from aviation and marine bunker fuels;

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

- (i) Clearer descriptions of the models used for predicting GHG emissions from different sectors, especially for the energy and agriculture sectors;
- (ii) More explicit information on the complementarity of the use of the Kyoto Protocol mechanisms;
- (iii) Details on vulnerability and adaptation assessment;
- (iv) English versions of all required documentation on the national registry;

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<sup>7</sup> The recommendations are given in full in the relevant sections of this report.

(c) Improve the transparency of its reporting by including in its next annual submission information on how it gives priority to the actions taken to implement its commitments under Article 3, paragraph 14, of the Kyoto Protocol regarding the minimization of adverse impacts of response measures to climate change.

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

(a) Report in more detail on the quantified emission reduction estimates for individual PaMs, and on how the effectiveness of PaMs is monitored and evaluated;

(b) Quantify the estimated impacts of its PaMs on emissions as far as possible;

(c) Provide information on PaMs that could potentially increase emissions;

(d) Include the results of the sensitivity and uncertainty analyses;

(e) Improve transparency in the description of the inventory preparation process, further improve its QA/QC procedure and report on the relevant progress made in its next national communication.

#### **IV. Questions of implementation**

89. During the review, the ERT assessed the NC5, including supplementary information provided under Article 7, paragraph 2, of the Kyoto Protocol, and reviewed information on the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol, with regard to timeliness, completeness and transparency. No question of implementation was raised by the ERT during the review.

## Annex

### Documents and information used during the review

#### A. Reference documents

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

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

“Guidelines for the preparation of the information required under Article 7 of the Kyoto Protocol”. Decision 15/CMP.1. Available at <<http://unfccc.int/resource/docs/2005/cmp1/eng/08a02.pdf#page=54>>.

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

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

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

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

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

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

FCCC/ARR/2010/LIE. Report of the individual review of the annual submission of Liechtenstein submitted in 2010. Available at <<http://unfccc.int/resource/docs/2010/arr/lie2.pdf>>.

FCCC/IRR/2007/LIE. Report of the review of the initial report of Liechtenstein. Available at <<http://unfccc.int/resource/docs/2007/irr/lie.pdf>>.

FCCC/IDR.4/LIE. Report of the centralized in-depth review of the fourth national communication of Liechtenstein. Available at <<http://unfccc.int/resource/docs/2008/idr/lie04.pdf>>.

Fourth national communication of Liechtenstein. Available at  
<<http://unfccc.int/resource/docs/natc/lienc4.pdf>>.

2009 greenhouse gas (GHG) inventory submission of Liechtenstein. Available at  
<[http://unfccc.int/national\\_reports/annex\\_i\\_ghg\\_inventories/national\\_inventories\\_submissions/items/4771.php](http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/4771.php)>.

2011 GHG inventory submission of Liechtenstein. Available at  
<[http://unfccc.int/national\\_reports/annex\\_i\\_ghg\\_inventories/national\\_inventories\\_submissions/items/5888.php](http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/5888.php)>.

## **B. Additional information provided by the Party**

Responses to questions during the review were received from Mr. Sven Braden (Office of Environmental Protection of Liechtenstein), including additional material on updated policies and measures, GHG projections, the national registry and recent climate policy developments in Liechtenstein.

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