COMPLIANCE COMMITTEE

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26 September 2008

Report of the centralized in-depth review of the fourth national communication of Liechtenstein

Note by the secretariat

The report of the centralized in-depth review of the fourth national communication of Liechtenstein was published on 25 September 2008. For purposes of rule 10, paragraph 2, of the rules of procedure of the Compliance Committee (annex to decision 4/CMP.2), the report is considered received by the secretariat on the same date. This report, FCCC/IDR.4/LIE, contained in the annex to this note, is being forwarded to the Compliance Committee in accordance with section VI, paragraph 3, of the annex to decision 27/CMP.1.

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Report of the centralized in-depth review of the fourth national communication of Liechtenstein

According to decision 4/CP.8, Parties included in Annex I to the Convention are requested to submit to the secretariat, in accordance with Article 12, paragraphs 1 and 2, of the Convention, a fourth national communication by 1 January 2006. This report presents the results of the in-depth review of the fourth national communication of Liechtenstein conducted by an expert review team in accordance with relevant provisions of the Convention and Article 8 of the Kyoto Protocol.

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I. Introduction and summary

A. Introduction

1. Liechtenstein has been a Party to the Convention since 1994 and to its Kyoto Protocol since 2005. Under the Kyoto Protocol, Liechtenstein committed itself to reducing its greenhouse gas (GHG) emissions by 8 per cent in relation to the 1990 level during the first commitment period from 2008 to 2012.

2. This report covers the centralized in-depth review (IDR) of the fourth national communication (NC4) of Liechtenstein, coordinated by the UNFCCC secretariat, in accordance with decision 7/CP.11. The review took place from 12 to 17 May 2008 in Bonn, Germany, and was conducted by the following team of nominated experts from the UNFCCC roster of experts: Mr. Marko Aunedi (Croatia), Mr. Daniel Bouille (Argentina), Mr. Mustafa Coskun (Turkey), Mr. Javier Gonzales (Bolivia), Mr. Bernd Gugele (European Community), Ms. Ashley King (United States of America) and Mr. Daniel Martino (Uruguay). Mr. Gugele and Mr. Martino were the lead reviewers. The review was coordinated by Mr. Harald Diaz-Bone (UNFCCC secretariat).

3. During the IDR, the expert review team (ERT) examined each part of the NC4. The ERT also evaluated the information contained in Liechtenstein's report demonstrating progress (RDP) in achieving its commitments under the Kyoto Protocol, and the supplementary information provided by Liechtenstein under Article 7, paragraph 2, of the Kyoto Protocol.

4. In accordance with the guidelines for review under Article 8 of the Kyoto Protocol (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 NC4 broadly complies 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 decisions 22/CP.7 and 25/CP/8, the RDP provides clear information on the progress made by Liechtenstein in achieving its commitments under the Kyoto Protocol. Most supplementary information under Article 7, paragraph 2, of the Kyoto Protocol[1] is provided in the NC4 and the RDP.

1. Completeness

6. The ERT noted that the NC4 covers all sections required by the UNFCCC reporting guidelines, but the level of detail could be improved in several areas. A missing element in the NC4 is the provision of GHG inventory trends for the complete time series. Liechtenstein's RDP contains most parts stipulated by decisions 22/CP.7 and 25/CP.8. Limited information was provided on how Liechtenstein intends to close the expected gap between its Kyoto target and the projected level of emissions. Furthermore, the ERT noted that Liechtenstein has provided the supplementary information required under Article 7, paragraph 2, except for information on what efforts Liechtenstein is making to implement PaMs in such a way as to minimize adverse effects (see chapter III B below).

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

2. Timeliness

7. The NC4 was submitted on 7 April 2006, and the RDP on 25 September 2006. Decision 4/CP.8 requested Parties to submit their NC4 by 1 January 2006. Decision 22/CP.7 set the same date for Parties to submit their RDPs.

3. Transparency

8. The ERT acknowledged that Liechtenstein's NC4 is well structured and concise. It is structured following the outline contained in the annex to the UNFCCC reporting guidelines. 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, such as recommendations to provide more detailed information on PaMs (e.g. quantitative estimates of GHG mitigation effects) and to prepare disaggregated emission projections according to the structure of sector reporting. The review team noted that the information contained in the NC4 is consistent with that contained in the RDP.

II. Technical assessment of the reviewed elements

A. National circumstances relevant to greenhouse gas emissions and removals

9. In its NC4, Liechtenstein has provided a short description of its national circumstances, how these national circumstances affect GHG emissions and removals in Liechtenstein, and how national circumstances and changes in national circumstances affect GHG emissions and removals over time. The ERT noted that the main drivers of emission trends in Liechtenstein include demographic developments, overall economic activity, changes in primary energy use and transport demand. Table 1 illustrates the national circumstances of the country by providing some indicators relevant to GHG emissions and removals.

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

	1990	1995	2000	2006	Change 1990–2000 (%)	Change 2000–2006 (%)	Change 1990–2006 (%)
Population (million)	29 032	30 923	32 863	35 168	13.2	7.0	21.0
GNP (millions of Swiss francs (CHF))	NA	NA	4 112	3 892[a]	NA	–5.4	NA
TPES (GWh)	1 102	1 084	1 244	1 405	12.9	12.9	27.5
GNP per capita (thousands of Swiss francs)	NA	NA	125	112	NA	–10.4	NA
TPES per capita (MWh)	38.0	35.1	37.9	40.0	0.0	5.3	5.3
GHG emissions without LULUCF (Gg CO_2 eq)	229.5	235.5	254.7	273.1	10.9	7.2	19.0
GHG emissions with LULUCF (Gg CO_2 eq)	221.2	227.1	249.8	266.5	12.9	6.7	20.5
CO_2 emissions per capita (Mg)[b]	7.0	6.8	6.9	6.9	–1.0	–0.8	–1.8
CO_2 emissions per GNP unit (kg per thousand CHF)	NA	NA	55.3	62.1	NA	12.2	NA
GHG emissions per capita (Mg CO_2 eq)	7.9	7.6	7.7	7.8	–2.0	0.2	–1.8
GHG emissions per GNP unit (kg CO_2 eq per thousand CHF)	NA	NA	2.0	2.5	NA	21.2	NA

Data sources: (1) GHG emissions data: Liechtenstein's 2008 greenhouse gas inventory submission; (2) Population, GNP and TPES data: Party during the review. GNP is equivalent to BNE (Bruttonationaleinkommen, gross national product).
Abbreviations: GHG = greenhouse gas, GNP = gross national product, LULUCF = land use, land-use change and forestry, NA = not available, TPES = total primary energy supply.
Note: The ratios per capita and per GNP 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.
[a] 2005 figure (2006 figure unavailable).
[b] CO_2 emissions excluding LULUCF.

10. Liechtenstein has provided a summary of information on GHG emission trends for the years 1990 and 2003. This information is consistent with the 2005 national GHG inventory submission. Summary tables (given in the common reporting format) are provided in an annex to the NC4 for

1990 and 2003. However, the ERT noted that Liechtenstein has not provided information on GHG emission trends for the complete period 1990–2003 as required by the UNFCCC reporting guidelines (para. 10). The ERT recommends that Liechtenstein provide this information in its next national communication.

11. Total GHG emissions excluding emissions and removals from land use, land-use change and forestry (LULUCF) increased by 19.0 per cent between 1990 and 2006, whereas total GHG emissions including net emissions or removals from LULUCF increased by 20.5 per cent (see table 2). This was mainly attributed to carbon dioxide (CO_2) emissions, which increased by 19.0 per cent over this period. Emissions of methane (CH_4) increased by 7.4 per cent, while emissions of nitrous oxide (N_2O) decreased by 1.7 per cent. A major part of these increases was experienced after 1995 (trends for 1995–2006: CO_2 +15 per cent, CH_4 +14 per cent, N_2O –2 per cent, total GHG +16 per cent). Emissions of fluorinated gases (hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6)) were not reported for the base year (1990) and accounted for 1.5 per cent of total GHG emissions in 2006. Table 2 provides an overview of GHG emissions by sector from the base year to 2006 (see also discussion of sectoral trends in chapter II B below).

Table 2. Greenhouse gas emissions by sector in Liechtenstein, 1990–2006

	GHG emissions (Gg CO_2 eq)					Change (%)		Shares[a] by sector (%)	
	1990	1995	2000	2005	2006	1990–2006	2005–2006	1990	2006
1. Energy	203.47	210.69	229.48	241.93	243.63	19.7	0.7	88.6	89.2
A1. Energy industries	0.18	2.04	2.72	3.07	2.80	1 499.2	–8.9	0.1	1.0
A2. Manufacturing industries and construction	35.33	34.35	34.34	36.20	37.44	6.0	3.4	15.4	13.7
A3. Transport	76.39	81.71	95.91	85.46	82.52	8.0	–3.4	33.3	30.2
A4.–A5. Other	91.26	92.06	95.78	116.17	119.81	31.3	3.1	39.8	43.9
B. Fugitive emissions	0.32	0.53	0.73	1.03	1.07	231.5	3.5	0.1	0.4
2. Industrial processes	0.00	0.38	2.35	4.12	4.20	50 003 598.3	1.9	0.0	1.5
3. Solvent and other product use	1.99	1.61	1.28	1.10	1.11	–44.2	0.8	0.9	0.4
4. Agriculture	22.52	21.32	19.83	21.60	22.33	–0.9	3.4	9.8	8.2
5. LULUCF	–8.32	–8.46	–4.90	–6.50	–6.55	–21.3	0.7	–3.6	–2.4
6. Waste	1.55	1.52	1.72	1.93	1.78	14.3	–7.8	0.7	0.7
7. Other	NO	NO	NO	NO	NO				
GHG total with LULUCF	221.21	227.05	249.75	264.18	266.50	20.5	0.9	96.4	97.6
GHG total without LULUCF	229.53	235.52	254.65	270.68	273.05	19.0	0.9	100.0	100.0

Abbreviations: GHG = greenhouse gas, LULUCF = land use, land-use change and forestry, NO = not occurring.
Notes: 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.
[a] The shares of sectors are calculated relative to GHG emissions without LULUCF; for the LULUCF sector, the negative values indicate the share of GHG emissions that was offset by GHG removals through LULUCF.

12. The main cause of the increasing emission trend is increasing emissions from households and services, which are included in "A.4. – A.5 Other" in table 2.

B. Policies and measures

13. As required by the UNFCCC reporting guidelines, Liechtenstein has provided in its NC4 concise and well-organized information on its package of polocies and measures (PaMs) implemented, adopted and planned in order to fulfil its commitments under the Convention and its Kyoto Protocol. Although not all the information required by the guidelines is included in the NC4, the Party sent additional information during the review that includes new measures and their estimated GHG mitigation effects for the period 2008–2012.

14. In the NC4, each sector has its own textual description of the principal PaMs, supplemented by an overview summary table on PaMs structured by sector. However, no quantitative estimates of the GHG mitigation effects of PaMs are provided in the NC4. Also, there is no discussion of long-term policies and long-term trends; only medium-term (up to 2010) projections are considered in the NC4. Additional information provided during the review extends the analysis to 2012, including estimated GHG mitigation effects for individual PaMs. The ERT noted that Liechtenstein has not provided the following reporting elements required by the UNFCCC reporting guidelines: summary tables on PaMs by sector including impacts on GHG mitigation (para. 23 of the guidelines); how they interact with other PaMs (para. 24 (c)); and PaMs reported in previous national communications that are no longer in place (para. 24). The ERT recommends that Liechtenstein provide this information in the next national communication.

15. The additional information sent by the Party (not included in the NC4) shows that total GHG mitigation effect of PaMs (100 kt CO_2 in 2008–2012) amounts to about one third of the reductions needed to reach the Party's Kyoto Protocol target (300 kt CO_2 in 2008–2012). No reference is made to the costs of PaMs, and co-benefits of PaMs are hardly described (see para. 24 (b) and (c) of the UNFCCC reporting guidelines). The additional information sent by the Party explains which policies are no longer in place or have been replaced by other PaMs. Some actions reported as PaMs should be considered enabling activities for future PaMs but, by themselves, are actions with no direct contribution to GHG mitigation. The summary of PaMs in table 4-1 of the NC4 does not include quantified GHG mitigation effects. There is no clear reference to a baseline scenario and, in consequence, no identification of whether PaMs are included in a baseline.

16. Table 3 provides a summary of the reported information on the PaMs of Liechtenstein.

1. Policy framework and cross-sectoral measures

17. Responsibility for climate change related policies in the Government lies with the Minister of Environmental Affairs, Land Use Planning, Agriculture and Forestry. This Minister also oversees the financial aspects of policies and national allocation of climate-related funds.

18. Liechtenstein has close links with Switzerland. The two countries have concluded numerous bilateral agreements, the Customs Treaty and the Currency Treaty being the most important. This has led to alignment or harmonization with Switzerland in key fields of Liechtenstein Government policy such as economics, social law and transport. This is also the case with key Liechtenstein environmental policies such as the heavy duty vehicle fee and the CO_2 tax. In addition, Liechtenstein is a member of the European Economic Area and applies the rules of the four basic freedoms (free movements of goods, services, capital and persons). From 2008 onwards Liechtenstein will participate in the European Union emissions trading scheme.

19. The ERT encourages Liechtenstein to extend the description of the overall policy context, sustainable development strategies and the inter-ministerial decision-making processes in its next national communication.

2. Policies and measures in the energy sector

20. Between 1990 and 2006, GHG emissions from energy increased by 19.7 per cent (40.16 Gg), mainly driven by the increase in emissions relating to residential, institutional and commercial energy consumption (31.3 per cent). This increase in GHG emissions accounts for 71.1 per cent of the total increase. The trend in GHG emissions from fuel combustion also showed increases in transport (8.0 per cent) and manufacturing industries (6.0 per cent).

Table 3. Summary of information on policies and measures

Major policies and measures	Examples/comments
Framework policies and cross-sectoral measures	
Integrated climate programme	Clean Air Act of 2003; Energy Conservation Act (1996); Liechtenstein Energy Concept 2013; Intelligent Energy Europe; climate protection and energy platform, as a part of the Environment Commission of the International Lake Constance Conference; national guidance plan
Energy/emissions taxation	CO_2 tax (2006).
Regional partnership/agreements	Climate Cent Foundation – agreement with Swiss Government to levy a charge on engine fuel
Policies and measures by sector	
Energy	
Energy sector liberalization	An act and ordinance on the liberalization of the electricity market
Combined heat and power generation	Increasing number of wood-chip plants used in public buildings to generate heat
Renewable energy sources	Production of photovoltaic systems for private owners; promotion of more efficient systems for efficient energy production; development of a hydrogeological map as a basis for using near-surface geothermal heat; promotion of solar-, electric-, and natural gas-powered and/or hybrid vehicles; supply of biogas to natural gas fuelling stations
Energy efficiency improvements	Energy ordinance (1993, 1996, 2003); green electricity – auditing and certification of all domestic production sites; "minergy" standard for State buildings (energy savings of 30% per building); Energy Star labelling programme for energy-saving office appliances; construction and operation of a public natural-gas fuelling station
Transport	Replacement of diesel buses in public transport with buses that run on natural gas; promotion of public transport; exhaust regulations; promotion of slow transport; zoning requirements
Integrated transport planning	Replacement of diesel buses in public transport with buses that run on natural gas; promotion of public transport; exhaust regulations; promotion of slow transport; zoning requirements
Vehicle and fuel taxes	Vehicle purchase tax; subsidies for electric scooters and bicycles; design of motor vehicle tax according to specific CO_2 emissions
Industry	
Pollution prevention and control	Regulations on dangerous substances (HFC, PFC, SF_6).
Agriculture	Direct Payment Act, the Law on Compensation for Ecological and Animal-friendly Practices in Agriculture, and the Ordinance on the Compensation Act; the Ecological Performance Certificate; ecological equalization payments in agriculture; preservation of soil for agricultural use; Water Protection Act – cap on maximum number of cattle per land area
Waste management	Waste Prevention and Disposal Act (1988); waste removal regulations in construction
Land use, land-use change and forestry	Cultivation regulations in the Forestry Act – sustainable cultivation of forests; ordinance on the scope and benefits of compensation and financial aid in the framework of the Forestry Act; ordinance on forest reserves and protected areas; Forest Inventory 1998 and National Forest Programme (2002–2012); Forest Stewardship Council certification of the entire forest stock

21. As the evolution of final energy consumption in building appears to be the key driver for increases in GHG emissions, the underlying drivers could be two factors – demographic change, and the increased use of oil and natural gas for heating. In the residential and services sector, reductions in emissions resulting from increased thermal insulation and the use of solar energy could not compensate for increases in emissions resulting from the growing number of dwellings, the improved standard of living and the increasing floor area of commercial premises.

22. In its Energy Concept 2013, Liechtenstein has set specific targets relating to energy consumption, such as increasing the share of renewable energy from 8 per cent to 10 per cent of total consumption by 2013, reducing heat loss from buildings and increasing investment in block heating plants. The main measures reported are:

(a) ***Energy:*** Promotion of building insulation, heating regulations, new regulations for building insulation, biogas development and use of biogas for heating, labelling of appliances to indicate energy consumption, promotion of photovoltaic systems, introduction of an energy-efficiency labelling system for cities and promotion of geothermal energy;

(b) ***Transport:*** Vehicle carbon fees, promotion of hybrid vehicles, substitution of diesel oil with natural gas in public transport vehicles, promotion of electric scooters and bicycles, guaranteed natural gas supply for vehicles, use of biogas in vehicles, emission taxes and promotion of public transport.

23. Table 4 shows the estimated mitigation effects of the 10 key PaMs for the energy sector as provided by the Party during the review.

Table 4. Estimated mitigation effects of key policies and measures for the energy sector

Measure	Estimated mitigation effect ($Gg\ CO_2$ eq)	
	Annual average	Total 2008–2012
Rehabilitation of old buildings	2.2	11.0
Replacement of old oil and gasoil heating systems	0.4	2.0
Increased use of renewable energy	0.3	1.5
Promotion of wood furnaces	0.8	4.0
Public information on thermophotovoltaics	1.0	5.0
Establishment of biogas plants	0.4	2.0
Use of natural gas as fuel	0.2	1.0
Internal mobility management for private entities	1.0	5.0
Steam pipeline	11.2	56.0
CO_2 levy	2.5	12.5
Total reductions (rounded)	**20.0**	**100.0**

Data source: Liechtenstein's Climate Protection Strategy

24. Given the substantial share of emissions from the category 'energy use in other sectors' in the total increase in emissions from the energy sector, the ERT recommends that Liechtenstein provide, in its next national communication, disaggregated information on the main drivers (residential and commercial key energy uses), in order to identify mitigation options.

3. Policies and measures in other sectors

25. Between 1990 and 2006, GHG emissions from industrial processes (including solvent and other product use), agriculture and waste increased by almost 13 per cent (from 26.1 to 29.4 Gg CO_2), mainly driven by an increase in the consumption of HFCs. Non-energy emissions currently constitute almost 11 per cent of total emissions in Liechtenstein.

26. ***Industrial processes.*** Consumption of HFCs from refrigeration is the only source of industrial process emissions in Liechtenstein, with the exception of trace amounts of sulphur hexafluoride used in electricity installations. There were no emissions of HFCs or SF_6 in the base year (1990), but in 2006 emissions of HFCs totalled 4.2 Gg CO_2 eq. Liechtenstein reported no measures to reduce the consumption of HFCs in the NC4.

27. ***Agriculture.*** After energy, agriculture is the largest source of emissions in Liechtenstein, responsible for 8 per cent (22.3 Gg CO_2 eq) of total emissions in 2006. Emission levels have been stable in this sector since 1990, and mainly comprise of CH_4 from livestock (46 per cent) and N_2O from soils (39 per cent). These sources also account for more than 80 per cent of total CH_4 and nitrogen emissions. Liechtenstein is moving towards more environmentally benign forms of agriculture and has reported several policies which facilitate that shift, including the elimination of subsidies for open liquid-manure containers and financial support to farmers shifting to organic farming.

28. ***Forestry.*** Between 1990 and 2006, the size of the forest sink in Liechtenstein decreased by more than 20 per cent (from 8.3 to 6.6 Gg CO_2), and in 2006 net removals from LULUCF equalled to 2.4 per cent of total emissions. Liechtenstein has not reported estimates of GHG mitigation effects for

any of the measures outlined in the NC4. The ERT noted that the textual discussion of PaMs does not always correspond directly with the policies outlined in the summary tables.

29. ***Waste.*** There are no landfills in Liechtenstein, and all incineration of waste takes place in Switzerland. Therefore, the main source of emissions in this sector is wastewater treatment (57 per cent), followed by composting (40 per cent). Total waste emissions in 2006 were 1.78 Gg CO_2, an increase of 14 per cent from 1990. This was mainly a result of the growth of composting, which reduced the amount of waste exported to Switzerland. Liechtenstein has reported no measures in the NC4 that would reduce GHG emissions in the waste sector.

30. The ERT recommends that Liechtenstein provide estimate of GHG mitigation effects for implemented PaMs in the non-energy sectors, as well as to investigate the feasibility of efforts to limit HFC emissions in its next national communication.

C. Projections and the total effect of policies and measures

1. Projections

31. The GHG emission projections provided by Liechtenstein in the NC4 include a simple presentation of a reference scenario 'with measures' for the year 2010, which is presented relative to actual inventory data for 1990 and 2003. Projections are presented on a sectoral basis, using the following categories: industry, transport, residential and commercial, agriculture and waste (this is not fully in accordance with the UNFCCC reporting guidelines, paras. 17 and 34). GHGs covered are CO_2, CH_4 and N_2O. Aggregated GHG values for sectors as well as for the national total were also provided. The ERT noted that Liechtenstein has not provided 'without measures' or 'with additional measures' projections, although it has provided an estimate of emissions for a 'without measures' scenario in its RDP. Table 5 and the figure below provide a summary of GHG emission projections for Liechtenstein.

32. Owing to its size, Liechtenstein does not have a comprehensive system for drafting GHG emission projections. The 2010 projections presented in the NC4 and the RDP are based on cross-references and comparison with equivalent data from Switzerland, and are produced by the Swiss Federal Office for Energy and the Swiss Federal Office for Environment. No further information about the models used has been reported, and a reference was made to the NC4 of Switzerland for details. The main modelling parameters and assumptions have been given in the NC4 (growth rates for population, gross domestic product and industrial output, oil price, energy efficiency improvements, transport trends, etc.).

Table 5. Summary of greenhouse gas projections for Liechtenstein

	Greenhouse gas emissions (Gg CO_2 eq per year)	Changes in relation to base year level (%)
Inventory data 1990[a]	230	NA
Inventory data 2006[a]	273	19.0
Kyoto Protocol base year[a]	230	NA
Kyoto Protocol target[a]	211	–8.0
'Without measures' projections for 2010[b]	280	22.0
'With measures' projections for 2010[c]	260	13.3

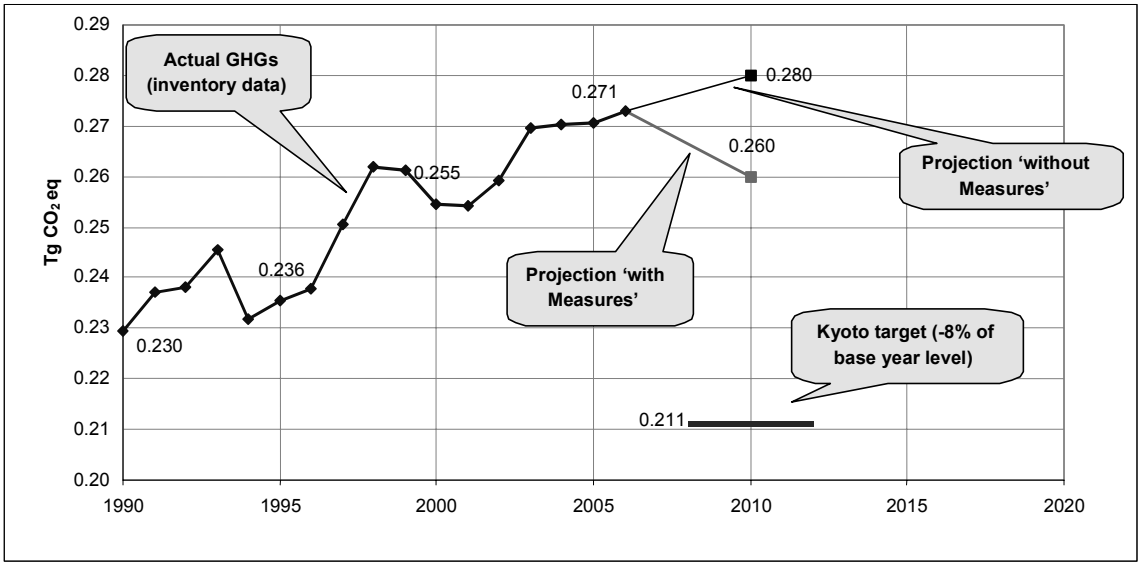
Abbreviation: NA = not applicable.
[a] Data source: Liechtenstein's 2008 greenhouse gas inventory submission; the emissions are without land use, land-use change and forestry.
[b] Data source: Liechtenstein's report demonstrating progress.
[c] Data source: Liechtenstein's fourth national communication.

33. Liechtenstein's overall GHG emissions increased by 19 per cent between 1990 and 2006, but its Kyoto Protocol target is 8 per cent below the base year emissions (i.e. at 211 Gg CO_2 eq). With existing

measures, the aggregate emissions would reach 260 Gg CO_2 eq in 2010, which is still 49 Gg CO_2 eq above the Kyoto Protocol target. With regard to emissions of individual gases in 2010, CO_2 emissions are projected to increase by 5 per cent from the base year level, whereas CH_4 and N_2O emissions are expected to decline by 0.3 and 15.6 per cent, respectively. In its NC4, Liechtenstein has not included information on actions to address the gap between projected and required emission levels, partly because of uncertainty in estimates of 1990 emissions at the time the NC4 was drafted. In its RDP, Liechtenstein has mentioned that owing to a recommendation from a study, it is investigating the scope of its engagement in the flexible mechanisms. In the Climate Protection Strategy of Liechtenstein submitted during the review, it is mentioned that two thirds of the reductions needed in order for Liechtenstein to reach the Kyoto Protocol target will be achieved through use of the flexible mechanisms.

34. The ERT recommends that in future national communications, Liechtenstein prepare the disaggregated emission projections according to the usual structure of sector reporting; that is, to report industrial processes and energy use in industry separately. Liechtenstein is also encouraged to provide a 'with additional measures' scenario, and if possible even a 'without measures' scenario, which would enable the effect of existing and planned PaMs for all sectors and gases to be quantified.

Greenhouse gas emission projections for Liechtenstein



Data sources: Liechtenstein's fourth national communication and report demonstrating progress; the emissions are without land use, land-use change and forestry.

2. Total effect of policies and measures

35. In its NC4, Liechtenstein has presented only the 'with measures' scenario, which does not allow for any estimation of the total effects of PaMs through comparisons between relevant scenarios. The effects of individual PaMs have also not been reported in the PaMs section, meaning that no conclusions on the total effects of PaMs could be drawn from there either. The RDP, on the other hand, does provide an estimate of the total effect of existing PaMs (albeit in graphical format only), which amounts to 20 Gg CO_2 eq in 2010.

36. During the review, the ERT was provided with additional information on the estimated effects of PaMs for the period 2008–2012. This information was based on the Climate Protection Strategy in its updated version from March 2008. The average effect of implemented and adopted PaMs during 2008–2012 is estimated at 20 Gg CO_2 eq per year (see table 6). According to the Climate Protection

Strategy, the average total emissions during the period 2008–2012 are projected at 250 Gg CO_2 eq per year, which is 10 Gg CO_2 eq lower than the estimate given in the NC4. The ERT noted that this would imply that the remaining gap between projected and required emission levels for the first commitment period amounts to 39 Gg CO_2 eq.

37. Liechtenstein has provided a concise description of its GHG emission projections in the NC4. The ERT encourages Liechtenstein to further improve the quality of reporting by providing the actual data used also in tables and describing in greater detail the modelling approach taken, input assumptions and uncertainties. In addition, the ERT recommends that Liechtenstein provide an aggregate effect of existing measures (and planned measures, if reported) in its future national communications (in accordance with para. 39 of the UNFCCC reporting guidelines) and provide projections on a sectoral basis, using the recommended list of sectors (paras. 17 and 34).

Table 6. Projected effects of planned, implemented and adopted policies and measures in 2010

	Effect of implemented and adopted measures (Gg CO_2 eq)	Relative value (% of base year emissions)	Effect of planned measures (Gg CO_2 eq)	Relative value (% of base year emissions)
Energy (without CO_2 from transport)	18.8	8.17	NA	NA
Transport – CO_2	1.2	0.50	NA	NA
Industrial processes	NA	NA	NA	NA
Agriculture	NA	NA	NA	NA
Land-use change and forestry	NA	NA	NA	NA
Waste management	NA	NA	NA	NA
Total	20.0	8.67	NA	NA

Data source: Communication by the Party in response to a questions raised by the ERT during the review.
Abbreviation: NA = not applicable.

D. Vulnerability assessment, climate change impacts and adaptation measures

38. In its NC4, Liechtenstein has provided the required information on expected impacts of climate change in the country. However, the ERT noted that Liechtenstein has not provided information on adaptation options, except for in the tourism sector. Table 7 summarizes the information on vulnerability and adaptation to climate change presented in the NC4.

Table 7. Summary of information on vulnerability and adaptation to climate change

Vulnerability area	Examples/comments/adaptation measures reported
Agriculture and forestry	Rising temperatures will impair the productivity of grain cultivation in the long term
Glaciers and permafrost	Evidence of vulnerability includes a loss of 25% of glaciers in the Alps since 1970, a high number of rock slides, and an indication of further reduction of permafrost recorded in 2003
Biodiversity and natural ecosystems	The biological beginning of spring has advanced by 1.5–2.5 days per decade. Warming changes the composition of forest vegetation
Water resources	Increasing weather instabilities may lead to floods in winter and droughts in summer.
Human health	Risks include increased mortality due to heat waves; increase in the incidence of tropical diseases; spread of existing diseases to higher elevations; and indirect consequences from storms, floods and landslides
Tourism	***Vulnerability:*** The expected increase in elevation of the snow and permafrost boundaries and increasing weather instability may have an effect on the important recreation and tourism area of Malbun ***Adaptation:*** Various municipalities and institutions have introduced new offerings for winter and summer tourism, in order to counter potential revenue losses
Insurance	The internationally engaged insurance sector is likely to suffer the most severe consequences from an increase in the probability of losses

E. Financial resources and transfer of technology

1. Financial resources

39. The ERT noted that in its NC4, Liechtenstein has not provided detailed information on its contribution of financial resources and technology transfer in the following areas: climate-related support programmes, contribution to the Global Environment Facility (GEF), any pledge for the third GEF replenishment, activities implemented jointly, joint implementation and the clean development mechanism under the Kyoto Protocol, and other bilateral/multilateral contributions. Although 60 development projects of Liechtenstein's Development Service Foundation were mentioned, a detailed description of their relevance to climate change and their allocated funds according to Article 4, paragraphs 3, 4 and 5, of the Convention, have not been provided (see UNFCCC reporting guidelines, paras. 50–56). In addition, the ERT noted that Liechtenstein did not indicate what "new and additional" financial resources it has provided pursuant to Article 4, paragraph 3, of the Convention. Table 8 summarizes information on financial resources.

40. The ERT recommends that Liechtenstein provide in its next national communication more detailed information on financial resources as required by the UNFCCC reporting guidelines.

Table 8. Summary of information on financial resources and technology transfer

Official development assistance (ODA)	0.45% of GNP in 2005 0.6% of GNP in 2008.
Climate-related aid in bilateral ODA	17.2 million Swiss francs (approximately USD 16.3 million as at 16 May 2008)
Climate-related support programmes	NA
Contributions to GEF (USD million)	NA
Pledge for third GEF replenishment	NA
Activities implemented jointly	NA
JI and CDM under the Kyoto Protocol	NA
Other (bilateral/multilateral)	NA

Abbreviations: CDM = clean development mechanism, GEF = Global Environment Facility, GNP = gross national product, JI = joint implementation, NA = not available.

2. Transfer of technology

41. In its NC4, Liechtenstein has provided details of measures relating to the promotion, facilitation and financing of the transfer of, or access to, environmentally sound technologies. The ERT noted that the Party has not reported on activities relating to technology transfer, including success or failure stories, and details of its activities in financing access by developing countries to 'hard' or 'soft' environmentally sound technologies. Additionally, the ERT noted that Liechtenstein has not provided the following reporting elements required by the UNFCCC reporting guidelines: a clear distinction between activities undertaken by the public sector and those undertaken by the private sector (in accordance with para. 54), and information, in textual format, on steps taken by the Government to promote, facilitate and finance transfer of technology, and to support development and enhancement of endogenous capacities and technologies of developing countries (para. 56). The ERT recommends that Liechtenstein include in its next national communication a detailed description of activities relating to transfer of technology as required by the UNFCCC reporting guidelines.

F. Research and systematic observation

42. Liechtenstein has provided information on its actions relating to research and systematic observation, and has addressed both domestic and international activities of its own University of Applied Sciences through the Swiss National Science Foundation and the Austrian Science Fund and in

the context of the European Community. The NC4 has also provided a summary of information on Liechtenstein's participation in activities of the Global Climate Observing System.

G. Education, training and public awareness

43. In the NC4, Liechtenstein has provided information on its actions relating to education, training and public awareness, as required by the UNFCCC reporting guidelines. Relevant aspects of education in schools, public outreach and the involvement of the public and non-governmental organizations have been reported. Liechtenstein is encouraged to report on its efforts to promote capacity-building in developing countries.

III. Evaluation of information contained in the report demonstrating progress and of supplementary information under Article 7, paragraph 2, of the Kyoto Protocol

A. Information contained in the report demonstrating progress

44. Liechtenstein's RDP includes five chapters, which contain most of the information required by decisions 22/CP.7 and 25/CP.8. The ERT found the information contained in the RDP to be consistent with that provided in the NC4.

45. In its RDP, Liechtenstein has explained that it has decided to integrate climate policy into individual sector policies, with a focus on energy, environment, transport, agriculture and forestry. It is working in close cooperation with Switzerland on the development of carbon tax legislation applicable to both countries. In 2003, the Clean Air Act, a central piece of Liechtenstein's environmental policy, was updated to include GHG emission targets.

46. Under the Kyoto Protocol, Liechtenstein is committed to reducing its emissions to 8 per cent below the base year (1990) level. Current projections provided by Liechtenstein indicate that in the period 2008–2012, emissions will be between 13.3 and 22.0 per cent above the base year level. Limited information is provided in the RDP to demonstrate how Liechtenstein will address the expected gap. Liechtenstein has provided no explicit definition of supplementarity in the RDP, but it informed the ERT during the review that if its Kyoto Protocol target cannot be met by domestic action alone, the Government may take advantage of the flexible mechanisms of the Kyoto Protocol. The ERT noted that if Liechtenstein uses the flexibility mechanisms to close the projected gap, this will account for twice the amount of GHG mitigation effects that are projected to be achieved through the PaMs (which is approximately 20 Gg CO_2 eq.).

B. Supplementary information under Article 7, paragraph 2, of the Kyoto Protocol

47. Liechtenstein has provided most supplementary information under Article 7, paragraph 2, of the Kyoto Protocol in its NC4 and RDP. This information reflects the steps taken by Liechtenstein to implement the relevant provisions of the Kyoto Protocol. The supplementary information is placed in different sections of the NC4 and RDP. Table 9 provides references to the NC4 and RDP chapters in which supplementary information is provided.

48. Liechtenstein has not reported on what efforts it 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. This information is required under Article 7, paragraph 2, of the Kyoto Protocol, and the ERT recommends that Liechtenstein include this reporting element in its next national communication.

Table 9. Overview of supplementary information under Article 7, paragraph 2, of the Kyoto Protocol

Supplementary information	Reference
Supplementarity relating to the mechanisms pursuant to Articles 6, 12 and 17	RDP, section 3.7
Policies and measures in accordance with Article 2	RDP, chapter 2 NC4, chapter 4
Domestic and regional programmes and/or legislative arrangements and enforcement and administrative procedures	RDP, sections 2.1 and 5.2
Information under Article 10	RDP, chapter 5
Financial resources	RDP, section 5.4 NC4, chapter 7

49. Liechtenstein has reported only limited information on its national registry and national inventory system in the NC4 and the RDP. However, during the review of Liechtenstein's initial report under the Kyoto Protocol, which took place in 2007, the national inventory system was found to be fully functional and the national registry to be fully compliant with reporting requirements.

50. The information provided in the RDP on the mechanisms pursuant to Articles 6, 12, and 17 was also limited. Given the stated importance of the flexibility mechanisms in meeting Liechtenstein's Kyoto target, the ERT encourages Liechtenstein to provide more complete information in future national communications.

IV. Conclusions

51. On the basis of the information provided in Liechtenstein's NC4 and RDP, as well as additional information provided by Liechtenstein in response to questions raised by the ERT during the review, the ERT developed an understanding of Liechtenstein's approach to climate policy and the state of its implementation of its commitments under the Convention and its Kyoto Protocol. The ERT noted that Liechtenstein is far from reaching its Kyoto Protocol target through domestic PaMs alone, and is likely to rely to a considerable extent on the use of Kyoto Protocol mechanisms.

52. Liechtenstein's CO_2 emissions and total GHG emissions both increased by 19 per cent between 1990 and 2006. Emissions increased in all major sectors; only emissions from solvent use and from agriculture declined.

53. In its NC4 and RDP, Liechtenstein has presented GHG projections for the period from 1990 to 2010. Based on this information and on information provided during the review, two scenarios are included in this report: a baseline ('without measures') scenario; and a 'with measures' scenario (including the effect of currently implemented and adopted PaMs). The projected GHG emissions under the baseline scenario and the 'with measures' scenario are 22.0 and 13.3 per cent, respectively, above the base year level. Thus, the projections indicate that Liechtenstein cannot meet its Kyoto Protocol target (which is an 8 per cent reduction from the base year level), under the 'with measures' scenario, through the implementation of domestic measures alone.

54. In the course of the IDR, the ERT formulated a number of recommendations relating to the completeness and transparency of Liechtenstein's reporting under the Convention and its Kyoto Protocol. The key recommendations[2] are that Liechtenstein:

- Extend the description of the overall policy context, sustainable development strategies and the inter-ministerial decision-making processes; provide GHG inventory trends for the complete time series in its next national communication; and provide a more detailed description of the energy

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

use in other sectors, including disaggregated information of main drivers (residential and commercial key energy uses);

- Provide more detailed information on PaMs, specifically summary tables of PaMs by sector including quantitative estimates of GHG mitigation effects, and an indication of which PaMs reported in previous national communications are no longer in place;

- Develop estimates of GHG mitigation effects of implemented PaMs in the non-energy sectors and investigate the feasibility of efforts to limit HFC emissions;

- Prepare disaggregated emission projections according to the usual structure of sector reporting; and provide a 'with additional measures' scenario, and if possible even a 'without measures' scenario, enabling the quantification of GHG mitigation effects of existing and planned PaMs for all sectors and gases;

- Improve the quality of reporting of projections by providing the actual data used also in tables, and describing in greater detail the modelling approach used, input assumptions and uncertainties; and by providing an aggregate effect of existing measures (and of additional measures, if reported);

- Provide more detailed information on financial resources and include a detailed description of activities relating to technology transfer.

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 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/IDR.3/LIE. Report on the in-depth review of the third national communication of Liechtenstein. Available at <http://unfccc.int/resource/docs/idr/lie.pdf>.

FCCC/SBI/2007/INF.2. Synthesis of reports demonstrating progress in accordance with Article 3, paragraph 2, of the Kyoto Protocol. Available at <http://unfccc.int/resource/docs/2007/sbi/eng/inf02.pdf>.

FCCC/SBI/2007/INF.6. Compilation and synthesis of fourth national communications. Available at <http://unfccc.int/resource/docs/2007/sbi/eng/inf06.pdf>.

FCCC/SBI/2007/INF.7. Compilation and synthesis of supplementary information incorporated in fourth national communications submitted in accordance with Article 7, paragraph 2, of the Kyoto Protocol. Available at <http://unfccc.int/resource/docs/2007/sbi/eng/inf07.pdf>.

FCCC/ARR/2006/LIE. Report of the individual review of the greenhouse gas inventory of Liechtenstein submitted in the year 2006. Available at <http://unfccc.int/resource/docs/2007/arr/lie.pdf>.

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

Regierung des Fuerstentums Liechtenstein. 2007. *National Klimaschutzstrategie für das Fürstentum Liechtenstein, September 2007*. (Government of the Principality of Liechtenstein. 2007 National Climate Change Strategy for the Principality of Liechtenstein, September 2007). Available (in German only) at <http://www.llv.li/pdf-llv-aus-nationale_klimaschutzstrategie_07.pdf>.

Report demonstrating progress of Liechtenstein. Available at <http://unfccc.int/resource/docs/dpr/lie1.pdf>

2008 Greenhouse gas inventory submission of Liechtenstein. Available at <http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/4303.php >.

B. Additional information provided by the Party

Responses to questions during the review were received from Mr. Sven Braden (Office of Environmental Protection, Air Quality and Climate Division), including additional material on energy and national account statistics, quantified emission reduction effects according to the Climate Protection Strategy of September 2007 (updated in March 2008), an update of the overview table of PaMs, and information on Liechtenstein's definition of supplementarity.

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