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Report of the individual review of the annual submission of Liechtenstein submitted in 2010*

* In the symbol for this document, 2010 refers to the year in which the inventory was submitted, and not to the year of publication.

Contents

I. Introduction and summary

A. Overview

1. This report covers the centralized review of the 2010 annual submission of Liechtenstein, coordinated by the UNFCCC secretariat, in accordance with decision 22/CMP.1. The review took place from 30 August to 4 September 2010 in Bonn, Germany, and was conducted by the following team of nominated experts from the UNFCCC roster of experts: generalists – Ms. Suvi Monni (Finland) and Mr. Tinus Pulles (the Netherlands); energy – Mr. Nicolas di Sbroivacca (Argentina) and Mr. Steven Oliver (Australia); industrial processes – Ms. Ils Moorkens (Belgium); agriculture – Ms. Olga Gavrilova (Estonia), Ms. Anoja Udaya Kumari Herath (Sri Lanka) and Ms. Tajda Mekinda-Majaron (Slovenia); land use, land-use change and forestry (LULUCF) – Mr. Héctor Ginzo (Argentina), Mr. Andis Lazdins (Latvia) and Ms. Kimberly Todd (United States of America); and waste – Ms. Kristin Hardardottir (Iceland) and Ms. Sirintornthep Towprayoon (Thailand). Ms. Towprayoon and Mr. Pulles were the lead reviewers. The review was coordinated by Mr. Matthew Dudley and Ms. Barbara Muik (UNFCCC secretariat).

2. 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, into this final version of the report.

B. Emission profiles and trends

3. In 2008, the main greenhouse gas (GHG) in Liechtenstein was carbon dioxide (CO_2), accounting for 87.3 per cent of total GHG emissions[1] expressed in carbon dioxide equivalent (CO_2 eq), followed by methane (CH_4) (5.7 per cent) and nitrous oxide (N_2O) (4.9 per cent). Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6) collectively accounted for 2.1 per cent of the overall GHG emissions in the country. The energy sector accounted for 88.1 per cent of total GHG emissions, followed by agriculture (8.6 per cent), industrial processes (2.1 per cent), waste (0.7 per cent) and solvent and other product use (0.4 per cent). Total GHG emissions amounted to 263.38 Gg CO_2 eq and increased by 15.5 per cent between the base year[2] and 2008.

4. Tables 1 and 2 show GHG emissions from Annex A sources, emissions and removals from the LULUCF sector under the Convention and emissions and removals from activities under Article 3, paragraph 3, and, if any, Article 3, paragraph 4, of the Kyoto Protocol (KP-LULUCF), by gas and by sector, respectively. In table 1, CO_2, CH_4 and N_2O emissions included in the rows under Annex A sources do not include emissions and removals from the LULUCF sector.

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

[2] "Base year" refers to the base year under the Kyoto Protocol, which is 1990 for all gases. The base year emissions include emissions from Annex A sources only.

Table 1
Greenhouse gas emissions from Annex A sources and emissions/removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, by gas, base year to 2008[a]

			Gg CO_2 eq								*Change*
		Greenhouse gas	*Base year*	*1990*	*1995*	*2000*	*2005*	*2006*	*2007*	*2008*	*Base year–2008 (%)*
Annex A sources		CO_2	203.06	203.06	209.42	227.57	239.97	241.61	210.96	229.92	13.2
		CH_4	13.40	13.40	12.60	12.27	13.98	14.34	14.69	14.95	11.6
		N_2O	13.09	13.09	13.16	12.52	12.63	12.81	12.94	13.00	–0.7
		HFCs	0.00	0.00	0.38	2.32	4.38	4.39	4.67	5.09	5 363 477.4
		PFCs	0.00	0.00	0.00	0.00	0.03	0.04	0.05	0.06	NA
		SF_6	0.00	0.00	0.00	0.09	0.27	0.06	0.12	0.36	NA
KP-LULUCF	Article 3.3[b]	CO_2								–8.22	
		CH_4								0.00	
		N_2O								0.00	
	Article 3.4[c]	CO_2	NA							NA	NA
		CH_4	NA							NA	NA
		N_2O	NA							NA	NA

Abbreviations: KP-LULUCF = land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, NA = not applicable.

[a] "Base year" for Annex A sources refers to the base year under the Kyoto Protocol, which is 1990 for all gases. The "base year" for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol is 1990.

[b] Activities under Article 3, paragraph 3, of the Kyoto Protocol, namely afforestation and reforestation, and deforestation. Only inventory years of the commitment period of the Kyoto Protocol must be reported.

[c] Elected activities under Article 3, paragraph 4, of the Kyoto Protocol, including forest management, cropland management, grazing land management and revegetation. For cropland management, grazing land management and revegetation the base year and the inventory years of the commitment period of the Kyoto Protocol must be reported.

Table 2
Greenhouse gas emissions by sector and activity, base year to 2008

			Gg CO_2 eq								*Change*
		Sector	*Base year[a]*	*1990*	*1995*	*2000*	*2005*	*2006*	*2007*	*2008*	*Base year–2008 (%)*
Annex A		Energy	203.48	203.48	210.72	229.53	241.99	243.65	213.02	232.12	14.1
		Industrial processes	0.00	0.00	0.38	2.41	4.68	4.49	4.84	5.51	5 805 512.9
		Solvent and other product use	2.00	2.00	1.62	1.28	1.08	1.07	1.08	1.08	–46.2
		Agriculture	22.52	22.52	21.32	19.83	21.59	22.26	22.65	22.70	0.8
		Waste	1.55	1.55	1.52	1.72	1.93	1.78	1.85	1.97	27.1
		Other	NO	NO	NO	NO	NO	NO	NO	NO	NA
		LULUCF	NA	–8.22	–8.36	–4.90	–6.30	–6.35	–6.37	–6.39	NA
		Total (with LULUCF)	**NA**	**219.78**	**225.68**	**248.15**	**263.03**	**265.12**	**237.06**	**256.99**	**NA**
		Total (without LULUCF)	**228.00**	**228.00**	**234.04**	**253.05**	**269.33**	**271.47**	**243.43**	**263.38**	**15.5**
KP-LULUCF	Article 3.3[b]	Afforestation & reforestation								–11.88	
		Deforestation								3.66	
		Total (3.3)								**–8.22**	
	Article 3.4[c]	Forest management								NA	NA
		Cropland management	NA							NA	NA
		Grazing land management	NA							NA	NA
		Revegetation	NA							NA	NA
		Total (3.4)	**NA**							**NA**	**NA**

Abbreviations: LULUCF = land use, land-use change and forestry, KP-LULUCF = LULUCF emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, NA = not applicable, NO = not occurring.

[a] "Base year" for Annex A sources refers to the base year under the Kyoto Protocol, which is 1990 for all gases. The "base year" for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol is 1990.

[b] Activities under Article 3, paragraph 3, of the Kyoto Protocol, namely afforestation and reforestation, and deforestation. Only the inventory years of the commitment period of the Kyoto Protocol must be reported.

[c] Elected activities under Article 3, paragraph 4, of the Kyoto Protocol, including forest management, cropland management, grazing land management and revegetation. For cropland management, grazing land management and revegetation the base year and the inventory years of the commitment period of the Kyoto Protocol must be reported.

5. Table 3 provides information on the most important emissions and removals and accounting parameters that will be included in the compilation and accounting database.

Table 3
Information to be included in the compilation and accounting database in t CO_2 eq

	As reported	*Adjustment*[a]	*Final*[b]	*Accounting quantity*[c]
Commitment period reserve	950 061		950 061	NA
Annex A emissions for current inventory year				
CO_2	229 922		229 922	NA
CH_4	14 946		14 946	NA
N_2O	13 005		13 005	NA
HFCs	5 091		5 091	NA
PFCs	56		56	NA
SF_6	363		363	NA
Total Annex A sources	**263 383**		**263 383**	**NA**
Activities under Article 3, paragraph 3, for current inventory year				
3.3 Afforestation and reforestation on non-harvested land for current year of commitment period as reported	–11 463.78		–11 879	–11 879
3.3 Afforestation and reforestation on harvested land for current year of commitment period as reported	NA		NA	NA
3.3 Deforestation for current year of commitment period as reported	3 658.47		3 658.47	3 658.47
Activities under Article 3, paragraph 4, for current inventory year[d]				
3.4 Forest management for current year of commitment period				
3.4 Cropland management for current year of commitment period				
3.4 Cropland management for base year				
3.4 Grazing land management for current year of commitment period				
3.4 Grazing land management for base year				
3.4 Revegetation for current year of commitment period				
3.4 Revegetation in base year				

Abbreviations: KP-LULUCF = land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, NA = not applicable.

[a] "Adjustment" is relevant only for Parties for which the expert review team (ERT) has calculated a or several adjustment(s).

[b] "Final" includes revised estimates, if any, and/or adjustments, if any.

[c] "Accounting quantity" is included in this table only for Parties that chose annual accounting for activities under Article 3, paragraph 3, and elected activities under Article 3, paragraph 4, if any.

[d] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

II. Technical assessment of the annual submission

A. Overview

1. Annual submission and other sources of information

6. The 2010 annual inventory submission was submitted on 15 April 2010; it contains a complete set of common reporting format (CRF) tables for the period 1990–2008 and a national inventory report (NIR). Liechtenstein also submitted information required under Article 7, paragraph 1, of the Kyoto Protocol, including information on: activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol (KP-LULUCF), accounting of Kyoto Protocol units, changes in the national system and in the national registry, and minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol. The standard electronic format (SEF) tables were submitted on 1 April 2010. The annual submission was submitted in accordance with decision 15/CMP.1.

7. Liechtenstein officially submitted revised information and data on KP-LULUCF (see para. 78 below) and on the accounting of Kyoto Protocol units (see para. 93 below) on 15 October 2010 in response to questions raised by the expert review team (ERT) during the course of the centralized review. Where necessary, the ERT also used the previous year's submission during the review.

8. In addition, the ERT used the standard independent assessment report (SIAR), parts I and II, to review information on the accounting of Kyoto Protocol units (including the SEF tables and their comparison report) and on the national registry.[3]

9. During the review, Liechtenstein provided the ERT with additional information and documents which are not part of the annual submission. The full list of information and documents used during the review is provided in annex I to this report.

Completeness of inventory

10. The inventory covers all source and sink categories for the period 1990–2008 and is complete in terms of years and geographical coverage. However, CRF table 7 has not been provided for the years 1990–2003.

2. A description of the institutional arrangements for inventory preparation, including the legal and procedural arrangements for inventory planning, preparation and management

Overview

11. The ERT concluded that the national system continues to perform its required functions.

12. The NIR states that there have been no changes in the national system since the previous annual submission.

[3] The SIAR, parts I and II, is prepared by an independent assessor in line with decision 16/CP.10 (paras. 5(a), 6(c) and 6(k)), under the auspices of the international transaction log administrator using procedures agreed in the Registry System Administrators Forum. Part I is a completeness check of the submitted information relating to the accounting of Kyoto Protocol units (including the SEF tables and their comparison report) and to national registries. Part II contains a substantive assessment of the submitted information and identifies any potential problem regarding information on the accounting of Kyoto Protocol units and the national registry.

Inventory planning

13. The NIR described the institutional arrangements for the preparation of the inventory. The Office of Environmental Protection has overall responsibility for the national inventory. The Office of Economic Affairs, the Office of Agriculture, the Office of Forests, Nature and Land Management and the Office of Land Use Planning directly participate in the compilation of the inventory. Several other administrative and private institutions are also involved in the preparation of the inventory. The inventory group consists of a project manager, a person responsible for quality assurance/quality control (QA/QC) activities, and a national inventory compiler, who is represented by the project manager and his assistant. A number of external experts also belong to the inventory group, such as the sectoral specialists.

14. As noted in the previous review, due to the specific circumstances of the country, Liechtenstein's inventory is closely linked to the inventory of Switzerland. While the use of Swiss methodologies and emission factors (EFs) is in many cases appropriate for Liechtenstein, the ERT considers it important that Liechtenstein should have the national capacity for inventory development.

15. During the review, the ERT noted that the Party experienced difficulties in responding to specific questions from the ERT, in particular those concerning the agriculture sector. The ERT reiterates the recommendation from the previous review report that Liechtenstein continue to develop country-specific capacity for inventory planning and preparation.

Inventory preparation

Key categories

16. Liechtenstein has reported a key category tier 1 analysis, both level and trend assessment, as part of its 2010 submission. The key category analysis performed by the Party and that performed by the secretariat[4] produced broadly similar results. Differences can be explained by the different levels of disaggregation among categories. Liechtenstein has included the LULUCF sector in its key category analysis, which was performed in accordance with the Intergovernmental Panel on Climate Change (IPCC) *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC good practice guidance) and the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF). The ERT recommends that Liechtenstein report the results of the key category analysis using tables 7.2–7.3 of the IPCC good practice guidance and tables 5.4.2–5.4.3 of the IPCC good practice guidance for LULUCF, as the current format used by the Party is not consistent with the abovementioned IPCC format.

17. CRF table 7 is provided only for the years 2004–2008, and includes only key categories without LULUCF. The reported results of the key category analysis for 2008 in the NIR and CRF table 7 are not fully consistent. The ERT reiterates the recommendation made during the previous review that the Party improve the consistency of the NIR and

[4] The secretariat identified, for each Party, the categories that are key categories in terms of their absolute level of emissions, applying the tier 1 level assessment as described in the IPCC good practice guidance for LULUCF. Key categories according to the tier 1 trend assessment were also identified for Parties that provided a full set of CRF tables for the base year or period. Where the Party performed a key category analysis, the key categories presented in this report follow the Party's analysis. However, they are presented at the level of aggregation corresponding to a tier 1 key category assessment conducted by the secretariat.

CRF table 7 and report in CRF table 7 the results of the key category analysis both with and without LULUCF for the base year and the latest inventory year.

18. Liechtenstein has identified deforestation as a key category in the key category analysis of activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol.

19. The ERT noted that Liechtenstein's choice of methodologies is often linked with the methodological choice of Switzerland. It is not clear from the NIR whether Liechtenstein uses its own key category analysis to guide methodological choice and improvement of the inventory. The ERT therefore recommends that Liechtenstein consider using its own key category analysis for these purposes, in accordance with the IPCC good practice guidance, and report thereon in its next annual submission.

Uncertainties

20. Liechtenstein has carried out an uncertainty analysis using the tier 1 method for emissions and removals in 1990 and 2008, and for the trend. The ERT commends Liechtenstein for having included the LULUCF sector in the uncertainty analysis for the first time, following a recommendation of the previous review. A tier 2 uncertainty analysis was carried out for the 2009 submission, and the Party has indicated that this will be updated in 2012. The differences between the tier 1 and tier 2 uncertainty analyses are discussed in the NIR. The results of the uncertainty analyses are similar, but the tier 2 method yields greater uncertainties. The uncertainty level for 2007 was estimated at 5.95 per cent according to the tier 1 method and at 6.05 per cent according to the tier 2 method (without LULUCF). The somewhat greater uncertainty of the tier 2 method is due to the fact that significant uncertainties, correlations and the lognormal distributions for categories in the agriculture sector can be more appropriately addressed with tier 2 than with tier 1. The trend uncertainty (1990–2007) was estimated at 7.7 per cent with the tier 1 approach and at 8.9 per cent with the tier 2 approach. According to the NIR, this is due to the methodological differences between the two approaches.

21. The uncertainty estimates of activity data (AD) and EFs are largely based on the uncertainty analysis of Switzerland. The ERT considers that the Swiss uncertainty estimates may not always be applicable to the case of Liechtenstein. For example, as mentioned in the NIR, the uncertainty of the consumption of halocarbons and SF_6 in Liechtenstein is likely to be larger than in Switzerland. The ERT reiterates the recommendation made by the previous ERT that the Party further consider the applicability of Swiss uncertainty estimates to the national circumstances of Liechtenstein and that it develop national uncertainty estimates where necessary. The ERT also encourages the Party to qualitatively discuss the uncertainties introduced in its inventory due to the application of data from the Swiss inventory, in particular for the key categories. The ERT also recommends that Liechtenstein use the results of the uncertainty analysis in the prioritization of inventory improvements.

22. Liechtenstein did not report in its 2010 annual submission the uncertainty estimates for its KP-LULUCF inventory. However, in its NIR, the Party justified this exclusion by the fact that its KP-LULUCF inventory is based on Switzerland's methodology and, therefore, the uncertainty estimates associated with Switzerland's KP-LULUCF inventory would also hold for Liechtenstein. The ERT recommends that Liechtenstein report its uncertainty estimates for afforestation, reforestation and deforestation in its next annual submission.

Recalculations and time-series consistency

23. Recalculations have been performed and reported in accordance with the IPCC good practice guidance. The ERT noted that recalculations reported by the Party of the time

series 1990 to 2007 have been undertaken to take into account changes in the Swiss EFs (in the energy, industrial processes and agriculture sectors), to correct errors found in AD (in the energy, industrial processes and agriculture sectors) and due to updated AD (in the energy and solvent and other product use sectors). Liechtenstein included PFC emissions in its annual submission for the first time for the years 1997–2008: PFC emissions are reported as "NO" (not occurring) for the years 1990–1996. The ERT commends Liechtenstein for this improvement in the completeness of its reporting. Furthermore, recalculations were undertaken in the LULUCF sector resulting from the inclusion in this submission of land-use changes from a country-specific category under unmanaged land to another country-specific category (for example from stony to unproductive grassland), in response to a recommendation made by the previous ERT. The impact of the recalculations on total GHG emissions in 2007 is a reduction of 0.02 per cent and an increase of 0.06 per cent excluding and including LULUCF, respectively, when compared with the 2009 inventory submission.

24. Chapter 10 of the NIR provides the rationale for the recalculations undertaken in the 2010 annual submission. However, the Party has not included an explanation for these recalculations in CRF table 8(b), as required by the UNFCCC reporting guidelines; the comments in CRF table 8(b) state that the Party intends to provide an explanation for the recalculations in this table in its 2011 annual submission. The ERT recommends that the Party provide a rationale for the recalculations in its next annual submission.

Verification and quality assurance/quality control approaches

25. Liechtenstein has a QA/QC plan in place in accordance with decision 19/CMP.1 and the IPCC good practice guidance. The QA/QC activities are coordinated by the quality manager of the inventory group. Operational tasks are delegated to the lead NIR author, who distributes QA/QC checklists to the project manager (who is also the national inventory compiler), the sectoral experts and the other NIR authors, who then confirm the QA/QC procedures that they have carried out. The checklists are subsequently sent back to the quality manager, who confirms the performance of the QA/QC activities. The checklists, including information on the person who carried out the QA/QC activity and when, are provided in an annex to the NIR.

26. In its 2010 submission, Liechtenstein has provided an Inventory Development Plan (IDP) for the first time as an annex to the NIR. The IDP includes a description of the planned improvements, including information on deadlines, responsibilities, priorities (high, medium, low) and workload (low, mean, high), and the status of the improvements. The ERT commends the Party for the development of the IDP, and the fact that issues included in the previous review report were classified as having the highest priority. However, the ERT recommends that Liechtenstein add the 2010 review recommendations to the IDP as soon as they become available. The ERT also recommends that the Party use the key category assessment and uncertainty analysis when prioritizing the inventory improvements and that the Party set quality objectives on that basis.

27. The Party did not report on any category-specific tier 2 QC procedures. The ERT encourages Liechtenstein to plan and implement tier 2 QC procedures for the key categories.

28. During the 2008 and 2009 reviews, Liechtenstein provided the ERT with further information on its activities conducted both internally and externally in accordance with its QA/QC plan. However, these activities have not been reflected in the 2009 NIR or in the 2010 submission. The ERT reiterates the recommendation made in the previous review report that Liechtenstein include this information in its next annual inventory submission, particularly a description of the QA/QC activities conducted in connection with AD.

Transparency

29. The NIR and CRF tables are generally transparent. However, the ERT reiterates the recommendation of the previous review that the Party further improve the transparency of its reporting, in particular in the agriculture sector (see para. 53 below) and in the LULUCF sector (see paras. 66 and 69 below). The ERT also recommends that Liechtenstein further increase the transparency of its reporting by providing a more detailed justification for its use of the EFs, AD and parameters contained in Switzerland's inventory.

Inventory management

30. The initial report review of Liechtenstein noted that the Party has a centralized archiving system, but that the information on archiving provided in the NIR is not transparent. The 2010 NIR states that all the electronic files of Liechtenstein's GHG inventory are saved by the backup system of Liechtenstein's administration. However, the type of data archived and the centralized nature of the archiving system have not been transparently described in the NIR. The ERT recommends that Liechtenstein report, in its next annual submission, information on its archiving practices in line with paragraph 16(a) of the annex to decision 19/CMP.1.

3. Follow-up to previous reviews

31. The ERT noted that Liechtenstein has implemented several recommendations contained in the previous review report in relation to improving the transparency of the inventory and that it has also implemented specific QA/QC procedures in the energy sector. The ERT commends Liechtenstein for these improvements. The ERT reiterates the recommendations contained in the previous review report that have not yet been implemented by the Party:

(a) Increasing the use of country-specific methods, including the provision in the NIR of more precise descriptions of the methodologies that differ from those of the IPCC;

(b) Enhancing the consistency of the information provided in the NIR and the CRF tables on the following: the information provided on the key category analysis (CRF table 7); the rationale for the recalculations; and the information on the stock change in soil organic carbon in the cropland and grassland categories;

(c) Improving the transparency of documentation on QA/QC activities;

(d) Considering the applicability of Swiss uncertainty estimates to the national circumstances of Liechtenstein and developing national uncertainty estimates where necessary;

(e) Improving transparency, in particular in the agriculture and LULUCF sectors;

(f) Improving the transparency of its reporting on the archiving of information.

4. Areas for further improvement

Identified by the Party

32. The 2010 NIR identifies the following areas for improvement:

(a) The correction of an error found in the CH_4 EF for diesel and biofuel;

(b) The use of country-specific data for fugitive emissions of oil and natural gas;

(c) Updating the proxy data of the Swiss population for asphalt roofing and road paving with asphalt to increase consistency with the Swiss NIR;

(d) The provision of data on the consumption of halocarbons and SF_6 in cooperation with the Swiss inventory;

(e) Updating the data for solvent and other product use by updating the population data.

33. In addition, the IDP includes several items for which improvements have been planned, based on the recommendations of the previous review.

Identified by the expert review team

34. The ERT identifies the following cross-cutting issues for improvement:

(a) Further development of country-specific capacity for inventory planning and preparation;

(b) Use of the key category and uncertainty analyses for methodological choice and the prioritization of inventory improvements;

(c) The creation and implementation of a QA/QC management system;

(d) Ensuring that its national registry addresses the requirement for publicly available information.

35. Recommended improvements relating to specific categories are presented in the relevant sector chapters of this report.

B. Energy

1. Sector overview

36. The energy sector is the main sector in the GHG inventory of Liechtenstein. In 2008, emissions from the energy sector amounted to 232.12 Gg CO_2 eq, or 88.1 per cent of total GHG emissions. Since 1990, emissions have increased by 14.1 per cent. The key drivers for the rise in emissions are attributed to increases in other sectors (namely the commercial/institutional, residential and agriculture sectors) and road transportation. Within the energy sector, 43.3 per cent of the emissions were from the other sectors listed above, followed by 39.2 per cent from transport, 14.2 per cent from manufacturing industries and construction, 1.6 per cent from the category other (1.A.5) and 1.2 per cent from energy industries. The remaining 0.5 per cent was from fugitive emissions from fuels.

37. The ERT concluded that emissions have been compiled in line with the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Revised 1996 IPCC Guidelines) and the IPCC good practice guidance, and that the inventory is complete in terms of coverage of activities, gases and years. The energy section of the NIR is transparent and the ERT noted that this was further improved with the inclusion of detailed information on the way in which gas oil consumption is split among different consumers within the energy sector, as recommended by the previous ERT. The CRF tables are also complete. The ERT encourages Liechtenstein to continue with its efforts and to report on emissions of indirect GHGs in its next annual submission.

38. The ERT noted that Liechtenstein does not have its own energy balance; its energy consumption estimates are calculated from the corresponding energy balance of Switzerland.

39. The ERT noted fluctuations in the trend of CO_2 emissions for a number of key categories under stationary combustion – liquid and gaseous fuels (e.g. public electricity and heat production). In response to a question raised by the ERT, the Party stated that these fluctuations are a result of changing weather conditions and fluctuations in energy

prices that impact on energy stocks and on the fuel mix. The ERT recommends that Liechtenstein include this information in its next annual submission, which would significantly improve the transparency and understanding of emission trends.

40. Liechtenstein has reported recalculations for a number of categories as a result of improvements in AD and EFs. These recalculations have resulted in decreases in the 2007 inventory of 0.1, 0.3 and 4.0 per cent for CO_2, CH_4 and N_2O, respectively. The ERT reiterates the recommendation made by the previous ERT that Liechtenstein continue to implement QA/QC procedures for AD from the Swiss energy balance as well as for information on national energy statistics with a view to improving the quality of its inventory.

2. Reference and sectoral approaches

Comparison of the reference approach with the sectoral approach and international statistics

41. Liechtenstein has reported the CO_2 emission estimates from the energy sector using both the reference and sectoral approaches. However, the time series (1990–2008) showing the results obtained using both methods is not reported in the NIR. In its 2010 submission, Liechtenstein has provided revised implied emission factors (IEFs) for several liquid fuels, which has led to greater congruence between the two approaches. An explanation for the differences between the two approaches is provided in the NIR.

International bunker fuels

42. In Liechtenstein, civil aviation is the only source category contributing to international bunker fuel emissions (the Party has one helicopter base). Emission estimates in this category are calculated using the tier 1 method. Information on the share of fuel consumption from international flights is provided by the two companies operating in the country. This information allows Liechtenstein to separate domestic fuel use from bunker fuel use. The share of fuel consumption for international bunkers in 2008 was 85 per cent.

Feedstocks and non-energy use of fuels

43. The ERT noted that Liechtenstein continues to report feedstock and non-energy use of fuels as "NO". The ERT therefore reiterates the recommendation made in the previous review report that the Party include the use of lubricants and bitumen in this assessment with a view to ensuring the completeness of its inventory.

3. Key categories

Stationary combustion: liquid fuel – CO_2

44. The ERT noted that emissions from construction and manufacturing industries continue to be reported under the category other (mobile) which is not in line with the Revised 1996 IPCC Guidelines. These emissions should be reported in the CRF under the category other (manufacturing industries and construction). In response to a question raised by the ERT, Liechtenstein stated that it would review this issue in its next annual submission.

Road transportation: liquid fuel – CO_2, CH_4 and N_2O

45. The ERT noted that CO_2 EFs for gasoline and diesel oil are taken from Switzerland; further, these EFs are constant throughout the time series. The ERT also noted that Switzerland's 2007 IEF values for CH_4 and N_2O were used by Liechtenstein in its 2008 inventory, as Switzerland's 2008 IEF values for both gases were not available. In response

to a question raised by the ERT, Liechtenstein stated that it intends to recalculate the emission estimates for 2008 once the 2008 Switzerland data are available. However, the ERT reiterates the recommendation made in the previous review report that Liechtenstein explore ways to develop country-specific EFs for road transportation.

C. Industrial processes and solvent and other product use

1. Sector overview

46. In 2008, emissions from the industrial processes sector amounted to 5.51 Gg CO_2 eq, or 2.1 per cent of total GHG emissions, and emissions from the solvent and other product use sector amounted to 1.08 Gg CO_2 eq, or 0.4 per cent of total GHG emissions. Since the base year, emissions which originate only from the consumption of halocarbons and SF_6 have increased by 5,805,512.9 per cent.

47. No reference to category-specific QC procedures has been made for the industrial processes and solvent and other product use sectors in the NIR. The ERT reiterates the recommendation made in the previous review report that Liechtenstein perform category-specific QC procedures, as described in the IPCC good practice guidance. In its uncertainty analysis, Liechtenstein did not use country-specific uncertainty values but used those from Switzerland instead, which could be higher due to the conversion of Swiss data into Liechtenstein data. The ERT again encourages Liechtenstein to estimate its country-specific uncertainty values, in particular for the consumption of halocarbons and SF_6 key category, in its next annual submission.

48. Recalculations were conducted for the refrigeration and air-conditioning equipment subcategory (using final Swiss EFs that were provisional in the previous submission) and the electrical equipment category. PFC emission estimates have been reported for the first time in the current submission for the refrigeration and air conditioning category. The ERT commends Liechtenstein for this development. A summary table with information on the recalculations was reported in the NIR. The impact of the recalculations in 2007 is an increase in HFC emissions in the category consumption of halocarbons and SF_6 of 4.36 per cent. The ERT recommends that Liechtenstein complete CRF table 8(b) with explanatory information on the recalculations and that the Party improve the consistency of the information provided in the CRF tables and the NIR in relation to recalculations in its next annual submission.

2. Key categories

Consumption of halocarbons and SF_6 – HFCs

49. The ERT commends Liechtenstein for reporting HFC emissions from foam blowing in its 2010 inventory submission. Emissions for Liechtenstein are estimated by applying the rule of proportion based on the emissions reported by Switzerland and using the number of inhabitants as indicators. The ERT recommends that Liechtenstein take into consideration in its future improvement plans the development of its own AD to avoid using Swiss data, and include further explanations about specific assumptions made in its next annual inventory submission in order to enhance the transparency and completeness of the information provided.

50. In its NIR, Liechtenstein states that emissions of metered dose inhalers are estimated by applying the rule of proportion based on the emissions reported by Switzerland and using the number of inhabitants as indicators. However, in the CRF tables, these emissions are reported as “NO”. The ERT recommends that Liechtenstein correct this discrepancy in the reporting of this subcategory.

51. The ERT recommends that Liechtenstein report in its next annual submission on its efforts to collect additional information on the use of HFCs in fire extinguisher installations and on the further analysis of the delineation of emissions from disposal reported by Liechtenstein and Switzerland under domestic refrigeration, mobile air conditioning and transport refrigeration.

D. Agriculture

1. Sector overview

52. In 2008, emissions from the agriculture sector amounted to 22.70 Gg CO_2 eq, or 8.6 per cent of total GHG emissions. Since 1990, emissions have increased by 0.8 per cent. The key drivers for this trend are a 6.7 per cent increase in enteric fermentation, primarily due to an increase in EFs for dairy cattle and a decrease (3.8 per cent) in EFs for other livestock types. Within the sector, 46.1 per cent of the emissions were from enteric fermentation, followed by 39.0 per cent from agricultural soils and 14.9 per cent from manure management. CH_4 accounted for 53.7 per cent of total sectoral emissions with N_2O accounting for the remaining 46.3 per cent.

53. The ERT reiterates the finding from the previous review report that the NIR is not sufficiently transparent and that it has not been improved with respect to the previous annual submission. Relevant data, such as statistics on annual milk production per dairy cow, fractions of animal manure handled using different manure management systems and all fractional parameters used for the estimation of soil emissions, have not been presented in the NIR or in the CRF tables. In addition, the ERT noted that the recommendation from the previous review report that Liechtenstein provide in its NIR proper justification for the applicability of Swiss country-specific methodologies and EFs to its national circumstances has not yet been implemented.

54. The methodologies and EFs used by Liechtenstein are heavily dependent on those used by Switzerland, and Liechtenstein has not reported any plans to make improvements to them. In the 2010 submission, there has been a small recalculation for the inventory years 2006 and 2007 due to updated data on the area of fertilized land (resulting in a 0.3 per cent increase in sectoral emissions in 2007).

55. The data on the number of animals reported in the inventory have been obtained from the Office of Food Inspection and Veterinary Affairs in cooperation with the Office of Agriculture and are not entirely consistent with the official agricultural statistics of Liechtenstein. For example, the cattle population in 2008 has been reported in the CRF tables as 6,047 head of cattle, whereas the national agricultural statistics report 6,029. This inconsistency had already been noticed during the previous review when Liechtenstein explained to the ERT that this was due to different sampling techniques and that by 2011 at the latest full consistency between the numbers in the inventory and the agricultural statistics would be achieved. The ERT reiterates its previous recommendation that Liechtenstein perform this update of the AD for its next annual submission and report on any subsequent recalculations. In the CRF tables, Liechtenstein has classified 965 animals as “breeding cattle” under the category “other”, which is not in line with the IPCC methodology. In response to a question raised by the ERT, Liechtenstein explained that breeding cattle have a very different gross energy intake (GEI) from dairy cattle and therefore have to be treated separately. The ERT agrees that the calculation of emission estimates should be performed separately, but in order to maintain consistency with the IPCC methodology and to enable the comparison of IEFs, all cattle should be reported under the relevant cattle group. The ERT reiterates the recommendation that Liechtenstein report breeding cattle as appropriate in its next annual submission.

2. Key categories

Enteric fermentation – CH_4

56. Liechtenstein has used the tier 2 Swiss methodology for its emission estimates in this category for all livestock species, which is consistent with the IPCC tier 2 methodology and in line with the IPCC good practice guidance. The EFs used have been derived from a combination of IPCC default values and Swiss country-specific parameters. The ERT reiterates the recommendation that Liechtenstein provide an explanation in the NIR of its next annual submission, reflecting its national circumstances, of the applicability of Swiss country-specific methodologies and EFs for its estimates.

57. The livestock data are well disaggregated and have been applied across all appropriate categories in line with the IPCC good practice guidance. The complete time series of milk production has not been reported in the NIR or in the CRF tables, nor was it provided to the ERT in response to a question raised during the review. In the NIR, the amount of milk yielded per cow is presented for 1990 and 2007 and the values appear to be higher compared with those which could be estimated from the official agricultural statistics of Liechtenstein. The ERT strongly recommends that Liechtenstein report the time series of milk yield, including the sources for the data, and that the Party explain the differences compared to the official statistics if such differences exist in the next annual submission.

Direct soil emissions – N_2O

58. Estimates of direct N_2O soil emissions have been calculated using the IPCC tier 1b methodology and a combination of Swiss country-specific parameters and IPCC default EFs. The basis for estimating the consumption of mineral fertilizer is unclear, and the assumptions made have not been documented in the NIR. The fractional parameters used have not been reported in the additional information table in CRF table 4.D and were not provided to the ERT in response to a question raised during the review. Although some of the parameters are available in the NIR, it appears that the Party is not aware of this, as it answered that it would try to provide these data, if available, in the next annual submission. As it is not clear how the Party calculated the direct N_2O soil emissions without the use of fractional parameters, the ERT strongly recommends that Liechtenstein report the necessary data in its next annual submission and that it clearly present the procedures used to calculate direct N_2O soil emissions.

Indirect emissions – N_2O

59. As the procedures used to calculate emission estimates in this category are the same as those used to calculate direct N_2O soil emissions from synthetic fertilizers and animal manure applied to soil, the ERT reiterates the recommendations made in paragraph 58 above.

3. Non-key categories

Manure management – N_2O

60. Country-specific methodologies and default EFs were used to estimate N_2O emissions from manure management in animal waste management systems (AWMS), based on the Swiss data. No information is given in the NIR on the AWMS distribution adopted by Liechtenstein, but in response to a question raised by the ERT, the Party explained that Swiss data have been used. Data on the use of different AWMS have not been provided to the ERT, even though they were requested. The ERT estimated those data from the nitrogen (N) excretion rates reported in CRF table 4.B(b) and realized that the AWMS distribution

reported is not the same as that reported in the 2010 submission of Switzerland, but is the same as that reported in Switzerland's 2009 submission. The ERT reiterates the recommendation made in the previous review report that Liechtenstein collect and verify information on the distribution of livestock in different AWMS and, if necessary, update the N_2O emission estimates in its next annual inventory submission.

61. The total quantity of N excreted (calculated as a product of the livestock population number and N excretion factor) is not consistent with the sum of N allocated to different types of manure management systems. The ERT recommends that Liechtenstein correct this in the next annual submission.

E. Land use, land-use change and forestry

1. Sector overview

62. In 2008, net removals from the LULUCF sector amounted to 6.39 Gg CO_2 eq. Since the base year, net removals have decreased by 22.3 per cent. The key driver for the fall in net removals is increased emissions in other land-use categories, particularly wetlands and grassland. Within the sector, there was a removal of 19.14 Gg CO_2 eq from forest land, but emissions were reported for the following categories: 4.57 Gg CO_2 eq from cropland, 3.53 Gg CO_2 eq from settlements, 2.75 Gg CO_2 eq from grassland, and 0.98 Gg CO_2 eq from other land. Wetlands accounted for the remaining 0.92 Gg CO_2 eq.

63. Liechtenstein has carried out an uncertainty analysis of LULUCF for the first time. The ERT commends the Party for responding to the recommendation made in the previous review report that Liechtenstein include LULUCF in its uncertainty analysis. However, the LULUCF chapter in the NIR still states that an uncertainty analysis of LULUCF was not carried out. The ERT recommends that the Party update this chapter to accurately reflect the improvement made and fully describe the category-specific uncertainty analysis.

64. It is not clear whether Liechtenstein has a cyclical system in place for the QA of LULUCF sector estimates. The Party explained to the ERT during the review that there has been periodic exposure to independent review, but a sustainable QA system does not appear to be in place. The ERT encourages Liechtenstein to explore the implementation of more rigid and frequent QA/QC procedures.

65. Liechtenstein has included land-use change matrices for 1990 only rather than for all years of the reported time series. During the centralized review, the Party informed the ERT that it might provide periodic matrices for three years in the next annual submission. The ERT recommends that Liechtenstein provide the complete time series of land matrices in its next annual submission.

66. In response to a recommendation made by the previous ERT, Liechtenstein divided lands into managed and unmanaged for its emission/removal estimates. However, Liechtenstein did not provide in its NIR detailed information on definitions and the national approach used to distinguish between unmanaged and managed land in a transparent manner as suggested by the IPCC good practice guidance for LULUCF. During the review, Liechtenstein provided the ERT with information on the national approach and definitions for managed and unmanaged land. The ERT recommends that Liechtenstein include these descriptions in the NIR of its next annual submission, together with information on how it ensures that land areas once accounted as managed land continue to be tracked as managed land.

67. In the 2008 and 2009 review reports, it was noted that the use of a 12-year interval for calculating annual carbon stock change in soils due to land-use conversion is not consistent with the IPCC good practice guidance for LULUCF. In the 2010 submission,

Liechtenstein has continued to apply the 12-year interval. During the review, the Party informed the ERT that it is investigating whether and how the modification to the 20-year default value can be done. The ERT reiterates the recommendation of the previous ERT on this issue and strongly encourages the Party to use the 20-year default value in its next annual submission.

68. A number of significant inter-annual changes in net carbon stock changes in living biomass, dead organic matter and soils per area have been identified for most land-use categories between 1996 and 1997 and between 2002 and 2003 in the 2009 and 2010 annual submissions. These changes were identified by the previous ERT and Liechtenstein explained that this is due to a change in interpolation parameters between these two groups of years, as the Party used three land-use data sets (aerial photographs for 1984, 1996 and 2002) for its emission estimates in the LULUCF sector. This issue was again raised with the Party during the review, and Liechtenstein informed the ERT that new aerial photographs had been taken in 2008 and 2009, resulting in an update of the land statistics. Based on the new data, the interpolation between 1996 and 2008 will be updated. The ERT recommends that Liechtenstein revisit and refine the interpolation method used in order to ensure a more consistent data series in its next annual submission, including the incorporation of this new data set to improve the interpolated trend.

69. The previous review report raised the issue that certain AD used by the Party had no references for carbon stock change factors and related assumptions. These references were not provided in Liechtenstein's 2010 NIR. The ERT appreciates that the Party provided the missing information during the review week and recommends that Liechtenstein include these data sources, factors and related assumptions in future annual submissions.

2. Key categories

Cropland remaining cropland – CO_2

70. Cropland remaining cropland accounted for a net source of 4.57 Gg CO_2 eq in 2008. Liechtenstein uses a tier 2 methodology, applying Swiss land-use statistics and carbon stock change factors. In the CRF tables, these emissions are reported as occurring from mineral soils. The previous ERT raised the issue of inconsistency between the CRF tables and the NIR regarding the reported emissions from cropland remaining cropland due to the loss of carbon stock in mineral soils. While Liechtenstein reported emissions from this category in the CRF tables, it reported zero emissions in the NIR. As this has not been corrected in the 2010 submission, the ERT reiterates the recommendation that Liechtenstein ensure consistency between the CRF tables and the NIR. During the review, Liechtenstein again informed the ERT that it would correct this inconsistency in its next annual submission. No category-specific recalculations have been carried out.

Grassland remaining grassland – CO_2

71. Grassland remaining grassland accounted for a net source of 1.78 Gg CO_2 eq in 2008. In the CRF tables, these emissions are reported as occurring from mineral soils. Similarly to its 2009 NIR, in its 2010 NIR, Liechtenstein reports that carbon stock changes in mineral soils in this category are not estimated. Liechtenstein again informed the ERT during the review that it would correct this inconsistency in its next annual submission. The ERT reiterates the recommendation that Liechtenstein ensure consistency between the NIR and the CRF tables in this regard.

Land converted to grassland – CO_2

72. Land converted to grassland accounted for a net source of 0.97 Gg CO_2 eq in 2008. In the case of wetlands converted to grassland, Liechtenstein reports that conversion in this

category has led to an increase of 68 Mg C/ha in soil carbon. The ERT reiterates the recommendation from the previous review report that Liechtenstein revisit and check the data used and the calculations made for this category in its next annual inventory submission.

Land converted to settlements – CO_2

73. The assumed rate of loss of soil carbon during the conversion of forest land, cropland and grassland to settlements is between 19 and 44 Mg C/ha. The ERT reiterates the previous ERT's recommendation that Liechtenstein revisit and check the data used and the calculations made for this category in its next annual inventory submission.

F. Waste

1. Sector overview

74. In 2008, emissions from the waste sector amounted to 1.97 Gg CO_2 eq, or 0.7 per cent of total GHG emissions. Since the base year, emissions have increased by 27.1 per cent. According to the NIR, the key driver for the rise in emissions is mostly due to an increase in composting activities (85.7 per cent). Within the sector, 52.1 per cent of the emissions were from wastewater handling, followed by 46.2 per cent from composting, 0.9 per cent from solid waste disposal on land and the remaining 0.7 per cent was from waste incineration.

75. There are no key categories in the waste sector and no recalculations were reported in the 2010 submission. No category-specific improvements are planned for the sector.

2. Non-key categories

Solid waste disposal on land – CH_4

76. CH_4 emissions from solid waste disposal on land amounted to 0.02 Gg CO_2 eq in 2008. The IPCC first order decay method was used to estimate CH_4 from solid waste disposal in unmanaged landfills. There are no managed landfills in Liechtenstein as all municipal solid waste is exported to Switzerland for incineration. The estimates included in the NIR are from Liechtenstein's unmanaged landfill, which was closed in 1974.

Wastewater handling – CH_4 and N_2O

77. Liechtenstein used the IPCC default methodology to estimate N_2O emissions from human sewage, based on a constant value of 36 kg/person/year for protein consumption for the entire time series. The ERT recommends that Liechtenstein use annual country-specific values or data on protein consumption from neighbouring countries with similar circumstances, such as Switzerland, or from the Food and Agriculture Organization of the United Nations Statistical Database (FAOSTAT) in order to improve accuracy in its future annual submissions.

G. Supplementary information required under Article 7, paragraph 1, of the Kyoto Protocol

1. Information on activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol

Overview

78. Liechtenstein has reported information on afforestation and deforestation for 2008 under Article 3, paragraph 3, of the Kyoto Protocol. The Party has not elected any activities under Article 3, paragraph 4, of the Kyoto Protocol. In response to questions raised by the ERT, Liechtenstein submitted revised information on 15 October 2010 on carbon pools. The ERT concludes that this information is in line with the requirement of paragraph 6(e) of the annex to decision 15/CMP.1 Reported removals due to afforestation in 2008 were 11.46 Gg CO_2 eq. Emissions reported from deforestation in 2008 amounted to 3.66 Gg CO_2 eq. In annex II to its NIR, Liechtenstein has reported information in accordance with paragraphs 6–9 of the annex to decision 15/CMP.1. Land subject to afforestation prior to 2002 is determined by aerial photographs, which form the basis of the Party's land-use statistics; these statistics are verified using data from the Forest Register of the Office of Forests, Nature and Land Management. For afforestation since 2003, only the Forest Register data were used.

79. Liechtenstein has provided information that states that afforested areas of land since 1990 have not been subject to harvest since there are no forests with such short rotation lengths. In addition, the Party has provided information that demonstrates that these afforestation events occurred after 1990. Land-use conversions are tracked using the AREA system, which detects the land that was already forest land in 1990 and the land that has since been converted to forest land.

80. In response to the recommendation of the previous ERT that Liechtenstein provide information on how it distinguishes forest disturbance followed by re-establishment from deforestation, the Party stated that its definition of forest covers only permanent deforestation, but the permits used by the Party to track deforestation events are actually contingent upon the re-establishment of forest land at a later date; it therefore appears that the Party may not be adequately distinguishing these categories of forest loss. The ERT recommends that the Party provide information to clearly demonstrate how the lands that were deforested but have since been reforested will be removed from the deforestation estimates reported in future annual submissions.

81. Areas subject to deforestation are determined based on records of permits to deforest. Units of land area reported under deforestation equate to at least 625 m^2.

82. The spatial assessment unit is the entire national territory of Liechtenstein.

83. No anthropogenic GHG emissions have been factored out from the Article 3, paragraph 3, activity reporting.

Activities under Article 3, paragraph 3, of the Kyoto Protocol

Afforestation and reforestation – CO_2

84. In estimating the emissions and removals from afforestation, Liechtenstein used the tier 1 method of the IPCC good practice guidance, and reported only changes in living biomass and soil, while conservatively excluding the litter and dead wood carbon pools, as these are expected to be net sinks under afforestation. Liechtenstein asserts that litter, dead wood and soil, when combined, are not a net source and can therefore be excluded. It is conservative to exclude these pools in the case of afforestation as they are likely to be sinks.

The ERT therefore recommends that Liechtenstein provide an enhanced justification for this exclusion in its next NIR.

85. With regard to the conservative assumption concerning litter and dead wood carbon pools, Liechtenstein submitted revised information on 22 October 2010 that demonstrated that these carbon pools are not net sources of emissions, as afforestation mainly occurs on grassland and, since there is no litter or dead wood on grassland, an increase in these carbon pools is expected after afforestation. The ERT concludes that this conservative assumption satisfies the requirement in paragraph 6(e) of the annex to decision 15/CMP.1.

86. Above-ground biomass (AGB) is reported, whereas below-ground biomass (BGB) is reported as "IE" (included elsewhere). The AGB pool always reflects the total living biomass, as Liechtenstein does not distinguish between AGB and BGB. During the review, the ERT pointed out that this could present a potential underestimation of emissions if harvests subsequently take place on afforested land. However, Liechtenstein submitted revised information to the ERT on 15 October 2010 that supported the validity of this approach.

Deforestation – CO_2

87. With regard to deforestation, Liechtenstein has accounted for losses of carbon in living biomass, litter, dead wood and soil. Assumed loss of soil carbon from deforestation is about 46 Mg C/ha, which is beyond the IPCC default value range, as pointed out by the previous ERT. The ERT recommends that Liechtenstein revisit and check the data used and calculations made for this category.

88. In table 5(KP-I)A.2, the Party reports carbon stock changes in BGB as both "IE" and "NE" (not estimated). The explanation provided in the NIR and to the ERT during the review is that BGB is not accounted individually because total biomass is estimated and the approach used does not allow a disaggregation of AGB and BGB. Given the conflicting notation keys and the lack of a full methodological description, the ERT considered that there is a lack of transparency regarding the reporting of BGB carbon stock changes, and recommends that the Party either provide separate estimates for AGB and BGB or additional information regarding the approach used and the justification for using an approach that does not allow the disaggregation of AGB and BGB.

89. According to KP-LULUCF CRF table 1 in the NIR, all carbon pools are reported. BGB is reported as "IE" and "NE", with the Party describing in the CRF comment field that deforestation results in a 100 per cent loss of AGB and BGB stocks, dead wood and litter. Organic soils are reported as "IE" and "NE", although it is not clear why those notation keys have been used.

2. Information on Kyoto Protocol units

Standard electronic format and reports from the national registry

90. Liechtenstein has reported information on its accounting of Kyoto Protocol units in the required SEF tables, as required by decisions 15/CMP.1 and 14/CMP.1. The ERT took note of the findings and recommendations included in the SIAR on the SEF tables and the SEF comparison report.[5] The SIAR was forwarded to the ERT prior to the review, pursuant to decision 16/CP.10. The ERT reiterated the main findings and recommendations contained in the SIAR.

[5] The SEF comparison report is prepared by the international transaction log (ITL) administrator and provides information on the outcome of the comparison of data contained in the Party's SEF tables with corresponding records contained in the ITL.

91. Information on the accounting of Kyoto units has been prepared and reported in accordance with chapter I.E of the annex to decision 15/CMP.1, and reported in accordance with decision 14/CMP.1 using the SEF tables. This information is consistent with that contained in the national registry and with the records of the international transaction log (ITL) and the clean development mechanism registry and meets the requirements set out in paragraph 88 (a–j) of the annex to decision 22/CMP.1. The transactions of Kyoto Protocol units initiated by the national registry are in accordance with the requirements of the annex to decision 5/CMP.1 and the annex to decision 13/CMP.1. No discrepancy has been identified by the ITL and no non-replacement has occurred. The national registry has adequate procedures in place to minimize discrepancies.

Accounting of activities under Article 3, paragraph 3, of the Kyoto Protocol

92. Liechtenstein has reported information on its accounting of KP-LULUCF in the accounting table, as included in the annex to decision 6/CMP.3. Information on the accounting of KP-LULUCF has been prepared and reported in accordance with decisions 16/CMP.1 and 6/CMP.3.

93. Table 4 shows the accounting quantities for KP-LULUCF as reported by the Party and the final values after the review after Liechtenstein submitted revised accounting for KP-LULUCF on 15 October 2010 in response to a question of the ERT.

Table 4
Accounting quantities for activities under Article 3, paragraph 3, and, if any, activities under Article 3, paragraph 4, of the Kyoto Protocol, in t CO_2 eq

Activity	*Accounting quantity*	
	As reported	*Final*
Afforestation and reforestation	–11 464	–11 879
Deforestation	3 658	3 658
Forest management	NA	NA
Article 3.3 offset[a]	NA	NA
Forest management cap	NA	NA
Cropland management	NA	NA
Grazing land management	NA	NA
Revegetation	NA	NA

[a] Article 3.3 offset: for the first commitment period, a Party included in Annex I that incurs a net source of emissions under the provisions of Article 3, paragraph 3, may account for anthropogenic greenhouse gas (GHG) emissions by sources and removals by sinks in areas under forest management under Article 3, paragraph 4, up to a level that is equal to the net source of emissions under the provisions of Article 3, paragraph 3, but not greater than 9.0 megatonnes of carbon times five, if the total anthropogenic GHG emissions by sources and removals by sinks in the managed forest since 1990 is equal to, or larger than, the net source of emissions incurred under Article 3, paragraph 3.

94. Based on the information provided in table 4, Liechtenstein shall issue 8,221 tonnes of removal units in its national registry.

National registry

95. The ERT took note of the SIAR and its finding that the reported information on the national registry is complete and has been submitted in accordance with the annex to decision 15/CMP.1. The ERT further noted from the SIAR and its finding 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 decisions 16/CP.10 and 12/CMP.1. The national registry also has adequate security, data safeguard and disaster recovery measures in place and its operational performance is adequate.

96. The ERT reiterates the recommendation from the SIAR that the national registry fulfil the requirements regarding the public availability of information in accordance with section II.E of the annex to decision 13/CMP.1. Liechtenstein has not addressed the recommendation of the previous ERT with regard to ensuring the availability of public information required by paragraph 44 of the annex to decision 13/CMP.1 as outlined in section 4 of the SIAR.

Calculation of the commitment period reserve

97. Liechtenstein has reported that its commitment period reserve has not changed since the initial review report (950,061 t CO_2 eq) as it is based on the assigned amount and not on the most recently reviewed inventory. The ERT agrees with this figure.

3. Changes to the national system

98. Liechtenstein reported that there have been no changes in its national system since the previous annual submission. However, the Party states in its NIR that there has been a change in responsibility for the reporting system within the Office of Environmental Protection (section 13, page 217 of the NIR). The ERT concluded that, taking into account the confirmed change in the national system, Liechtenstein's national system continues to be in accordance with the requirements of national systems set out in decision 19/CMP.1.

4. Changes to the national registry

99. Liechtenstein reported that there have been no changes in its national registry since the previous annual submission. The ERT noted that this was confirmed in the SIAR. The ERT concluded that the Party'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, and continues to adhere to the technical standards for data exchange between registry systems in accordance with relevant CMP decisions.

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

100. Liechtenstein has reported information on the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol, as requested in chapter I.H of the annex to decision 15/CMP.1, in its 2010 annual submission.

101. The reported information is considered generally complete and transparent. Liechtenstein reports that the tax exemption in Liechtenstein for biofuels is limited to fuels that meet ecological and social criteria. The conditions are set out in such a way that biofuels do not compete with food production and are not causing the degradation of rainforests or other valuable ecosystems. In response to a question raised by the ERT during the review, Liechtenstein provided additional information on its foreign policy, including the protection and promotion of human rights and international humanitarian cooperation and development. All the laws in Liechtenstein are checked to ensure compliance with these principles.

102. The ERT encourages Liechtenstein, if it is in position to do so, to improve its reporting on how it gives priority, in implementing its commitments under Article 3, paragraph 14, to the actions listed in paragraph 24 of the annex to decision 15/CMP.1.

III. Conclusions and recommendations

103. Liechtenstein made its annual submission on 15 April 2010. The annual submission contains the GHG inventory (comprising CRF tables and an NIR) and supplementary information under Article 7, paragraph 1, of the Kyoto Protocol (information on: activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, Kyoto Protocol units, and changes to the national system and the national registry and minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol). This is in line with decision 15/CMP.1.

104. The ERT concludes that the inventory submission of Liechtenstein has been prepared and reported in accordance with the UNFCCC reporting guidelines. The inventory submission is complete and the Party has submitted a complete set of CRF tables for the years 1990–2008 and an NIR; these are complete in terms of geographical coverage, years and sectors, as well as complete in terms of categories and gases.

105. The submission of information required under Article 7, paragraph 1, of the Kyoto Protocol has been prepared and reported in accordance with decision 15/CMP.1. Liechtenstein submitted mandatory information to the ERT during the course of the review that was not included in the annual inventory submission on the coverage of carbon pools as required by paragraph 8(a) of the annex to decision 15/CMP.1.

106. The Party's inventory is generally in line with the UNFCCC reporting guidelines, the Revised 1996 IPCC Guidelines, the IPCC good practice guidance and the IPCC good practice guidance for LULUCF. However, Liechtenstein draws heavily on the methodological choices made by the Swiss national inventory team. The ERT noted that the Party does not always provide a rationale to explain why these choices are also valid for Liechtenstein.

107. Liechtenstein has reported afforestation and deforestation for 2008 under Article 3, paragraph 3, of the Kyoto Protocol. It has not elected any activities under Article 3, paragraph 4, of the Kyoto Protocol.

108. Liechtenstein has reported information on its accounting of Kyoto Protocol units in accordance with chapter I.E of the annex to decision 15/CMP.1, and used the required reporting format tables as required by decision 14/CMP.1.

109. The national system continues to perform its required functions as set out in the annex to decision 19/CMP.1.

110. 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 CMP decisions. However, the ERT identified that the Party did not address the recommendation contained in the previous annual review report in relation to publicly available information.

111. Liechtenstein has reported the information requested in chapter I.H of the annex to decision 15/CMP.1, "Minimization of adverse impacts in accordance with Article 3, paragraph 14", as part of its 2010 annual submission. The information was provided on 15 April 2010 and is complete and transparent.

112. In the course of the review, the ERT formulated a number of recommendations relating to the transparency of the information presented in Liechtenstein's annual submission. The key recommendations are that Liechtenstein:

(a) Continue to develop country-specific capacity for inventory planning and preparation;

(b) Improve the transparency of the inventory, especially in the agriculture and LULUCF chapters;

(c) Use key category and uncertainty analyses for methodological choices and the prioritization of inventory improvements;

(d) Report in its next annual submission information submitted to the ERT during the course of the review in relation to KP-LULUCF (e.g. reporting of carbon pools);

(e) Report in its next annual submission uncertainty estimates for the KP-LULUCF inventory;

(f) Create and implement a QA/QC management system;

(g) Ensure that the national registry addresses the requirement for publicly available information.

IV. Questions of implementation

113. No questions of implementation were identified by the ERT during the review.

Annex I

Documents and information used during the review

A. Reference documents

Intergovernmental Panel on Climate Change. *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*. Available at <http://www.ipcc-nggip.iges.or.jp/public/gl/invs1.htm>.

Intergovernmental Panel on Climate Change. *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*. Available at <http://www.ipcc-nggip.iges.or.jp/public/gp/english/>.

Intergovernmental Panel on Climate Change. *Good Practice Guidance for Land Use, Land-Use Change and Forestry*. Available at <http://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf.htm>.

"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/SBSTA/2006/9. Available at <http://unfccc.int/resource/docs/2006/sbsta/eng/09.pdf>.

"Guidelines for the technical review of greenhouse gas inventories from Parties included in Annex I to the Convention". FCCC/CP/2002/8. Available at <http://unfccc.int/resource/docs/cop8/08.pdf>.

"Guidelines for national systems under Article 5, paragraph 1, of the Kyoto Protocol". Decision 19/CMP.1. Available at <http://unfccc.int/resource/docs/2005/cmp1/eng/08a03.pdf# page=14>.

"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>.

Status report for Liechtenstein 2010. Available at <http://unfccc.int/resource/docs/2008/asr/lie.pdf>.

Synthesis and assessment report on the greenhouse gas inventories submitted in 2010. Available at <http://unfccc.int/resource/webdocs/sai/2010.pdf>.

FCCC/ARR/2009/LIE. Report of the individual review of the greenhouse gas inventory of Liechtenstein submitted in 2009. Available at <http://unfccc.int/resource/docs/2009/arr/LIE.pdf>.

UNFCCC. *Standard Independent Assessment Report*, Parts I and II. Available at <http://unfccc.int/kyoto_protocol/registry_systems/independent_assessment_reports/items/4061.php>.

B. Additional information provided by the Party

Responses to questions during the review were received from Mr. Patrick Insinna (Office of Environmental Protection), including additional material on the methodologies and assumptions used.

Annex II

Acronyms and abbreviations

AD	activity data
AGB	above-ground biomass
AWMS	animal waste management system
BGB	below-ground biomass
CH_4	methane
CO_2	carbon dioxide
CO_2 eq	carbon dioxide equivalent
CRF	common reporting format
EF	emission factor
ERT	expert review team
GEI	gross energy intake
GHG	greenhouse gas; unless indicated otherwise, GHG emissions are the sum of CO_2, CH_4, N_2O, HFCs, PFCs and SF_6 without GHG emissions and removals from LULUCF
HFC	hydrofluorocarbons
IE	included elsewhere
IEF	implied emission factor
IPCC	Intergovernmental Panel on Climate Change
ITL	international transaction log
kg	kilogram (1 kg = 1,000 grams)
KP-LULUCF	land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol
LULUCF	land use, land-use change and forestry
Mg	megagram (1 Mg = 1 tonne)
N	nitrogen
NA	not applicable
NE	not estimated
N_2O	nitrous oxide
NIR	national inventory report
NO	not occurring
PFC	perfluorocarbons
QA/QC	quality assurance/quality control
SEF	standard electronic format
SF_6	sulphur hexafluoride
SIAR	standard independent assessment report
UNFCCC	United Nations Framework Convention on Climate Change