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Report on the individual review of the annual submission of Liechtenstein submitted in 2016*

Note by the expert review team

Summary

Each Party included in Annex I to the Convention must submit an annual greenhouse gas (GHG) inventory covering emissions and removals of GHG emissions for all years from the base year (or period) to two years before the inventory due date (decision 24/CP.19). Parties included in Annex I to the Convention that are Parties to the Kyoto Protocol are also required to report supplementary information required under Article 7, paragraph 1, of the Kyoto Protocol, with the inventory submission due under the Convention. This report presents the results of the individual inventory review of the 2016 annual submission of Liechtenstein, conducted by an expert review team in accordance with the “Guidelines for review under Article 8 of the Kyoto Protocol.” The review took place from 26 September to 1 October 2016 in Bonn, Germany.

* In the symbol for this document, 2016 refers to the year in which the inventory was submitted, not to the year of publication.

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I. Introduction¹

1. This report covers the review of the 2016 annual submission of Liechtenstein organized by the UNFCCC secretariat, in accordance with the “Guidelines for review under Article 8 of the Kyoto Protocol” (decision 22/CMP.1, as revised by decision 4/CMP.11) (hereinafter referred to as the Article 8 review guidelines). As indicated in the Article 8 review guidelines, this review process also encompasses the review under the Convention, as described in the “Guidelines for the technical review of information reported under the Convention related to greenhouse gas inventories, biennial reports and national communications by Parties included in Annex I to the Convention” (hereinafter referred to as the UNFCCC review guidelines) and particularly part III, “UNFCCC guidelines for the technical review of greenhouse gas inventories from Parties included in Annex I to the Convention”. The review took place from 26 September to 1 October 2016 in Bonn, Germany, and was coordinated by Mr. Nalin Srivastava and Mr. Jongikhaya Witi (UNFCCC secretariat). Table 1 provides information on the composition of the expert review team (ERT) that conducted the review of Liechtenstein.

Table 1

Composition of the expert review team that conducted the review of Liechtenstein

<i>Area of expertise</i>	<i>Name</i>	<i>Party</i>
Generalist	Mr. Manfred Ritter	Austria
	Ms. Melissa Weitz	United States of America
Energy	Ms. Kristien Aernouts	Belgium
	Mr. Constantin Harjeu	Romania
	Ms. Lungile Glodine Manzini	South Africa
	Mr. Vishwa Bandhu Pant	India
	Mr. Steve Smyth	Canada
IPPU	Mr. Thapelo Clifford Mohale Letete	South Africa
	Ms. Ingrid Person Rocha e Pinho	Brazil
Agriculture	Mr. Jorge Lam Alvarez	Peru
	Mr. Kingsley Kwako Amoako	Ghana
	Ms. Yue Li	China
LULUCF	Ms. Sekai Ngarize	Zimbabwe
	Mr. Walter Oyhantcabal	Uruguay
	Mr. Atsushi Sato	Japan
Waste	Ms. Fatma Betül Demirok	Turkey

¹ At the time of publication of this report, Liechtenstein had submitted its instrument of ratification of the Doha Amendment; however, the amendment had not yet entered into force. The implementation of the provisions of the Doha Amendment is therefore considered in this report in the context of decision 1/CMP.8, paragraph 6, pending the entry into force of the amendment.

<i>Area of expertise</i>	<i>Name</i>	<i>Party</i>
	Mr. Excellent Hachileka	Zambia
	Mr. Hans Oonk	Netherlands
Lead reviewers	Mr. Vishwa Pant	
	Ms. Weitz	

Abbreviations: IPPU = industrial processes and product use, LULUCF = land use, land-use change and forestry.

2. This report contains findings based on the assessment by the ERT of the 2016 annual submission against the Article 8 review guidelines. The ERT has made recommendations to resolve those findings related to issues,² including issues related to problems.³ Other findings, and if applicable, the ERT’s encouragements to resolve them, are also included.

3. 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.

4. Annex I shows annual greenhouse gas emissions for Liechtenstein, including totals excluding and including the land use, land-use change and forestry sector, indirect carbon dioxide emissions and emissions by gas and by sector. Annex I also contains background data related to emissions and removals from activities under Article 3, paragraph 3, forest management under Article 3, paragraph 4, and additional activities under Article 3, paragraph 4, of the Kyoto Protocol, if elected, by gas, sector and activity for Liechtenstein.

5. Information to be included in the compilation and accounting database can be found in annex II.

6. The ERT notes that Liechtenstein’s 2015 annual submission was delayed, consistent with decision 6/CMP.9, paragraph 4. As a result, the review of the 2016 annual submission is being held in conjunction with the review of the 2015 annual submission, in accordance with decision 10/CMP.11, paragraph 1. To the extent that identical information is presented in both annual submissions, the ERT has reviewed this information only once, and, as appropriate, has replicated the findings below in both the 2015 and the 2016 annual review reports.

II. Summary and general assessment of the 2016 annual submission

7. Table 2 provides the ERT assessment of the annual submission with respect to the tasks undertaken during the review. Further information on the issues identified, as well as additional findings, may be found in tables 3 and 5 below.

² Issues are defined in decision 13/CP.20, annex, paragraph 81.

³ Problems are defined in decision 22/CMP.1, annex, paragraphs 68 and 69, as revised by decision 4/CMP.11.

Table 2
Summary of review results and general assessment of the inventory of Liechtenstein

<i>Assessment</i>		<i>Issue or problem ID#(s) in tables 3 and/or 5^a</i>	
Dates of submission	Original submission: 27 May 2016 (NIR), 15 April 2016, Version 5 (CRF tables), 5 August 2016 (SEF tables) Revised submission: 14 November 2016, version 7 (CRF tables) The values from the latest submission are used in this report		
Review format	Centralized		
Application of the requirements of the UNFCCC Annex I inventory reporting guidelines and Wetlands Supplement (if applicable)	Have any issues been identified in the following areas:		
	Identification of key categories	No	
	Selection and use of methodologies and assumptions	Yes	E.16, W.6, KL.3
	Development and selection of emission factors	Yes	W.6
	Collection and selection of activity data	No	
	Reporting of recalculations	Yes	I.3
	Reporting of a consistent time series	Yes	E.3, E.17, L.10
	Reporting of uncertainties, including methodologies	Yes	W.2
	QA/QC	QA/QC procedures were assessed in the context of the national system (see below)	
	Missing categories/completeness ^b	Yes	E.15
	Application of corrections to the inventory	No	
Significance threshold	For categories reported as insignificant, has the Party provided sufficient information showing that the likely level of emissions meets the criteria in paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines?	Yes	
Description of trends	Did the ERT conclude that the description in the NIR of the trends for the different gases and sectors is reasonable?	Yes	
Supplementary information under the Kyoto Protocol	Have any issues been identified in the following areas:		
	1. National system:		
	(a) The overall organization of the national system, including the effectiveness and reliability of the institutional, procedural and legal arrangements	No	
	(b) Performance of the national system functions	Yes	KL.3
	2. National registry:		
	(a) Overall functioning of the national registry	No	

<i>Assessment</i>	<i>Issue or problem ID#(s) in tables 3 and/or 5^a</i>
(b) Performance of the functions of the national registry and the technical standards for data exchange	Yes G.10
3. ERUs, CERs, AAUs and RMUs and on information on discrepancies reported in accordance with decision 15/CMP.1, annex, chapter I.E, taking into consideration any findings or recommendations contained in the SIAR	No
4. Matters related to Article 3, paragraph 14, of the Kyoto Protocol, specifically problems related to the transparency, completeness or timeliness of reporting on the Party's activities related to the priority actions listed in decision 15/CMP.1, annex, paragraph 24, including any changes since the previous annual submission	Yes G.4, G.5
5. LULUCF activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol:	
(a) Reporting in accordance with the requirements of decision 2/CMP.8, annex II, paragraphs 1–5	No
(b) The Party has demonstrated methodological consistency between the reference level and reporting on forest management in accordance with decision 2/CMP.7, annex, paragraph 14	No
(c) The Party has reported information in accordance with decision 6/CMP.9	No
(d) Country-specific information has been reported to support provisions for natural disturbances, in accordance with decision 2/CMP.7, annex, paragraphs 33 and 34	No
(e) Other issues	No
CPR Was the CPR reported in accordance with the annex to decision 18/CP.7, the annex to decision 11/CMP.1 and decision 1/CMP.8, paragraph 18?	Yes
Adjustments Has the ERT applied an adjustment under Article 5, paragraph 2, of the Kyoto Protocol?	No
The ERT accepts that the revised estimates submitted by Liechtenstein in its 2016 submission can replace a previously applied adjustment in the compilation and accounting database	NA
Response from the Party during the review Has the Party provided the ERT with responses to the questions raised, including the data and information necessary for the assessment of conformity with the UNFCCC Annex I inventory reporting guidelines and any further guidance adopted by the Conference of the Parties?	Yes
Recommendation for an exceptional On the basis of the issues identified, does the ERT recommend that the next review be conducted as an in-	No

Assessment	Issue or problem ID#(s) in tables 3 and/or 5 ^a
in-country review country review?	
Questions of implementation	Did the ERT list a question of implementation? No

Abbreviations: AAU = assigned amount unit, CER = certified emission reduction, CPR = commitment period reserve, CRF = common reporting format, ERT = expert review team, ERU = emission reduction unit, LULUCF = land use, land-use change and forestry, NA = not applicable, NIR = national inventory report, QA/QC = quality assurance/quality control, RMU = removal unit, SEF = standard electronic format, SIAR = standard independent assessment report, UNFCCC Annex I inventory reporting guidelines = “Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual greenhouse gas inventories”, Wetlands Supplement = 2013 Supplement to the 2006 Intergovernmental Panel on Climate Change Guidelines for National Greenhouse Gas Inventories: Wetlands.

^a The ERT identified additional issues in the LULUCF and waste sectors that are not specifically listed in table 2 but are included in table 3 and/or 5.

^b Missing categories, for which methods are provided in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, may affect completeness and are listed in annex III to this document.

III. Status of implementation of issues and/or problems raised in the previous review report

8. Table 3 compiles all the recommendations made in the previous review report. Owing to the unique circumstances of the 2015 annual submission described in paragraph 6 above, the latest available review report was for the review of the 2014 annual submission, published on 13 April 2015. For each issue and/or problem, the ERT specified whether it believes the issue and/or problem has been resolved by the conclusion of the review of the 2016 annual submission and provided the rationale for its determination, taking into consideration the publication date of the previous review report and national circumstances.

Table 3
Status of implementation of issues and/or problems raised in the previous review report of Liechtenstein

ID#	Issue and/or problem classification ^{a, b}	Recommendation made in previous review report ^c	ERT assessment and rationale
General			
G.1	QA/QC and verification (12, 2014) Transparency	Include the findings of the implemented QA/QC reviews in the NIR	Resolved. The current submission (NIR chapter 1.2.3.1) includes comprehensive information on the internal reviews (performed by the Swiss inventory team) carried out as part of the Swiss internal inventory review process and how they affect Liechtenstein’s inventory (p.30; annex A8.3)
G.2	Inventory planning (14, 2014) (11, 2013) Transparency	Revise the improvement development plan by including all the recommendations made in previous review reports, together with transparent information on how each recommendation was	Resolved. Liechtenstein’s improvement plan (and NIR annex A8.3) now includes a list of all previous

ID#	Issue and/or problem classification ^{a, b}	Recommendation made in previous review report ^c	ERT assessment and rationale
		taken into consideration and its intended implementation date	recommendations and their status (annex 8) (see also ID#s G.6 and G.7 in table 5)
G.3	Key category analysis (17, 2014) Adherence to UNFCCC Annex I inventory reporting guidelines	Consistently apply the approach set out in the IPCC <i>Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories</i>	Resolved. In the current submission, the key category analysis has been carried out based on CRF table 7, which is automatically filled with values derived from the IPCC Approach 1 methodology (NIR, p.45). An Approach 2 assessment has not been carried out
G.4	Article 3, paragraph 14, of the Kyoto Protocol (115, 2014) Transparency*	Include in the NIR information on how priority is given to the actions listed in decision 15/CMP.1, annex, paragraph 24(a) and (b), in implementing commitments under Article 3, paragraph 1, of the Kyoto Protocol	Not resolved. Liechtenstein stated during the review that this recommendation would be considered in the next submission
G.5	Article 3, paragraph 14, of the Kyoto Protocol (116, 2014) Transparency*	Report any changes in the information provided under Article 3, paragraph 14, of the Kyoto Protocol, in accordance with decision 15/CMP.1, annex, chapter I.H	Not resolved. Liechtenstein stated during the review that there was nothing to report as there had been no changes since the last submission
Energy			
E.1	General (energy sector) (26, 2014) (21, 2013) Adherence to UNFCCC Annex I inventory reporting guidelines	Implement additional QC procedures in order to avoid errors in as well as discrepancies between the CRF tables and the NIR	Resolved. The previous ERT noted some discrepancies in the previous submission in the share of emissions from international aviation between CRF table 1.C and the NIR; for example, for 2001, CRF table 1.C reported the share as 86.2 per cent while the NIR reported it as 84.0 per cent, and for 2002, CRF table 1.C reported 84.3 per cent while the NIR reported 86.0 per cent. In the current submission, Liechtenstein corrected the discrepancies between CRF table 1.D and the NIR related to the share of emissions from international aviation. The ERT commends the Party for addressing this issue through the implementation of proper QC

ID#	Issue and/or problem classification ^{a, b}	Recommendation made in previous review report ^c	ERT assessment and rationale
E.2	International bunkers and multilateral operations – liquid fuels (jet kerosene) – CO ₂ , CH ₄ and N ₂ O (31, 2014) Accuracy*	Determine the shares of domestic and international aviation for the years of the 2003–2011 period based on data collected in 2002 and 2012 in a similar manner to the approach used for the period 1996–2000 (i.e. interpolation based on data available for 1995 and 2001)	procedures Not resolved. In the current submission, Liechtenstein assumed the fuel consumption for 1990 to 1994 to be constant, and equal to the 1995 value (a share of 15 per cent for domestic aviation) owing to missing data and implying that no splicing technique had been used to ensure AD time-series consistency
E.3	International bunkers and multilateral operations – liquid fuels (jet kerosene) – CO ₂ , CH ₄ and N ₂ O (32, 2014) Consistency*	Correct the values reported in the NIR for the share of emissions from international aviation and improve the QC procedures so as to minimize discrepancies between the CRF tables and the NIR	Not resolved. For the current submission Liechtenstein assumed a share of 15 per cent fuel consumption for domestic aviation in the NIR, yet in CRF table 1.D the share was reported as 5 per cent
E.4	Feedstocks, reductants and other NEU of fuels – liquid fuels (lubricants and bitumen) – CO ₂ (33, 2014) (27, 2013) (36, 2012) Completeness*	Report lubricants and bitumen use in CRF tables 1.A(b) and 1.A(d) for the entire time series, including lubricants used for two-stroke engines	Not resolved. Liechtenstein has not accounted for emissions associated with the use of lubricants and bitumen for the entire time series. See also ID#E.15 in table 5
E.5	1.A.1.a Public electricity and heat production – liquid and gaseous fuels – CO ₂ , CH ₄ and N ₂ O (35, 2014) Transparency	Incorporate in the NIR all the information provided during the review in order to improve the transparency of the description of the sources for electricity production and the trend of natural gas use in Liechtenstein	Resolved. Liechtenstein provided in the NIR (p.83) a comprehensive description of the sources for electricity production. In 2014, natural gas accounted for 85 per cent of public electricity and 5 per cent of heat fuel consumption. The ERT commends the Party for transparently reporting the sources of emissions related to electricity generation
E.6	1.A.2 Manufacturing Industries and Construction – all fuels – CO ₂ , CH ₄ and N ₂ O (37, 2014) Transparency	Update the description of the allocation of fuel consumption and emissions in the NIR	Resolved. Liechtenstein provided in the NIR (p.86) a clear description of the allocation of fuel consumption for the category manufacturing industries and construction (1.A.2). Fuel

<i>ID#</i>	<i>Issue and/or problem classification^{a, b}</i>	<i>Recommendation made in previous review report^c</i>	<i>ERT assessment and rationale</i>
			consumption in this category was allocated between food processing, beverages and tobacco (1.A.2.e) and other – non-road machinery (1.A.2.g)
E.7	1.A.2 Manufacturing Industries and Construction – all fuels – CO ₂ , CH ₄ and N ₂ O (39, 2014) Transparency	Improve the transparency of the NIR and its consistency with the CRF tables	Resolved. See ID#E.6 above
E.8	1.A.2.e Food processing, beverages and tobacco – liquid and gaseous fuels – CO ₂ , CH ₄ and N ₂ O (41, 2014) Transparency*	Review the confidentiality of the emission estimates and AD of the two operators in order to be able to report information in the category food processing, beverages and tobacco for the period 2008–2012	Not resolved. Based on the information in the NIR (p.84), Liechtenstein still has not been able to access and include the confidential information from the two operators
E.9	1.A.2.e Food processing, beverages and tobacco – liquid and gaseous fuels – CO ₂ , CH ₄ and N ₂ O (41, 2014) (39, 2012) Accuracy	Implement the reallocation of emissions from liquid and gaseous fuels from the category other (manufacturing industries and construction) to the category food processing, beverages and tobacco for the applicable years in the entire time series	Resolved. See ID#E.6 above
E.10	1.A.3.b Road transportation – biomass – CO ₂ (44, 2014) Consistency*	Revise the information contained in the NIR to clarify that CO ₂ emissions from biofuels used in road transportation for the years 2007–2009 are not reported under memo items but under 1.A.3.b consistent with the information reported in the CRF tables	Not resolved. The NIR still states that CO ₂ emissions from biofuels used in road transportation are reported under the memo item “biomass”
E.11	1.A.3.e Other transportation – liquid fuels – CO ₂ , CH ₄ and N ₂ O (47, 2014) Transparency*	Include the information in the NIR that neither fuel consumption by equipment supporting the pipeline transportation activities of natural gas nor ground activities in airports occur in Liechtenstein	Not resolved. Liechtenstein reported other (fuel combustion activities) (1.A.5) as “NO”; however, the Party did not include in the NIR an explanation that neither fuel consumption by equipment supporting the pipeline transportation activities of natural gas nor ground activities in airports occur in the country
E.12	1.A.5 Other (fuel combustion activities) – liquid fuels – CO ₂ ,	Report emissions from military activities as “NO” and include the explanation that there are no	Resolved. Liechtenstein reported other (fuel combustion activities) (1.A.5)

ID#	Issue and/or problem classification ^{a, b}	Recommendation made in previous review report ^c	ERT assessment and rationale
	CH ₄ and N ₂ O (38, 2014) Transparency*	military activities in the country	as “NO” and stated in the NIR (p.59) that Liechtenstein has no army
E.13	1.B.2.b Natural gas – CH ₄ (50, 2014) Transparency*	Explain in detail the methodology for estimating emissions, and provide and reference in the NIR all the AD and parameters used	Not resolved. While Liechtenstein included additional information used to estimate emissions from gas transmission (1.B.2.b.4) in the NIR (p.105), the complete set of parameters used to estimate emissions for gas distribution (1.B.2.b.5) is not present, including the parameters used for network maintenance, components and end-user losses
E.14	1.B.2.b Natural gas – CH ₄ (50, 2014) Not an issue	Report the CH ₄ emissions from natural gas distribution activities separately from the CH ₄ emissions from other leakage of natural gas activities (losses at the services end user)	No longer relevant. The 2006 IPCC Guidelines do not require separate reporting of fugitive emissions from natural gas distribution activities and CH ₄ emissions from other leakage of natural gas activities. This was a requirement of the <i>Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories</i>
IPPU			
I.1	2.F.1 Refrigeration and air conditioning – HFCs (53, 2014) Accuracy	In order to reduce overestimation of emissions and avoid double counting of emissions from Liechtenstein and Switzerland, exclude the emissions from manufacture and disposal of refrigeration and air-conditioning equipment from the estimates, and assess how the accuracy of the estimation of emissions from disposal can be improved to avoid overestimating them	Resolved. In accordance with decision 13/CP.20, annex, paragraph 73, Liechtenstein argued that the effort required for the collection and analysis of the relevant data would be disproportionate to the impact on accuracy, given the category’s minor contribution to the total national GHG emissions. Because the Party’s approach is a conservative one of overestimating emissions, the ERT did not make any further encouragements
I.2	2.F.1 Refrigeration and air conditioning –	Include in the NIR the reasons for the stagnation of HFC-134a emissions between 2004 and 2006	Resolved. An explanation was included in the NIR (p.109)

<i>ID#</i>	<i>Issue and/or problem classification^{a, b}</i>	<i>Recommendation made in previous review report^c</i>	<i>ERT assessment and rationale</i>
	HFCs (55, 2014) Transparency		
Agriculture			
A.1	3. General (agriculture) (62, 2014) Accuracy	Include the comparison analysis of national and other data sources in the QC checklist and report on the results on an annual basis	Resolved. In the 2016 submission, Liechtenstein included in the NIR (chapter 5) a reference to the relevant study documenting how national data and international data, particularly from Switzerland, have been used for the agriculture sector ^d
A.2	3.A Enteric fermentation and 3.B Manure management (61, 2014) Transparency*	Include in the NIR relevant information on country-specific CH ₄ EFs as well as values for volatile solids excreted per animal subcategory for the categories enteric fermentation and manure management	Not resolved. Liechtenstein in the NIR reported only on the use of the information but not the values used in the estimations
A.3	3.A Enteric fermentation – CH ₄ (69, 2014) Transparency	Replace the notation key “NE” in CRF table 4.B(a) with the values reported in CRF table 4.A	Resolved. Liechtenstein has reported typical animal weight in CRF table 3.As2 and CRF table 3.B(a)s1
A.4	3.A Enteric fermentation – CH ₄ (69, 2014) Transparency*	Improve QC procedures to ensure the consistency of the information provided in the CRF tables	Not resolved. Errors still exist in the CRF tables (see ID#A.6 below and ID#s A.15 and A.16 in table 5)
A.5	3.A.1 Cattle – CH ₄ (64, 2014) (49, 2013) Transparency	Include in the NIR a table with all the parameters used to calculate gross energy intake for cattle	Resolved. Liechtenstein reported the relevant information in the NIR (pp.128 and 129)
A.6	3.A.1 Cattle – CH ₄ (65, 2014) Transparency*	Replace notation keys with numerical data in the additional information table, where appropriate, or justify the use of notation keys in a footnote or the documentation box to CRF table 4.A	Not resolved. Liechtenstein has not replaced the notation keys with values for the parameters contained in CRF table 3.As2 and has not justified the use of notation keys in a footnote or the documentation box to this CRF table
A.7	3.A.1 Cattle – CH ₄ (66, 2014) Transparency	Include information explaining the methane conversion rate used for cattle in the NIR and in the documentation box to CRF table 4.A	Resolved. Liechtenstein reported the relevant information in the NIR (p.131) and in CRF table 3.B(a)s2

<i>ID#</i>	<i>Issue and/or problem classification^{a, b}</i>	<i>Recommendation made in previous review report^c</i>	<i>ERT assessment and rationale</i>
A.8	3.B Manure management – CH ₄ and N ₂ O (63, 2014) (57, 2013) Not an issue	Include in the next NIR detailed explanatory information on why “animal place” is used to calculate N ₂ O emissions and the estimation of Nex instead of animal head numbers	No longer relevant. Liechtenstein has applied country-specific AD and methodologies in accordance with the 2006 IPCC Guidelines to calculate CH ₄ and N ₂ O emissions from manure management and the calculation of Nex and the new methodologies do not use “animal place”
A.9	3.B Manure management – CH ₄ and N ₂ O (68, 2014) (64, 2013) Not an issue	Investigate the possibility of gathering country-specific AWMS data	Resolved. The ERT considers, based on information provided by Liechtenstein during the review, the use of the AWMS data of Switzerland is appropriate because of the Parties’ similar national circumstances
A.10	3.B Manure management – CH ₄ and N ₂ O (70, 2014) Transparency	Report the fraction of manure management systems that do not occur in Liechtenstein as “NO” rather than zero in CRF table 4.B(a)	Resolved. Liechtenstein reported the notation key “NO” rather than the value zero
A.11	3.B.1 Cattle – CH ₄ and N ₂ O (68, 2014) Not an issue	Provide in the NIR an explanation for methodological changes associated with changes in EFs and Nex values as well as an estimation of N ₂ O emissions from manure management and agricultural soils	No longer relevant. For the current submission Liechtenstein used new information based on country-specific EFs, default EFs and the 2006 IPCC Guidelines
A.12	3.D.a Direct N ₂ O emissions from managed soils – CH ₄ and N ₂ O (71, 2014) Transparency*	Include in the NIR information about factors that influenced the sharp increase of emissions from nitrogen-fixing crops in 2011	Addressing. During the review, Liechtenstein indicated that because of the small number of farms in Liechtenstein, changes in management on single farms can have a large impact on the agricultural statistics (e.g. crop cultures, livestock populations). For example, leguminous vegetable areas decreased from 15 ha to 9 ha between 2011 and 2012, which was the result of changes on a single farm
A.13	3.D.a.2.b Sewage sludge applied to	Refer, in the NIR, to the legislation that prohibits the use of sewage sludge as fertilizer	Resolved. Liechtenstein included the required

<i>ID#</i>	<i>Issue and/or problem classification^{a, b}</i>	<i>Recommendation made in previous review report^c</i>	<i>ERT assessment and rationale</i>
	soils – N ₂ O (72, 2014) Transparency		information in annex 6 to the NIR
A.14	3.F Field burning of agricultural residues – CH ₄ and N ₂ O (73, 2014) Transparency	Report AD and emissions as “NO” and the implied emission factor as “NA” in CRF table 4.F	Resolved. Liechtenstein reported the correct notation keys for AD and emissions in this category
LULUCF			
L.1	4. General (LULUCF) (77, 2014) Transparency*	Improve the descriptions of the methodology for estimating uncertainties and the reporting of the uncertainty values in the NIR	Addressing. During the review, Liechtenstein indicated that in the NIR, uncertainties were updated by adopting more recent values from Switzerland (2016 annual greenhouse gas inventory submission) and by new expert judgment (NIR, chapters 6.4.3, 6.5.3 and 6.6.3). For non-key categories, mean uncertainties were used in the simplified uncertainty analysis (NIR, chapter 1.6.1) (see also ID#L.13 in table 5)
L.2	4. General (LULUCF) – CO ₂ (78, 2014) (68, 2013) Transparency*	Continue to develop the land area identification system in order to obtain accurate data, or validate data calculated by extrapolation	Addressing. The ERT noted that Liechtenstein reported in the NIR (chapter 6.2) that it will use the new AREA survey for the 2017 or 2018 submission to update land use and land-use change matrices after 2009 (see also ID#L.12 in table 5)
L.3	4.A.1 Forest land remaining forest land – CO ₂ (78, 2014) (68, 2013) Transparency	Use data from the most recent Swiss national forest inventory, after checking that these data are applicable to the circumstances in Liechtenstein, or collect additional country-specific data to estimate gross biomass growth including harvest and mortality	Resolved. In the 2016 submission, country-specific data from Liechtenstein's national forest inventory ^e were used for growth, cut and mortality
L.4	4.A.1 Forest land remaining forest land – CO ₂ (79, 2014) (70, 2013) Transparency	Use data from the most recent Swiss national forest inventory, which may be more relevant for making accurate estimations for the most recent periods, or collect additional country-specific data, and report on the methodology used for estimating carbon stock changes in the deadwood pool	Resolved. Liechtenstein used country-specific data from the Swiss national forest inventory ^f to estimate carbon stock changes in the deadwood pool (see NIR, table 6.4, for the data, and

<i>ID#</i>	<i>Issue and/or problem classification^{a, b}</i>	<i>Recommendation made in previous review report^c</i>	<i>ERT assessment and rationale</i>
			chapter 6.4.2 for the methodology)
L.5	4.A.1 Forest land remaining forest land – CO ₂ (80, 2014) Accuracy	Provide an explanation in the NIR that the wood density values used are basic density values with a unit of t dry biomass/m ³ wood	Resolved. Liechtenstein provided an explanation in the NIR (chapter 6.4.2.2) that the reported values used to estimate carbon stock changes in forest biomass were indeed basic wood density values (i.e. mass of dry biomass per volume of wood)
L.6	4.A.2 Land converted to forest land – CO ₂ (81, 2014) Transparency	Improve the description of the methodology for estimating CO ₂ emissions from land converted to forest land	Resolved. Liechtenstein included in the NIR (table 6-13) information on how harvests and mortality were numerically taken into account in the stock values for land converted to forest land. During the review, the Party indicated that carbon stocks and gains on afforestation were updated with new results from the Swiss national forest inventory ^g (NIR, table 6-13)
L.7	4.A.2 Land converted to forest land – CO ₂ (82, 2014) Transparency	Improve, in the NIR, the description of the methodology for estimating carbon stock changes in mineral and organic soils in land converted to forest land	Resolved. Liechtenstein provided a description of the methodology used to estimate carbon stock changes in mineral and organic soils in land converted to forest land in the NIR (chapter 6.4.2.9)
L.8	4.A.2 Land converted to forest land – CO ₂ (83, 2014) Transparency*	Report afforestation under the category land converted to forest land rather than the category forest land remaining forest land, explain the recalculation and include the explanation in the appropriate section of the NIR (e.g. in the NIR 2014 it would be moved from chapter 7.3.2.1.i to chapter 7.3.2.2)	Not resolved. Liechtenstein continues to report afforestation under forest land remaining forest land rather than under land converted to forest land. During the review, the Party indicated that it has restructured chapter 6.4.2 of the NIR; however, the ERT notes that the issue is still relevant and unresolved (see also ID#L.14 in table 5)
L.9	4.C.1 Grassland remaining grassland – CO ₂ (84, 2014)	Include, in the NIR, a more detailed justification for the categorization of grasslands applied to subcategories representing carbon stocks and dynamics of grasslands better than those of	Not resolved. Liechtenstein provided insufficient justification according to the 2006 IPCC Guidelines for the

<i>ID#</i>	<i>Issue and/or problem classification^{a, b}</i>	<i>Recommendation made in previous review report^c</i>	<i>ERT assessment and rationale</i>
	Transparency*	croplands in order to meet the requirements of the IPCC <i>Good Practice Guidance for Land Use, Land-Use Change and Forestry</i> , or use the categorization indicated in that guidance	categorization applied (NIR, chapter 6.2.1) (see also ID#L.15 in table 5)
Waste			
W.1	5. General (waste) (88, 2014) Comparability*	Undertake an evaluation to ensure that the methods, parameters and other data provided in the inventory submission are applicable to the national circumstances, and document these checks in future annual submissions	Addressing. During the review, Liechtenstein provided information justifying the use of Switzerland's data for the waste sector. The ERT agrees with this justification and considers that the information could be used to document the rationale for using waste data from Switzerland in the next submission (see also ID#W.4 in table 5)
W.2	5. General (waste) (89, 2014) Adherence to UNFCCC Annex I inventory reporting guidelines	Provide quantitative uncertainty estimates for all waste categories and discuss the reasons for the uncertainty estimates in the appropriate section of the waste chapter of the NIR, following the outline for the NIR in the UNFCCC Annex I inventory reporting guidelines	Not resolved. In the NIR (chapter 1.6), quantitative estimates for uncertainties for waste categories are given without any discussion of how the values have been derived. Although Liechtenstein made a statement in the appropriate section of the waste chapter of the NIR, quantitative uncertainty estimates for all waste categories were not provided
W.3	5.A Solid waste disposal on land – CH ₄ (92, 2014) Transparency	Explain in the NIR methodological changes associated with use of the k-values	Resolved. Liechtenstein applied a k-value of 0.09/year (the default value for bulk waste for wet conditions in boreal and temperate climates sourced from the 2006 IPCC Guidelines (volume 5, table 3.3)) and explained these methodological changes in the NIR (p.211)
KP-LULUCF			
KL.1	Deforestation – CO ₂ Transparency*	Provide in the NIR a detailed explanation of the estimation of the areas reported for deforestation	Addressing. Although Liechtenstein provided an explanation in the NIR

ID#	Issue and/or problem classification ^{a, b}	Recommendation made in previous review report ^c	ERT assessment and rationale
			(chapter 11.1.3.2), further clarification is needed to understand how the deforestation areas were calculated (see also ID#KL.2 in table 5)

Abbreviations: AD = activity data, AWMS = animal waste management system, CRF = common reporting format, EF = emission factor, ERT = expert review team, IPCC = Intergovernmental Panel on Climate Change, IPPU = industrial processes and product use, KP-LULUCF = LULUCF emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, k-value = reaction constant, LULUCF = land use, land-use change and forestry, NA = not applicable, NE = not estimated, NEU = non-energy use, Nex = nitrogen excretion, NIR = national inventory report, NO = not occurring, QA/QC = quality assurance/quality control, UNFCCC Annex I inventory reporting guidelines = “Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual greenhouse gas inventories”, 2006 IPCC Guidelines = *2006 IPCC Guidelines for National Greenhouse Gas Inventories*.

^a References in parentheses are to the paragraph(s) and the year(s) of the previous review report(s) where the issue was raised. Issues are further classified as defined in decision 13/CP.20, annex, paragraph 81. In the review of the supplementary information reported in accordance with Article 7, paragraph 1 of the Kyoto Protocol, the ERT has applied the classification in decision 22/CMP.1, annex, paragraph 69, in conjunction with decision 4/CMP.11.

^b An asterisk is included next to each issue type for all issues that are also problems, as defined in decision 22/CMP.1, annex, paragraphs 68 and 69, including those that lead to an adjustment or a question of implementation.

^c The review of the 2016 annual submission is being held in conjunction with the review of the 2015 annual submission, and as such, the 2015 annual review report was not available at the time of this review. Therefore, the recommendations reflected in table 3 are from the 2014 annual review report. For the same reason, the year 2015 is excluded from the list of years in which the issue has been identified.

^d Bretscher D and Leifeld J. 2015. *Uncertainty in Agricultural CH₄ and N₂O Emissions of Switzerland*. Internal report. Tänikon Research Station, Zürich, Switzerland: Agroscope Reckenholz. Available at <<http://www.bafu.admin.ch/klima/13879/13880/14577/15536/index.html?lang=en>>.

^e Office of Environmental Protection of Liechtenstein (formerly AWLN). 2012. *Liechtensteinisches Landeswaldinventar*. [*Liechtenstein's National Forest Inventory*.] Available at <http://www.llv.li/files/au/pdf-llv-au-landeswaldinventar_2012_awnl.pdf>.

^f Thürig E and Herold A. 2013. *Recalculation of Emission Factors in Swiss Forests for the Swiss GHGI*. Internal documentation of technical adjustments of data delivery and more recent data. Swiss Federal Institute for Forest, Snow and Landscape Research. Available at <<http://www.bafu.admin.ch/ghginv-ref>>.

IV. Issues identified in three successive reviews and not addressed by the Party

9. In accordance with paragraph 83 of the UNFCCC review guidelines, the ERT noted that the issues included in table 4 have been identified in three successive reviews, including the review of the 2016 annual submission of Liechtenstein, and have not been addressed by the Party.

Table 4

Issues identified in three successive reviews and not addressed by Liechtenstein

ID# ^a	Previous recommendation for the issue identified	Number of successive reviews issue not addressed ^b
General	No such general issues were identified	
Energy		

<i>ID#^a</i>	<i>Previous recommendation for the issue identified</i>	<i>Number of successive reviews issue not addressed^b</i>
E.4*	Report lubricants and bitumen use in CRF tables 1.A(b) and 1.A(d) for the entire time series, including lubricants used for two-stroke engines	4 (2012–2015/16)
IPPU	No such issues for the IPPU sector were identified	
Agriculture	No such issues for the agriculture sector were identified	
LULUCF	No such issues for the LULUCF sector were identified	
Waste	No such issues for the waste sector were identified	
KP-LULUCF	No such issues for KP-LULUCF activities were identified	

Abbreviations: CRF = common reporting format, IPPU = industrial processes and product use, KP-LULUCF = LULUCF emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, LULUCF = land use, land-use change and forestry.

^a An asterisk is included after any issue ID# where the underlying issue is related to accuracy or completeness of a key category, a missing category or a potential key category, as indicated in decision 13/CP.20, annex, paragraph 83.

^b The review of the 2016 annual submission is being held in conjunction with the review of the 2015 annual submission. As the reviews of the 2015 and 2016 annual submissions are not “successive” reviews, but are rather being held in conjunction, for the purpose of counting successive years in table 4, 2015/2016 is considered as one year. The ERT noted that this table 4 is the same as that in the 2015 annual review report for Liechtenstein, modified to reflect the combined 2015/2016 review.

V. Additional findings made during the 2016 technical review

10. Table 5 contains findings made by the ERT during the technical review of the 2016 annual submission of Liechtenstein that are additional to those identified in table 3 above.

Table 5

Additional findings made during the 2016 technical review of the annual submission of Liechtenstein

<i>ID#</i>	<i>Finding classification</i>	<i>Description of the finding with recommendation or encouragement</i>	<i>Is finding an issue^a and/or a problem^b? If yes, classify by type</i>
General			
G.6	QA/QC and verification	<p>Liechtenstein states in the NIR (p.14) that “not all recommendations are incorporated in the current inventory development plan”. In annex 8.3 to the NIR a list is provided of recommendations and encouragements, with the status of each (i.e. not yet implemented, will not be implemented) noted. During the review week, the Party explained that work on implementing some of these recommendations has in fact already begun, and that the status of the recommendations and encouragements in the NIR is therefore misleading</p> <p>The ERT encourages Liechtenstein to further improve the description of the status of the recommendations and encouragements in its NIR</p>	Not an issue
G.7	Inventory planning	<p>The ERT noted that although Liechtenstein’s improvement plan includes all the recommendations made in the previous review reports as well as information on how each recommendation is to be addressed, it does not give the intended time frame of implementation for each recommendation</p> <p>The ERT encourages Liechtenstein to further improve its inventory development plan by including the expected time frame for implementation of each recommendation and by including cross-references within the NIR to where a description of the follow-up measures is provided</p>	Not an issue
G.8	Recalculations	<p>In the NIR, quantified information on recalculations is not given at the key category level, while the 2006 IPCC Guidelines state that “in addition to following the category-specific guidance, countries should clearly document any recalculations” (volume 1, p.5.15). Further, table 5.2 in the 2006 IPCC Guidelines (volume 1) provides a recommended format for the category-specific documentation of recalculations</p> <p>The ERT encourages Liechtenstein to provide quantified recalculations for all key categories</p>	Not an issue
G.9	QA/QC and verification	<p>One of the recurring sectoral findings of previous ERTs has been discrepancies between the CRF tables and the NIR. In annex 8.3 to the current NIR (the table of the annex under item 7), Liechtenstein states that “the quality control so far implemented will have to be adapted. The party will check how systematic additional quality control procedures can be implemented for future submissions.” However, the status of the related recommendation is given as “not yet implemented”. The Party explained during the review week that as a result of unique circumstances relating to CRF Reporter during the finalization of the 2016</p>	Not an issue

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue ^a and/or a problem ^b ? If yes, classify by type
G.10	National registry	<p>submission, the inventory team was forced to work quickly, which reduced the time for QA/QC procedures to be thoroughly applied</p> <p>The ERT notes from the SIAR that the national registry does not fully comply with the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1. The SIAR points out that relevant information from the administrator of the national registry is lacking. Such information includes, in the disaster recovery plan, the following: (1) disaster recovery roles and responsibilities for primary and alternative national registry personnel; (2) a contingency plan communication procedure; (3) documentation on the operation of the national registry in a crisis situation; and (4) a periodic testing strategy, based on mechanisms agreed with the host of the national registry. During the review, Liechtenstein explained that its national registry is operated by the European Union hence the Party assigned the functions relating to the disaster recovery plan to the Central Administrator of the European Union</p> <p>The ERT, noting the explanation by Liechtenstein, recommends that this information is included in its next submission</p>	Yes. Transparency*
Energy			
E.15	Feedstocks, reductants and other NEU of fuels – liquid fuels – CO ₂	<p>Liechtenstein imports bitumen for road paving (NIR, p.86), but reports this fuel as “NO” in CRF tables 1.A(b) and 1.A(d). In response to a question raised by the ERT during the review, the Party explained that emissions from bitumen are not estimated, and stated that bitumen is used for road paving and further added that lubricants are used for asphalt roofing. In the NIR (p.71), Liechtenstein provided information on what has been done so far to address this issue. The ERT commends the Party for its progress in collecting the relevant data</p> <p>The ERT recommends that Liechtenstein improve the completeness of its submission by reporting lubricant and bitumen use in CRF tables 1.A(b) and 1.A(d), respectively, for the entire time series, including lubricants used for two-stroke engines. If these emissions are considered insignificant, the Party should report them as “NE” and provide a quantitative estimate of the likely level of the emissions in accordance with paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines in order for the ERT to be able to assess whether the sum of all gases and categories considered insignificant remains below 0.1 per cent of the national total GHG emissions</p>	Yes. Completeness*
E.16	1.A.1.a Public electricity and heat production – all	<p>Liechtenstein applies a tier 1 method for the estimation of emissions from public electricity and heat production, which it has identified as a key category. The ERT notes that it is good practice to estimate emissions using the tier 2 or tier 3 approach by following the decision tree for estimating emissions from stationary combustion contained in the 2006 IPCC</p>	Not an issue

<i>ID#</i>	<i>Finding classification</i>	<i>Description of the finding with recommendation or encouragement</i>	<i>Is finding an issue^a and/or a problem^b? If yes, classify by type</i>
	fuels – N ₂ O	Guidelines (figure 2.1 in volume 2) The ERT encourages Liechtenstein to apply a higher-tier method for the estimation of N ₂ O emissions from public electricity and heat production	
E.17	1.A.3.a Domestic aviation – liquid fuels – CO ₂ , CH ₄ and N ₂ O	In the NIR (p.93), Liechtenstein explains the procedures it used to split kerosene consumption from aviation into domestic and international shares for the period 1990–2014. The consumption for the period 1990–1994 was assumed to be constant, and equal to the 1995 value (a mean share of 15 per cent for domestic aviation) owing to missing data. The consumption for the period 1996–2000 was linearly interpolated between the values for 1995 and 2001. For the period 2003–2011, a mean share 15 per cent for domestic aviation was assumed. According to the 2006 IPCC Guidelines, it is good practice to perform a comprehensive data gap analysis and apply the most suitable splicing techniques to fill gaps in the time series, to ensure consistency The ERT recommends that Liechtenstein apply a comprehensive data gap analysis and select the most relevant splicing technique to fill gaps in the time series for the percentage allocation of kerosene consumption between domestic and international aviation	Yes. Consistency*
E.18	1.A.4.a Commercial/Institutional – liquid fuels – CO ₂ , CH ₄ and N ₂ O	Liechtenstein reported identical values for alkylate gasoline consumption for 2012 and 2013. In response to a question raised by the ERT during the review, the Party explained that this was an error rather than a reflection of the AD reported in the NIR. The ERT considers it to be good practice to implement QC and verification procedures in the development of national GHG inventories to prevent these kinds of errors occurring The ERT recommends that Liechtenstein correct the values reported for alkylate gasoline consumption for 2012 and 2013	Yes. Accuracy*
E.19	1.A.4.c Agriculture/Forestry/Fishing – liquid fuels – CO ₂ , CH ₄ and N ₂ O	Liechtenstein reported identical values for alkylate gasoline consumption for 2012 and 2013. In response to a question raised by the ERT during the review, the Party explained that this was an error rather than a reflection of the AD reported in the NIR. The ERT considers it to be good practice to implement QC and verification procedures in the development of national GHG inventories to prevent these kinds of errors occurring The ERT recommends that Liechtenstein correct the values reported for alkylate gasoline consumption for 2012 and 2013	Yes. Accuracy*
E.20	1.B.2.b Natural gas – gaseous fuels –	During the review, Liechtenstein provided the calculation spreadsheet for category 1.B.2.b.5 (natural gas distribution). The ERT noted several errors in the spreadsheet that resulted in a	Yes. Accuracy*

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue ^a and/or a problem ^b ? If yes, classify by type
CH ₄		<p>minor overestimation of emissions (e.g. 0.003 kt CO₂ for 2013)</p> <p>The ERT recommends that Liechtenstein correct the errors in the calculation spreadsheet for the category 1.B.2.b.5</p>	
IPPU			
I.3	2.F.1 Refrigeration and air conditioning – HFCs and PFCs	<p>In the NIR (p.117), Liechtenstein states that it has undertaken recalculations of emissions from refrigeration and air conditioning for two reasons, namely: (1) the availability of updated statistical data on the number of households from the 2010 census; and (2) Switzerland’s recalculations owing to optimized models, which affect Liechtenstein’s time series. However, this explanation does not include information on the years for which recalculations have been made and on the impact of these recalculations on AD and EFs. In response to a question raised by the ERT during the review, the Party indicated that it has not assessed the impact of recalculations for each F-gas but rather has opted for an aggregated assessment. Liechtenstein also indicated that it will clarify the years for which recalculations were performed in its next submission. The ERT notes that the approach followed by the Party in performing the recalculations reduces the ability of the ERT to transparently assess how recalculations for the use of F-gases in refrigeration and air conditioning were performed</p> <p>The ERT recommends that Liechtenstein improve the reporting of recalculations associated with the use of F-gases in refrigeration and air conditioning</p>	Yes. Transparency*
Agriculture			
A.15	3.A.1 Cattle – CH ₄	<p>As previous review reports indicated, the ERT observed in the current submission that values used for the feeding situation are the same as those of Switzerland. In addition, as Switzerland did not publish data on the feeding situation in its CRF tables for its current submission, Liechtenstein decided not to declare the feeding situation for its current submission. The previous ERT recommended that Liechtenstein change the notation keys as soon as Switzerland’s values were published. In the current submission, Switzerland reported “NA” for this parameter in CRF table 3.As2. Furthermore, Liechtenstein mentions in its current submission that according to its inventory development plan, it intends to, based on a recommendation in the previous review report, change the notation key for the feeding situation (“NE” in the past and current submissions) to align with table 10.5 of the 2006 IPCC Guidelines (volume 4) for the 2017 submission onwards. The ERT, while understanding there is little clarity about the feeding situation that would allow the use of the</p>	Yes. Transparency*

<i>ID#</i>	<i>Finding classification</i>	<i>Description of the finding with recommendation or encouragement</i>	<i>Is finding an issue^a and/or a problem^b? If yes, classify by type</i>
		correct notation key, considers these contradictions non-transparent and inconsistent	
		The ERT recommends that Liechtenstein use Switzerland's values for the feeding situation and justify the relevance of these values to its national circumstances	
A.16	3.B Manure management – CH ₄	<p>In CRF table 3.B(a)s2, Liechtenstein reported the allocation of manure for goats, mules and asses as “NO” for all AWMS. However, CH₄ emissions from manure management for these animals were reported in CRF table 3.B(a)s1, and information on nitrogen excretion was reported for some manure management systems in CRF table 3.B(b) for these animals. The ERT considers this to be an inconsistency within the CRF tables. The ERT also observed that in CRF table 3.B(a)s2, allocation of manure to estimate CH₄ emissions for manure management for growing cattle is 1.4 per cent of the total growing cattle, while in table 5-11 of the NIR (“Manure management system distribution (MS) for Liechtenstein for selected years”), 1.5 per cent of allocation of manure is given for growing cattle in other systems. Therefore, this is a case of inconsistency between the information reported in the NIR and in the CRF tables</p> <p>The ERT recommends that Liechtenstein review the consistency of the information reported within the CRF tables and between the CRF tables and the NIR on AWMS for goats, mules and assess and on the allocation of manure for growing cattle</p>	Yes. Adherence to UNFCCC Annex I inventory reporting guidelines
LULUCF			
L.10	4. General (LULUCF)	<p>The ERT noted high inter-annual variability in the net emissions for the LULUCF sector (NIR, chapter 6.1.2, figure 6.2) particularly for the years 2009 and 2010 (for 2009, net emissions were 14.27 kt CO₂ eq; for 2010, they were 14.37 kt CO₂ eq). During the review, Liechtenstein indicated that the high peaks observed for the years 2009 and 2010 resulted from the use of AD from FAO for HWP (sawnwood production). Table 6-2 in the NIR shows that HWP were a net source in 2009 and 2010 while in other years HWP were a net sink of GHG emissions. The ERT notes that the use of FAO data introduces time-series inconsistencies in the AD for HWP and results in high net emissions for the LULUCF sector for 2009 and 2010</p> <p>The ERT recommends that Liechtenstein investigate the consistency of AD for HWP from the various sources it has used and correct any inconsistencies identified</p>	Yes. Consistency*
L.11	4. General (LULUCF)	<p>Liechtenstein used country-specific land-use categories (e.g. alpine meadow and copse). The ERT noted that although some information on land-use change matrices was included in the NIR (chapter 6.2), the information does not allow a verification to be made as to whether</p>	Yes. Transparency*

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue ^a and/or a problem ^b ? If yes, classify by type
L.12	4. General (LULUCF)	<p>country-specific land-use categories are classified in accordance with the IPCC land-use classification. The ERT considers the land-use codes used in the land-use matrix in table 6.7 of the NIR could be translated into IPCC land-use categories in order to adhere to the IPCC good practice guidance</p> <p>The ERT recommends that Liechtenstein improve the transparency of information on land-use areas and land-use changes by demonstrating that country-specific land-use categories have been classified in accordance with the IPCC land-use classification</p> <p>As a follow-up to ID#L.2, the ERT noted that Liechtenstein continues to develop its land area identification system in order to obtain accurate data, and to validate data calculated by extrapolation</p> <p>The ERT encourages Liechtenstein to use the new AREA survey for the 2017 or 2018 submission to update land use and land-use changes after 2009</p>	Not an issue
L.13	4. General (LULUCF)	<p>As a follow-up to ID#L.1, the ERT noted that the description of the methodology for estimating uncertainties and the reporting of the uncertainty values in the NIR are not transparent. During the review, Liechtenstein indicated that in the NIR, uncertainties were updated by adopting more recent values from Switzerland (2016 annual GHG inventory submission) and by new expert judgment (NIR, chapters 6.4.3, 6.5.3 and 6.6.3). For non-key categories, mean uncertainties were used in the simplified uncertainty analysis (NIR, chapter 1.6.1)</p> <p>The ERT, while recognizing that the Party will address this issue as part of its improvement plan, recommends that Liechtenstein improve the transparency of reporting the methodologies for estimating uncertainties by providing information on methods used for estimating uncertainty in the form of an annex for the AD, EFs and other parameters</p>	Yes. Transparency*
L.14	4.C.1 Grassland remaining grassland – CO ₂	<p>Liechtenstein has made an effort to include, in its NIR (chapter 6.6.1), justification for the categorization under grasslands of subcategories representing carbon stocks and dynamics of croplands, such as biomass from vineyards, low-stem orchards, tree nurseries, other orchards, copse and shrubs. In response to a question raised by the ERT during the review, the Party explained that the rationale for reporting carbon stock changes of biomass for the subcategories under grasslands is that the subcategories mentioned have permanent grass layers, and that the Party does not plan to alter its land-use categories. The ERT considers the explanation provided not adequate to justify the categorization under grasslands of the subcategories representing carbon stocks under cropland because these subcategories exhibit</p>	Yes. Transparency*

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue ^a and/or a problem ^b ? If yes, classify by type
		<p>higher carbon stock levels compared with grassland categories</p> <p>The ERT recommends that Liechtenstein report carbon stock changes of biomass from vineyards, low-stem orchards, tree nurseries, other orchards, copse and shrubs under cropland remaining cropland and not under grassland remaining grassland, because these are typical cropland vegetation types</p>	
L.15	4.G Harvested wood products – CO ₂	<p>Information on what Liechtenstein has included in the HWP inflow into the HWP pool is not provided in the NIR, and there is a lack of clarity on the methodology that was used to take into account inflow before the year 2000. The Party reported as a proxy for sawnwood production an estimate of roundwood production using the number of inhabitants, which is proportional to development in Liechtenstein (an increase from 10,500 inhabitants in 1900 to 16,500 inhabitants in 1960). The ERT considers it unclear why the Party used a proxy to extrapolate HWP sawnwood production before 1961, and noted that regional rates in industrial roundwood production prior to 1961 are provided in table 12.3 of the 2006 IPCC Guidelines and that industrial roundwood is used as a feedstock in most regions</p> <p>The ERT recommends that Liechtenstein improve the accuracy and transparency of reporting for HWP by exploring the possibility of using industrial roundwood production in accordance with the good practice from the 2006 IPCC Guidelines</p>	Yes. Transparency*
L.16	4.G Harvested wood products – CO ₂	<p>Liechtenstein reported HWP pools as the sum of domestically consumed and exported HWP. This is not in accordance with the requirements of decision 2/CMP.8, annex II, paragraph 2(g)(i), which requires a Party to provide information on AD for HWP categories used for estimating the HWP pool removed from domestic forests, for domestic consumption and for export, as appropriate</p> <p>The ERT recommends that Liechtenstein report information on HWP pools and categories in accordance with the requirements of decision 2/CMP.8, annex II, paragraph 2(g)(i)</p>	Yes. Transparency*
L.17	4.G Harvested wood products – CO ₂	<p>Liechtenstein reported one type of HWP, sawnwood. During the review the Party indicated that there is no production of wood panels or paper or pulp in Liechtenstein</p> <p>The ERT recommends that Liechtenstein explore the collection of data on the other types of HWP and provide information in the NIR on whether it uses the same half-life for export and import for these products</p>	Yes. Transparency*

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue ^a and/or a problem ^b ? If yes, classify by type
Waste			
W.4	5. General (waste) – CO ₂ , CH ₄ and N ₂ O	<p>Liechtenstein uses methods, EFs and assumptions from the NIR of Switzerland to estimate emissions from the waste sector. However, the applicability of the assumptions to the national circumstances of Liechtenstein is not still known and has not been justified. In response to a question raised by the ERT during the review, the Party explained that living standards in the country as well as the regulatory framework, technical standards and legal principles (e.g. threshold values) of the waste sector of Liechtenstein are identical to those of Switzerland. Because of these similarities, Switzerland's country-specific methodology and EFs are usually adopted by Liechtenstein. The Party provided a table showing the similarities in the regulatory framework for waste management in both countries</p> <p>The ERT recommends that Liechtenstein improve the transparency of its reporting by providing in its NIR a detailed justification for the methods, EFs and assumptions of Switzerland being applicable to the estimation of emissions in Liechtenstein, and a description of how standards in the waste sector of Liechtenstein correspond to those of the waste sector in Switzerland. The ERT notes that the Party can use the information provided to the ERT during the review week for this purpose</p>	Yes. Transparency*
W.5	5. General (waste) – CH ₄	<p>The NIR (p.208) states that 31.62 per cent of the total emissions from the waste sector originate from solid waste disposal (5.A). The ERT estimated the percentage contribution from solid waste disposal to be 1.62 per cent using the information reported in the CRF tables. During the review, Liechtenstein acknowledged this typing error, which was missed during the QC check, and indicated that it would be corrected in the next submission</p> <p>The ERT encourages Liechtenstein to strengthen its QC procedures for the waste sector to avoid typographical errors in future submissions</p>	Not an issue
W.6	5.A.1 Managed waste disposal sites and 5.A.2 Unmanaged waste disposal sites – CH ₄	<p>As described in the NIR (p.210), Liechtenstein uses a first-order decay model to estimate CH₄ emissions from this category, in accordance with the Revised 1996 IPCC Guidelines and the IPCC good practice guidance. The Party had assumed that this model is also in accordance with the 2006 IPCC Guidelines. Thus the Party uses default parameters from the Revised 1996 IPCC Guidelines for DOC_f (0.6) and DOC parameters for different waste materials (e.g. DOC for garden waste of 17 per cent). The ERT notes that these parameters are not in accordance with the 2006 IPCC Guidelines (0.5 for DOC_f and, for example, DOC for garden waste of 20 per cent). The ERT concluded that the use of parameters from the Revised 1996 IPCC Guidelines and the IPCC good practice guidance might lead to overestimates or underestimates of emissions and included this issue in the list of potential</p>	Yes. Accuracy*

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue ^a and/or a problem ^b ? If yes, classify by type
		<p>problems and further questions raised by the ERT during the review. In response to this list, Liechtenstein submitted revised estimates on 14 November 2016 wherein it estimated CH₄ emissions from solid waste disposal for the entire time series using DOC_f and DOC parameters sourced from the 2006 IPCC Guidelines. The ERT agreed with the revised estimates provided by Liechtenstein</p> <p>The ERT recommends that Liechtenstein apply the first-order decay model and the parameters provided in the 2006 IPCC Guidelines (volume 5, chapters 2 and 3) to quantify CH₄ emissions from solid waste disposal and include this information in its next submission</p>	
W.7	5.A.2 Unmanaged waste disposal sites – CH ₄	<p>Liechtenstein used a default methane correction factor of 0.4 (dimensionless) for unmanaged solid waste disposal sites in accordance with the 2006 IPCC Guidelines. This implies that all unmanaged solid waste disposal sites are of less than 5 m depth for the calculation of emission estimates in this category. However, the NIR does not provide information justifying all unmanaged sites in Liechtenstein to be of less than 5 m depth. During the review, Liechtenstein indicated that only unmanaged landfill sites exist in Liechtenstein and that all landfill sites are less than 5 m deep. The assessment of the depth of landfills is based on information provided by the Office of Environmental Protection in 2007. The ERT notes that the depth of some of the landfill sites might have increased over time and therefore the assessment done in 2007 may need to be revised by conducting a survey to assess the current depth of existing unmanaged landfill sites</p> <p>The ERT recommends that Liechtenstein include in the NIR an explanation for its assumption that all unmanaged solid waste disposal sites are of less than 5 m depth and perform a country-wide survey to assess the current depth of its unmanaged landfill sites or provide justification for the assumption that even with a growth in height of the landfill, total CH₄ emissions from this category will remain below the 500 kt threshold</p>	Yes. Transparency*
W.8	5.A.2 Unmanaged waste disposal sites – CH ₄	<p>The ERT notes that the first-order decay model has two options to determine DOC values: waste by composition, or bulk waste data only. However, the Party did not include in the NIR an explanation of which option was selected. The ERT concluded that the bulk waste data option was used</p> <p>The ERT recommends that Liechtenstein provide in the NIR clear information on the selection of the bulk waste data option for the first-order decay model used to estimate emissions in this category</p>	Yes. Transparency*
W.9	5.B.1 Composting	The AD for the amount of waste composted given in table 7-7 of the NIR (p.215) are not consistent with the AD provided in the CRF tables (e.g. 6.8 kt reported in table 7-7 but 3.8 kt	Yes. Transparency*

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue ^a and/or a problem ^b ? If yes, classify by type
	– CH ₄ and N ₂ O	<p>reported in CRF table 5.B for the year 2013). In response to a question raised by the ERT during the review, Liechtenstein provided information on the reason for the difference between the AD and explained that data in the NIR are reported on a wet basis while data in the CRF tables are reported on a dry basis as required in CRF table 5.B</p> <p>The ERT recommends that Liechtenstein provide in the NIR clear information on the AD related to dry matter and wet matter, and ensure that the AD are consistent between the NIR and the CRF tables</p>	
W.10	5.D Wastewater treatment and discharge – N ₂ O	<p>As stated in the NIR (p.219), N₂O emissions from this subcategory are calculated in accordance with the Revised 1996 IPCC Guidelines. The ERT concluded that the use of parameters from the Revised 1996 IPCC Guidelines and the IPCC good practice guidance might lead to overestimates or underestimates of emissions and included this issue in the list of potential problems and further questions raised by the ERT during the review. In response to this list, Liechtenstein submitted revised estimates on 14 November 2016 wherein it estimated N₂O emissions from wastewater treatment and discharge by using N₂O EFs from the 2006 IPCC Guidelines for N₂O emissions in centralized wastewater treatment plants and wastewater effluent. In addition, the Party estimated CH₄ emissions from its domestic wastewater treatment plants in accordance with the 2006 IPCC Guidelines. The revised estimates contain relevant background information and the description of the revisions is sufficient</p> <p>The ERT encourages Liechtenstein to include in the NIR detailed information on the choice of parameters and transparent data of those parameters (i.e. degree of utilization of modern, centralized wastewater treatment plants (T_{PLANT}), annual per capita protein consumption (Protein) and mass of nitrogen contained in the removed sludge (N_{SLUDGE})) for each year for this subcategory</p> <p>The ERT recommends that Liechtenstein report transparently on the methodology and parameters used</p>	Yes. Accuracy*
KP-LULUCF			
KL.2	Deforestation	<p>As a follow-up to ID#KL.1 in the previous review, the ERT noted that Liechtenstein uses data from periodic aerial surveys to determine the land-use change from forest to non-forest land. In order to estimate the area of deforestation, Liechtenstein estimates the gross area of land-use change from forest to non-forest land while excluding areas that have regrown between two surveys (e.g. 6 per cent of the gross deforested area was excluded in the last inventory). In response to a question raised by the ERT during the review, the Party clarified</p>	Yes. Accuracy*

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue ^a and/or a problem ^b ? If yes, classify by type
KL.3	General (KP-	<p>that it is using a statistical approach based on sampled data from a survey that was conducted in the years 2002, 2008 and 2015, and that it has no monitoring mechanism to track areas of deforestation. The Party provided a table with data from the surveys showing how numbers were split between forests that were deforested between 1996 and 2002 and the areas of forest regeneration in 2008. The table included information on four different survey results for calculating areas subject to deforestation, taking into account the areas that are subsequently regenerated. The Party highlighted that these values represent numbers of sampling points filtered in the AREA database (NIR, chapters 6.2.1 and 6.3.1). The land-use change data based on the last two surveys were chosen for reporting in the second commitment period of the Kyoto Protocol as they reflected the most recent changes. The portion of non-permanent deforestation was 6 per cent, and Liechtenstein clarified that the reduction of the gross area of land-use change from forest to non-forest land by 6 per cent was a methodological procedure intended to identify the component of the deforested land subject to direct human-induced deforestation. The ERT notes that without a clear approach to identify and track deforestation, Liechtenstein's national system is not able to identify and track lands subject to deforestation activity in accordance with the requirements set out in decisions 2/CMP.7 and 2/CMP.8</p> <p>In response to the list of potential problems raised by the ERT during the review week, Liechtenstein stated it has a plan for establishing a system for identifying and tracking lands subject to deforestation. The ERT noted that Liechtenstein in its response proposed six years as the time interval for tracking deforestation and would apply this time interval consistently to all areas subject to deforestation, using a statistical approach. In order to ensure that the national system is able to distinguish between harvesting and forest disturbance that is followed by the re-establishment of a forest from deforestation, the Party proposed to use human interpretation of the aerial photographs while considering the spatial context of the neighbouring area. The ERT considers this approach to be consistent with the requirements set out in decisions 2/CMP.7 and 2/CMP.8</p> <p>The ERT recommends that Liechtenstein follow the methodology that was proposed during the review week for tracking deforestation in future submissions, noting that the transparency of reporting would be enhanced if the Party provides in the next NIR, in tabular format, the four variations of survey results presented during the review week that could be used for calculating areas subject to deforestation, taking into account the areas that are subsequently regenerated</p> <p>In the NIR, Liechtenstein reported uncertainties for the LULUCF sector using a simplified approach under each land-use category; however, the Party did not report the methodology</p>	Yes. Transparency*

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue ^a and/or a problem ^b ? If yes, classify by type
	LULUCF)	<p>used for conducting the uncertainty analysis of KP-LULUCF activities (i.e. afforestation and reforestation, deforestation, forest management and HWP) in a transparent manner that allows an assessment to be made</p> <p>The ERT recommends that Liechtenstein provide a clear description of the methodology for conducting the uncertainty analysis of KP-LULUCF activities (afforestation and reforestation, deforestation, forest management and HWP) based on the uncertainty of AD and EFs in each carbon pool and each emission estimate</p>	

Abbreviations: AD = activity data, CRF = common reporting format, DOC = degradable organic carbon, DOC_f = fraction of DOC that decomposes, EF = emission factor, ERT = expert review team, F-gas = fluorinated gas, FAO = Food and Agriculture Organization of the United Nations, GHG = greenhouse gas, HWP = harvested wood products, IPCC = Intergovernmental Panel on Climate Change, IPCC good practice guidance = *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*, IPPU = industrial processes and product use, KP-LULUCF = LULUCF emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, LULUCF = land use, land-use change and forestry, NA = not applicable, NE = not estimated, NEU = non-energy use, NIR = national inventory report, NO = not occurring, QA/QC = quality assurance/quality control, Revised 1996 IPCC Guidelines = *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*, SIAR = standard independent assessment report, UNFCCC Annex I inventory reporting guidelines = "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual greenhouse gas inventories", 2006 IPCC Guidelines = *2006 IPCC Guidelines for National Greenhouse Gas Inventories*.

^a Recommendations are related to issues as defined in decision 13/CP.20, annex, paragraph 81, or problems as identified in decision 22/CMP.1, annex, paragraph 69, identified by the ERT during the review. Encouragements are made to the Party to address all findings not related to such issues.

^b An asterisk is included next to each issue type that is also a problem, as defined in decision 22/CMP.1, annex, paragraphs 68 and 69, including those that lead to an adjustment or a question of implementation.

VI. Application of adjustments

11. The ERT has not identified the need to apply any adjustments to the 2016 annual submission of Liechtenstein.

VII. Accounting quantities for activities under Article 3, paragraph 3, and, if any, activities under Article 3, paragraph 4, of the Kyoto Protocol

12. Liechtenstein has elected commitment period accounting and therefore the issuance and cancellation of units for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol are not applicable for the 2016 review.

VIII. Questions of implementation

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

Overview of greenhouse gas emissions and removals for Liechtenstein for submission year 2016 and data and information on activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol

1. Tables 6–9 provide an overview of total greenhouse gas emissions and removals as submitted by Liechtenstein.

Table 6

Total greenhouse gas emissions for Liechtenstein, base year^a–2014^b
(kt CO₂ eq)

	Total GHG emissions excluding indirect CO ₂ emissions		Total GHG emissions including indirect CO ₂ emissions ^c		Land-use change (Article 3.7 bis as contained in the Doha Amendment) ^d	KP-LULUCF activities (Article 3.3 of the Kyoto Protocol) ^e	KP-LULUCF activities (Article 3.4 of the Kyoto Protocol)	FM
	Total including LULUCF	Total excluding LULUCF	Total including LULUCF	Total excluding LULUCF	2.38	NA	CM, GM, RV, WDR	
FMRL								0.10
Base year	233.76	229.18	233.76	229.18	2.38	NA		
1990	233.76	229.18	233.76	229.18				
1995	241.84	234.32	241.84	234.32				
2000	256.56	248.17	256.56	248.17				
2010	246.03	231.23	246.03	231.23				
2011	230.15	218.61	230.15	218.61				
2012	239.95	228.19	239.95	228.19				
2013	246.62	234.91	246.62	234.91		4.19	NA, NO	3.81
2014	215.97	204.42	215.97	204.42		4.10	NA, NO	3.74

Abbreviations: CM = cropland management, FM = forest management, FMRL = forest management reference level, GHG = greenhouse gas, GM = grazing land management, KP-LULUCF = LULUCF emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, LULUCF = land use, land-use change and forestry, NA = not applicable, NO = not occurring, RV = revegetation, WDR = wetland drainage and rewetting.

^a Base year refers to the base year under the Kyoto Protocol, which is 1990 for CO₂, CH₄ and N₂O, and 1995 for HFCs, PFCs, SF₆ and NF₃. Liechtenstein has not elected any activities under Article 3, paragraph 4, of the Kyoto Protocol. For activities under Article 3, paragraph 3, of the Kyoto Protocol and forest management under Article 3, paragraph 4, only the inventory years of the commitment period must be reported.

^b Emissions/removals reported in the sector other (sector 6) are not included in total GHG emissions.

^c The Party has not reported indirect CO₂ emissions in common reporting format table 6.

^d The value reported in this column refers to 1990.

^e Activities under Article 3, paragraph 3, of the Kyoto Protocol, namely afforestation and reforestation, and deforestation.

Table 7

Greenhouse gas emissions by gas for Liechtenstein, excluding land use, land-use change and forestry, 1990–2014^a(kt CO₂ eq)

	<i>CO₂^b</i>	<i>CH₄</i>	<i>N₂O</i>	<i>HFCs</i>	<i>PFCs</i>	<i>Unspecified mix of HFCs and PFCs</i>	<i>SF₆</i>	<i>NF₃</i>
1990	198.78	19.54	10.86	0.0001	NA, NO	NA, NO	NA, NO	NO
1995	204.06	18.31	10.60	1.35	0.002	NA, NO	NA, NO	NO
2000	216.75	17.37	9.85	4.10	0.01	NA, NO	0.09	NO
2010	191.05	19.93	9.91	10.25	0.07	NA, NO	0.02	NO
2011	177.09	20.37	10.30	10.77	0.06	NA, NO	0.01	NO
2012	185.63	20.78	10.22	11.50	0.06	NA, NO	0.0005	NO
2013	192.86	19.90	9.96	11.95	0.06	NA, NO	0.17	NO
2014	161.54	20.60	9.97	12.15	0.04	NA, NO	0.12	NO
Per cent change 1990–2014	-18.7	5.4	-8.22	11 633 501.0	NA	NA	NA	NA

Abbreviations: NA = not applicable, NO = not occurring.

^a Emissions/removals reported in the sector other (sector 6) are not included in total greenhouse gas emissions.

^b The Party did not report indirect CO₂ emissions in common reporting format table 6.

Table 8
Greenhouse gas emissions by sector for Liechtenstein, 1990–2014^{a, b}
 (kt CO₂ eq)

	<i>Energy</i>	<i>IPPU</i>	<i>Agriculture</i>	<i>LULUCF</i>	<i>Waste</i>	<i>Other</i>
1990	201.06	0.45	25.50	4.58	2.17	NO
1995	206.78	1.72	23.67	7.52	2.16	NO
2000	219.88	4.46	21.47	8.39	2.36	NO
2010	194.11	10.54	24.17	14.80	2.41	NO
2011	180.12	11.04	24.90	11.55	2.55	NO
2012	188.69	11.75	25.12	11.75	2.63	NO
2013	195.87	12.38	24.01	11.72	2.64	NO
2014	164.26	12.50	24.38	11.56	3.27	NO
Per cent change 1990–2014	–18.3	2 663.6	–4.4	152.3	50.8	NA

Abbreviations: IPPU = industrial processes and product use, LULUCF = land use, land-use change and forestry, NA = not applicable, NO = not occurring.

^a Emissions/removals reported in the sector other (sector 6) are not included in total greenhouse gas emissions.

^b The Party did not report indirect CO₂ emissions in common reporting format table 6.

Table 9
Greenhouse gas emissions/removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol by activity, base year^{a, b}–2014, for Liechtenstein
 (kt CO₂ eq)

	<i>Article 3.7 bis as contained in the Doha Amendment^c</i>			<i>Forest management and elected Article 3.4 activities of the Kyoto Protocol</i>					
	<i>Article 3.3 of the Kyoto Protocol</i>	<i>Land-use change</i>	<i>Afforestation and reforestation</i>	<i>Deforestation</i>	<i>Forest management</i>	<i>Cropland management</i>	<i>Grazing land management</i>	<i>Revegetation</i>	<i>Wetland drainage and rewetting</i>
FMRL					0.10				
Technical correction					0.02				
Base year		2.38					NO	NO	NO
2013			-0.26	4.45	3.81		NO	NO	NO
2014			-0.27	4.38	3.74		NO	NO	NO
Per cent change base year– 2014							NA	NA	NA

Abbreviations: FMRL = forest management reference level, NA = not applicable, NO = not occurring.

^a Base year refers to the base year under the Kyoto Protocol, which is 1990 for CO₂, CH₄ and N₂O, and 1995 for HFCs, PFCs, SF₆ and NF₃. Liechtenstein has not elected any activities under Article 3, paragraph 4, of the Kyoto Protocol. For activities under Article 3, paragraph 3, of the Kyoto Protocol, and forest management under Article 3, paragraph 4, only the inventory years of the commitment period must be reported.

^b Values in this table include emissions on lands subject to natural disturbances, if applicable.

^c The value reported in this column refers to 1990.

2. Table 10 provides an overview of relevant key data for Liechtenstein's reporting under Article 3, paragraphs 3 and 4, of the Kyoto Protocol.

Table 10

Key relevant data for Liechtenstein under Article 3, paragraphs 3 and 4, of the Kyoto Protocol

<i>Key parameters</i>	<i>Values</i>
Periodicity of accounting	(a) Afforestation/reforestation: commitment period accounting (b) Deforestation: commitment period accounting (c) Forest management: commitment period accounting (d) Cropland management: not elected (e) Grazing land management: not elected (f) Revegetation: not elected (g) Wetland drainage and rewetting: not elected
Election of activities under Article 3, paragraph 4	None
Election of application of provisions for natural disturbances	Yes, for forest management
3.5 per cent of total base year GHG emissions, and including indirect CO ₂ emissions and excluding LULUCF	8.021 kt CO ₂ eq (64.169 kt CO ₂ eq for the duration of the commitment period)
Cancellation of AAUs, ERUs, CERs and/or issuance of RMUs in the national registry for:	
1. Afforestation and reforestation in 2014	NA
2. Deforestation in 2014	NA
3. Forest management in 2014	NA
4. Cropland management in 2014	NA
5. Grazing land management in 2014	NA
6. Revegetation in 2014	NA
7. Wetland drainage and rewetting in 2014	NA

Abbreviations: AAU = assigned amount unit, CER = certified emission reduction, ERU = emission reduction unit, GHG = greenhouse gas, LULUCF = land use, land-use change and forestry, NA = not applicable, RMU = removal unit.

Annex II

Information to be included in the compilation and accounting database

Tables 11 and 12 include the information to be included in the compilation and accounting database for Liechtenstein. Data shown are from the original annual submission of the Party, including the latest revised estimates submitted, adjustments (if applicable), as well as the final data to be included in the compilation and accounting database.

Table 11

Information to be included in the compilation and accounting database for 2014, including the commitment period reserve, for Liechtenstein

(t CO₂ eq)

	<i>Original submission</i>	<i>Revised estimates</i>	<i>Adjustment^a</i>	<i>Final^b</i>
Commitment period reserve	1 413 756	1 400 440		1 400 440
Annex A emissions for 2014				
CO ₂	161 542			161 542
CH ₄	20 858	20 605		20 605
N ₂ O	10 392	9 965		9 965
HFCs	12 147			12 147
PFCs	42			42
Unspecified mix of HFCs and PFCs	NA, NO			NA, NO
SF ₆	116			116
NF ₃	NA, NO			NA, NO
Total Annex A sources	205 096	204 416		204 416
Activities under Article 3, paragraph 3, of the Kyoto Protocol for 2014				
3.3 Afforestation and reforestation		-274		-274
3.3 Deforestation		4 379		4 379
Forest management and elected activities under Article 3, paragraph 4, of the Kyoto Protocol for 2014				
3.4 Forest management		3 742		3 742

Abbreviations: Annex A sources = sources included in Annex A to the Kyoto Protocol, NA = not applicable, NO = not occurring.

^a "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).

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

Table 12

Information to be included in the compilation and accounting database for 2013, for Liechtenstein
(t CO₂ eq)

	<i>Original submission</i>	<i>Revised estimates</i>	<i>Adjustment^a</i>	<i>Final^b</i>
Annex A emissions for 2013				
CO ₂	192 864			192 864
CH ₄	19 153	19 901		19 901
N ₂ O	10 369	9 956		9 956
HFCs	11 951			11 951
PFCs	60			60
Unspecified mix of HFCs and PFCs	NA, NO			NA, NO
SF ₆	175			175
NF ₃	NA, NO			NA, NO
Total Annex A sources	234 572	234 907		234 907
Activities under Article 3, paragraph 3, of the Kyoto Protocol for 2013				
3.3 Afforestation and reforestation		-261		-261
3.3 Deforestation	4 450			4 450
Forest management and elected activities under Article 3, paragraph 4, of the Kyoto Protocol for 2013				
3.4 Forest management for 2013	3 807			3 807

Abbreviations: Annex A sources = sources included in Annex A to the Kyoto Protocol, NA = not applicable, NO = not occurring.

^a "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).

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

Annex III

Additional information to support findings in table 2

Missing categories that may affect completeness

The categories for which methods are included in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories were reported as “NE” (not estimated) or for which the expert review team otherwise determined that there may be an issue with the completeness of reporting in the Party’s inventory are the following:

Feedstocks, reductants and other NEU of fuels – liquid fuels – CO2
(see ID# E.15 in table 5).

Annex IV

Documents and information used during the review

A. Reference documents

Aggregate information on greenhouse gas emissions by sources and removals by sinks for Parties included in Annex I to the Convention. Note by the secretariat. Available at <<http://unfccc.int/resource/webdocs/agi/2015.pdf>>.

Annual status report for Liechtenstein for 2016. Available at <<http://unfccc.int/resource/docs/2016/asr/lie.pdf>>.

FCCC/ARR/2015/LIE. Report on the individual review of the annual submission of Liechtenstein submitted in 2015. Available at <<http://unfccc.int/resource/docs/2016/arr/lie.pdf>>.

FCCC/ARR/2014/LIE. Report on the individual review of the annual submission of Liechtenstein submitted in 2014. Available at <<http://unfccc.int/resource/docs/2015/arr/lie.pdf>>.

FCCC/ARR/2013/LIE. Report of the individual review of the annual submission of Liechtenstein submitted in 2013. Available at <<http://unfccc.int/resource/docs/2014/arr/lie.pdf>>.

“Guidelines for national systems for the estimation of anthropogenic greenhouse gas emissions by sources and removals by sinks 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 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>>.

“Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual greenhouse gas inventories”. Annex to decision 24/CP.19. Available at <<http://unfccc.int/resource/docs/2013/cop19/eng/10a03.pdf#page=4>>.

“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 the technical review of information reported under the Convention related to greenhouse gas inventories, biennial reports and national communications by Parties included in Annex I to the Convention”. Annex to decision 13/CP.20. Available at <<http://unfccc.int/resource/docs/2014/cop20/eng/10a03.pdf#page=6>>.

“Implications of the implementation of decisions 2/CMP.7 to 4/CMP.7 and 1/CMP.8 on the previous decisions on methodological issues related to the Kyoto Protocol, including those relating to Articles 5, 7 and 8 of the Kyoto Protocol, part I: implications related to accounting and reporting and other related issues”. Decision 3/CMP.11. Available at <<http://unfccc.int/resource/docs/2015/cmp11/eng/08a01.pdf#page=5>>.

“Implications of the implementation of decisions 2/CMP.7 to 4/CMP.7 and 1/CMP.8 on the previous decisions on methodological issues related to the Kyoto Protocol including those relating to Articles 5, 7 and 8 of the Kyoto Protocol, part II: implications related to review

and adjustments and other related issues”. Decision 4/CMP.11. Available at <<http://unfccc.int/resource/docs/2015/cmp11/eng/08a01.pdf#page=30>>.

Intergovernmental Panel on Climate Change. 2006. *2006 IPCC Guidelines for National Greenhouse Gas Inventories*. Available at <<http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html>>.

Intergovernmental Panel on Climate Change. 2014. 2013 Revised Supplementary Methods and Good Practice Guidance Arising from the Kyoto Protocol. Available at <<http://www.ipcc-nggip.iges.or.jp/public/kpsg>>.

Intergovernmental Panel on Climate Change. 2014. *2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands*. Available at <<http://www.ipcc-nggip.iges.or.jp/public/wetlands/index.html>>.

Standard independent assessment report, part 1, for Liechtenstein for 2016. Available at <http://unfccc.int/files/kyoto_protocol/registry_systems/independent_assessment_reports/application/pdf/siar_2016_lie_1_2.pdf>.

Standard independent assessment report, part 2, for Liechtenstein for 2016. Available at <http://unfccc.int/files/kyoto_protocol/registry_systems/independent_assessment_reports/application/pdf/siar_2016_lie_2_2.pdf>.

B. Additional information provided by the Party

Responses to questions during the review were received from Ms. Heike Summer (Office of Environment), including additional material on the methodology and assumptions used. The following documents¹ were also provided by Liechtenstein:

Bretscher D and Leifeld J. 2015. *Uncertainty in Agricultural CH₄ and N₂O Emissions of Switzerland*. Internal report. Tänikon Research Station, Zürich, Switzerland: Agroscope Reckenholz. Available at <<http://www.bafu.admin.ch/klima/13879/13880/14577/15536/index.html?lang=en>>.

INFRAS. 2014. *Verbrennung natürlicher Wald- Feld- und Gartenabfälle - Datengrundlagen zur Aktualisierung der Jahresleistungen*. Office of Environment.

Summer H. *Fahrzeugstatistik-bestand-30-juni-2016-grafiken.xls*. Excel spreadsheet. Office of Environment.

¹ Reproduced as received from the Party.

Annex V

B. Acronyms and abbreviations

AD	activity data
AAU	assigned amount unit
AWMS	animal waste management system
CER	certified emission reduction
CH ₄	methane
CO ₂	carbon dioxide
CO ₂ eq	carbon dioxide equivalent
CPR	commitment period reserve
CRF	common reporting format
DOC	degradable organic carbon
DOC _f	fraction of DOC that decomposes
EF	emission factor
ERT	expert review team
ERU	emission reduction unit
F-gas	fluorinated gas
FAO	Food and Agriculture Organization of the United Nations
GHG	greenhouse gas
HFC	hydrofluorocarbon
HWP	harvested wood products
IPCC	Intergovernmental Panel on Climate Change
IPPU	industrial processes and product use
KP-LULUCF	LULUCF emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol
kt	kilotonne
LULUCF	land use, land-use change and forestry
NA	not applicable
NE	not estimated
NEU	non-energy use
Nex	nitrogen excretion
NF ₃	nitrogen trifluoride
NIR	national inventory report
NO	not occurring
N ₂ O	nitrous oxide
PFC	perfluorocarbon
QA/QC	quality assurance/quality control
RMU	removal unit
SEF	standard electronic format
SF ₆	sulphur hexafluoride
SIAR	standard independent assessment report
UNFCCC	United Nations Framework Convention on Climate Change
