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## Report on the individual review of the annual submission of Denmark 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 Denmark, 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 Roskilde, Denmark.

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\* 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. Introduction<sup>1</sup>

1. This report covers the review of the 2016 annual submission of Denmark 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 Roskilde, Denmark, and was coordinated by Mr. Tomoyuki Aizawa and Ms. Lisa Hanle (UNFCCC secretariat). Table 1 provides information on the composition of the expert review team (ERT) that conducted the review of Denmark.

Table 1

### Composition of the expert review team that conducted the review of Denmark

<i>Area of expertise</i>	<i>Name</i>	<i>Party</i>
Generalist	Ms. Anna Romanovskaya	Russian Federation
Energy	Mr. Leif Hockstad	United States of America
IPPU	Mr. Menouer Boughedaoui	Algeria
Agriculture	Mr. Leandro Buendia	Philippines
LULUCF	Mr. Harry Vreuls	Netherlands
Waste	Mr. Gábor Kis-Kovács	Hungary
Lead reviewers	Mr. Menouer Boughedaoui Ms. Anna Romanovskaya	

*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,<sup>2</sup> including issues related to problems.<sup>3</sup> Other findings, and, if applicable, the ERT’s encouragements to resolve them, are also included.

<sup>1</sup> At the time of publication of this report, Denmark had not yet submitted its instrument of ratification of the Doha Amendment, and 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.

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

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

3. A draft version of this report was communicated to the Government of Denmark, 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 Denmark, 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 (KP-LULUCF), if elected, by gas, sector and activity for Denmark.
5. Information to be included in the compilation and accounting database can be found in annex II.
6. The ERT notes that Denmark’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.

Table 2

### Summary of review results and general assessment of the inventory of Denmark

<i>Assessment</i>	<i>Issue or problem ID #(s) in tables 3 and/or 5<sup>a</sup></i>		
Dates of submission	Original submission: 15 April 2016 (NIR, SEF-CP1-2015, CRF tables for Convention (DNK)), 6 June 2016 (SEF-CP2-2014, SEF-CP2-2015), 15 June 2016 (NIR for KP, CRF tables for KP (DKE), CRF tables for KP2 (DNM)) Revised submissions: 15 June 2016 (NIR, CRF tables for Convention (DNK)), 14 November 2016 (CRF tables for KP2 (DNM)) The values from the latest submission are used in this report		
Review format	In-country		
Application of the requirements of the UNFCCC Annex I inventory reporting guidelines and Wetlands Supplement (if	Have any issues been identified in the following areas:		
	<ol style="list-style-type: none"> <li>1. Identification of key categories</li> <li>2. Selection and use of methodologies and assumptions</li> <li>3. Development and selection of emission factors</li> </ol>		
		No	
		Yes	I.12, I.14, L.14, KL.3
		Yes	I.10, W.10, KL.6,

<i>Assessment</i>				<i>Issue or problem ID #(s) in tables 3 and/or 5<sup>a</sup></i>
applicable)	4.	Collection and selection of activity data	Yes	A.1, I.13, W.13
	5.	Reporting of recalculations	No	
	6.	Reporting of a consistent time series	Yes	E.6, I.11, L.13
	7.	Reporting of uncertainties, including methodologies	Yes	G.3, W.12
	8.	QA/QC	QA/QC procedures were assessed in the context of the national system (see below)	
	9.	Missing categories/completeness <sup>b</sup>	No	
	10.	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?	The Party did not report "NE" for any insignificant categories	
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	No	
	2.	National registry:		
		(a) Overall functioning of the national registry	No	
		(b) Performance of the functions of the national registry and the technical standards for data exchange	No	
	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	No	

<i>Assessment</i>	<i>Issue or problem ID #(s) in tables 3 and/or 5<sup>a</sup></i>
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	NA
(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 estimate submitted by Denmark 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 in-country review On the basis of the issues identified, does the ERT recommend that the next review be conducted as an in-country review?	No
Question 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, DKE = country identification code for Denmark’s submission under the Kyoto Protocol (Denmark and Greenland), DNK = country identification code for Denmark’s submission under the Convention (mainland Denmark, Greenland and the Faroe Islands), DNM = country identification code for Denmark’s submission under the Kyoto Protocol (mainland Denmark only), ERT = expert review team, ERU = emission reduction unit, IPCC = Intergovernmental Panel on Climate Change, 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, 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 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands.

<sup>a</sup> The ERT identified additional issues in the energy, industrial processes and product use, agriculture, LULUCF and waste sectors, as well as for KP-LULUCF activities, that are not specifically listed in table 2 but are included in table 3 and/or 5.

<sup>b</sup> 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 4 February 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 Denmark

<i>ID#</i>	<i>Issue and/or problem classification<sup>a,b</sup></i>	<i>Recommendation made in previous review report<sup>f</sup></i>	<i>ERT assessment and rationale</i>
<b>General</b>			
G.1	QA/QC and verification (11, 2014) Adherence to UNFCCC Annex I inventory reporting guidelines	Enhance QC activities to avoid inconsistencies between the NIR and CRF summary table 3	Resolved. No inconsistencies between the NIR and CRF summary table 3 were identified by the ERT during the review
<b>Energy</b>			
E.1	1.A.1.c Manufacture of solid fuels and other energy industries – gaseous fuels – N <sub>2</sub> O (24, 2014) Transparency	Explain in the NIR that the observed decline in the N <sub>2</sub> O IEF for offshore natural gas fuelled turbines in combined heat and power plants over the time series is expected owing to the fact that the Party uses the same EF for both onshore and offshore natural gas turbines (as there is no evidence to suggest that these types of turbines have different emission characteristics for N <sub>2</sub> O), and that the EF for onshore turbines has declined	Resolved. In the 2016 NIR, this explanation has been included (p. 158)
E.2	1.A.1.c Manufacture of solid fuels and other energy industries – gaseous fuels – N <sub>2</sub> O (24, 2014) Adherence to UNFCCC Annex I inventory reporting	Improve QA/QC procedures	Resolved. In the 2016 NIR, extensive discussion of QA/QC procedures has been included (p. 166)

<i>ID#</i>	<i>Issue and/or problem classification<sup>a,b</sup></i>	<i>Recommendation made in previous review report<sup>c</sup></i>	<i>ERT assessment and rationale</i>
	guidelines		
E.3	1.A.1.c Manufacture of solid fuels and other energy industries – gaseous fuels – N <sub>2</sub> O (24, 2014) Adherence to UNFCCC Annex I inventory reporting guidelines	Follow up on the recommendations made in previous review reports	Resolved. In the 2016 NIR, each category contains a section on “Improvements related to reviews”
IPPU			
I.1	2.A.1 Cement production – CO <sub>2</sub> (29, 2014) (28, 2013) (56, 2012) Transparency	Provide detailed explanations in the NIR on the method used to estimate CO <sub>2</sub> EFs for the years 1990–1997 and how the method ensures that all CO <sub>2</sub> emissions generated during cement production (including CKD) have been taken into account	Resolved. Explanation provided in the NIR (pp. 296–298)
I.2	2.A.1 Cement production – CO <sub>2</sub> (30, 2014) Adherence to UNFCCC Annex I inventory reporting guidelines	Improve the QA/QC procedures to avoid the omission in the NIR, whereby EFs were reported for 2005 and 2007 in the text but the corresponding footnote indicated that the EFs were reported for the period 2005–2012	Resolved. Table 4.2.2 in the NIR contains the CO <sub>2</sub> per tonne of total cement equivalent for the entire time series 1990–2014, consistent with the footnotes
I.3	2.A.2 Lime production – CO <sub>2</sub> (33, 2014) Accuracy	Correct the AD for lime production to avoid the double counting of AD for hydraulic lime and improve QA/QC procedures	Resolved. QA/QC procedures have been improved as the error has been corrected in table 4.2.8 in the NIR
I.4	2.F. Product uses as substitutes for ozone depleting substances – HFCs and SF <sub>6</sub> (31, 2014) (29, 2013) Comparability*	Change the notation key from “NE” to “NO” for the AD for the amounts of HFCs remaining in products at decommissioning for refrigeration and air conditioning and aerosols and the amount of SF <sub>6</sub> remaining in products at decommissioning of electrical equipment, and provide a transparent explanation in the NIR	Addressing. Notation keys were revised in accordance with the new guidelines for Denmark, but “NE” continues to be reported for Greenland. A description is provided in the NIR for refrigeration and air conditioning (p. 344) but not for the other applications
I.5	2.F. Product uses as substitutes for ozone depleting substances – HFCs and SF <sub>6</sub> (31, 2014) Adherence to UNFCCC Annex I inventory reporting guidelines*	Improve the QA/QC checks for the use of notation keys for the entire time series	Addressing. The notation keys for Greenland were not corrected and “NE” is still used for Greenland in 2G electrical equipment and 2F transport refrigeration (see ID#I.4 above)



<i>ID#</i>	<i>Issue and/or problem classification<sup>a,b</sup></i>	<i>Recommendation made in previous review report<sup>c</sup></i>	<i>ERT assessment and rationale</i>
I.6	2.F.2 Foam blowing agents – HFCs (32, 2014) Completeness	Estimate the AD for HFCs remaining in hard foam and verify that, consistent with Danish law, emissions from disposal are not occurring	Resolved. AD has been provided for hard foams in CRF table 2(II)B-H and a description was provided in the NIR (p. 346)
I.7	2.G.2 SF <sub>6</sub> and PFCs from other product use – SF <sub>6</sub> (35, 2014) Comparability	Report the SF <sub>6</sub> emissions remaining in double-glazed windows at decommissioning separately from the emissions from stocks, and, if not possible, change the notation key from “NO” to “IE”	Resolved. The emissions from decommissioning have been separated from stocks in CRF table 2(II)B-H
I.8	2.G.2 SF <sub>6</sub> and PFCs from other product use – SF <sub>6</sub> (36, 2014) Adherence to UNFCCC Annex I inventory reporting guidelines	Correct the amount of SF <sub>6</sub> accumulated as stock in double-glazed windows as reported in the NIR and improve QA/QC procedures to avoid such errors	Resolved. The error has been corrected

#### Agriculture

A.1	3. General (agriculture) (41, 2014) Adherence to UNFCCC Annex I inventory reporting guidelines*	Report, to the extent possible, the results of the comparison of total N excretion in the inventory with calculations of N excretion for all livestock production estimated by the Danish Centre for Food and Agriculture (stage IV of the QA/QC improvement plan)	Addressing. Denmark informed the ERT that the comparison of the N <sub>2</sub> O emissions from manure management as estimated by IDA and the Danish Normative System is ongoing (NIR table 9.2)
A.2	3.A.1 Cattle – CH <sub>4</sub> (42, 2014) Consistency	Explain in the NIR the reasons for the decline in the number of dairy cattle and non-dairy cattle. In particular, include the rationale that for dairy cattle, increasing feed efficiency has resulted in higher milk production per cow, which means that fewer dairy cattle are needed to produce the amount of milk allowed by the EU milk quota, while for non-dairy cattle, the decrease is mainly due to the fact that a smaller population of dairy cattle leads to a reduced number of calves and hence also fewer heifers and bulls, which are reported as non-dairy cattle	Resolved. Figure 5.3 of the NIR shows the increasing trend of milk production over the years (from 6 000 kg milk/head/year in 1990 to 9 100 kg milk/head/year in 2014), which explains the decline in the number of dairy cattle while ensuring that the EU milk quota is met. For non-dairy cattle, the reason for the decline is also linked to the milk quota (NIR p. 387). Non-dairy cattle has a high share of heifers and the production of heifers is closely connected to dairy cattle production. Regarding the increase in feed efficiency that resulted in lower CH <sub>4</sub> emissions, this is due to improvement of the feed

<i>ID#</i>	<i>Issue and/or problem classification<sup>a,b</sup></i>	<i>Recommendation made in previous review report<sup>f</sup></i>	<i>ERT assessment and rationale</i>
			utilization (NIR p. 385)
A.3	3.A.1 Cattle – CH <sub>4</sub> (43, 2014) (42, 2013) Transparency	Include in the NIR a description of the interpolation method and parameters used to estimate average gross energy intake (GE) for non-dairy cattle	Resolved. The NIR stated that interpolation of GE for heifers was chosen from the years 2004 to 2007 to avoid a significant jump from 2006 to 2007, and that the GE for non-dairy cattle is obtained by taking the average of GE for calves, heifers, bulls and suckling cattle (p. 384)
A.4	3.D.a.3 Crop residues – N <sub>2</sub> O (45, 2014) (47, 2013) Consistency	Provide the time series for the crop yield of nitrogen fixing crops in the NIR	Resolved. Data of above-ground residue dry matter for different crops, from 1990 to 2014, are provided in NIR, annex 3D, table 3D-16. These include data of nitrogen-fixing crops like beans and pulses
<b>LULUCF</b>			
L.1	4. General (LULUCF) (47, 2014) Transparency	Elaborate on the explanation of any recalculations in the NIR	Resolved. More explanation is included in the NIR (see sections 6.2.7 and 6.2.15)
L.2	Land representation – (48, 2014) Transparency*	Provide information on how data sources have been combined and used to construct the land-use and land-use change matrices, including a summary of the methodology used for estimating land use and land-use change for the period between 1990 and 2011 and 2011 to 2012	Addressing. In each of the sections in chapter 6 of the NIR information on the data sources their use and how they have been combined is now presented. The overall description is not fully in line with the details presented in those sections and a transparent overall description (not related to a specific land-use category) is still missing
L.3	Land representation – (49, 2014) Transparency	Provide in the NIR information to explain the country-specific land-use transition periods chosen and how they are determined for each LULUCF land category, including information on Danish climate conditions and the soil organic matter degradation functions of the C-Tool	Resolved. More explanation is included in the NIR (see pp. 444, 461 and 465)
L.4	4.A.1 Forest land remaining forest land – CO <sub>2</sub> (50, 2014) Transparency*	Explain in the NIR that the large inter-annual variations in the carbon stock in living biomass are actually small compared to the overall size of the pools	Addressing. Information provided in the NIR (p. 558) indicates that analysis and discussions are under way in

<i>ID#</i>	<i>Issue and/or problem classification<sup>a,b</sup></i>	<i>Recommendation made in previous review report<sup>c</sup></i>	<i>ERT assessment and rationale</i>
			Denmark but no conclusion was provided
L.5	4.A.1 Forest land remaining forest land – CO <sub>2</sub> (51, 2014) (51, 2013) Transparency*	Provide additional information on the area and volume of clear cutting and the area subject to destructive disturbance, subject to the availability of data	Addressing. Information on temporary unstocked areas was presented during the review process, but is not yet included in the NIR
L.6	4.B.1 Cropland remaining cropland – CO <sub>2</sub> (52, 2014) Transparency	Describe in the NIR the rationale for, and application of, the methods used to estimate emissions from areas previously classified as organic soils that no longer qualify as organic due to the depletion of the depth of organic soils through agricultural cultivation	Resolved. More information is included in the NIR, including a new soil map (pp. 456–457)
L.7	4.B.1 Cropland remaining cropland – CO <sub>2</sub> (52, 2014) Accuracy	Incorporate the results of the university research and mapping study that was under way in 2014 and which involved taking some measurements on organic soils and developing a more detailed map for the 6–12 per cent national share of organic soils	Resolved. Results of the study are reported in the NIR (pp. 456–457) and used in estimating areas and emissions from organic soils
L.8	4.B.1 Cropland remaining cropland – CO <sub>2</sub> (53, 2014) Adherence to UNFCCC Annex I inventory reporting guidelines*	Accurately report the area of cultivated organic soils in the CRF tables among the cropland and grassland categories and improve the implementation of QC measures	Not resolved. Overall, the area of organic soils and their distribution over land-use classes still needs to be improved and the errors corrected
L.9	4.B.1 Cropland remaining cropland – CO <sub>2</sub> (54, 2014) (53, 2013) Transparency*	Provide additional information on the large variations in the areas of set-aside to help explain the estimates associated with cropland management practices	Addressing. Information was provided during the review process, but information is not yet included in the NIR
L.10	4.E. Settlements – CO <sub>2</sub> , CH <sub>4</sub> and N <sub>2</sub> O (55, 2014) Adherence to UNFCCC Annex I inventory reporting guidelines	Enhance QA/QC procedures and accurately report the total area estimates for settlements in both the NIR and CRF tables	Resolved. Area reported in NIR and CRF table 4.E is consistent
L.11	4 (V) Biomass burning – CO <sub>2</sub> , CH <sub>4</sub> and N <sub>2</sub> O (56, 2014) Adherence to UNFCCC Annex I inventory reporting guidelines	Enhance QA/QC procedures and accurately report the AD associated with biomass burning in the CRF tables	Resolved. AD provided in CRF table 5(V) also suggests that QA/QC procedures have been enhanced

<i>ID#</i>	<i>Issue and/or problem classification<sup>a,b</sup></i>	<i>Recommendation made in previous review report<sup>f</sup></i>	<i>ERT assessment and rationale</i>
<b>Waste</b>			
W.1	5. General (waste) (58 and 70, 2014) Transparency	Provide all necessary explanations for recalculations in the NIR	Resolved. Recalculations and the currently applied methodology are well documented in the NIR (section 7.9)
W.2	5. General (waste) (59, 2014) Adherence to UNFCCC Annex I inventory reporting guidelines*	Enhance category-specific QC procedures in order to avoid discrepancies between the NIR and the CRF data	Addressing. See ID#W.8 in table 5
W.3	5.A Solid waste disposal on land – CO <sub>2</sub> (61, 2014) Comparability*	Use the notation key “NA” to report CO <sub>2</sub> emissions for solid waste disposal on land	Addressing. The notation key for managed waste disposal sites was changed to “NA” for Denmark, but CO <sub>2</sub> emissions from Greenland are still reported as “NE”
W.4	5.D Wastewater treatment and discharge – CH <sub>4</sub> and N <sub>2</sub> O (70, 2014) Transparency	Document the data available and studies used to develop the country-specific factors for MCF and TOW	Resolved. In addition to providing information in the NIR (chapter 7.5.2), Denmark has published a peer-reviewed scientific report (see ID#W.16)
W.5	5.D Wastewater treatment and discharge – CH <sub>4</sub> (70, 2014) Transparency	Justify the recalculation in the NIR	Resolved. Denmark provided information on the recalculation in the NIR (chapter 7.9)
W.6	5.D Wastewater treatment and discharge – CH <sub>4</sub> and N <sub>2</sub> O (72, 2014) Accuracy	Collect or estimate data on the fraction of sludge treated anaerobically for 2008 onwards	Not relevant. Denmark applies a country-specific methodology that is based on produced sewage sludge gas
W.7	5.E Other (waste) – CO <sub>2</sub> , CH <sub>4</sub> and N <sub>2</sub> O (66, 2014) Transparency	Provide a clearer description of activities related to sludge spreading, fugitive emissions from biological waste, sludge and manure during biogas production, and flaring and venting	Resolved. The NIR contains a clear description of the mentioned activities (throughout chapter 7). Moreover, leakage emissions from manure-based biogas production plants have been added to the inventory
<b>KP-LULUCF</b>			
KL.1	Deforestation – CO <sub>2</sub> (76, 2014)	Enhance QC procedures to avoid errors such as the one identified in the 2014 annual submission,	Resolved. Christmas trees received additional attention

<i>ID#</i>	<i>Issue and/or problem classification<sup>a,b</sup></i>	<i>Recommendation made in previous review report<sup>c</sup></i>	<i>ERT assessment and rationale</i>
	Accuracy	whereby the Party made an error in determining the proportion of deforested areas that contained short-rotation Christmas trees for 2012	for deforestation/crop management (NIR pp. 449 and 460 and section 10.6.5)
KL.2	Deforestation – CO <sub>2</sub> (77, 2014) Transparency	Include information in the NIR to justify the 100-year transition period chosen for deforested lands that were converted to settlements Applies to 2015	Resolved. Additional information is provided in the NIR (p. 470)
KL.3	Deforestation – CO <sub>2</sub> (77, 2014) Accuracy*	Perform a QA assessment of the approach used to determine the 100-year transition period for deforested lands that were converted to settlements, using independent model verification based on country-specific data relevant to deforestation	Not resolved. The Party stated that the period of 100 years had been accepted by the ERT in the 2012 review, as reported in the 2016 NIR on p. 470. This is reaffirmed in the ARR 2014 (para. 77). However, no information on the QA assessment is included in the 2016 NIR
KL.4	Cropland management – CO <sub>2</sub> and N <sub>2</sub> O (79, 2014) Transparency	Include information in the NIR to justify how AD for cropland management from Statistics Denmark ensure full coverage of the national territory	Resolved. Data used in the land-use matrix and areas are in line with full coverage (NIR pp. 447–448)
KL.5	Cropland management – CO <sub>2</sub> and N <sub>2</sub> O (79, 2014) Accuracy	Validate, using country-specific data, results of the model used to calculate emissions from the degradation of carbon	Resolved. Validation reported in the NIR (pp. 451–452)

*Abbreviations:* AD = activity data, CKD = cement kiln dust, CRF = common reporting format, EF = emission factor, ERT = expert review team, EU = European Union, GE = gross energy, IE = included elsewhere, IEF = implied emission factor, IDA = Integrated Database model for Agriculture, 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, MCF = methane conversion factor, NA = not applicable, NE = not estimated, NIR = national inventory report, NO = not occurring, NIR = national inventory report, QA/QC = quality assurance/quality control, TOW = total organic waste, 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”.

<sup>a</sup> 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.

<sup>b</sup> 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.

<sup>c</sup> 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.

#### **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 Denmark, and have not been addressed by the Party.

Table 4

**Issues identified in three successive reviews and not addressed by Denmark**

<i>ID#<sup>a</sup></i>	<i>Previous recommendation for the issue identified</i>	<i>Number of successive reviews issue not addressed<sup>b</sup></i>
<b>General</b>		
	No such general issues were identified	
<b>Energy</b>		
	No such issues for the energy sector were identified	
<b>IPPU</b>		
I.4	Change the notation key from “NE” to “NO” for the AD for the amounts of HFCs remaining in products at decommissioning for refrigeration and air conditioning and aerosols and the amount of SF <sub>6</sub> remaining in products at decommissioning of electrical equipment for Greenland, and provide a transparent explanation in the NIR	3 (2013–2015/2016)
<b>Agriculture</b>		
	No such issues for the agriculture sector were identified	
<b>LULUCF</b>		
L.5	Provide additional information on the area and volume of clear cutting and the area subject to destructive disturbance, subject to the availability of data	3 (2013–2015/2016)
L.9	Provide additional information on the large variations in the areas of set-aside to help explain the estimates associated with cropland management practices	3 (2013–2015/2016)
<b>Waste</b>		
	No such issues for the waste sector were identified	
<b>KP-LULUCF</b>		
	No such issues with KP-LULUCF activities were identified	

*Abbreviations:* AD = activity data, 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, NE = not estimated, NIR = national inventory report, NO = not occurring.

<sup>a</sup> 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.

<sup>b</sup> 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 Denmark, 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 Denmark 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 Denmark**

<i>ID#</i>	<i>Finding classification</i>	<i>Description of the finding with recommendation or encouragement</i>	<i>Is finding an issue<sup>a</sup> and/or a problem<sup>b</sup>? If yes, classify by type</i>
<b>General</b>			
G.2	Annual submission	The ERT noted that Denmark submitted two sets of CRF tables under the Kyoto Protocol for the second commitment period, one of which contains data for mainland Denmark and Greenland, and one of which contains data for mainland Denmark only. In its NIR, Denmark states “According to the instrument of ratification, the Danish government has ratified the UNFCCC on behalf of Denmark, Greenland and the Faroe Islands. The Danish government has ratified the Kyoto Protocol on behalf of Denmark and Greenland. In the first commitment period under the Kyoto Protocol, Greenland had a reduction commitment. However, for the second commitment period a territorial exemption for Greenland will be made in the ratification of the Doha Amendment”. At the time of publication of this report, Denmark had not yet submitted its instrument of ratification of the Doha Amendment. The assessment of the inventory is based on the submission for Denmark and Greenland, unless otherwise specified. The information on accounting is based on the submission for mainland Denmark only, in accordance with the information above	Not an issue
G.3	Uncertainty analysis	<p>The ERT noted that the Party did not provide information in accordance with paragraph 15 of the annex to decision 24/CP.19 on the results of the uncertainty analysis for the base year. During the review, Denmark indicated that it failed to include the uncertainty analysis for the base year by mistake and its results were provided to the ERT. The results showed that the uncertainties are lower in 2014 compared to the base year, especially when considering the analysis without LULUCF (4.8% and 5.2%, respectively)</p> <p>The ERT recommends that Denmark report uncertainties for the base year in the NIR</p>	Yes. Adherence to UNFCCC Annex I inventory reporting guidelines
<b>Energy</b>			
E.4	1. General (energy sector)	<p>Denmark has elected to report indirect CO<sub>2</sub> emissions (from all sectors except agriculture and LULUCF) and indirect N<sub>2</sub>O emissions from all sectors in CRF table 6. However, limited details are provided in NIR chapter 11 on the calculation of these indirect CO<sub>2</sub> and N<sub>2</sub>O emissions</p> <p>The ERT recommends that Denmark provide information on the calculation approaches in line with paragraphs 48 and 50 of annex I to decision 24/CP.19 and the appendix to that annex, to facilitate review, including methodological information such as the choice of methods, AD and EFs</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<sup>a</sup> and/or a problem<sup>b</sup>? If yes, classify by type</i>
E.5	1.A.1.a Public electricity and heat production – liquid fuels – CO <sub>2</sub>	<p>For residual fuel oil the EU ETS data have been applied for estimating the EF for category 1.A.1.a in the 2006–2014 period. The estimated EF from the EU ETS (77.87 kg/GJ – 79.70 kg/GJ) covering 84% of residual fuel oil consumption for this category and the 2006 IPCC Guidelines default value (77.4 kg/GJ), which is used for the few plants outside of the EU ETS covering 17% of residual fuel oil consumption for this category as well as the residual fuel oil EF used in transportation (77.89 kg/GJ), are not consistent. During the review Denmark explained that, based on discussions with an industry body, it assumes the EU ETS EF is not necessarily representative for residual oil consumed in categories other than 1.A.1.a</p> <p>The ERT encourages Denmark to continue investigations into how to utilize the EU ETS data on EFs to derive a country-specific EF for residual fuel oil instead of using IPCC defaults</p>	Not an issue
E.6	1.A.1 Energy industries – other fuels – CO <sub>2</sub>	<p>All waste incineration in Denmark is utilized for heat and/or power production and these emissions are included in the energy sector. Waste fuel consumption rates are based on the official Danish energy statistics prepared by the Danish Energy Agency aggregated to Standardized Nomenclature for Air Pollutants categories for emission calculations. Actual emission rates are collected under the EU ETS, while data for waste incineration are only available for 2013 (43.0 kg/GJ) and 2014 (40.8 kg/GJ). For 1990–2012 emission calculations, a constant CO<sub>2</sub> EF has been applied. During the review Denmark stated that discussions with an industry body on the waste incineration EFs have not been informative and that operations and waste composition are highly variable between different incineration plants. In the NIR (p. 141) Denmark details the highly variable CO<sub>2</sub> EF collected under the EU ETS. Denmark further details in the NIR (p. 148) how it utilizes the results of a one-time study of Danish waste incineration plants to develop the country-specific EF used from 1990 to 2012</p> <p>The ERT recommends that Denmark continue the analyses with subsequent years of EU ETS EFs on how to improve earlier time series EFs and the consistency of the full time series</p>	Yes. Consistency*
<b>IPPU</b>			
I.9	2. General (IPPU)	<p>There is no category-specific QA/QC procedure for all F-gases, as suggested in the Poulsen report,<sup>c</sup> to ensure the quality of estimates</p> <p>The ERT encourages Denmark to develop a category-specific QA/QC plan for F-gases to improve reporting and transparency for this category</p>	Not an issue
I.10	2.A.4 Other process uses of carbonates – CO <sub>2</sub>	<p>The EF used by Denmark for limestone consumed for ceramic production in 2014 is 0.43971 t CO<sub>2</sub>/t CaCO<sub>3</sub>. Denmark is using a tier 2 method with a country-specific EF for the ceramics category although it is not a key category. In the 2016 NIR submission the Party reported on a possible misreporting caused by the inclusion of emissions not related to the production of</p>	Yes. Accuracy*

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue <sup>a</sup> and/or a problem <sup>b</sup> ? If yes, classify by type
		<p>expanded clay products</p> <p>The ERT recommends that Denmark check with the producers (Damolin, Saint Gobin and Weber) for any mistaken inclusion leading to such a high IEF and potential double counting and report this as appropriate in the next submission</p>	
I.11	2.B.10 Other (chemical industry) – CO <sub>2</sub>	<p>Catalyst and potassium nitrate are produced by a single company in Denmark. AD are available for the years 1996 onwards and are estimated by extrapolation for the period 1990–1995. Denmark used an average of the catalyst and nitrate potassium production in the period 1997–2001 as a constant value for the period of 1990–1995</p> <p>Because of the global growth in consumption of fertilizers and ammonia production between 1990–1995, and the increase in energy consumption in this category as described in figure 3.2.25 on page 120 of the NIR, the ERT considers that the extrapolation made does not correspond with the trend of production during that period</p> <p>The ERT considers that a linear extrapolation is more appropriate to reflect the trend of production during the period 1990–1995. The ERT recommends that Denmark apply a linear extrapolation based on the trend for the period 1997–2001 or the period 1997–2014 to complete the time series of AD and recalculate CO<sub>2</sub> emissions from catalyst and potassium nitrate production</p>	Yes. Consistency*
I.12	2.E.5 Other (electronics industry) – HFCs and PFCs	<p>Consumption and emissions of F-gases in the year 2013 from fibre optics are reported as “NO” for HFC-23 and PFC-318. For the same year 2013, there is an important increase in the use of PFC-14 by 178% (from 0.18 t in 2012 to 0.50 t in 2013) and a subsequent decrease to 0.08 t in 2014. There is no information or data provided in the NIR and no information provided directly from the plant as this would be reflected in the reference list of the F-gas report<sup>c</sup></p> <p>During the review, the Party clarified that it assumes that 100% of the purchased F-gases are consumed in the same year by the plant. The Party also indicated that it expects that a technical substitute for PFC-318 has been introduced and that in the latest year there continues to be no PFC-318 imported. Further, the Party suggested that the increase in PFC-14 was due to its use in a new application (as a refrigerant in extremely low temperatures) and likely not for use in fibre optics</p> <p>The ERT recommends that Denmark investigate whether there was any change in the process during 2012 and in the F-gas consumption in 2013 and to report this as appropriate in the next submission for transparency. The ERT further recommends that Denmark assess the assumption of 100% of F-gas consumption from industrial plants (fibre optics) to improve</p>	Yes. Accuracy*

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue <sup>a</sup> and/or a problem <sup>b</sup> ? If yes, classify by type
		estimations and to report on this in its next submission	
I.13	2.G.2 SF <sub>6</sub> and PFCs from other product use – SF <sub>6</sub>	<p>Denmark reported F-gases emissions based on Poulsen (2016),<sup>c</sup> which stated that data are collected only from the following five types of source: (1) importers, agency enterprises, wholesalers and suppliers; (2) consuming enterprises and trade and industry associations; (3) the Danish Environmental Protection Agency; (4) official trade statistics; and (5) previous estimations of F-gases. In this review report, it is stated that there is no particle accelerator in Denmark and research laboratories and medical services are not identified as potential consumers of SF<sub>6</sub>. During the review, Denmark acknowledged there are additional consumers of SF<sub>6</sub> in Denmark: a particle accelerator at Aarhus University, a radiotherapy device occurring in a medical centre in Copenhagen, and electron microscopes. Denmark further explained that SF<sub>6</sub> emissions from the particle accelerator are included in the AD provided by suppliers.</p> <p>The ERT recommends that Denmark investigate all users of SF<sub>6</sub>, to collect data and information and revise previous estimates as appropriate. In addition, the ERT understands that emissions are already included in the current estimate of SF<sub>6</sub> emissions and recommends that the Party report information on the particle accelerator and other SF<sub>6</sub> sources in the next submission for transparency and comparability among Parties. The ERT also encourages Denmark to include these sources in the questionnaire of the next survey, to explore all SF<sub>6</sub> users and report on them in its next submission for transparency</p> <p>In the comment on the draft review report, Denmark stated that, for the next submission, importers/suppliers will be questioned specifically with regard to their knowledge of use of SF<sub>6</sub> in laboratories and the EFs thereof, and it will be clarified whether Denmark should/can collect data which justify the introduction of a national EF for laboratories</p>	Yes. Accuracy*
I.14	2.G.2 SF <sub>6</sub> and PFCs from other product use – SF <sub>6</sub>	<p>The ERT notes that Denmark estimates emissions from this category based on the assumption that all F-gases purchased in a given year are consumed in the same year. In years where there is no purchase of F-gases, zero is reported or “NO” is used</p> <p>The ERT recommends that Denmark assess the assumption of 100% of F-gas consumption from possible sources (e.g. laboratories, universities, research laboratories and medical centres), to improve estimations and increase the consistency of the time series</p>	Yes. Accuracy*
Agriculture			
A.5	3.D Direct and indirect N <sub>2</sub> O emissions from	Denmark recognized the decreasing trend in N <sub>2</sub> O emissions between 1990 (5 363.16 kt CO <sub>2</sub> eq) and 2014 (3 744.24 kt CO <sub>2</sub> eq) from soils due to the gradual decrease in the use of inorganic fertilizer (from 400.41 kt N in 1990 to only 186.97 kt N in 2014; see NIR table	Not an issue

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue <sup>a</sup> and/or a problem <sup>b</sup> ? If yes, classify by type
agricultural soils – N <sub>2</sub> O	5.16), and resulting from increasing requirements for improved use of nitrogen in livestock manure and reduction of nitrogen loss to the environment. Denmark plans, as stated in the NIR section 5.15 (p. 425), to provide a comparison of AD for inorganic nitrogen fertilizer given by Statistics Denmark and FAO. As shown in NIR figure 5.8, the consistent gradual decrease in the use of inorganic nitrogen fertilizer over the years is an indication that the N <sub>2</sub> O emissions from agricultural soils in 2014 are not underestimated	The ERT encourages Denmark to continue with the plan to validate the decreasing trend in the amount of inorganic nitrogen fertilizer consumed	
LULUCF			
L.12	Land representation	Denmark provides descriptions of the wall-to-wall approach for mapping land areas in different sections of the NIR, while an overall description of the use of different sources for the wall-to-wall mapping is missing  The ERT encourages Denmark to provide an overall description of the wall-to-wall approach and the sources used to enable the approach to be understood	Not an issue
L.13	Land representation	Beginning in 2011, Denmark changed the method for constructing the land-use matrices into an annual construction instead of the multi-annual construction with interpolations and models (NIR p. 432). The new approach results in annual fluctuations in emissions and removals from 2012 onwards, while prior to 2011 there were smooth lines. During the review, Denmark informed the ERT that the annual fluctuations are, in practice, the result of the use of provisional numbers that will be recalculated in future submissions. This change in approach results in time series that are not consistent until the “final” land-use changes are determined. The continuation of the approach used for the years prior to 2011 would ensure time-series consistency  The ERT recommends that Denmark ensure time-series consistency and transparent documentation of the new approach	Yes. Consistency*
L.14	4. General (LULUCF)	Denmark does not report on land-use changes prior to 1990, although it uses land-use conversion periods of 50 and 100 years. The result is that land-use changes prior to 1990 are misallocated in the land-use categories remaining and not in the land-use change categories. While this misallocation would be ended in 2010 in cases where the default transition period would be used, this misallocation continues to 2040 and later because of the use of longer transition periods than the 20-year default. During the review, the Party explained that comparable land-use maps for 50–100 years prior to 1990 are not available, and it is hard to make an estimate for the land-use changes, as extrapolation from the period 1990–2010 back	Yes. Accuracy*

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue <sup>a</sup> and/or a problem <sup>b</sup> ? If yes, classify by type
		<p>in time cannot be done because the situations are not comparable. Depending on the land-use changes, this misallocation could have a minor impact on soil emissions. But the NIR does not provide information on this issue</p> <p>The ERT recommends that Denmark research the impact of the land-use conversions prior to 1990 on the estimated emissions and removals from soils from 1990 onwards and revise the reporting allocation and estimates, or, if Denmark considers that a disproportionate amount of effort would be required to estimate these impacts in terms of the likely level of emissions and removals (i.e. if they would be insignificant in terms of the overall level and trend in national emissions), provide justifications in the NIR for this</p>	
L.15	4. General (LULUCF)	<p>The ERT welcomes Denmark's efforts to produce a new organic soil map for mainland Denmark for the year 2010 (soil with over 12% organic carbon) (NIR pp. 456–457). However, the ERT noted that the numbers reported are not consistent: in the NIR the area of organic soils on page 456 (106.642 kha in 2010) differs from that on page 457 (178.00 kha in 1975), while the areas in CRF table 4.A-4.E for 2010 equals 153.63 kha and in the report for the soil map<sup>d</sup> it is reported: "Our results show that the contemporary peatland covers 70,176 ha with an S.E. of 8.95%. The results also indicate that the historical coverage was 107,962 ha, resulting in a loss of 37,786 ha of peatland since 1975, or a yearly average loss of almost 1,080 ha of peatland".</p> <p>The ERT recommends that Denmark ensure consistent reporting of the area of organic soils between the NIR and CRF table 4 and improve QC procedures for consistent reporting of the areas of organic soils</p>	Yes. Adherence to UNFCCC Annex I inventory reporting guidelines
L.16	4. General (LULUCF) – CO <sub>2</sub> , CH <sub>4</sub> and N <sub>2</sub> O	<p>The ERT noted that for cropland Denmark estimates emissions for two types of organic soils: soils with 6–12% organic carbon; and soil with over 12% organic carbon. In table 6.15 of the NIR, Denmark presents emission factors for soils with 6–12% organic carbon for cropland (5.75 t C/ha per year) as well as for grassland (4.2 t C/ha per year). In the NIR Denmark did not provide a clear reason why it only applies this approach of two types of organic soils to cropland and not to other or all organic soils</p> <p>The ERT recommends that Denmark provide an explanation in the NIR for the broader definition of organic soils for cropland and not for all land-use categories</p>	Yes. Transparency*
L.17	4.B Cropland – general	<p>In table 6.11 of the NIR Denmark reports the areas of "set-aside and other land" (41 873 ha in 2014). While in the NIR the calculation of this "other land" as a type within cropland is documented, this calculation is missing for "set-aside land". During the review process Denmark explained to the ERT that for the calculation of emissions set-aside land is dealt with as an ordinary crop with a low impact on carbon stocks</p>	Yes. Transparency*

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue <sup>a</sup> and/or a problem <sup>b</sup> ? If yes, classify by type
L.18	4.B Cropland – CO <sub>2</sub> , CH <sub>4</sub> and N <sub>2</sub> O	<p>The ERT recommends that Denmark report in the NIR that the set-aside area is included in the C-TOOL model as an ordinary crop with a low input of carbon of 4.2 t C/ha per year</p> <p>Denmark reports in the NIR (p. 432) that Christmas trees on agricultural land are treated as agricultural crops and have been moved from forest land to cropland</p> <p>As the ERT recommends that Christmas trees should be reported under forest management and under deforestation for the purpose of reporting under the Kyoto Protocol (see ID#KL.7), the ERT recommends that Denmark treat Christmas trees consistently and report these under forest land and under forest land changed to other land uses for the entire time series</p>	Yes. Comparability*
Waste			
W.8	5. General (waste) – CH <sub>4</sub>	<p>Denmark’s reporting is generally transparent, the methodological descriptions are clear and plenty of background information provided. However, the ERT noted some inconsistencies between the different elements of the submission of Denmark. For example, the net CH<sub>4</sub> emissions in 2014 reported in table 7.2.1 of the NIR (820 Gg CO<sub>2</sub> eq) for solid waste disposal sites differ from the data reported in CRF summary table 2 for mainland Denmark (825.57 Gg CO<sub>2</sub> eq). Similarly, CH<sub>4</sub> emissions from composting in 2014 are reported in table 7.3.1 of the NIR as 5 025.0 Mg whereas in CRF table 5.B a slightly different value can be found (5 026.91 Mg) for mainland Denmark only. Furthermore, for solid waste disposal, AD are described back to 1960 in the main text of the NIR whereas table 3F-2.3 in annex 3F-2 starts with the year 1940; therefore it was not fully clear which was the starting year of the calculations</p> <p>The ERT recommends that the Party correct the errors identified in tables 7.2.1 and 7.3.1 and the description of the AD in the NIR (p. 488) and enhance its QC activities by implementing a specific QA/QC procedure to ensure that consistent data are reported in the different elements of its submission</p>	Yes. Adherence to UNFCCC Annex I inventory reporting guidelines
W.9	5. General (waste)	<p>The ERT noted that the NIR contains a rich list of references, which contributes to the overall good transparency of the reporting. However, some literature referred to in the methodological description could not be found among the references, some links to online documents are not working anymore, and previous IPCC guidelines are still referenced</p> <p>The ERT recommends that unnecessary references to previous IPCC guidelines be removed from the methodological descriptions and encourages Denmark to regularly update the references in the NIR</p>	Yes. Transparency*
W.10	5.A.1 Managed waste disposal sites	In the model for calculating CH <sub>4</sub> emissions from solid waste disposal, Denmark applies the same parameter F (fraction of CH <sub>4</sub> in generated landfill gas) for both generated and recovered	Yes. Accuracy*

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue <sup>a</sup> and/or a problem <sup>b</sup> ? If yes, classify by type
– CH <sub>4</sub>		<p>landfill gas. The ERT notes that the used value (0.41) is lower than the default value in the 2006 IPCC Guidelines (i.e. 0.5). The country-specific value of F used by Denmark could be found in a document on emissions from a gas engine burning landfill gas referenced in the NIR (Danish Gas Technology Center, 2009). The 2006 IPCC Guidelines (chapter 3.2.3, p. 3.15) contain the following warnings regarding this parameter: “The fraction of CH<sub>4</sub> in generated landfill gas should not be confused with measured CH<sub>4</sub> in gas emitted from the SWDS. (...) The concentration of CH<sub>4</sub> in recovered landfill gas may be lower than the actual value because of potential dilution by air, so F values estimated in this way will not necessarily be representative”. The ERT considers that the relatively high fraction of nitrogen in the landfill gas (29.8% volume) as given in annex 7 to the referenced document can be seen as an indication of dilution by air. The ERT considers that deriving the parameter F using the total gas analysis of a biogas that contains significant amounts of components other than CO<sub>2</sub> or CH<sub>4</sub> might lead to underestimation of methane generation and consequently to underestimation of methane emissions in the entire time series, including 2013 and 2014. The ERT included this issue in the list of potential problems and further questions raised by the ERT</p> <p>In response to this list, the Party provided revised estimates using the default IPCC-recommended F value of 0.5. The Party provided additional information that it has initiated a monitoring campaign of the generated methane gas at selected landfills; the data from that monitoring campaign may be included in a re-evaluation and if relevant implementation of plant-specific F values</p> <p>The ERT accepts the revised estimates. The ERT welcomes the information provided on the monitoring campaign and recommends that Denmark provide estimates based on the campaign transparently when the data from the campaign become available</p>	
W.11	5.A.1 Managed waste disposal sites – CH <sub>4</sub>	<p>The DOC content of disposed sludge is reported as 57% DOC in table 7.2.2 in the NIR. The ERT noted that the highest value among the examples of carbon content in industrial sludge listed in the 2006 IPCC Guidelines is 52% dry matter ratio (section 2.3.2 of volume 5, chapter 2). In contrast, the AD reported by Denmark are expressed in wet weight. The ERT concluded that using a high DOC value on a dry weight basis with AD on a wet weight basis is inconsistent, and might lead to overestimation of emissions in the whole time series, including the base year, and decided to include this issue in the list of potential problems and further questions raised by the ERT</p> <p>In response to this list, the Party provided revised estimates applying the DOC value of sludge as 0.15, which the Party explained as fresh weight industrial sludge. The ERT accepted the revised estimates and recommends that Denmark provide a transparent</p>	Yes. Transparency*

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue <sup>a</sup> and/or a problem <sup>b</sup> ? If yes, classify by type
		explanation on the method in the next NIR	
W.12	5.A.1 Managed waste disposal sites – CH <sub>4</sub>	<p>The ERT noted that for the uncertainty analysis Denmark still uses default uncertainty values for AD and EFs from the IPCC <i>Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories</i></p> <p>As updated default uncertainty data for EFs are provided in the 2006 IPCC Guidelines, the ERT recommends that Denmark change its approach for the uncertainty analysis by applying the updated default uncertainty values from the 2006 IPCC Guidelines</p>	Yes. Comparability*
W.13	5.B.1 Composting – CH <sub>4</sub> and N <sub>2</sub> O	<p>The ERT noted that the amount of composted waste increased fourfold between 1990 (324.00 kt DM) and 2014 (1 312.00 kt DM). The AD show large inter-annual variation with the growth between 2012 (928.00 kt DM) and 2013 especially high; the amount of composted waste increased by 41.4%. The ERT noted further that AD were held constant between 2013 and 2014 due, according to the NIR (p. 494), to challenges in the new domestic waste reporting system. As the AD reported for 2014 is higher than what the linear trend would suggest, the ERT saw no clear proof that this was an underestimation</p> <p>The ERT recommends that Denmark provide more explanation in the NIR on the large increase of composted waste between 2012 and 2013. In addition, the ERT recommends that the Party assess the accuracy of the AD for 2014 to ensure that there is not an underestimate of emissions for the latest year</p>	Yes. Accuracy*
W.14	5.B.2 Anaerobic digestion at biogas facilities – CH <sub>4</sub>	<p>Leakage emissions from manure-based biogas plants are estimated from gross biogas production data included in the annual energy statistics combined with a CH<sub>4</sub> content of the biogas of 65% (v/v) and the net calorific value of CH<sub>4</sub> of 50 GJ per tonne applying a leakage rate of 4.2%. The ERT notes that in this approach the volume fraction of CH<sub>4</sub> is combined inconsistently with a mass-based calorific value. Furthermore, the ERT considers that applying the theoretical CH<sub>4</sub> calorific value together with the CH<sub>4</sub> fraction of biogas is inconsistent and leads to an underestimation of the amount of methane in the biogas and decided to include this issue in the list of potential problems and further questions raised by the ERT</p> <p>In response to this list, the Party provided revised estimates following the ERT's recommendation applying the calorific value provided by the Danish Energy Agency of 23 GJ/1 000 m<sup>3</sup> biogas, the methane content of 65% and the methane density 0.67 kg CH<sub>4</sub>/Nm<sup>3</sup> (normal temperature and pressure defined as 20°C and 1 atm). The ERT accepted the revised estimates and recommends that Denmark provide an explanation of the method in its NIR</p>	Yes. Transparency*
W.15	5.B.2 Anaerobic	In CRF table 5.B Denmark reports CH <sub>4</sub> emissions from animal manure and other organic waste (2.15 kt CH <sub>4</sub> ) in 2014, but AD are reported as “NO”. During the review the Party	Yes.



<i>ID#</i>	<i>Finding classification</i>	<i>Description of the finding with recommendation or encouragement</i>	<i>Is finding an issue<sup>a</sup> and/or a problem<sup>b</sup>? If yes, classify by type</i>
	digestion at biogas facilities – CH <sub>4</sub>	explained that Denmark applies a different calculation method based on produced biogas (TJ) instead of organic waste (kt DM), and therefore did not report AD  The ERT recommends that the Party either report the AD as expected in the CRF table 5.B when such data are available, or use the notation key “NE”	Comparability*
W.16	5.D Wastewater treatment and discharge – CH <sub>4</sub> and N <sub>2</sub> O	During the previous review it was recommended that Denmark document the data available and studies used to develop the country-specific factors for MCF and TOW (see W.4 in table 3). In the meantime, Denmark has published a scientific report on wastewater treatment and discharge that contains a detailed description of the methodologies used in this category with substantial background data. This report has been reviewed by international experts, <sup>e</sup> which the ERT considers as a good practice. The ERT commends Denmark for this development in increasing transparency	Not an issue
W.17	5.D Wastewater treatment and discharge – CH <sub>4</sub>	In table 7.5.3 in the NIR, TOW is reported as 386 Gg COD for 2014 whereas in CRF table 5.D a somewhat different value can be found (382.78 Gg) (for mainland Denmark only). During the review, Denmark explained that in the CRF table the national total COD values are reported according to the calculation methodology used throughout the time series, while in the NIR plant-level information is included  The ERT recommends that in addition to reporting the plant-level information for the TOW in domestic wastewater, Denmark also report in the NIR the COD data reported in CRF table 5.D that are actually used for the calculations	Yes. Transparency*
W.18	5.D Wastewater treatment and discharge – CH <sub>4</sub>	The net CH <sub>4</sub> emissions from anaerobic digestion of sewage sludge in biogas tanks are at present estimated from gross energy production. However, in the NIR no information is given on the gross sewage sludge gas production (TJ)  The ERT recommends that whenever biogas production data serve as AD in the emission calculations, these should also be included in the NIR	Yes. Transparency*
<b>KP-LULUCF</b>			
KL.6	Afforestation and reforestation – CO <sub>2</sub>	In CRF table 4(KP-1)A.1 the implied EF of 0.09 for mineral soils is reported for afforestation and deforestation, while in the NIR on page 444 separate average carbon sequestration rates of 0.09 t C/ha per year for broadleaves and 0.31 t C/ha per year for conifers for forest floor development on afforestation sites are reported. During the review, Denmark informed the ERT that the CRF table was not updated with the new information. The ERT concluded that the calculations are incorrect, but the Party’s estimates of removals are not overestimated  The ERT recommends that Denmark implement the country-specific carbon sequestration	Yes. Accuracy*

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue <sup>a</sup> and/or a problem <sup>b</sup> ? If yes, classify by type
KL.7	Deforestation and forest management – CO <sub>2</sub> , CH <sub>4</sub> and N <sub>2</sub> O	<p>rates for broadleaves and conifers for forest floor development in CRF table 4(KP-1)A.1</p> <p>Denmark reported in the NIR in the section on cropland management (p. 573) that Christmas trees were previously reported under forest management and are now are included in cropland (see also ID# L.18 above). In the Kyoto Protocol Supplement it is stated on page 1.13 of chapter 1 that “land cannot be transferred from forest management to an elected Article 3.4 activity” and also that “land cannot leave the Article 3.3 reporting”. The ERT concluded that Denmark’s reporting is not consistent with decision 2/CMP.7, annex, paragraph 24, which indicates that once land is accounted for under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, this land must be accounted for throughout subsequent and contiguous commitment periods. The ERT also concluded that this could lead to an underestimate of CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O emissions from deforestation in the base year, so the ERT included this issue in the list of potential problems and further questions raised by the ERT</p> <p>In response to this list, as recommended by the ERT, Denmark provided the revised estimates regarding Christmas trees from 1990 onwards under the relevant activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol. As the period that a land area is forested with Christmas trees is rather short, the approach of Denmark to assume that there is no generation of litter and dead organic matter, as well as no change in the soil carbon stock for mineral soils, is acceptable</p> <p>The ERT accepted the revised estimates and recommends that Denmark provide documentation for the values of 10 t C/ha for above-ground living biomass and of 2 t C/ha for below-ground biomass in the next NIR, as the NIR now contains references to models and reports and does not present values</p>	Yes. Transparency*
KL.8	Forest management – CO <sub>2</sub>	<p>The numbers for the technical correction to the FMRL as reported on page 571 of the NIR (–474 kt CO<sub>2</sub> eq per year) are not consistent with those reported in the report to facilitate the calculation of the assigned amount, table 5 (–83 kt CO<sub>2</sub> eq per year) and the numbers in CRF table (–82.617 kt CO<sub>2</sub> eq per year). Also, the documentation referred to for the correction in the NIR on page 571 does not contain the information as requested by decision 2/CMP.7, annex, paragraph 14; specifically, it does not include information other than that related to harvested wood products. During the review, Denmark provided the ERT with the IGN note of September 2016 on “Projections of carbon stocks and emissions from forests 2015–2035”. Although improved information is reported on the harvested wood products in the document referred to in the NIR (by Schou et al. 2015), the IGN holds the documentation for all the other elements relevant for the technical correction. During the review, Denmark completed the documentation of all the information for the technical correction and provided this information to the ERT</p>	Yes. Transparency*

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue <sup>a</sup> and/or a problem <sup>b</sup> ? If yes, classify by type
		The ERT recommends that Denmark improve the documentation of the technical correction by providing all of the elements as included in decision 2/CMP.7, annex, paragraphs 14 and 15, and in the future reports any technical correction, when needed, in line with decision 2/CMP.7 and the Kyoto Protocol Supplement	

*Abbreviations:* AD = activity data, CMP = Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol, COD = chemical oxygen demand, CRF = common reporting format, DOC = degradable organic carbon, EF = emission factor, ERT = expert review team, EU ETS = European Union Emissions Trading System, FAO = Food and Agriculture Organization of the United Nations, F-gases = fluorinated gases, FMRL = forest management reference level, GE = gross energy intake, IEF = implied emission factor, IGN = University of Copenhagen, Faculty of Sciences, IPCC = Intergovernmental Panel on Climate Change, IPPU = industrial processes and product use, ITL = international transaction log, KP-LULUCF = LULUCF emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, Kyoto Protocol Supplement = *2013 Revised Supplementary Methods and Good Practice Guidance Arising from the Kyoto Protocol*, LULUCF = land use, land-use change and forestry, MCF = methane conversion factor, N<sub>2</sub>O = nitrous oxide, NIR = national inventory report, QA/QA = quality assurance/quality control, SIAR = standard independent assessment report, TOW = total organics in wastewater, 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*.

<sup>a</sup> 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.

<sup>b</sup> 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.

<sup>c</sup> Poulsen TS. 2016. *Danish consumption and emission of F-gases*. Environmental Project No. 1842.

<sup>d</sup> Greve MH, Christensen OF, Greve MB and Kheir RB. 2014. Change in Peat Coverage in Danish Cultivated Soils During the Past 35 Years. *Soil Science*. 179(5): pp.250–257.

<sup>e</sup> Pipatti Ritta, Statistics Finland, Helsinki Greenhouse Gas Inventory Unit and Hans Oonk, OonKAY!, Apeldoorn, The Netherlands. The report has been made available in electronic format (pdf) at <<http://dce2.au.dk/pub/SR193.pdf>>.

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

11. Annex I shows the accounting quantities for KP-LULUCF as reported by the Party and the final values after the review. The final quantity of units to be issued and cancelled are presented in the same annex.

**VII. Questions of implementation**

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

## Annex I

### Overview of greenhouse gas emissions and removals for Denmark 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 Denmark (mainland Denmark and Greenland, except when explicitly mentioned).

Table 6

#### Total greenhouse gas emissions for Denmark (mainland Denmark and Greenland), base year<sup>a</sup>–2014<sup>b</sup>

(kt CO<sub>2</sub> eq)

	Total GHG emissions excluding indirect CO <sub>2</sub> emissions		Total GHG emissions including indirect CO <sub>2</sub> emissions <sup>c</sup>		Land-use change (Article 3.7 bis as contained in the Doha Amendment) <sup>d</sup>	KP-LULUCF activities (Article 3.3 of the Kyoto Protocol) <sup>e</sup>	KP-LULUCF activities (Article 3.4 of the Kyoto Protocol)	
	Total including LULUCF	Total excluding LULUCF	Total including LULUCF	Total excluding LULUCF			CM, GM, RV, WDR	FM
FMRL								409.00
Base year	76 647.16	70 400.30	77 871.82	71 624.95	8.807		4 958.37	
1990	76 345.02	70 098.16	77 569.68	71 322.81				
1995	83 155.49	78 026.26	84 298.54	79 169.32				
2000	75 669.43	70 908.47	76 546.47	71 785.51				
2010	65 275.30	63 760.63	65 831.13	64 316.47				
2011	57 859.26	58 627.07	58 363.37	59 131.18				
2012	55 230.31	53 595.86	55 704.75	54 070.30				
2013	58 058.89	55 595.48	58 509.60	56 046.18		24.46	3548.55	–2 591.16
2014	52 882.50	51 301.23	53 303.88	51 722.61		–3.38	3 900.20	–3 786.53

*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, RV = revegetation, WDR = wetland drainage and rewetting.

<sup>a</sup> Base year refers to the base year under the Kyoto Protocol, which is 1990 for CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O and 1995 for HFCs, PFCs, SF<sub>6</sub> and NF<sub>3</sub>. The base year for cropland management and grazing land management under Article 3, paragraph 4, of the Kyoto Protocol is 1990. 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.

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

<sup>c</sup> The Party has reported indirect CO<sub>2</sub> emissions in common reporting format table 6.

<sup>d</sup> The value reported in this column refers to 1990 for mainland Denmark only (see document FCCC/IRR/2016/DNK).

<sup>e</sup> Activities under Article 3, paragraph 3, of the Kyoto Protocol, namely afforestation and reforestation, and deforestation.

Table 7

**Greenhouse gas emissions by gas for Denmark (mainland Denmark and Greenland), excluding land use, land-use change and forestry 1990–2014<sup>a</sup>**(kt CO<sub>2</sub> eq)

	<i>CO<sub>2</sub><sup>b</sup></i>	<i>CH<sub>4</sub></i>	<i>N<sub>2</sub>O</i>	<i>HFCs</i>	<i>PFCs</i>	<i>Unspecified mix of HFCs and PFCs</i>	<i>SF<sub>6</sub></i>	<i>NF<sub>3</sub></i>
1990	55 408.81	8 060.61	7 810.98	NA, NE, NO	NA, NE, NO	NA, NO	42.41	NA, NO
1995	63 264.45	8 474.93	7 085.40	241.48	0.63	NA, NO	102.43	NA, NO
2000	55 823.04	8 333.00	6 845.10	705.73	22.57	NA, NO	56.07	NA, NO
2010	50 401.28	7 766.88	5 135.67	958.19	18.67	NA, NO	35.76	NA, NO
2011	45 396.74	7 622.02	5 132.62	894.65	15.76	NA, NO	69.39	NA, NO
2012	40 700.05	7 464.30	4 972.30	809.41	12.25	NA, NO	112.00	NA, NO
2013	42 642.60	7 360.24	5 111.90	789.95	10.90	NA, NO	130.59	NA, NO
2014	38 447.34	7 342.55	5 081.48	710.20	8.66	NA, NO	132.37	NA, NO
<b>Per cent change 1990– 2014</b>	<b>–30.6</b>	<b>–8.9</b>	<b>–34.9</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>212.1</b>	<b>NA</b>

*Abbreviations:* NA = not applicable, NE = not estimated, NO = not occurring.

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

<sup>b</sup> CO<sub>2</sub> emissions include indirect CO<sub>2</sub> emissions reported in common reporting format table 6.

Table 8

**Greenhouse gas emissions by sector for Denmark (mainland Denmark and Greenland), 1990–2014<sup>a, b</sup>**  
(kt CO<sub>2</sub> eq)

	<i>Energy</i>	<i>IPPU</i>	<i>Agriculture</i>	<i>LULUCF</i>	<i>Waste</i>	<i>Other</i>
1990	54 194.52	2 370.28	12 737.52	6 246.87	2 020.50	NO
1995	62 212.45	2 906.20	12 207.16	5 129.23	1 843.51	NO
2000	55 039.62	3 662.53	11 346.29	4 760.97	1 737.07	NO
2010	50 334.31	2 049.42	10 604.25	1 514.67	1 328.48	NO
2011	45 007.01	2 190.67	10 567.01	-767.81	1 366.49	NO
2012	40 157.63	2 138.78	10 473.39	1 634.45	1 300.50	NO
2013	42 004.56	2 150.88	10 544.94	2 463.42	1 345.80	NO
2014	37 716.86	2 088.12	10 579.02	1 581.27	1 338.60	NO
<b>Per cent change 1990–2014</b>	<b>-30.4</b>	<b>-11.9</b>	<b>-16.9</b>	<b>-74.7</b>	<b>-33.7</b>	<b>NA</b>

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

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

<sup>b</sup> Totals include indirect CO<sub>2</sub> emissions reported 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<sup>a,b</sup> – 2014, for Denmark (values for mainland Denmark are presented in brackets, separately from values for mainland Denmark and Greenland)**  
(kt CO<sub>2</sub> eq)

	<i>Article 3.7 bis as contained in the Doha Amendment<sup>c</sup></i>		<i>Article 3.3 of the Kyoto Protocol</i>		<i>Forest management and elected Article 3.4 activities 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					409.00				
Technical correction					-82.62				
Base year	NA (8.807)					4 142.47 (5 247.19)	815.90 (762.43)	NA	NA
2013			-6.89 (24.35)	31.35 (43.99)	-2 591.16 (-2 546.19)	2 925.20 (4 063.01)	623.35 (627.73)	NA	NA
2014			-117.43 (-324.25)	114.05 (124.48)	-3 786.53 (-3 774.13)	2 727.17 (4 079.62)	1 173.03 (1 184.77)	NA	NA
<b>Per cent change base year–2014</b>						<b>-34.2</b> <b>(-22.3)</b>	<b>43.8</b> <b>(55.4)</b>	NA	NA

*Note:* For each year and for each activity, values are presented separately for mainland Denmark plus Greenland and for mainland Denmark only, the latter designated in parentheses. Although values in the table may appear the same, in some cases this may be due to rounding.

*Abbreviations:* FMRL = forest management reference level, NA = not applicable.

<sup>a</sup> Base year refers to the base year under the Kyoto Protocol, which is 1990 for CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O and 1995 for HFCs, PFCs, SF<sub>6</sub> and NF<sub>3</sub>. The base year for cropland management and grazing land management under Article 3, paragraph 4, of the Kyoto Protocol is 1990 for Denmark. 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.

<sup>b</sup> Values in this table include emissions on lands subject to natural disturbances, if applicable.

<sup>c</sup> The value reported in this column refers to 1990.

2. Table 10 provides information on the accounting quantities for reporting under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, as reported by the Party, and the final values after the review.

Table 10

**Accounting quantities for activities under Article 3, paragraph 3, and forest management and any elected activities under Article 3, paragraph 4, of the Kyoto Protocol, for Denmark<sup>a</sup>**

(t CO<sub>2</sub> eq)

Greenhouse gas source and sink activities	Base year <sup>b</sup>	Net emissions/removals			Accounting parameters	Accounting quantity <sup>d</sup>
		2013	2014	Total <sup>e</sup>		
		kt CO <sub>2</sub> eq				
A.1. Afforestation/reforestation		24.349	-324.251	-299.902		-299.02
Excluded emissions from natural disturbances		NA	NA	NA		NA
Excluded subsequent removals from land subject to natural disturbances		-	-	-		-
A.2. Deforestation		43.993	124.485	168.478		168.478
B.1. Forest management				-6 320.317		-6 973.083
Net emissions/removals		-2 546.191	-3 774.127	-6 320.317		
Excluded emissions from natural disturbances		NA	NA	NA		NA
Excluded subsequent removals from land subject to natural disturbances		-	-	-		-
Any debits from CEF-ne		NA	NA	NA		NA
FMRL <sup>e</sup>					409.000	
Technical corrections to FMRL					-82.617	
Forest management cap <sup>f</sup>					19 822.069	-
B.2. Cropland management (if elected)	5 247.189	4 063.013	4 079.624	8 142.637		-2 351.741
B.3. Grazing land management	762.429	627.733	1 184.772	1 812.505		287.646

Greenhouse gas source and sink activities	Base year <sup>b</sup>	Net emissions/removals			Accounting parameters	Accounting quantity <sup>d</sup>
		2013	2014	Total <sup>e</sup>		
		kt CO <sub>2</sub> eq				
(if elected)						
B.4. Revegetation (if elected)	NA	NA	NA	NA		NA
B.5. Wetland drainage and rewetting (if elected)	NA	NA	NA	NA		NA

*Abbreviations:* CEF-ne = newly established forest, FMRL = forest management reference level, NA = not applicable.

<sup>a</sup> Data in this table are based on information provided by the Party in its 2016 annual submission for mainland Denmark only, as Denmark indicated in its NIR that “the target for the second commitment period under the Kyoto Protocol will be ratified with [a] territorial exclusion to Greenland in accordance with an agreement with the government of Greenland”.

<sup>b</sup> Net emissions and removals from cropland management, grazing land management, revegetation and/or wetland drainage and rewetting, if elected, in the Party’s base year, as established by decision 9/CP.2.

<sup>c</sup> Cumulative net emissions and removals for all years of the commitment period reported in the current submission.

<sup>d</sup> The accounting quantity is the total quantity of units to be added to or subtracted from a Party’s assigned amount for a particular activity in accordance with the provisions of Article 7.4 of the Kyoto Protocol.

<sup>e</sup> Forest management reference level as inscribed in the appendix of the annex to decision 2/CMP.7, in kt CO<sub>2</sub> eq per year.

<sup>f</sup> Denmark did not report its forest management cap in its CRF accounting table. The value included in the table is as calculated during the review.

3. Table 11 provides an overview of relevant key data for Denmark's reporting under Article 3, paragraphs 3 and 4, of the Kyoto Protocol.

Table 11

**Key relevant data for Denmark under Article 3, paragraphs 3 and 4, of the Kyoto Protocol<sup>a</sup>**

<i>Key parameters</i>	<i>Values</i>
Periodicity of accounting	(a) Afforestation/reforestation: annual accounting (b) Deforestation: annual accounting (c) Forest management: annual accounting (d) Cropland management: annual accounting (e) Grazing land management: annual accounting (f) Revegetation: not elected (g) Wetland drainage and rewetting: not elected
Election of activities under Article 3, paragraph 4	Cropland management and grazing land management
Election of application of provisions for natural disturbances	No
3.5% of total base-year GHG emissions, excluding LULUCF and including indirect CO <sub>2</sub> emissions	2 477.758 kt CO <sub>2</sub> eq (19 822.068 kt CO <sub>2</sub> 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	Issue 324 251 RMUs
2. Deforestation in 2014	Cancel 124 485 units
3. Forest management in 2014	Issue 4 100 509 RMUs
4. Cropland management in 2014	Issue 1 167 565 RMUs
5. Grazing land management in 2014	Cancel 422 343 units
6. Revegetation in 2014	NA
7. Wetland drainage and rewetting in 2014	NA

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

<sup>a</sup> Data in this table are based on information provided by the Party in its 2016 annual submission for mainland Denmark only, as Denmark indicated in its NIR that “the target for the second commitment period under the Kyoto Protocol will be ratified with [a] territorial exclusion to Greenland in accordance with an agreement with the government of Greenland”.

## Annex II

### Information to be included in the compilation and accounting database

Tables 12 and 13 include the information to be included in the compilation and accounting database for Denmark. 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 12

#### Information to be included in the compilation and accounting database for 2014, including the commitment period reserve, for Denmark<sup>a</sup>

(t CO<sub>2</sub> eq)

	Original submission	Revised estimates	Adjustment <sup>b</sup>	Final <sup>c</sup>
<b>Commitment period reserve</b>	242 427 291	242 440 102		242 440 102
<b>Annex A emissions for 2014</b>				
CO <sub>2</sub> <sup>d</sup>	37 926 552			37 926 552
CH <sub>4</sub>	7 328 250	7 217 437		7 217 437
N <sub>2</sub> O	5 071 648			5 071 648
HFCs	701 672			701 672
PFCs	8 664			8 664
Unspecified mix of HFCs and PFCs	NA, NO			NA, NO
SF <sub>6</sub>	132 369			132 369
NF <sub>3</sub>	NA, NO			NA, NO
<b>Total Annex A sources</b>	<b>51 169 153</b>	<b>51 058 341</b>		<b>51 058 341</b>
<b>Activities under Article 3, paragraph 3, of the Kyoto Protocol for 2014</b>				
3.3 Afforestation and reforestation	-117 431	-324 251		-324 251
3.3 Deforestation	114 051	124 485		124 485
<b>Forest management and elected activities under Article 3, paragraph 4, of the Kyoto Protocol for 2014</b>				
3.4 Forest management for 2014	-3 786 481	-3 774 127		-3 774 127
3.4 Cropland management for 2014	3 994 568	4 079 624		4 079 624
3.4 Cropland management for the base year	5 558 532	5 247 189		5 247 189
3.4 Grazing land management for 2014	1 187 385	1 184 772		1 184 772
3.4 Grazing land management for the base year	816 973	762 429		762 429

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

<sup>a</sup> Data in this table are based on information provided by the Party in its 2016 annual submission for mainland Denmark only, as Denmark indicated in its NIR that “the target for the second commitment period under the Kyoto Protocol will be ratified with [a] territorial exclusion to Greenland in accordance with an agreement with the government of Greenland”.

<sup>b</sup> “Adjustment” is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).

<sup>c</sup> “Final” includes revised estimates, if any, and/or adjustments, if any.

<sup>d</sup> CO<sub>2</sub> emissions include indirect CO<sub>2</sub> emissions reported in common reporting format table 6.

Table 13  
**Information to be included in the compilation and accounting database for 2013, including the commitment period reserve, for Denmark<sup>a</sup>**  
(t CO<sub>2</sub> eq)

	<i>Original submission</i>	<i>Revised estimates</i>	<i>Adjustment<sup>b</sup></i>	<i>Final<sup>c</sup></i>
<b>Annex A emissions for 2013</b>				
CO <sub>2</sub> <sup>d</sup>	42 081 319			42 081 319
CH <sub>4</sub>	7 345 453	7 252 087		7 252 087
N <sub>2</sub> O	5 101 876			5 101 876
HFCs	780 953			780 953
PFCs	10 903			10 903
Unspecified mix of HFCs and PFCs	NA, NO			NA, NO
SF <sub>6</sub>	130 583			130 583
NF <sub>3</sub>	NA, NO			NA, NO
<b>Total Annex A sources</b>	<b>55 451 087</b>	<b>55 357 722</b>		<b>55 357 722</b>
<b>Activities under Article 3, paragraph 3, of the Kyoto Protocol for 2013</b>				
3.3 Afforestation and reforestation	-6 887	24 349		24 349
3.3 Deforestation	31 350	43 993		43 993
<b>Forest management and elected activities under Article 3, paragraph 4, of the Kyoto Protocol for 2013</b>				
3.4 Forest management for 2013	-2 591 112	-2 546 191		-2 546 191
3.4 Cropland management for 2013	4 192 150	4 063 013		4 063 013
3.4 Cropland management for the base year	5 558 532	5 247 189		5 247 189
3.4 Grazing land management for 2013	635 885	627 733		627 733
3.4 Grazing land management for the base year	816 973	762 429		762 429

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

<sup>a</sup> Data in this table are based on information provided by the Party in its 2016 annual submission for mainland Denmark only, as Denmark indicated in its NIR that “the target for the second commitment period under the Kyoto Protocol will be ratified with [a] territorial exclusion to Greenland in accordance with an agreement with the government of Greenland.”

<sup>b</sup> “Adjustment” is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).

<sup>c</sup> “Final” includes revised estimates, if any, and/or adjustments, if any.

<sup>d</sup> CO<sub>2</sub> emissions include indirect CO<sub>2</sub> emissions reported in common reporting format table 6.

## **Annex III**

### **Additional information to support findings in table 2**

#### **Missing categories that may affect completeness**

No mandatory categories of the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* were identified as missing.

## 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 Denmark for 2016. Available at <<http://unfccc.int/resource/docs/2016/asr/dnk.pdf>>.

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

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

FCCC/ARR/2012/DNK. Report of the individual review of the annual submission of Party submitted in 2012. Available at <<http://unfccc.int/resource/docs/2013/arr/dnk.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 Denmark for 2016. Available at <[http://unfccc.int/files/kyoto\\_mechanisms/application/pdf/siar\\_2016\\_dnk\\_1\\_2.pdf](http://unfccc.int/files/kyoto_mechanisms/application/pdf/siar_2016_dnk_1_2.pdf)>

Standard independent assessment report, part 2, for Denmark for 2015. Available at <[http://unfccc.int/files/kyoto\\_mechanisms/application/pdf/siar\\_2016\\_dnk\\_2\\_21.pdf](http://unfccc.int/files/kyoto_mechanisms/application/pdf/siar_2016_dnk_2_21.pdf)>.

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

Responses to questions during the review were received from Mr. Ole-Kenneth Nielsen (Department of Environmental Science, Aarhus University), including additional material on the methodology and assumptions used. The following documents<sup>1</sup> were also provided by Denmark:

Hellwing A.L.F, et al. (2016). *Prediction of the methane conversion factor (Y<sub>m</sub>) for dairy cows on the basis of national farm data*. *Animal Production Science*, 2016, 56, 535–540.

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<sup>1</sup> Reproduced as received from the Party.

## Annex V

### Acronyms and abbreviations

AAU	assigned amount unit
AD	activity data
CEF-ne	newly established forest
CER	certified emission reduction
CH <sub>4</sub>	methane
CKD	cement kiln dust
CM	cropland management
CMP	Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol
CO <sub>2</sub>	carbon dioxide
CO <sub>2</sub> eq	carbon dioxide equivalent
COD	chemical oxygen demand
CPR	commitment period reserve
CRF	common reporting format
DKE (Denmark and Greenland)	country identification code for Denmark's submission under the Kyoto Protocol
DM	dry matter
DNK	country identification code for Denmark's submission under the Convention (mainland Denmark, Greenland and the Faroe Islands)
DNM	country identification code for Denmark's submission under the Kyoto Protocol (mainland Denmark only)
DOC	degradable organic carbon
EF	emission factor
ERT	expert review team
ERU	emission reduction unit
EU ETS	European Union Emissions Trading System
FAO	Food and Agriculture Organization of the United Nations
FM	forest management
FMRL	forest management reference level
GE	gross energy intake
Gg	gigagram
GHG	greenhouse gas
GM	grazing land management
GJ	gigajoule
HFC	hydrofluorocarbon
IEF	implied emission factor
IGN	University of Copenhagen, Faculty of Sciences
IPCC	Intergovernmental Panel on Climate Change
IPPU	industrial processes and product use
ITL	international transaction log
KP-LULUCF	LULUCF emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol
kg	kilogramme
kt	kilotonne
LULUCF	land use, land-use change and forestry
MCF	methane conversion factor
N	nitrogen
N <sub>2</sub> O	nitrous oxide
NA	not applicable

NE	not estimated
NF <sub>3</sub>	nitrogen trifluoride
NIR	national inventory report
NO	not occurring
PFC	perfluorocarbon
QA/QC	quality assurance/quality control
RMU	removal unit
RV	revegetation
SEF	standard electronic format
SIAR	standard independent assessment report
TJ	terajoule
TOW	total organics in wastewater
UNFCCC	United Nations Framework Convention on Climate Change
WDR	wetland drainage and rewetting

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