



COMPLIANCE COMMITTEE

CC/ERT/ARR/2021/13

5 May 2021

**Report of the individual review of the annual submission of
Denmark submitted in 2020**

Note by the secretariat

The report of the individual review of the annual submission of Denmark submitted in 2020 was published on 5 May 2021. For purposes of rule 10, paragraph 2, of the rules of procedure of the Compliance Committee (annex to decision 4/CMP.2, as amended by decisions 4/CMP.4 and 8/CMP.9), the report is considered received by the secretariat on the same date. This report, FCCC/ARR/2020/DNK, contained in the annex to this note, is being forwarded to the Compliance Committee in accordance with section VI, paragraph 3, of the annex to decision 27/CMP.1.



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Report on the individual review of the annual submission of Denmark submitted in 2020*

Note by the expert review team

Summary

Each Party included in Annex I to the Convention must submit an annual inventory of emissions and removals of greenhouse gases 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 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 review of the 2020 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 2 to 7 November 2020 remotely.

* In the symbol for this document, 2020 refers to the year in which the inventory was submitted, not to the year of publication.



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Abbreviations and acronyms

AAU	assigned amount unit
AD	activity data
Annex A source	source category included in Annex A to the Kyoto Protocol
AR	afforestation and reforestation
Article 8 review guidelines	“Guidelines for review under Article 8 of the Kyoto Protocol”
C	carbon
CER	certified emission reduction
CH ₄	methane
CM	cropland management
COD	chemical oxygen demand
Convention reporting adherence	adherence to the “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”
CO ₂	carbon dioxide
CO ₂ eq	carbon dioxide equivalent
CP	commitment period
CPR	commitment period reserve
CRF	common reporting format
DCA	Danish Centre for Food and Agriculture
DCE	Danish Centre for Environment and Energy
DKE	country identification code for Denmark’s submission under the Kyoto Protocol (mainland 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 second commitment period of the Kyoto Protocol (mainland Denmark only)
DOC	degradable organic carbon
DOC _f	fraction of degradable organic carbon that decomposes
DOC _i	degradable organic carbon per waste type
EEA	European Environment Agency
EF	emission factor
EF _{st}	emission factor for methane emissions from septic tanks
EMEP	Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe
ERT	expert review team
ERU	emission reduction unit
EU ETS	European Union Emissions Trading System
Eurostat	statistical office of the European Union
F	volume fraction of methane in generated landfill gas
FM	forest management
FMRL	forest management reference level
FOM	fresh organic matter
GHG	greenhouse gas
GM	grazing land management
HFC	hydrofluorocarbon
HUM	humified organic matter
HWP	harvested wood products

IE	included elsewhere
IEF	implied emission factor
IPCC	Intergovernmental Panel on Climate Change
IPPU	industrial processes and product use
KP-LULUCF	activities under Article 3, paragraphs 3–4, of the Kyoto Protocol
LNG	liquefied natural gas
$L_{o,i}$	methane generation potential per waste type
LULUCF	land use, land-use change and forestry
MCF	methane conversion factor
N	nitrogen
NA	not applicable
NE	not estimated
Nex	nitrogen excretion
NFI	national forest inventory
NF ₃	nitrogen trifluoride
NIR	national inventory report
NO	not occurring
N ₂ O	nitrous oxide
PFC	perfluorocarbon
QA/QC	quality assurance/quality control
RMU	removal unit
ROM	resilient organic matter
RV	revegetation
SEF	standard electronic format
SF ₆	sulfur hexafluoride
SOC	soil organic carbon
SWDS	solid waste disposal site(s)
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”
UNFCCC review guidelines	“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”
WDR	wetland drainage and rewetting
Wetlands Supplement	<i>2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands</i>
W_i	amount of waste generated per waste type
Y_m	methane conversion rate
2006 IPCC Guidelines	<i>2006 IPCC Guidelines for National Greenhouse Gas Inventories</i>

I. Introduction

1. This report covers the review of the 2020 annual submission of Denmark,¹ organized by the secretariat in accordance with the Article 8 review guidelines (adopted by decision 22/CMP.1 and revised by decision 4/CMP.11). In accordance with the Article 8 review guidelines, this review process also encompasses the review under the Convention as described in the UNFCCC review guidelines, particularly in part III thereof, namely the “UNFCCC guidelines for the technical review of greenhouse gas inventories from Parties included in Annex I to the Convention” (annex to decision 13/CP.20). The review took place from 2 to 7 November 2020 remotely² and was coordinated by Nalin Srivastava, Veronica Colerio, Roman Payo and Simon Wear (secretariat). Table 1 provides information on the composition of the ERT that conducted the review for Denmark.

Table 1

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

<i>Area of expertise</i>	<i>Name</i>	<i>Party</i>
Generalist	Elena Gavrilova	North Macedonia
	Harry Vreuls	Netherlands
Energy	Renata Patricia Soares Grisoli	Brazil
	Anand Sookun	Mauritius
	Julien Vincent	France
IPPU	Stanford Mwakasonda	United Republic of Tanzania
	Ingrid Person Rocha e Pinho	Brazil
	Emma Salisbury	United Kingdom
Agriculture	Kent Buchanan	South Africa
	Laura Cardenas	United Kingdom
	Marcelo Theoto Rocha	Brazil
LULUCF and KP-LULUCF	Sandro Federici	San Marino
	Esther Mertens	Belgium
	Sekai Ngarize	Zimbabwe
Waste	Philip Acquah	Ghana
	Jose Manuel Ramirez Garcia	Spain
	Sergii Shmarin	Ukraine
Lead reviewers	Philip Acquah	
	Harry Vreuls	

2. The basis of the findings in this report is the assessment by the ERT of the Party’s 2020 annual submission in accordance with the UNFCCC review guidelines and the Article 8 review guidelines.

¹ Denmark submitted its instrument of ratification of the Doha Amendment on behalf of Denmark and Greenland. Greenland had a reduction commitment for the first commitment period of the Kyoto Protocol; however, for the second commitment period, a territorial exemption for Greenland was made in the ratification of the Doha Amendment. Therefore, the assessment of the annual submission in this report, including information on accounting, is based on the submission for mainland Denmark only, unless otherwise specified.

² Owing to the circumstances related to the coronavirus disease 2019, the review had to be conducted remotely.

3. The ERT has made recommendations that Denmark resolve identified findings, including issues³ designated as problems.⁴ Other findings, and, if applicable, the encouragements of the ERT to Denmark to resolve related issues, are also included.

4. 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.

5. Annex I presents the annual GHG emissions of Denmark, including totals excluding and including LULUCF, indirect CO₂ emissions, and emissions by gas and by sector, and contains background data on emissions and removals from KP-LULUCF, if elected by the Party, by gas, sector and activity.

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

II. Summary and general assessment of the Party's 2020 annual submission

7. Table 2 provides the assessment by the ERT of the Party's 2020 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.

Table 2

Summary of review results and general assessment of the 2020 annual submission of Denmark

Assessment		Issue/problem ID#(s) in table 3 or 5 ^a	
Dates of submission	Original submission: NIR, 15 April 2020; CRF tables (DKE version 1, DNK version 1 and DNM version 1), 15 April 2020; SEF tables (SEF-CP2-2019), 15 April 2020 Revised submission: NIR, 25 May 2020; CRF tables (DKE version 4, DNK version 4 and DNM version 5), 25 May 2020 Unless otherwise specified, values from the most recent submission are included in this report		
Review format	Centralized review conducted remotely		
Application of the requirements of the UNFCCC	Have any issues been identified in the following areas:		
Annex I inventory reporting guidelines and the Wetlands Supplement (if applicable)	(a) Identification of key categories?	No	
	(b) Selection and use of methodologies and assumptions?	Yes	L.1, KL.3
	(c) Development and selection of EFs?	Yes	L.21, W.6, W.22, W.25, KL.12
	(d) Collection and selection of AD?	Yes	I.8, L.19, L.20, W.26, KL.11
	(e) Reporting of recalculations?	No	
	(f) Reporting of a consistent time series?	Yes	I.3, I.9, I.10, L.17, L.18
	(g) Reporting of uncertainties, including methodologies?	No	
	(h) QA/QC?	QA/QC procedures were assessed in the context of the national system (see supplementary information under the Kyoto Protocol below)	

³ Issues are defined in decision 13/CP.20, annex, para. 81.

⁴ Problems are defined in decision 22/CMP.1, annex, paras. 68–69, as revised by decision 4/CMP.11.

<i>Assessment</i>			<i>Issue/problem ID#(s) in table 3 or 5^a</i>
	(i) Missing categories, or completeness? ^b	Yes	G.2, G.3, E.8, W.13, W.17
	(j) 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?	No	E.8, W.13
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 related to the following aspects of the national system:		
	(a) 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	
	Have any issues been identified related to the national registry:		
	(a) Overall functioning of the national registry?	No	
	(b) Performance of the functions of the national registry and the adherence to technical standards for data exchange?	No	
	Have any issues been identified related to the reporting of information on AAUs, CERs, ERUs and RMUs and on discrepancies in accordance with decision 15/CMP.1, annex, chapter I.E, in conjunction with decision 3/CMP.11, taking into consideration any findings or recommendations contained in the standard independent assessment report?	No	
	Have any issues been identified in matters related to Article 3, paragraph 14, of the Kyoto Protocol, specifically problems related to the transparency, completeness or timeliness of the reporting on the Party's activities related to the priority actions listed in decision 15/CMP.1, annex, paragraph 24, in conjunction with decision 3/CMP.11, including any changes since the previous annual submission?	No	
	Have any issues been identified related to the following reporting requirements for KP-LULUCF:		
	(a) Reporting requirements of decision 2/CMP.8, annex II, paragraphs 1–5?	Yes	KL.2, KL.4
	(b) Demonstration of methodological consistency between the reference level and reporting on FM in accordance with decision 2/CMP.7, annex, paragraph 14?	No	
	(c) Reporting requirements of decision 6/CMP.9?	No	
	(d) Country-specific information to support provisions for natural disturbances in accordance with decision 2/CMP.7, annex, paragraphs 33–34?	NA	
CPR	Was the CPR reported in accordance with decision 18/CP.7, annex; decision 11/CMP.1, annex; and decision 1/CMP.8, paragraph 18?	Yes	
Adjustments	Has the ERT applied any adjustments under Article 5, paragraph 2, of the Kyoto Protocol?	No	

<i>Assessment</i>			<i>Issue/problem ID#(s) in table 3 or 5^a</i>
	Has the Party submitted a revised estimate to replace a previously applied adjustment?	NA	Denmark does not have a previously applied adjustment
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 assessing 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	
Questions of implementation	Did the ERT list any questions of implementation?	No	

^a Further information on the issues identified, as well as additional findings, may be found in tables 3 and 5.

^b Missing categories for which methods are provided in the 2006 IPCC Guidelines may affect completeness and are listed in annex III.

III. Status of implementation of recommendations included in the previous review report

8. Table 3 compiles the recommendations from previous review reports that were included in the most recent previous review report, published on 5 February 2019,⁵ and had not been resolved by the time of publication of the review report of the Party's 2018 annual submission. The ERT has specified whether it believes the Party had resolved, was addressing or had not resolved each issue or problem by the time of publication of this review report and has provided the rationale for its determination, which takes into consideration the publication date of the most recent previous review report and national circumstances. The ERT noted that the individual review of Denmark's 2019 annual submission did not take place in 2019 owing to insufficient funding for the review process.

⁵ FCCC/ARR/2018/DNK. The ERT notes that the report on the individual inventory review of Denmark's 2019 annual submission has not been published yet. As a result, the latest previously published annual review report reflects the findings of the review of the Party's 2018 annual submission.

Table 3

Status of implementation of recommendations included in the previous review report for Denmark

<i>ID#</i>	<i>Issue/problem classification^{a, b}</i>	<i>Recommendation made in previous review report</i>	<i>ERT assessment and rationale</i>
General			
G.1	Recalculations (G.2, 2018) Transparency	Ensure that any recalculations of indirect CO ₂ emissions included in the national totals are reported in the NIR with relevant explanations and references.	Resolved. The Party reported quantitative information on the recalculations of indirect CO ₂ emissions included in the national totals together with relevant explanations and references in the NIR (chap. 11, pp.612–615).
G.2	Annual submission (G.3, 2018) Completeness	Estimate and report the following categories for Greenland: HFC emissions from refrigeration and air conditioning (category 2.F.1), SF ₆ emissions from electrical equipment (2.G.1) and CO ₂ , CH ₄ and N ₂ O emissions and removals under forest land – drainage and rewetting (4(II)).	Addressing. The Party reported the relevant emissions for Greenland under categories 2.F.1 and 2.G.1 (NIR tables 16.4.5 and 16.4.6, respectively). However, the Party did not report GHG emissions and removals under forest land – drainage and rewetting (4(II)) for Greenland (NIR section 16.6.11, p.716).
G.3	Annual submission (G.3, 2018) Completeness	Estimate the following categories for the Faroe Islands: CO ₂ , CH ₄ and N ₂ O emissions from missing subcategories under fuel combustion (1.A), CO ₂ emissions from lubricant use (2.D.1) and paraffin wax use (2.D.2), HFC emissions from refrigeration and air conditioning (2.F.1), SF ₆ emissions from electrical equipment (2.G.1), indirect N ₂ O emissions from manure management (3.B.5), CH ₄ emissions from agricultural soils (3.D), CH ₄ emissions from solid waste disposal (5.A) and CH ₄ and N ₂ O emissions from wastewater treatment and discharge (5.D)).	Addressing. As explained in the NIR (annex 7), the Party reported GHG emissions for the Faroe Islands for all subcategories under fuel combustion (1.A), HFC emissions from refrigeration and air conditioning (2.F.1), SF ₆ emissions from electrical equipment (2.G.1) and indirect N ₂ O emissions from manure management (3.B.5). The ERT noted that the Party reported N ₂ O emissions from agricultural soils (3.D) for the Faroe Islands (NIR figure 19, annex 7), which were referred to erroneously as CH ₄ emissions in the recommendation from the previous review report. The Party did not estimate CO ₂ emissions from lubricant use (2.D.1), CH ₄ emissions from solid waste disposal (5.A), or CH ₄ or N ₂ O emissions from wastewater treatment and discharge (5.D) for the Faroe Islands owing to lack of data. According to the NIR (annex 7, pp.892–893), solid waste disposal and liquid waste treatment occur in the Faroe Islands, including septic tanks and industrial wastewater (e.g. from the fishing industry). During the review, the Party explained that it plans to include these emissions for the Faroe Islands in the 2021 or 2022 submission on the basis of the results of an ongoing project to improve the GHG inventory of the Faroe Islands.
G.4	Annual submission (G.3, 2018) Transparency	If it is not possible to estimate emissions (see ID#s G.2 and G.3 above), in line with the UNFCCC Annex I inventory reporting guidelines, indicate in both the NIR and the CRF completeness table why the notation key “NE” has been used.	Resolved. The Party did not use the notation key “NE” in the CRF tables to report emissions for the missing subcategories for Greenland and the Faroe Islands. However, the ERT noted that it is not possible to use the notation key “NE” to report emissions for the relevant subcategories (see ID#s G.2 and G.3 above) in the CRF tables separately for Greenland and the Faroe Islands. The Party explained in the NIR why the corresponding emissions were not estimated.
G.5	Annual submission (G.3, 2018) Completeness	Ensure that the total national aggregate of estimated emissions for all gases and categories considered insignificant remains below 0.1 per cent of the national total GHG emissions.	Resolved. Although the Party did not provide a quantitative justification for the exclusion of emissions for Greenland and the Faroe Islands in terms of their likely level as per the UNFCCC Annex I inventory reporting guidelines (para. 37(b)), the ERT notes that the total national aggregate of estimated emissions for

ID#	Issue/problem classification ^{a, b}	Recommendation made in previous review report	ERT assessment and rationale
			all gases and categories that were not estimated will likely be well below 0.1 per cent of national total GHG emissions, and thus considers this recommendation to have been resolved.
G.6	QA/QC and verification (G.5, 2018) Convention reporting adherence	Update the quality manual from 2013 and ensure its consistency with the revised UNFCCC Annex I inventory reporting guidelines.	Addressing. The Party reported in its NIR (table 9.6) that an updated quality manual for the GHG inventory is expected to be published in the first half of 2020. During the review, the Party clarified that, owing to the coronavirus disease 2019, publication has been delayed and is scheduled for the end of 2020.
Energy			
E.1	1. General (energy sector) (E.6, 2018) Accuracy	Report the correct estimates of indirect CO ₂ emissions by excluding the sources where the default IPCC CO ₂ EFs were used and report the correct estimates of indirect N ₂ O emissions by including the emissions from biomass.	Resolved. Denmark reported the correct estimates of indirect CO ₂ and N ₂ O emissions in CRF table 6 by addressing the errors identified in the previous review report (NIR p.162) and included a description of the methodologies used in the NIR (chap. 11).
E.2	1.A.1 Energy industries – other fossil fuels – CO ₂ (E.2, 2018) (E.6, 2016) (E.6, 2015) Consistency	Continue the analyses of waste incineration EFs with subsequent years of EU ETS EFs on how to improve earlier time-series EFs and the consistency of the full time series.	Resolved. The Party reported in its NIR (table 3.2.44) that work to improve the time series of EFs for waste incineration before 2011–2016 on the basis of EU ETS data for subsequent years is ongoing and will be mentioned in future NIRs. During the review, the Party explained that the collected data will not necessarily lead to a recalculation of the CO ₂ EF time series for waste incineration and that most of the updated CO ₂ EFs based on EU ETS data used for 2018 are presented in the NIR (table 3.2.19). The ERT found the explanation provided by the Party to be satisfactory.
E.3	1.A Fuel combustion – sectoral approach – liquid fuels – CO ₂ , CH ₄ and N ₂ O (E.3, 2018) Accuracy	Report the correct estimates of off-road vehicles and other machinery for 2009 in the subcategories manufacturing industries and construction – other – off-road vehicles and other machinery (1.A.2.g.vii), commercial/institutional – off-road vehicles and other machinery (1.A.4.a.ii), residential – off-road vehicles and other machinery (1.A.4.b.ii) and agriculture/forestry/fishing – off-road vehicles and other machinery (1.A.4.c.ii).	Resolved. The Party reported the correct estimates for off-road vehicles and other machinery for 2009 under the relevant subcategories in the CRF tables by rectifying the error for 2009 in the DCE model and by reporting correct estimates for 2009 for airport and seaport handling equipment under subcategory 1.A.4.a.ii and for off-road vehicles and other machinery under subcategories 1.A.2.g.vii and 1.A.4.b.ii.
E.4	1.A.3.d Domestic navigation – liquid and gaseous fuels – CO ₂ and CH ₄ (E.4, 2018) Comparability	Reallocate emissions from LNG used in ferries from natural gas liquid to gaseous fuels in CRF table 1.A(a).	Not resolved. In CRF table 1.A(a)s3, the Party reported the fuel consumption and emissions associated with LNG used in domestic navigation under other fossil fuels instead of gaseous fuels. In response to the draft review report, Denmark informed the ERT that the fuel consumption and associated emissions will be reallocated from natural gas liquid to gaseous fuels for the 2022 submission.

<i>ID#</i>	<i>Issue/problem classification^{a, b}</i>	<i>Recommendation made in previous review report</i>	<i>ERT assessment and rationale</i>
E.5	1.A.3.d Domestic navigation – gaseous fuels – CO ₂ and CH ₄ (E.5, 2018) Transparency	Elaborate the estimation method of fuel consumption of LNG for ferries in the NIR, including information on the calorific value used.	Not resolved. Denmark explained during the review that by mistake it did not include a explanation of the estimation method for fuel consumption of LNG for ferries in the 2020 NIR.
E.6	International bunkers and multilateral operations – liquid fuels – CO ₂ (E.7, 2018) Convention reporting adherence	Ensure consistent reporting between CRF tables 1.D and 1.A(b) for jet kerosene consumed in international aviation bunkers (1990–2000) and for residual fuel oil consumed in international navigation bunkers.	Addressing. Denmark ensured consistency in the estimates of jet kerosene consumed in international aviation bunkers (1990–2000) and residual fuel oil consumed in international navigation bunkers between the reference and sectoral approaches in DNM CRF tables 1.D and 1.A(b). However, the Party did not report the same values of fuel consumed in DNK CRF tables 1.D and 1.A(b). During the review, the Party explained that the differences are due to the Faroe Islands using only the sectoral approach in its reporting and not using the reference approach. Therefore, the fuel consumption estimates for the sectoral approach reported in the DNK CRF tables cover Denmark, Greenland and the Faroe Islands, while those reported for the reference approach cover only Denmark and Greenland.
IPPU			
I.1	2. General (IPPU) (I.11, 2018) Transparency	Report the new methodology used to calculate emissions from ceramics and catalyst production in the relevant category sections of the NIR (sections 4.2.6 and 4.3.4, respectively, of the 2018 NIR).	Resolved. The Party provided in the NIR (sections 4.2.6, p.307, and 4.3.4, p.316, respectively) details of the methodologies and data used for ceramics and catalyst production.
I.2	2.F Product uses as substitutes for ozone-depleting substances – HFCs and SF ₆ (I.6, 2018) (I.4, 2016) (I.4, 2015) (31, 2014) (29, 2013) Transparency	Provide a transparent explanation in the NIR regarding the use of the notation key “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 ₆ remaining in products at decommissioning of electrical equipment.	Resolved. The Party explained in the NIR (section 4.7.4, p.336) that “NO” was reported for the AD for the amounts of HFC-134a, HFC-125 and HFC-143a remaining in products at decommissioning for refrigeration and air-conditioning equipment because such equipment must be emptied before decommissioning by recovering, reusing or destroying the remaining gases. The Party further explained in the NIR (section 4.7.7, p.340) that the AD for aerosols were reported as “NO” because all fluorinated gases are assumed to be released during the product lifetime for all aerosols, and, as such, there are no fluorinated gases remaining in products at decommissioning and therefore no emissions from decommissioning and recovery of fluorinated gases. The Party explained in the NIR (section 4.8.3, p.343) that no SF ₆ emissions are assumed to result from the decommissioning of electrical equipment because SF ₆ is drawn off from the power switches and reused internally by the sole Danish supplier (Siemens) or appropriately disposed of through waste collection schemes.
I.3	2.F.1 Refrigeration and air conditioning – HFCs (I.12, 2018) Consistency	Ensure consistent reporting of the emissions from laboratory freezers in the CRF tables across the time series and include in the NIR an explanation on the	Not resolved. The Party reported in its NIR (table 4.11.3, p.363) that HFC emissions from laboratory freezers meant for export are reported under category 2.E (electronics industry), while those meant for use in Denmark are reported under category 2.F (product uses as substitutes for ozone-depleting substances).

<i>ID#</i>	<i>Issue/problem classification^{a, b}</i>	<i>Recommendation made in previous review report</i>	<i>ERT assessment and rationale</i>
		methodology used and allocation of the emissions from this subcategory.	During the review, the Party explained that consistent reporting of emissions from laboratory freezers across the time series is not yet possible because data are still being gathered.
I.4	2.F.1 Refrigeration and air conditioning – HFCs (I.13, 2018) Comparability	Separate HFC emissions from destruction from those from stock for HFC-134a, HFC-125 and HFC-143a from domestic refrigeration.	Resolved. Denmark reported in CRF table 2(II).B-Hs2 HFC emissions resulting from destruction and HFC emissions from stock separately under the subcategory domestic refrigeration. The Party explained in the NIR (section 4.7.4, p.336) that it does not report HFC emissions from decommissioning because they are recovered and reported as AD for HFC remaining in products. In accordance with Danish law, all domestic refrigeration equipment must be emptied by recovering, reusing or destroying the remaining gases before decommissioning. The Government facilitates this practice through mandatory free waste collection and by providing the necessary infrastructure for the recovery, reuse or destruction of remaining gases before decommissioning.
I.5	2.F.1 Refrigeration and air conditioning – HFCs (I.14, 2018) Accuracy	Correct the reporting by using the same quantity of stocks for reporting AD and emissions and recheck the product life factors in transport refrigeration across the time series, including a relevant explanation in the NIR in the case of remaining significant variations in the values.	Resolved. The Party used the same quantity of stock for reporting HFC emissions (HFC-125, HFC-134a and HFC-143a) in CRF table 2(II).B-Hs2 and AD and rechecked product life factors in transport refrigeration across the time series.
I.6	2.F.1 Refrigeration and air conditioning – HFCs (I.14, 2018) Transparency	Include consistent information on quantities in operating systems and relevant emissions of HFC-134a for 2000.	Resolved. The Party reported in CRF tables 2(II) and 2(II).B-Hs2 consistent information on quantities of HFC-134a in operating systems and related emissions for 2000.
Agriculture			
A.1	3. General (agriculture) (A.1, 2018) (A.1, 2016) (A.1, 2015) (41, 2014) Convention reporting adherence	Report, to the extent possible, the results of the comparison of total Nex in the inventory with calculations of Nex for all livestock production estimated by DCA (stage IV of the QA/QC improvement plan).	Resolved. The Party reported in its NIR (section 5.13.1, p.412) a comparison of the amounts of total Nex estimated for the inventory by DCE and by DCA. During the review, the Party clarified that the calculation methodologies used for the two systems do not have to be entirely consistent because the DCA estimate is aimed at helping to manage the farmers' N budget, while the DCE estimate is for calculating agricultural emissions. However, as the calculations in both systems are based on the same data set for Nex, comparing the two systems is an excellent way to identify potential calculation errors.
A.2	3. General (agriculture) (A.3, 2018) Convention reporting adherence	Ensure the consistency of the information in the NIR on the key categories between the explanatory text and the table on key categories (table 5.2 of the NIR).	Resolved. The Party reported consistent information on key categories in the explanatory text (NIR section 5.1.2, p.374) and in the key categories table (NIR table 5.3), indicating that the key categories were identified by applying approaches 1 and 2 from the 2006 IPCC Guidelines (vol. 1, chap. 4, section 4.3).

<i>ID#</i>	<i>Issue/problem classification^{a, b}</i>	<i>Recommendation made in previous review report</i>	<i>ERT assessment and rationale</i>
A.3	3.D Direct and indirect N ₂ O emissions from agricultural soils – N ₂ O (A.4, 2018) Convention reporting adherence	Correct the errors in the NIR and ensure the consistency of the provided information on the atmospheric deposition of N and N content in crop residues between the CRF tables and the NIR and within the NIR.	Resolved. The Party reported in NIR chapter 5 (p.370) that the data presented in that chapter relate to mainland Denmark only. During the review, the Party further clarified that the data on atmospheric deposition presented in NIR chapter 5 are consistent with those reported for Denmark in DNM CRF table 3.D for the reporting under the second commitment period of the Kyoto Protocol.
A.4	3.D.a.6 Cultivation of organic soils (i.e. histosols) – N ₂ O (A.5, 2018) Transparency	Provide further explanations to support the halving of the N ₂ O EFs for cultivated organic soils with 6–12 per cent SOC and relevant references in the NIR.	Resolved. The Party reported in the NIR (section 5.6.3, pp.399–400) transparent information to support the chosen values of SOC content of agricultural soils and the N ₂ O EFs used from the Wetlands Supplement in the light of Denmark's national circumstances.
LULUCF			
L.1	4. General (LULUCF) (L.1, 2018) (L.14, 2016) (L.14, 2015) Accuracy	Research the impact of the land-use conversions prior to 1990 on the estimated emissions and removals from soils from 1990 onward 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.	Addressing. Denmark did not include in the NIR research findings on the impacts of land-use conversions prior to 1990 on the estimated emissions and removals from soils or a justification for not estimating those impacts relating to their significance in terms of the overall emission level and trend. The NIR contains information related to previous land use before 1990 (figure 3E.2, p.852), but does not describe how this research could be used to update the land-use matrix for land-conversion categories. During the review, Denmark indicated that this information will be included in the 2021 submission following the implementation of a 30-year transition period for the land-conversion categories. The Party also explained that it has developed a land-use matrix consistent with the 30-year transition period and begun the process of estimating carbon stocks in forests.
L.2	4. General (LULUCF) (L.2, 2018) (L.15, 2016) (L.15, 2015) Convention reporting adherence	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.	Not resolved. The areas of organic soils reported for cropland in NIR table 6.17 are not consistent with the values reported in CRF table 4.B. During the review, the Party clarified that for CRF table 4.B the areas of organic soils had been erroneously subtracted from the areas of mineral soils in forest land converted to cropland, resulting in slightly lower area estimates (e.g. 126.59 kha instead of 127.40 kha for 2018). However, Denmark stated that the emission estimates given in the CRF table are correct.
L.3	4. General (LULUCF) (L.12, 2018) Transparency	Ensure that any recalculations in the sector are reported with a relevant explanation and justification in line with paragraph 44 of the UNFCCC Annex I inventory reporting guidelines.	Addressing. The Party reported that recalculations were performed for various land-use categories in the NIR (e.g. sections 6.3.10, 6.4.10 and 6.6.7). Denmark indicated that the recalculations were performed mainly to correct the areas of organic soils, which had been reported incorrectly owing to a misinterpretation of the soil map, and to implement the 30-year transition period for all land-use conversion categories. However, the Party did not report a complete overview of

ID#	Issue/problem classification ^{a, b}	Recommendation made in previous review report	ERT assessment and rationale
			<p>all the major changes in methods, EFs and AD that had a significant impact on estimated emissions and removals for each reporting category.</p> <p>During the review, Denmark explained that it also implemented a new model for estimating the carbon stock in hedges for the 2020 submission. The model is described in the NIR (section 6.3.6), but was not included in the recalculations for cropland (NIR section 6.3.10).</p>
L.4	4.A Forest land – CO ₂ (L.13, 2018) Accuracy	Make a simulated comparative analysis between the stock change method (at one-year and five-year reporting intervals) and the gain–loss method, including the associated uncertainty analysis, and report the results of this comparison in the next NIR.	Resolved. Denmark applied the stock change method with an annual reporting interval to estimate emissions and removals from forest land. The Party reported in the NIR (section 6.14) that it is considering moving to a five-year reporting interval, which is more consistent with the five-year measurement cycle of the NFI. The Party also stated that although the gain–loss method might provide more stable annual results, this method is also associated with higher uncertainties, given the type of data required. The ERT agrees with the Party's explanation and therefore does not consider it necessary to make a simulated comparative analysis between the stock change method and the gain–loss method.
L.5	4.A Forest land – CO ₂ (L.14, 2018) Transparency	Include in the NIR summary information regarding the harmonization of the two different types of forest data (NFI and National Forest Census), relevant for the stock change method in use.	Resolved. Denmark reported in the NIR (section 6.2.4, p.445) information on the harmonization of data from the different forest assessments (National Forest Census and NFI) and clarified in NIR table 6.9 that estimates of carbon pools for the period with National Forest Census data (1990–2000) have been harmonized with the results of the NFI in terms of both area estimation and the carbon pools.
L.6	4.A Forest land – CO ₂ (L.15, 2018) Transparency	Include in the NIR information on the methodology used to develop a biomass expansion factor for conifers and broadleaved species in forest land.	Resolved. The Party explained in the NIR (section 6.2.5, p.447) how expansion factors for conifers and broadleaves in forest land are calculated and provided the relevant references (Nord-Larsen et al., 2017; Skovsgaard and Nord-Larsen, 2012).
L.7	4.A Forest land – CO ₂ (L.16, 2018) Transparency	Include in the NIR synthesized information on the main parameters defining the characteristics used in the calculation of biomass and growing stocks.	<p>Not resolved. The Party did not include summary information on the main parameters defining the characteristics used in the calculation of biomass and growing stocks for each forest type. The Party included in the NIR (section 6.2.5, p.446) an analysis of NFI results and mapping products based on canopy cover classes, which was used to calculate the biomass and growing stocks in forest land. This analysis involved the evaluation of canopy cover according to three classes: “unlikely to be covered by forest (0) or other wooded land”, “likely to be covered by forest (1)” and “likely to be covered by other wooded land (3)”. However, Denmark did not analyse the results of the assessment by forest type, associated uncertainties or underlying errors.</p> <p>During the review, the Party clarified that, in order to avoid duplicating information, it included in the NIR a reference to the annual report published on the NFI (Johannsen et al., 2019; Nord-Larsen et al., 2016) and further explained</p>

<i>ID#</i>	<i>Issue/problem classification^{a, b}</i>	<i>Recommendation made in previous review report</i>	<i>ERT assessment and rationale</i>
			that it plans to perform a full recalculation of forest development for the 2021 inventory and provide supplementary documentation in the NIR.
L.8	4.A.1 Forest land remaining forest land – CO ₂ (L.7, 2018) (L.5, 2016) (L.5, 2015) (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. The Party did not report the additional information requested but explained in the NIR (section 6.2.10) that its planned improvements include QA/QC of the land-use matrix focusing on forest areas subject to afforestation, permanent clearing and temporary unstocking. During the review, the Party indicated that forest areas subject to permanent clearing are mapped on the basis of cadastral information and information from the Land Parcel Information System and are incorporated in the land-use matrix reported in the NIR. Clear cutting or selective harvesting is an integral part of sustainable FM for Danish forests, as per the Danish Forest Act, which requires that temporarily unstocked areas are replanted or regrown within 10 years of felling (NIR p.599). Similarly, destructive disturbances such as windthrow are also considered a temporary disturbance and therefore require re-establishment in accordance with the Danish Forest Act. The NFI remeasures permanent plots every fifth year as part of its design. The carbon estimates are therefore representative of the full forest area, including temporarily unstocked areas. The ERT considers that the Party could resolve the recommendation by clarifying that clear-cut forest areas are consistently used in the calculation of emissions using the stock-difference method.
L.9	4.A.1 Forest land remaining forest land – CH ₄ (L.17, 2018) Transparency	Include in the NIR information on the methodologies and factors used for the estimation of CH ₄ emissions from the drainage of different types of forest organic soils reported under drained organic soil/forest land in CRF table 4(II).	Resolved. The Party reported in its NIR (section 6.2.11, pp.454–455) the methodology and default EFs for drained organic soils (2.5 kg CH ₄ /ha) and ditches (217 kg CH ₄ /ha) from the Wetlands Supplement used for the estimation of CH ₄ emissions from drainage of forest organic soils.
L.10	4.A.2 Land converted to forest land – CO ₂ (L.18, 2018) Transparency	Improve the transparency of the NIR by explaining how land converted to forest land changed over the entire time series.	Not resolved. The Party did not explain the changes in annual land conversions to forest land over the 20-year transition period in the NIR. However, the NIR (table 9.6) reports that the results of the validation of the resulting methodology (reported in Johannsen et al., 2018) indicate that, while information on land uses and land cover for the assessed years is generally reasonably accurate, detailed analyses show that changes within areas subject to afforestation and particularly deforestation are significantly overestimated.
L.11	4.B Cropland – CO ₂ (L.19, 2018) Transparency	Correct the description of the representation of Christmas tree plantations and provide up-to-date information on their estimation and allocation in the NIR.	Resolved. Denmark indicated in the NIR (section 6.2, p.439) that Christmas tree plantations are accounted for under forest land even if some are located on left-aside cropland or an intermediate cropland use occurs after clear-cutting.
L.12	4.B Cropland – CO ₂	Include in the NIR summary information on the half-life values used in the estimation of the three soil	Resolved. The Party reported in the NIR (section 6.3.7, p.463) the average half-life values of the three soil pools (FOM, HUM and ROM) used in the C-TOOL model as 0.6–0.7 years, 50 years and 600–800 years, respectively.

ID#	Issue/problem classification ^{a, b}	Recommendation made in previous review report	ERT assessment and rationale
	(L.20, 2018) Transparency	pools (FOM, HUM and ROM) by the C-TOOL model.	
L.13	4.B Cropland – CO ₂ (L.21, 2018) Transparency	Include in the NIR summary information explaining the inter-annual variation between the FOM, HUM and ROM soil pools.	Resolved. The Party reported in its NIR (section 6.3.7, p.464) that FOM has a significant influence on SOC because the process of transforming organic matter from crop residues into soil organic matter begins after harvest in Denmark (August–October). Modelling shows that if there is a large input of crop residues and low temperatures occur during the autumn, only a small amount of the applied crop residues is degraded by 31 December of the reporting year (3.5–5.0 t C/ha/year). This leads to a rather high total C content of soil organic matter at the end of the year and a large inter-annual change if the previous year had the opposite pattern; that is, a low crop yield and a high temperature in the autumn. Denmark noted that such changes can be seen as “artefacts” depending on whether partly degraded organic matter is defined as crop residues or soil organic matter.
L.14	4.B Cropland – CO ₂ (L.22, 2018) Transparency	Include in the NIR specific information and references on the selection of the values on gains in living biomass used for land converted to cropland and cropland converted to other land.	Resolved. Denmark reported in the NIR (section 6.2.11, p.453) a standard value of biomass in cropland based on data on cereal crops in Denmark, which was used to estimate gains in living biomass in land converted from and to cropland. The Party reported that gains in living biomass are based on data collected between 2000 and 2010 by Statistics Denmark and a biomass expansion factor from Taghizadeh-Toosi et al. (2014), which was also used in the dynamic C-TOOL model to calculate living biomass stock gains, as explained in the NIR (section 6.3.7).
L.15	4.C.2 Land converted to grassland – CO ₂ (L.23, 2018) Transparency	Correct the text in the NIR on emissions from organic soils on grassland related to the trend in conversion of cultivated organic soils to permanent grassland.	Resolved. Denmark included in the NIR (section 6.3.7, p.470) a revised description of the effect of land-use conversion of intensive cropland and grassland with organic soils to permanent grassland on the emission trend. The Party explained that the drastic reduction in emissions from organic soils following this conversion is primarily due to Denmark’s relatively flat land with shallow organic layers, which, when combined with intensive agricultural practices and high drainage rates, results in the oxidation of most of the organic matter.
L.16	4.D.2 Land converted to wetlands – CH ₄ (L.24, 2018) Transparency	Include in the NIR information on methodological assumptions made to estimate and allocate CH ₄ emissions from land converted to wetlands and provide an explanation of the use of notation key “IE” in CRF table 4(II).	Resolved. Denmark provided in the NIR (section 6.15.13) additional information on the methodological assumptions used to estimate and allocate CH ₄ emissions from land converted to wetlands and explained its use of the notation key “IE” in CRF table 4(II). The Party explained that CH ₄ emissions were estimated using the total area of organic soils converted to wetlands since 1990 as AD and the default EF from the Wetlands Supplement (288 kg CH ₄ /ha/year; chap. 3, table 3.3). The Party further explained that CO ₂ emissions from rewetting and drainage of organic soils were reported as “IE” in CRF table 4(II) because they were reported along with CO ₂ emissions from mineralization in CRF table 4.A.

<i>ID#</i>	<i>Issue/problem classification^{a, b}</i>	<i>Recommendation made in previous review report</i>	<i>ERT assessment and rationale</i>
Waste			
W.1	5. General (waste) – CO ₂ , CH ₄ and N ₂ O (W.15, 2018) Convention reporting adherence	Provide correct data for the aggregate emissions in CO ₂ eq from the waste sector in the corresponding NIR table.	Resolved. Denmark reported data on aggregate emissions for the waste sector in CO ₂ eq in the NIR (table 7.1.1) that are consistent with those in DNM CRF table 5 and DNM CRF table summary 2.
W.2	5.A Solid waste disposal on land – CH ₄ (W.4, 2018) (W.3, 2016) (W.3, 2015) (61, 2014) Comparability	Use the notation key “NA” to report CO ₂ emissions for solid waste disposal on land.	Addressing. The Party used the notations keys “NA” and “NO” to report CO ₂ emissions from solid waste disposal on land in CRF table 5.A in the DKE and DNM submissions. However, the Party continued to report CO ₂ emissions from solid waste disposal as “NE” in DNK CRF table 5.
W.3	5.A.1 Managed waste disposal sites – CH ₄ (W.7, 2018) (W.12, 2016) (W.12, 2015) Comparability	Change the approach for the uncertainty analysis by applying the updated default uncertainty values from the 2006 IPCC Guidelines.	Resolved. As documented in the NIR (section 7.7.1, p.557), the uncertainty assessment for managed waste disposal sites in Denmark was performed by applying default uncertainty values from the 2006 IPCC Guidelines (vol. 5, chap. 3, table 3.5), wherein the uncertainty of first-order decay rate constant values was estimated on the basis of the uncertainty range of default half-life values provided in the 2006 IPCC Guidelines (vol. 5, chap. 3, table 3.4).
W.4	5.A Solid waste disposal on land – CH ₄ (W.16, 2018) Convention reporting adherence	Correct the erroneous entry of DOC _f in CRF table 5.A.	Addressing. Denmark reported a value of 4.02 for DOC _f for anaerobic managed waste disposal sites in CRF table 5.A. The Party explained in the NIR (chap. 7.10) its plans to correct the DOC _f values in DNK CRF table 5.A. During the review, the Party indicated that the error will be corrected in the 2021 submission. The ERT notes that the DOC _f values should be reported as percentages in the CRF tables consistently with the NIR.
W.5	5.A Solid waste disposal on land – CH ₄ (W.17, 2018) Transparency	Include in the NIR information and references justifying the country-specific half-life for sludge.	Resolved. Denmark included a clear explanation in the NIR (footnote 3, table 7.2.2) regarding the half-life value for sludge, which was used to estimate emissions from sludge disposal. The Party explained that the sludge deposited at landfills is normally the end-product of anaerobic digestion and has a lower degradation rate than that of undigested sludge and therefore the default value for slowly degrading waste (paper, textiles) is considered more suitable for Danish digestate.
KP-LULUCF			
KL.1	AR – CO ₂ (KL.1, 2018) (KL.6, 2016) (KL.6, 2015) Accuracy	Implement the country-specific carbon sequestration rates for broadleaves and conifers for forest floor development in CRF table 4(KP-1)A.1.	Resolved. As explained in the NIR (section 6.2.5), the Party recalculated the emissions and removals for AR activity by estimating the carbon stocks in the litter layer in all forest areas (both areas subject to afforestation and those subject to FM) on the basis of direct measurements of litter layer depth, forest type and carbon densities by forest type, as provided in the NFI report (Nord-Larsen et al., 2016). However, Denmark did not update the NIR to reflect the current methodology, which involves taking direct measurements of forest floor amounts

ID#	Issue/problem classification ^{a, b}	Recommendation made in previous review report	ERT assessment and rationale
KL.2	AR – CO ₂ (KL.6, 2018) Transparency	Include information to support the geographical location of boundaries of AR activities in the NIR, for both plantations and natural expansion of forests.	<p>and transferring them to carbon stocks. Therefore, the ERT raised a supplementary issue related to transparency (see ID# KL.10 in table 5).</p> <p>Not resolved. Denmark did not provide in the NIR information to support the geographical location of lands subject to AR activities (both plantations and natural expansion), such as by providing a table with the spatial delineation and exact boundaries of lands subject to KP-LULUCF activities (separating natural forests and plantations), or by including a reference to a source where that information can be found. The Party reported in the NIR (table 9.6) that the results of a validation of the methodology used for land identification performed in 2018 indicate that while accuracies of land use and land cover are reasonably high, detailed analyses show that assessed changes in areas subject to afforestation, and particularly deforestation, are significantly overestimated. There are still limited resources available for frequently updating land-use maps on the basis of field data and data from the Land Parcel Information System, and other registry data are not frequently updated.</p> <p>During the review, the Party explained that all land-use changes are the result of a conscious decision and that the land-area delineation of AR activities can be obtained from the raw data used to construct the land-use matrix.</p>
KL.3	Deforestation – CO ₂ (KL.3, 2018) (KL.3, 2016) (KL.3, 2015) (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.	<p>Not resolved. Denmark did not perform a QA assessment of the approach used to determine the 100-year transition period for deforested lands converted to settlements. The Party explained in the NIR (table 6.9 and annex 3E) that, in the absence of reliable data on soil carbon in areas converted from and to forest land, it used half-life values applied to land-use conversion categories in the agriculture sector to account for emissions and removals from soils in deforestation and afforestation areas. Denmark assumes that soil carbon equilibrium is likely to be reached faster on deforested land than on afforested land and is working on a model to verify these assumptions, which will decide its choice of transition period. Denmark is taking steps to improve the data to justify the 100-year transition period.</p>
KL.4	Deforestation – CO ₂ (KL.7, 2018) Transparency	Amend the information to support the geographical location of boundaries of deforestation activities in the NIR, including information on how deforestation (i.e. land-use change) is distinguished from regeneration clear-cuts in forest land (i.e. temporary change in land cover), and how different end uses of deforested land (e.g. settlements versus ‘nature restoration’) are distinguished from one another.	<p>Not resolved. The Party did not provide the requested information in the NIR. During the review, the Party indicated that relevant information was provided in NIR table 9.6 (see ID# KL.2 above). However, the ERT noted that the information provided in the NIR does not address the information requested in the recommendation.</p>

<i>ID#</i>	<i>Issue/problem classification^{a, b}</i>	<i>Recommendation made in previous review report</i>	<i>ERT assessment and rationale</i>
KL.5	CM – CO ₂ (KL.8, 2018) Accuracy	Provide updated estimates on hedgerows across the entire time series.	Resolved. The Party recalculated the estimates of hedgerows for the entire time series and provided in the NIR (sections 6.2 and 10.6.5, and annex 3E) the results of a new system it has established for monitoring and collecting data on hedgerows using Light Detection and Ranging covering the whole country with very-high-resolution imagery (0.4 m × 0.4 m). The model has been implemented for all years using backcasting.
KL.6	CM – CO ₂ (KL.8, 2018) Transparency	Include transparent documentation on the methodologies used to estimate annual changes to AD in the NIR.	Resolved. The Party provided in the NIR (section 6.3.6, p.464, and annex 3E, p.854) annual data on hedgerows planted and removed between 1990 and 2010, which were used to estimate the AD.
KL.7	GM – CO ₂ (KL.9, 2018) Transparency	Include in the next NIR the information on GM estimates obtained through C-TOOL, including the methodological changes compared with grassland estimates under the Convention.	Resolved. The Party provided in the NIR (sections 6.3.7 and 10.7.2) information on the GM estimates obtained using the C-TOOL model, including differences in the methodologies for reporting under the Convention and under the Kyoto Protocol. Denmark explained that of all the modelled changes in carbon stock in mineral soils included under cropland and grassland, only carbon stock changes in mineral soils resulting from land use since the start of the first commitment period are reported under CM and GM, respectively.
KL.8	HWP – CO ₂ (KL.10, 2018) Transparency	Improve the transparency of the NIR by clarifying that deforestation is accounted as instantaneous oxidation and explain in detail what the revised HWP accounting is based on, as well as the specific means used to discount deforestation from the HWP inflow.	Resolved. Denmark explained in the NIR (section 6.12) that HWP from deforestation (i.e. biomass extracted from deforested areas with a canopy height above 10 m) were accounted for as instantaneous oxidation.

^a References in parentheses are to the paragraph(s) and the year(s) of the previous review report(s) in which the issue or problem was raised. Issues are identified in accordance with paras. 80–83 of the UNFCCC review guidelines and classified as per para. 81 of the same guidelines. Problems are identified and classified as problems of transparency, accuracy, consistency, completeness or comparability in accordance with para. 69 of the Article 8 review guidelines in conjunction with decision 4/CMP.11.

^b The report on the review of the 2019 annual submission of Denmark was not available at the time of this review. Therefore, the recommendations reflected in this table are taken from the 2018 annual review report. For the same reason, 2019 and 2017 are excluded from the list of review years in which issues could have been identified.

IV. Issues and problems identified in three or more 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 and/or problems included in table 4 have been identified in three or more successive reviews, including the review of the 2020 annual submission of Denmark, and had not been addressed by the Party at the time of publication of this review report.

Table 4

Issues and/or problems identified in three or more successive reviews and not addressed by Denmark

<i>ID#</i>	<i>Previous recommendation for the issue</i>	<i>Number of successive reviews issue not addressed^a</i>
General	No issues identified.	
Energy	No issues identified.	
IPPU	No issues identified.	
Agriculture	No issues identified.	
LULUCF		
L.1	Research the impact of the land-use conversions prior to 1990 on the estimated emissions and removals from soils from 1990 onward 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.	3 (2015/2016–2020)
L.2	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.	3 (2015/2016–2020)
L.8	Provide additional information on the area and volume of clear cutting and the area subject to destructive disturbance, subject to the availability of data.	5 (2013–2020)
Waste		
W.2	Use the notation key “NA” to report CO ₂ emissions for solid waste disposal on land.	4 (2014–2020)
KP-LULUCF		
KL.3	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.	4 (2014–2020)

^a Reports on the reviews of the 2017 and 2019 annual submissions of Denmark have not yet been published. Therefore, 2017 and 2019 were not included when counting the number of successive years for this table. In addition, as the reviews of the Party’s 2015 and 2016 annual submissions were conducted together, they are not considered successive reviews and 2015/2016 is counted as one year.

V. Additional findings made during the individual review of the Party's 2020 annual submission

10. Table 5 presents findings made by the ERT during the individual review of the 2020 annual submission of Denmark that are additional to those identified in table 3.

Table 5

Additional findings made during the individual review of the 2020 annual submission of Denmark

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue/problem? ^a
Energy			
E.7	1.A.3.a Domestic aviation – gasoline – CH ₄	<p>The Party reported in its NIR (section 3.3.7, p.252) that the source of the EFs for CH₄ emissions from piston engine aircraft using aviation gasoline was changed to the <i>EMEP/EEA air pollutant emission inventory guidebook 2019</i>. However, the <i>EMEP/EEA air pollutant emission inventory guidebook 2019</i> does not contain a specific EF for CH₄ emissions from piston engines. During the review, the Party clarified that the EF for volatile organic compounds, and not the CH₄ EF, was updated on the basis of the <i>EMEP/EEA air pollutant emission inventory guidebook 2019</i>. With regard to the CH₄ EF for piston engines in aviation, owing to lack of data, Denmark used fuel-related EFs derived for conventional gasoline engines used in Danish road transport. The Party indicated that it will include a reference to the source of these EFs and additional information in the next NIR.</p> <p>The ERT recommends that the Party revise the incorrect reference to the source of the EFs for CH₄ emissions from piston engine aircraft using aviation gasoline.</p>	Yes. Transparency
E.8	1.A.3.d Domestic navigation – other fossil fuels – N ₂ O	<p>The Party reported N₂O emissions for other fossil fuels (LNG) as “NO” for 1990–2014 and as “NE” for 2015–2018 in CRF table 1.A(a)s3. However, the 2006 IPCC Guidelines (vol. 2, chap. 3, table 3.5.3) provide tier 1 N₂O EFs for the category, and, after calculating emissions using the tier 1 EF (4 kg/TJ) provided in the 2006 IPCC Guidelines, the ERT found that the Party had underestimated emissions by 0.049 kt CO₂ eq for 2018, which is below the significance threshold for the application of an adjustment in accordance with decision 22/CMP.1, annex, paragraph 80(b), in conjunction with decision 4/CMP.11.</p> <p>During the review, the Party stated that it will apply the EF from the 2006 IPCC Guidelines (vol. 2, chap. 3, table 3.5.3) for LNG in its next submission.</p> <p>The ERT recommends that Denmark estimate N₂O emissions for other fossil fuels (LNG) for the category for 2015 onward by applying a country-specific EF or the default EF provided in the 2006 IPCC Guidelines.</p>	Yes. Completeness
IPPU			
I.7	2.B.10 Other (chemical industry) – CO ₂	<p>The Party reported in its NIR (table 4.1.1, p.294) that it applied the tier 2 methodology from the 2006 IPCC Guidelines and a plant-specific EF to estimate CO₂ emissions from catalyst production. However, the methodology applied by the Party is not consistent with the tier 2 methodology provided in the 2006 IPCC Guidelines (vol. 3, chap. 2, equation 2.15) because it does not involve the use of national data on the quantity of limestone and dolomite consumed in the country. Instead, the Party used data from the EU ETS, which is consistent with a country-specific (tier 3) method, as per the 2006 IPCC Guidelines (vol. 3, chap. 2, p.2.35). During the review, the</p>	Yes. Transparency

<i>ID#</i>	<i>Finding classification</i>	<i>Description of the finding with recommendation or encouragement</i>	<i>Is finding an issue/problem?^a</i>
		<p>Party acknowledged that it applied a country-specific methodology and not the tier 2 methodology provided in the 2006 IPCC Guidelines.</p> <p>The ERT recommends that the Party correctly describe the methodology used for the category by referring to it as a tier 3 methodology in the relevant text and tables in the NIR.</p>	
I.8	2.B.10 Other (chemical industry) – CO ₂	<p>The Party reported in its NIR (section 4.3.4, p.316) that environmental reports were the source of the AD for catalysts and potassium nitrate fertilizer production for 2007–2012. However, the ERT was not able to reproduce the estimates using the information on the AD provided in the NIR. During the review, the Party explained that it used AD on catalyst production provided by Statistics Denmark for the 2020 submission, but these were not mentioned in the NIR. The Party shared the AD used in the calculations with the ERT during the review. Denmark also clarified that it calculated the data on potassium nitrate production for 2015–2018 by extrapolation. However, the ERT noted that the Party calculated emissions from potassium nitrate production incorrectly for 2018, as it used the extrapolated production AD for 2017 by mistake, rather than the AD for 2018. This resulted in an underestimation of emissions by 1.44 kt CO₂, which is below the significance threshold as defined in paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines and for the application of an adjustment in accordance with decision 22/CMP.1, annex, paragraph 80(b), in conjunction with decision 4/CMP.11.</p> <p>The ERT recommends that the Party recalculate emissions from potassium nitrate production for 2018 using the production AD for 2018 and update the reference in the NIR to the source of the historical AD.</p>	Yes. Accuracy
I.9	2.F.1 Refrigeration and air conditioning – HFCs	<p>The IEFs for the HFC-143a product manufacturing factor for commercial refrigeration reported in DNK CRF table 2(II).B-Hs2 for 2017–2018 are outliers in terms of the inter-annual variation across the time series. During the review, the Party explained that the significant inter-annual variation in the values reported for the HFC-143a product manufacturing factor for commercial refrigeration for 2017–2018 is due to the reporting for Greenland; although emissions related to the category have decreased significantly in mainland Denmark in recent years, emissions for Greenland account for a more significant share of the HFC-143a IEFs calculated for the submissions of Denmark under the Convention and for the first commitment period of the Kyoto Protocol.</p> <p>The ERT recommends that the Party investigate the reasons for the outlier values of the HFC-143a product manufacturing factor for commercial refrigeration reported for 2017–2018 and revise them, as necessary, providing a transparent explanation in the NIR if there continues to be significant inter-annual variation in the values reported.</p>	Yes. Consistency
I.10	2.F.1 Refrigeration and air conditioning – HFCs	<p>The HFC-125 IEFs for the product manufacturing factor for commercial refrigeration reported by the Party in DNK CRF table 2(II).B-Hs2 for 2011, 2012, 2013, 2014, 2017 and 2018 are outliers in terms of the inter-annual variation across the time series. During the review, the Party stated that the significant inter-annual variation in the values of the IEFs for those years stems from the fact that, for the 2011 inventory year onward, the Party incorrectly calculated a portion of the emissions from HFC-125 used for commercial refrigeration by using the product manufacturing factor for stationary cooling (0.5 per cent), which is lower than that for commercial refrigeration (1.5 per cent). Denmark explained that this led to a small underestimation of emissions from manufacturing for 2010–2018 and an overestimation of emissions from stocks for 2011–2018, resulting in an overall difference of 0.05–0.63 kt CO₂ eq, or up to 0.0012 per cent of the national total. The ERT noted that this is below the threshold of significance provided in paragraph 37(b) of the UNFCCC Annex I inventory reporting</p>	Yes. Consistency

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		<p>guidelines and for the application of an adjustment in accordance with decision 22/CMP.1, annex, paragraph 80(b), in conjunction with decision 4/CMP.11.</p> <p>The ERT recommends that the Party recalculate the emissions for the subcategory for 2010 onward by correcting the product manufacturing factor values used for the calculation of HFC-125 emissions from commercial refrigeration.</p>	
Agriculture			
A.5	3.A.1 Cattle – CH ₄	<p>The Party reported in its NIR (section 5.3.2, p.383) information on country-specific values of Y_m, which were developed on the basis of the Karoline model and new measurements from a publication (Hellwing et al., 2014). During the review, the Party explained that the new measurements presented in Hellwing et al. (2014) were based on a national database of results from respiration chamber studies on lactating dairy cows and were not estimated using the Karoline model. Denmark also explained that, although only minor changes in dairy cow feeding practices had occurred since 2014, it plans to carry out frequent evaluations to assess any potentially significant changes in feeding practices relevant to the model (e.g. future changes expected from the use of feed additives for reducing enteric CH₄, which are to be commercially available within the next few years) using AD obtained from Danish farms, and take those changes into account when revising the model, as necessary.</p> <p>The ERT recommends that the Party include information on the planned revisions for the Karoline model in its description of planned improvements in the NIR.</p>	Yes. Transparency
A.6	3.B Manure management – N ₂ O	<p>The Party reported in its NIR (section 5.13, p.412) a comparison between the total Nex estimated by DCE and DCA as part of the QA/QC procedures (stage IV). Although there was a brief explanation of the impact of the use of different animal categories and grazing definitions by DCE and DCA, the NIR did not contain information on potential differences between the estimation methods. During the review, the Party explained that it aims to gain a clear understanding of which parameters are behind the differences between the Nex totals calculated by DCE and DCA. Denmark also noted that comparing the two sets of calculations is difficult because the data from DCA were not disaggregated by livestock category or by N excreted in housing and during grazing because they were obtained for a different purpose and focus on total Nex. As such, the calculations of Nex performed using the DCA data cannot be used for the verification of the DCE data, and therefore a new verification plan is needed. As an alternative solution, the Party plans to compare the total Nex estimated by DCE with farmers' N accounts, which are part of a register controlled by the Danish Agricultural Agency (all farmers are required to submit information on management at farm level, including information on N in livestock manure applied to soils). However, Denmark did not include such a plan in the list of planned improvements.</p> <p>The ERT recommends that the Party include in the list of planned improvements in the NIR updated information on the verification of total Nex used in the inventory calculations, including its plan to compare it with farmers' N accounts.</p>	Yes. Transparency
A.7	3.D Direct and indirect N ₂ O emissions from agricultural soils – N ₂ O	<p>The Party reported in its NIR (section 5.14, p.423) information on recalculations performed for the agriculture sector. Although several improvements or changes have been implemented for several subcategories of agricultural soils, the Party did not estimate the impact of the recalculations on estimated emissions for each subcategory. During the review, the Party provided a detailed table listing the changes implemented for each subcategory, the</p>	Not an issue/problem

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<p>associated estimated impacts (in t N₂O) and their contribution (as a percentage) to the overall change in the category.</p> <p>The ERT encourages the Party to include in the NIR the impact of recalculations on estimated emissions for each subcategory and the contribution of the changes under each subcategory to the overall change in the category (percentage) in line with the information provided to the ERT during the review.</p>			
LULUCF			
L.17	4.A Forest land – CO ₂	<p>DNK CRF table 4.A shows a sharp increase in the IEF for the volume of living biomass/ha in forests between 2006 and 2007, with average IEF values of 0.22 and 1.03 t CO₂/ha for 1990–2006 and 2007–2018, respectively. Denmark provided information in the NIR (section 6.2.7, p.451) on the different data sets used to develop the growing stock values for 1990–2006 and 2007–2018, stating that consistent data were used for 2007 onward. However, the Party did not perform any recalculations to ensure consistency across the entire time series in accordance with the 2006 IPCC Guidelines (vol. 1, chap. 5). During the review, Denmark explained that the variations in the IEF for forest volume of living biomass/ha stem from the use of different methodologies for 1990–2006 and 2007–2018, and stated that it will ensure consistency across the whole time series by using consistent data in the next submission.</p> <p>The ERT recommends that Denmark ensure time-series consistency by revising the living biomass estimates to address the inconsistency caused by the use of different data sources for the periods before and after 2006.</p>	Yes. Consistency
L.18	4.A.1 Forest land remaining forest land – CO ₂	<p>The inter-annual variations of net carbon stock change in deadwood/ha for 2006–2007 (824.1 per cent) and 2015–2016 (416.9 per cent) are outliers across the time series and across Parties. During the review, Denmark explained that the inter-annual variation in deadwood/ha reflects the sampling uncertainty and the continuously changing composition of the land included under the category. The Party further explained that it expects to reduce the number of outliers for future submissions by changing to a 30-year transition period for forest land remaining forest land, with a greater focus on ensuring consistency in area and carbon pools. In addition, Denmark explained that it plans to recalculate the deadwood pool for the next submission to address a recently discovered coding error, which will lead to a revision of the estimates in general.</p> <p>The ERT recommends that Denmark take steps to minimize the inter-annual variations in the net carbon stock change in deadwood/ha to the extent possible, in line with the overall uncertainty of the net removals and emissions reported, by implementing the new transition period of 30 years and by aligning the reporting frequency with the frequency of sampling to gather new data on deadwood. The ERT also recommends that the Party explain the reasons for any significant inter-annual changes in deadwood/ha in the NIR and provide a justification as to why the changes do not result in underestimation of emissions or overestimation of removals.</p>	Yes. Consistency
L.19	4.A.2 Land converted to forest land – CO ₂	<p>Denmark stated in the NIR (pp.453, 457, 473, 479, 486 and 855) that it uses a 30-year transition period for land-use conversions. However, the reported areas of land-use conversion categories only include the accumulated areas of conversions since 1990 and do not cover all conversions occurring over the past 30 years. According to the 2006 IPCC Guidelines (vol. 4, chap. 3), the area under a land-use conversion category for any reporting year should be the sum of all the conversions occurring over the entire transition period chosen by the Party, as appropriate to national conditions (20 years by default). During the review, Denmark clarified that it applied the default transition period of 20 years. The Party also confirmed that the large differences in the IEF of the carbon stock change</p>	Yes. Accuracy

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		<p>between the base year and latest reporting year are due to the fact that it did not use a 30-year transition period for years prior to the base year 1990. Consequently, the area of land converted to forest land for 1990 includes only the conversions that occurred in that year, whereas the corresponding area for 2018 includes the area of land converted to forest land accumulated over the past 28 years.</p> <p>The ERT recommends that Denmark revise the total areas of land converted to forest land reported for each year, starting with the base year, by including the areas of land converted to forest land accumulated over the past 30 years, either by extrapolating land areas before 1990 or by collecting additional historical data on land use since 1960. The ERT also recommends that Denmark provide transparent information in the NIR on the transition period applied to construct the land-use change matrix, ensuring that the information reported in the NIR reflects the actual methodological approaches applied for estimating emissions and removals as reported in the CRF tables.</p>	
L.20	4.B Cropland – CO ₂	<p>Denmark reported in the NIR (section 6.3.7, p.469) that it overlaid soil classification maps relating to 1975 and 2010 with land-use maps to identify areas of drained organic soils. The areas of organic soils in 1975 and 2010 amounted to 243,000 and 176,124 ha, respectively. The Party used linear interpolation to estimate areas of drained organic soils for 1990–2010 and assumed a constant area of drained organic soils since 2010. However, the historical data for 1975 and 2010 used to determine the areas of drained organic soils are not representative of the more recent reporting years, and as such, using the 2010 area for 2010–2018 may result in an overestimation of emissions from drained organic lands. During the review, the Party acknowledged that the area of organic soils has changed since 2010, with greater amounts of conversion from organic soils to mineral soils occurring each year in more recent years. As such, assuming a constant area of drained organic soils since 2010 might lead to an overestimation.</p> <p>The ERT recommends that Denmark revise the areas of drained organic soils for 2011–2018 by collecting additional data on drainage status and recalculate the associated emissions. The ERT encourages the Party to further improve the disaggregation of AD on drained organic soils in line with the guidance on the tier 2 methodology provided in the Wetlands Supplement (chap. 2) by collecting additional data on water table (wetness) and land use at an increased level of disaggregation (e.g. by region and management practices).</p>	Yes. Accuracy
L.21	4.B Cropland – CO ₂	<p>The Party did not transparently describe the calculation of the EFs for drained organic soils in the NIR, and consequently the ERT was unable to determine whether the EFs used resulted in accurate emission estimates for organic soils with organic content of 6–12 per cent and above 12 per cent, with the former representing 60 per cent of all drained soils under cropland. Because the C-TOOL soil carbon stock simulator is unable to simulate carbon stock changes in organic soils with organic content greater than 6 per cent, Denmark used EFs based on a country-specific study (Elsgaard et al., 2012) for drained organic soils with organic content above 12 per cent and applied an adjustment of 50 per cent to calculate the EF for soils with carbon content of 6–12 per cent organic content (NIR p.471). However, the ERT noted that the country-specific study used to calculate the EF is from 2012 and is only applicable to soils with an organic content of 14–20 per cent. During the review, the Party clarified that the three soil types provided in Elsgaard et al. (2012) are fully drained organic soils, with an organic content of 15–20 per cent, which represent 40 per cent of all drained organic soils in the Land Parcel Information System. Denmark further noted that because bulk density, which best reflects the level of drainage, is higher in soils with 12 per cent organic content, assuming a 50 per cent reduction of the fixed EFs used for drained organic soils with organic content greater than 12 per cent for calculating the EFs for drained organic soils with 6–12 per cent organic content</p>	Yes. Accuracy

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		may result in a potential underestimation of emissions from these soils. However, no additional research is available to verify this assumption.	
		The ERT recommends that the Party recalculate emissions from drained organic soils under cropland by collecting additional data on soils with 6–12 per cent organic content. The ERT also recommends that Denmark include in the NIR data and information from the study by Elsgaard et al. (2012) on calculating the EFs for drained organic soils with organic content greater than 12 per cent, including soil type, percentage of organic content and assumptions made, demonstrating their applicability for all the reporting years.	
L.22	4.B Cropland – CO ₂	The Party reported the total area of organic soils in cropland for 2018 as 126.9 kha in DNK CRF table 4.B and as 127.4 kha in the NIR (table 6.17, p.472). During the review, Denmark explained that DNK CRF table 4.B contains an error in the area of organic soils reported, but confirmed that this does not impact the calculation of emissions.	Yes. Convention reporting adherence
		The ERT recommends that Denmark correct the total area of organic soils in cropland reported for 2018 in DNK CRF table 4.B, ensuring consistency between the areas reported in the NIR and in CRF table 4.B.	
L.23	4.C Grassland – CO ₂	The Party reported in the NIR (section 6.4.1, p.477) that it estimated the areas of organic soils in grassland by mapping organic soils and overlaying those maps with land-use maps under grassland. In line with its approach for drained organic soils, these areas were then combined with country-specific EFs (8,400 kg C/ha/year for organic soils with at least 12 per cent organic content (Elsgaard et al., 2012) and 4,200 kg C/ha/year for those with 6–12 per cent organic content) to calculate on-site CO ₂ emissions from drained organic soils. However, the Party did not clearly indicate the extent to which the EFs used are representative of the different management practices. During the review, Denmark noted that given its use of the Land Parcel Information System, the information on management practices is already incorporated in the estimation methodology.	Yes. Transparency
		The ERT recommends that the Party include information in the NIR on how the EFs used for drained organic soils in grassland are representative of the drained soils in terms of management practices.	
L.24	4(II) Emissions/removals from drainage and rewetting and other management of organic/mineral soils – CO ₂	Denmark reported in the NIR (tables 6.17, 6.20 and 6.23) and in CRF table 4(II) total CO ₂ emissions from leaching of dissolved organic carbon (off-site emissions) from drained organic soils in cropland, grassland and wetlands. However, the Party did not explain the methodological approach or the EFs used to calculate emissions. During the review, the Party explained that it used default EFs from the Wetlands Supplement in the absence of country-specific EFs.	Yes. Transparency
		The ERT recommends that Denmark include in the NIR information on the methodological approach and the EFs used for calculating off-site emissions from leaching of dissolved organic carbon in cropland, grassland and wetlands.	
L.25	4(II) Emissions/removals from drainage and rewetting and other management of organic/mineral soils – CH ₄	Denmark calculated CH ₄ emissions from drained organic soils and ditches using the default EFs from the Wetlands Supplement (chap. 2, table 2.3 and equation 2.6). As mentioned in the NIR (table 6.18, p.477), the uncertainty associated with the use of the EF is 90 per cent. Given that CH ₄ emissions from drained organic soils is a key category (as reported in CRF table 7), according to the UNFCCC Annex I inventory reporting guidelines (para. 11) and in line with the IPCC good practice guidance, the Party should use a higher-tier method (e.g. a tier 2 method using country-specific EFs) to calculate emissions for the category. During the review, the Party explained that it will improve the stratification of drained organic soils for future submissions and, to this end, measurements of soil wetness are being collected using remote sensing, and carbon stock and wetness are being monitored using drone-	Not an issue/problem

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		<p>based remote sensing. The studies aim to improve Denmark's groundwater map for low-lying areas on a 10 m × 10 m grid using machine learning. More than 10,000 groundwater sampling measurements taken in organic soils in 2009 are due to be revisited in 2020 and 2021, thus enabling Denmark to move to a tier 3 method with a dynamic degradation model of organic content in the drained zones.</p> <p>The ERT encourages Denmark to use higher-tier methods (e.g. by developing and using country-specific EFs) to calculate CH₄ emissions from drained organic soils and drained ditches for cropland, grassland and wetlands in accordance with the IPCC good practice guidance. The ERT notes that, in order to develop country-specific EFs, the Party could consider stratifying drained organic soils by nutrient status and drainage class on the basis of country-specific studies in accordance with the guidance provided in the Wetlands Supplement.</p>	
Waste			
W.6	5.A Solid waste disposal on land – CH ₄	<p>Denmark reported in the NIR (table 16.7.4, p.720) that the DOC weighted (after open burning) fraction in dry paper/cardboard for waste disposal and in wet paper/cardboard used to estimate CH₄ emissions from solid waste disposal in Greenland were 0.40 and 0.20, respectively, and indicated that these values were derived in accordance with the 2006 IPCC Guidelines and the IPCC good practice guidance. However, the 2006 IPCC Guidelines (vol. 5, chap. 2, table 2.4) give the DOC content for wet paper/cardboard and dry paper/cardboard as 40 and 44 per cent, respectively. During the review, the Party explained that some of the DOC values used to estimate CH₄ emissions from solid waste disposal were not updated in accordance with the 2006 IPCC Guidelines. Denmark confirmed that it will use the correct DOC values from the 2006 IPCC Guidelines for the next submission.</p> <p>The ERT recommends that Denmark recalculate CH₄ emissions from solid waste disposal in Greenland using the correct values of DOC for dry and wet paper/cardboard in line with the 2006 IPCC Guidelines (vol. 5, chap. 2, table 2.4).</p>	Yes. Accuracy
W.7	5.A.1 Managed waste disposal sites – CH ₄	<p>According to the NIR (section 7.2.1, p.523), Denmark used an oxidation factor of 0.1 from the 2006 IPCC Guidelines (vol. 5, chap. 3, table 3.2), which corresponds to managed SWDS covered with CH₄ oxidizing material, in its model for estimating CH₄ emissions from solid waste disposal. However, the Party did not provide sufficient justification as to why this oxidation factor value is applicable to Denmark. During the review, Denmark provided detailed information justifying its choice of oxidation factor and explained that, as Danish landfills were covered with a soil top layer, the requirements of the 2006 IPCC Guidelines are met for the whole time series 1990–2018.</p> <p>The ERT recommends that the Party include in its NIR a detailed explanation on its choice of oxidation factor for managed SWDS in Denmark.</p>	Yes. Transparency
W.8	5.A.1 Managed waste disposal sites – CH ₄	<p>The Party did not transparently describe in the NIR (section 7.2.1, p.523) the parameters used to estimate CH₄ recovery in managed SWDS in NIR equation 7.2.8. The NIR did not contain the definitions of the parameters, the sources of input data or the specific values chosen. During the review, Denmark provided detailed information on the parameters used to estimate CH₄ recovery in NIR equation 7.2.8.</p> <p>The ERT recommends that Denmark include in the NIR a detailed description of the parameters used to estimate CH₄ recovery in managed SWDS, including definitions of all input parameters, sources of the input data and the values chosen.</p>	Yes. Transparency

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W.9	5.A.1 Managed waste disposal sites – CH ₄	<p>The statement in the NIR (section 7.2.1, p.523) that the CH₄ recovered was reported in NIR tables 7.2.1 and 7.2.9 in kt is inaccurate because the NIR does not include a table 7.2.9. During the review, the Party explained that the amount of recovered CH₄ was reported in NIR tables 7.2.1 (p.520) and 7.2.6 (p.527) in kt.</p> <p>The ERT recommends that Denmark ensure that the references to NIR tables relating to CH₄ recovered from solid waste disposal are correct in the NIR.</p>	Yes. Convention reporting adherence
W.10	5.A.1 Managed waste disposal sites – CH ₄	<p>According to NIR equation 7.2.9 (p.525), CH₄ generation potential can be estimated as $L_{o,i}/W_i = DOC_F \times MCF \times F \times 16/12 \cdot DOC_i$, where $L_{o,i}/W_i = 0.27 \times DOC_i$. However, the two parts of the equation are not consistent. During the review, Denmark explained that the coefficient in equation 7.2.9 should be 0.33 rather than 0.27 (i.e. $L_{o,i}/W_i = 0.33 \times DOC_i$) and indicated that the typographical error will be corrected for the next submission. The ERT noted that the incorrect value of the coefficient in NIR equation 7.2.9 did not lead to errors in the Party's estimation of CH₄ emissions.</p> <p>The ERT recommends that the Party correct the equation used for estimating the CH₄ generation potential by using the correct value for the coefficient (0.33).</p>	Yes. Convention reporting adherence
W.11	5.B.1 Composting – CH ₄ and N ₂ O	<p>Denmark reported in CRF table summary 3s2 that it used tier 1 and country-specific methods to estimate and report CH₄ and N₂O emissions from biological treatment of solid waste (category 5.B), including composting (subcategory 5.B.1). However, according to the NIR (section 7.3.1, p.529), emissions from composting were calculated using both IPCC default EFs and other country-specific EFs, which corresponds to a hybrid approach incorporating tier 1 and 2 methodologies. During the review, Denmark explained that, in general, it applied a mix of tier 1 and 2 methodologies for estimating CH₄ and N₂O emissions from waste composting: CH₄ emissions from composting of garden and park waste and N₂O emissions from composting of sludge were estimated using a tier 2 method, while the remaining emissions were estimated using tier 1 methods.</p> <p>The ERT recommends that Denmark accurately report the methodological tiers used to estimate CH₄ and N₂O emissions from composting in CRF table summary 3s2, ensuring consistency with the NIR.</p>	Yes. Convention reporting adherence
W.12	5.B.1 Composting – CH ₄ and N ₂ O	<p>The Party stated in the NIR (section 7.3.1, p.528) that information on GHGs emitted from composting (CH₄, N₂O and CO₂) is presented in NIR table 7.3.1. However, NIR table 7.3.1 does not include information on CO₂ emissions. During the review, Denmark acknowledged that the inclusion of CO₂ in the above-mentioned list of gases is incorrect and was caused by a typographical error.</p> <p>The ERT recommends that Denmark correct the reference in the NIR to the GHGs emitted from composting by clarifying that only CH₄ and N₂O emissions are estimated for composting.</p>	Yes. Convention reporting adherence
W.13	5.B.1 Composting – CH ₄ and N ₂ O	<p>Denmark reported sludge composted in the NIR (table 3F-3.2, annex 3F) as 6.348 Gg for 1995–2018 and as “NO” for 1990–1994. The Party explained in the NIR (section 5.3.1, p.531) that the amount of sludge composted was reported as “NO” for 1990–1994 because it does not demonstrate a convincing trend and therefore cannot be used to estimate the AD for previous years, and also stated that this activity was insignificant in 1995–1997 (1–2 per cent). However, the Party did not provide information in the NIR to support the assumption that no sludge was composted in 1990–1994. In addition, Denmark did not provide justification for the exclusion in terms of the likely level of emissions being below 0.05 per cent of national total GHG emissions without exceeding 500 kt CO₂ eq, as per paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines. During the review, Denmark</p>	Yes. Completeness

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		<p>explained that it plans to provide conservative estimates in the next submission and use the average amount composted in 1995–1997 (6.7 kt) to report the amount of sludge composted in 1990–1994.</p> <p>The ERT recommends that Denmark use appropriate splicing techniques, as described in the 2006 IPCC Guidelines (vol. 1, chap. 5), to estimate AD for sludge composting for 1990–1994 and only report a conservative estimate if none of the splicing techniques can be used appropriately for Denmark.</p>	
W.14	5.B.1 Composting – CH ₄ and N ₂ O	<p>According to the NIR (section 7.3.2, p.533), emissions from anaerobic digestion at wastewater treatment plants are included in the inventory under CRF category 5.B (wastewater treatment and discharge). However, the CRF code for wastewater treatment and discharge is 5.D. During the review, Denmark acknowledged that the CRF code for wastewater treatment and discharge was incorrectly given as category 5.B in the NIR owing to a typographical error, and the category should be given as 5.D.</p> <p>The ERT recommends that the Party correct the category code for wastewater treatment and discharge provided in the NIR.</p>	Yes. Convention reporting adherence
W.15	5.B.1 Composting – CH ₄ and N ₂ O	<p>The NIR does not transparently describe the estimation of CH₄ and N₂O emissions for the subcategories composting of garden and park waste and home composting of garden and vegetable food waste, for example by explaining how the country-specific EFs presented in NIR table 7.3.4 were derived. Moreover, the NIR (section 7.3.1, p.532) cites a publication (Boldrin et al., 2009) that is not included in the list of references (p.574). During the review, Denmark provided the ERT with clear and detailed information on how the country-specific EFs for CH₄ and N₂O emissions were derived for the above-mentioned subcategories, including an example estimation. These details enabled the ERT to understand all the inputs, coefficients and assumptions used in the estimation methodology.</p> <p>The ERT recommends that Denmark include detailed information on the estimation of CH₄ and N₂O emissions from composting of garden and park waste and from home composting of garden and vegetable food waste, including detailed equations, descriptions of all the input data and parameters, and references to relevant publications justifying the suitability of the equations and parameters used.</p>	Yes. Transparency
W.16	5.B.1 Composting – CH ₄ and N ₂ O	<p>Denmark did not estimate and report CH₄ or N₂O emissions from waste composting for Greenland. During the review, the Party explained that this is because Greenland has an arctic climate and mostly consists of rocks with very little soil. Therefore, it is not a suitable place for composting waste because, in addition to the difficulties that sub-zero temperatures present for composting, there is no use for compost in such a climate. The ERT agreed with the response provided by the Party.</p> <p>The ERT recommends that the Party explain why CH₄ and N₂O emissions from biological treatment of waste (category 5.B) are not estimated and reported for Greenland in the NIR.</p>	Yes. Transparency
W.17	5.B.1 Composting – CH ₄ and N ₂ O	<p>The Party did not estimate CH₄ or N₂O emissions from waste composting for the Faroe Islands, but according to the NIR (annex 7, p.892) waste composting does occur there. During the review, the Party explained that it plans to include CH₄ and N₂O emissions from waste composting for the Faroe Islands in the 2021 or 2022 submission on the basis of the results of an ongoing project to improve the GHG inventory of the Faroe Islands.</p> <p>The ERT recommends that Denmark estimate CH₄ and N₂O emissions from waste composting for the Faroe Islands.</p>	Yes. Completeness

<i>ID#</i>	<i>Finding classification</i>	<i>Description of the finding with recommendation or encouragement</i>	<i>Is finding an issue/problem?^a</i>
W.18	5.B.2 Anaerobic digestion at biogas facilities – CH ₄	<p>In the equation used to estimate CH₄ emissions from anaerobic digestion of organic waste at biogas facilities (NIR equation 7.3.1, p.535), the EF used (0.42) is equal to the weighted average of nine biogas plants. However, the NIR (section 7.3.2, p.535) also states that the weighted average for the nine plants was 4.2 per cent, and as such the EF should be 0.042 rather than 0.42. During the review, Denmark acknowledged that the EF (0.42) was incorrectly reported because of a typographical error and explained that it will be corrected in the next submission. However, the ERT noted that the Party calculated CH₄ emissions using an EF of 0.042, and therefore the incorrect reporting did not lead to an overestimation of emissions.</p> <p>The ERT recommends that the Party ensure that the correct EF value is given in the equation used to estimate emissions from anaerobic digestion of organic waste at biogas facilities.</p>	Yes. Convention reporting adherence
W.19	5.B.2 Anaerobic digestion at biogas facilities – CH ₄	<p>According to the NIR (table 7.3.6, p.535), CH₄ production from anaerobic digestion of organic waste at biogas facilities in 2018 was estimated at 240,078 t CH₄, which was calculated as biogas production (12,244 TJ) divided by net calorific value (50 MJ/kg). However, this calculation does not produce the value 240,078 t CH₄. During the review, Denmark explained that this was due to an error in the calculation, whereby a net calorific value of 51 MJ/kg was used instead of 50 MJ/kg. The Party also explained that dividing biogas production in 2018 (12,244 TJ) by the correct net calorific value (50 MJ/kg) results in 244,879 t CH₄ produced instead of 240,078 t CH₄. The ERT noted that this error led to emissions being underestimated by 202 t CH₄ (5.05 kt CO₂ eq) for the category for 2018, which is below the threshold of significance for Denmark, as per paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines and for the application of an adjustment in accordance with decision 22/CMP.1, annex, paragraph 80(b), in conjunction with decision 4/CMP.11. The Party explained that the error will be corrected in the next submission.</p> <p>The ERT recommends that Denmark recalculate CH₄ emissions from anaerobic digestion of organic waste at biogas facilities for 2018 using the correct net calorific value (50 MJ/kg) instead of the incorrect value used for the 2020 submission (51 MJ/kg).</p>	Yes. Accuracy
W.20	5.B.2 Anaerobic digestion at biogas facilities – CH ₄	<p>Denmark reported the amount of CH₄ for energy recovery from anaerobic digestion at biogas facilities as “NO” for the entire time series in CRF table 5.B. However, CH₄ recovery from anaerobic digestion of organic waste could be easily estimated using the information on CH₄ production and emissions provided in the NIR (table 7.3.6). During the review, Denmark explained that data on biogas production are compiled by the Danish Energy Agency as part of Denmark’s national energy statistics, and that, while historically biogas has mainly been used directly in gas engines to produce electricity and heat, parts of the biogas network were upgraded and fed into the natural gas network.</p> <p>The ERT recommends that Denmark estimate and report the amount of CH₄ for energy recovery in CRF table 5.B rather than reporting it as “NO”.</p>	Yes. Transparency
W.21	5.C.1 Waste incineration – CH ₄ and N ₂ O	<p>Denmark did not clarify whether the EFs for CH₄ and N₂O emissions from human and animal cremation provided in the NIR (tables 7.4.4 and 7.4.7) include CH₄ and N₂O emissions from fuel combusted for the purpose of the cremation and whether the fuel used for human and animal cremation is included in the Danish energy balance. In addition, the document referred to in the NIR (Aasestad, 2008) in relation to the CH₄ and N₂O EFs for human and animal cremation does not explain how the CH₄ and N₂O EFs were derived. During the review, Denmark explained that, although the Danish energy balance includes all fuels used, the information it provides is not detailed enough</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/problem?^a</i>
		<p>to enable the identification of fuels used in crematoria. The Party further explained that to the best of its knowledge, the EFs were estimated without accounting for the contribution of emissions from fuel combustion (i.e. including only emissions from the incineration of the corpse/carcass and the casket or other storage materials).</p> <p>The ERT recommends that Denmark include in the NIR information on how the CH₄ and N₂O EFs for human and animal cremation were derived, including whether the contribution of any emissions from the fuels used was considered when deriving the EFs.</p>	
W.22	5.C.1 Waste incineration – CO ₂ , CH ₄ and N ₂ O	<p>According to the NIR (section 7.4, p.537), the AD for waste incineration are the number (or mass when estimated) of human corpses and animal carcasses cremated, as provided in the relevant tables (tables 7.4.3 and 7.4.6). However, while Denmark reported AD for animal cremation in CRF table 5.C, it reported the AD for human cremation as “NO” without providing any explanation for the use of the notation key. During the review, Denmark explained that the calculation of emissions from the cremation of human corpses is based on EFs per body, while emissions from the cremation of animal carcasses were calculated using EFs per weight unit. Given that the weights of deceased persons are not known, the AD cannot be reported in kt as required in CRF table 5.C. Denmark also explained that it plans to include an explanation in the documentation box of CRF table 5.C and to report the AD as “NE” rather than “NO” in future submissions.</p> <p>The ERT recommends that Denmark report the AD on the amount of waste incinerated for human cremation as “NE” instead of “NO” in CRF table 5.C and provide a corresponding explanation in a documentation box.</p>	Yes. Transparency
W.23	5.C.1 Waste incineration – CO ₂ , CH ₄ and N ₂ O	<p>Denmark did not provide in the NIR information on the estimation of CO₂, CH₄ and N₂O emissions from waste incineration in the Faroe Islands, such as the derivation of EFs and the calorific values used, clarification of whether the same calorific value was used for fossil and biogenic waste, analyses of the trends for non-CO₂ EFs, and the composition of the incinerated waste and how the fossil share was derived. During the review, the Party explained that the CO₂ EFs used for the Faroe Islands are the same as those used for mainland Denmark. The Party further explained that the CH₄ and N₂O EFs were provided in the NIR (table 6, p.896), while the annual amount of waste incinerated is shown in NIR figure 20 (p.893).</p> <p>The ERT recommends that Denmark include in the NIR information on:</p> <ul style="list-style-type: none"> (a) The derivation of CO₂, CH₄ and N₂O EFs; (b) Analyses of the trends for non-CO₂ EFs; (c) The derivation of the calorific value of incinerated waste, clarifying whether the same calorific value was used for fossil and biogenic waste; (d) The composition of the incinerated waste (if available) and how the fossil share was derived. 	Yes. Transparency

<i>ID#</i>	<i>Finding classification</i>	<i>Description of the finding with recommendation or encouragement</i>	<i>Is finding an issue/problem?^a</i>
W.24	5.D.1 Domestic wastewater – CH ₄	<p>Denmark stated in the NIR (section 7.5.2, p.545) that, starting with the 2019 inventory submission, it used a revised EF for calculating CH₄ emissions from septic tanks, moving from the default value of 0.125 kg CH₄/kg COD (equal to 0.25×0.5) from the 2006 IPCC Guidelines (vol. 5, chap. 6, tables 6.2–6.3) to a country-specific value (0.047 kg CH₄/kg COD). This revised EF was calculated using a country-specific value for the CH₄ conversion factor which, in turn, was calculated using the CH₄ emission measurements provided in a publication (Nielsen et al., 2018). As a result, Denmark revised its estimates of CH₄ emissions from domestic wastewater treatment, leading to a decrease in estimated emissions of 54.63–57.22 per cent for the whole time series (1990–2016) in the 2019 submission. The Party mentioned in the NIR (section 7.5.2, p.545) that the country-specific EF was derived by applying an “uncertainty factor” of 10 to account for the fact that the installed septic tanks are older and may not be functioning optimally. As such, the EF value was reduced by a factor of 2.6 (i.e. from 0.125 to 0.047). However, the Party did not provide sufficiently detailed information on the derivation of the country-specific EF, in particular information on the methodology and parameters used to estimate CH₄ emissions from septic tanks, including references to relevant publications and a justification that the EF was determined in a scientifically sound manner. In addition, NIR equation 7.5.6 gave incorrect units of measurement for the EF (kg CH₄/kg DOC instead of kg CH₄/kg COD). During the review, Denmark provided the information requested by the ERT, including a detailed description of the equations used (NIR equations 7.5.5–7.5.6) and the expert judgment used to derive the country-specific EF. The Party explained that the EF was determined using an expert judgment based on measurements carried out over three months on two septic tanks. In response to the draft review report, the Party further explained that the factor of 10 does not represent the uncertainty of the country-specific EF but instead is a factor of safety used to make a conservative estimate of the CH₄ emissions from septic tanks in Denmark, given that the two septic tanks used in the above-mentioned study are not representative of the whole of Denmark.</p> <p>The ERT recommends that Denmark enhance the transparency of its reporting by:</p> <ul style="list-style-type: none"> (a) Correcting the units of measurement for the EF (EF_{st}) presented in NIR equation 7.5.6 (kg CH₄/kg COD instead of kg CH₄/kg DOC); (b) Providing detailed and transparent information on the methodology used to estimate CH₄ emissions from septic tanks; (c) Explaining all the parameters used to estimate CH₄ emissions from septic tanks and including accurate references to justify them; (d) Stating clearly in the NIR that the factor of 10 is based on expert judgment and was applied to make a conservative estimate of the EF for CH₄ emissions from septic tanks in Denmark; (e) Explaining how the revision of CH₄ emissions from septic tanks due to the use of the country-specific CH₄ EF affected uncertainty estimates of CH₄ emissions from wastewater handling. 	Yes. Transparency
W.25	5.D.1 Domestic wastewater – CH ₄	<p>Denmark stated in the NIR (section 7.5.2, p.545) that the country-specific EF used for calculating CH₄ emissions from septic tanks (0.047 kg CH₄/kg DOC) was derived using an “uncertainty factor” of 10. In response to the draft review report, Denmark provided further clarification regarding the uncertainty factor (see ID# W.24 above).</p> <p>The ERT recommends that Denmark consider revising the methodology used to derive the country-specific CH₄ EF for septic tanks with a view to making it accurate and representative of the management practices in Denmark.</p>	Yes. Accuracy

<i>ID#</i>	<i>Finding classification</i>	<i>Description of the finding with recommendation or encouragement</i>	<i>Is finding an issue/problem?^a</i>
W.26	5.D.1 Domestic wastewater – CH ₄	<p>According to the NIR (section 7.5.1, p.541), Denmark assumed the share of the population not connected to the sewer system (i.e. scattered houses) to be 10 per cent. However, the NIR did not state the basis for this assumption or provide a justification that it did not lead to an underestimation or overestimation of CH₄ emissions from septic tanks. Moreover, it was not clear whether the share is constant and equal to 10 per cent for the whole time series (1990–2018). During the review, Denmark explained that, although the share of scattered houses is assumed to remain constant at 10 per cent on the basis of an expert judgment, this assumption is consistent with Eurostat data on the percentage of the Danish population connected to urban wastewater collection and treatment systems, which increased from 89.7 to 91.9 per cent between 2009 and 2017. Denmark explained that it plans to recalculate CH₄ emissions from septic tanks for the whole time series by using the data on the percentage of scattered houses reported to Eurostat for 2007 onward, while keeping a constant level for 1990–2006.</p> <p>The ERT recommends that Denmark estimate CH₄ emissions from septic tanks using existing data on the percentage of scattered houses from relevant data sources (e.g. Eurostat). If no data on the population living in scattered houses are available for 1990–2006, the ERT recommends that Denmark use appropriate splicing techniques as described in the 2006 IPCC Guidelines (vol. 1, chap. 5).</p>	Yes. Accuracy
W.27	5.D Wastewater treatment and discharge – CH ₄ and N ₂ O	<p>Denmark reported in CRF table summary 3s2 that N₂O emissions from wastewater treatment and discharge were estimated using a tier 1 method for 1990–2016, a combination of tier 1 and 2 methods for 2017 and a combination of tier 2 and 3 methods for 2018. However, Denmark did not explain whether it used consistent methodologies to estimate CH₄ and N₂O emissions from different wastewater treatment and discharge sources across the whole time series. During the review, Denmark explained that the 2006 IPCC Guidelines do not specify which methodological tiers should be used for estimating N₂O emissions from wastewater treatment, which complicates reporting on the level of methodological tiers used. Denmark explained that the methodology was applied consistently for the whole time series, maintaining the same level of detail in AD (monitoring data on total organic content in influents and effluents and N and energy production from anaerobic digestion of sludge) and using the country-specific EF values for N₂O and CH₄. For the share of the population not connected to the sewer system, Denmark introduced a country-specific EF value for 2018. For direct emissions from industrial wastewater treatment, the Party developed a method for backcasting emissions on the basis of the amount of effluent N on a national scale. The ERT noted that including this explanation in the NIR would enhance the transparency of reporting. Further, in response to the review report, Denmark confirmed that there was a mistake in CRF table summary 3s2 for the reported tier level of the N₂O emissions and explained that country-specific monitoring data for the AD and default EF value were applied for wastewater discharge, and that country-specific AD and EFs were applied for direct emissions for the whole time series.</p> <p>The ERT recommends that Denmark:</p> <ul style="list-style-type: none"> (a) Ensure that the tier levels of methods used for estimating N₂O emissions are reported correctly in CRF table summary 3s2 for the whole time series; (b) Explain in the NIR the method applied for backcasting direct emissions from industrial wastewater treatment plants. 	Yes. Transparency
W.28	5.E Other (waste) – N ₂ O	Denmark reported N ₂ O emissions from accidental fires as “NA” in CRF tables 5 and summary 2, but did not explain why this notation key was used. In addition, according to the 2006 IPCC Guidelines (vol. 5, chap. 5, p.5.5), incineration and open burning of waste lead to CO ₂ , CH ₄ and N ₂ O emissions. During the review, Denmark	Yes. Comparability

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue/problem? ^a
<p>explained that it did not report N₂O emissions because EFs and other parameters for accidental fires were not available, as they differ from those for incineration and open burning activities, for which default EFs are provided in the 2006 IPCC Guidelines. The ERT noted that this calls for the reporting of “NE” rather than “NA”.</p> <p>The ERT recommends that Denmark report N₂O emissions from accidental fires as “NE” instead of “NA” in CRF tables 5 and summary 2, and correct the reporting in the NIR accordingly.</p>			
KP-LULUCF			
KL.9	General (KP-LULUCF)	<p>Denmark erroneously stated in NIR table 10.5, which shows the relationship between the LULUCF categories used for Convention reporting and the KP-LULUCF activities, that the Convention reporting category forest land remaining forest land is related to the reporting of CM and GM activities under the Kyoto Protocol. During the review, the Party acknowledged the error in NIR table 10.5 and explained that no conversions between lands subject to FM and those subject to GM or CM occur in Denmark.</p> <p>The ERT recommends that the Party correct the error in the table showing the relationship between the LULUCF categories and the KP-LULUCF activities by removing the references comparing CM and GM against forest land remaining forest land.</p>	Yes. Transparency
KL.10	General (KP-LULUCF) – CO ₂	<p>Denmark applied country-specific carbon sequestration rates for broadleaves and conifers for forest floor development in CRF table 4(KP-1)A.1 (see ID# KL.1 in table 3). However, the Party did not update the NIR to reflect the methodology used. During the review, the Party explained that the carbon pool in the litter layer in all forest areas (both land subject to afforestation activity and forest land remaining forest land) is reported on the basis of direct measurements of litter layer depth and carbon densities for litter layers according to forest type, as provided in the NFI report. However, the NIR (section 6.1) does not report these measurements or clarify the IEFs for litter reported in CRF table 4(KP-1)A.1. Moreover, the Party did not report broadleaves and conifers separately in CRF table 4(KP-1)A.1; the carbon stock factors from the NFI are calculated separately.</p> <p>The ERT recommends that Denmark include the method and country-specific carbon stock values used to estimate carbon stock changes in litter in areas subject to AR and FM and separately provide the values used for broadleaves and conifers in the NIR and report them as separate subcategories in the corresponding CRF tables.</p>	Yes. Transparency
KL.11	CM – CO ₂	<p>Denmark used a constant value for the area of drained organic soils for all reporting years under the second commitment period of the Kyoto Protocol (2013–2018), assuming it to be equal to the 2010 area (see ID# L.20 above). If the area of drained organic soils has a declining trend, this assumption will likely result in an overestimation of annual emissions from drained organic soils under cropland and therefore of those reported for CM. During the review, the Party acknowledged that given that the area of drained organic soils has been decreasing since 2010, with more organic soils converted to mineral soils every year, assuming a constant area of drained organic soils since 2010 would likely lead to an overestimation of emissions.</p> <p>The ERT recommends that Denmark recalculate emissions from drained organic soils reported under CM by collecting AD on the area of drained organic soils for all reporting years in the second commitment period of the Kyoto Protocol.</p>	Yes. Accuracy
KL.12	CM – CO ₂	<p>The Party did not transparently describe the calculation of the EFs for drained organic soils in the NIR (see issue ID# L.21 above), which meant that the ERT was unable to determine whether the EFs are suitable for soils with 6–</p>	Yes. Accuracy

<i>ID#</i>	<i>Finding classification</i>	<i>Description of the finding with recommendation or encouragement</i>	<i>Is finding an issue/problem?^a</i>
		<p>12 per cent organic content, which represent 60 per cent of all drained soils under cropland and CM, and for those with an organic content above 12 per cent. On the basis of the explanation provided by Denmark during the review (see issue ID# L.21 above), the ERT noted that the assumptions made by Denmark (a 50 per cent reduction of the fixed EFs used for drained organic soils with organic content greater than 12 per cent for calculating the EFs for drained organic soils with 6–12 per cent organic content) may result in a potential underestimation of emissions from these soils.</p> <p>The ERT recommends that the Party recalculate emissions from drained organic soils under CM by collecting additional data on soils with 6–12 per cent organic content. The ERT also recommends that Denmark include in the NIR data and information on calculating the fixed EFs for drained organic soils with organic content greater than 12 per cent, referring to the study by Elsgaard et al. (2012), including soil type, percentage of organic content and assumptions made, and demonstrate their applicability for all reporting years in the second commitment period of the Kyoto Protocol.</p>	

^a Recommendations made by the ERT during the review are related to issues as defined in para. 81 of the UNFCCC review guidelines or problems as defined in para. 69 of the Article 8 review guidelines.

VI. Application of adjustments

11. The ERT did not identify the need to apply any adjustments for the 2020 annual submission of Denmark.

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

12. Table I.5 presents the accounting quantities for KP-LULUCF reported by Denmark and the final values agreed by the ERT. The final quantities of units to be issued and cancelled are presented in table I.6.

VII. Questions of implementation

13. No questions of implementation were identified by the ERT during the individual review of the Party's 2020 annual submission.

Annex I

Overview of greenhouse gas emissions and removals and data and information on activities under Article 3, paragraphs 3–4, of the Kyoto Protocol, as submitted by Denmark in its 2020 annual submission

1. Tables I.1–I.4 provide an overview of the total GHG emissions and removals as submitted by Denmark.

Table I.1

Total greenhouse gas emissions for Denmark, base year^a–2018

(kt CO₂ eq)

	Total GHG emissions excluding indirect CO ₂ emissions		Total GHG emissions including indirect CO ₂ emissions ^b		Land-use change (Article 3.7 bis as contained in the Doha Amendment) ^c	KP-LULUCF (Article 3.3 of the Kyoto Protocol) ^d	KP-LULUCF (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	76 422.35	69 965.78	77 555.58	71 099.01	8.807		7 021.99	
1990	76 102.51	69 645.94	77 235.73	70 779.16				
1995	82 583.09	77 597.03	83 648.09	78 662.02				
2000	75 611.51	70 371.63	76 440.41	71 200.53				
2010	63 591.26	63 046.62	64 073.28	63 528.65				
2011	56 897.02	57 884.62	57 312.85	58 300.45				
2012	54 038.25	53 356.24	54 416.21	53 734.20				
2013	57 037.60	55 120.49	57 389.66	55 472.55		45.05	4 344.58	–2 543.65
2014	52 506.13	50 923.88	52 828.27	51 246.03		–219.46	5 510.51	–3 741.03
2015	53 479.59	48 321.37	53 788.45	48 630.24		–364.28	4 834.56	677.04
2016	56 532.25	50 366.51	56 830.19	50 664.45		182.11	5 239.36	703.31
2017	52 546.34	48 060.84	52 839.21	48 353.71		–574.11	4 662.71	322.53
2018	54 536.30	47 942.74	54 817.35	48 223.79		–166.74	6 138.11	554.20

Note: Emissions and removals reported in the sector other (sector 6) are not included in the total GHG emissions.

^a “Base year” refers to the base year under the Kyoto Protocol, which is 1990 for CO₂, CH₄ and N₂O, and 1995 for HFCs, PFCs, SF₆ and NF₃. The base year for CM and GM under Article 3, para. 4, of the Kyoto Protocol is 1990. For activities under Article 3, para. 3, of the Kyoto Protocol and FM under Article 3, para. 4, only the inventory years of the commitment period must be reported.

^b The Party reported indirect CO₂ emissions in CRF table 6.

^c The value reported in this column relates to GHG emissions from conversion of forests (deforestation) in 1990 as contained in the report on the review of the report to facilitate the calculation of the assigned amount for the second commitment period of the Kyoto Protocol of the Party.

^d Activities under Article 3, para. 3, of the Kyoto Protocol, namely AR and deforestation.

Table I.2

Greenhouse gas emissions by gas for Denmark, excluding land use, land-use change and forestry, 1990–2018(kt CO₂ eq)

	CO ₂ ^a	CH ₄	N ₂ O	HFCs	PFCs	Unspecified mix of HFCs and PFCs	SF ₆	NF ₃
1990	54 685.99	7 903.01	8 147.76	NO, NA	NO, NA	NO, NA	42.41	NO, NA
1995	62 646.61	8 299.72	7 353.43	257.86	0.63	NO, NA	103.76	NO, NA
2000	55 105.62	8 156.37	7 092.94	766.19	22.57	NO, NA	56.84	NO, NA
2010	49 634.31	7 630.90	5 381.23	828.17	17.06	NO, NA	36.97	NO, NA
2011	44 612.97	7 471.72	5 375.09	751.26	11.95	NO, NA	77.46	NO, NA
2012	40 201.56	7 364.22	5 284.16	751.39	3.39	NO, NA	129.47	NO, NA
2013	42 081.60	7 271.93	5 280.13	685.29	3.70	NO, NA	149.90	NO, NA
2014	37 849.49	7 238.57	5 377.63	623.67	2.66	NO, NA	154.00	NO, NA
2015	35 490.35	7 165.80	5 387.83	464.83	0.02	NO, NA	121.40	NO, NA
2016	37 286.64	7 217.32	5 537.97	518.35	0.01	NO, NA	104.17	NO, NA
2017	35 015.03	7 244.87	5 597.83	419.44	1.09	NO, NA	75.45	NO, NA
2018	34 932.48	7 332.63	5 398.15	487.35	0.01	NO, NA	73.18	NO, NA
Percentage change 1990–2018	–36.1	–7.2	–33.7	NA	NA	NA	72.6	NA

Note: Emissions and removals reported in the sector other (sector 6) are not included in this table.

^a Including indirect CO₂ emissions as reported in CRF table 6.

Table I.3

Greenhouse gas emissions by sector for Denmark, 1990–2018(kt CO₂ eq)

	Energy	IPPU	Agriculture	LULUCF	Waste	Other
1990	53 493.30	2 362.82	13 161.17	6 456.57	1 761.88	NO
1995	61 610.27	2 918.61	12 535.51	4 986.06	1 597.63	NO
2000	54 329.33	3 717.18	11 667.22	5 239.88	1 486.79	NO
2010	49 554.30	1 912.34	10 910.83	544.63	1 151.17	NO
2011	44 206.94	2 054.28	10 901.38	–987.60	1 137.85	NO
2012	39 650.57	2 086.89	10 896.66	682.01	1 100.09	NO
2013	41 444.38	2 051.85	10 898.41	1 917.11	1 077.91	NO
2014	37 135.79	2 009.22	11 023.87	1 582.25	1 077.15	NO
2015	34 825.58	1 833.00	10 912.52	5 158.22	1 059.13	NO
2016	36 438.54	2 040.51	11 090.18	6 165.74	1 095.23	NO

	<i>Energy</i>	<i>IPPU</i>	<i>Agriculture</i>	<i>LULUCF</i>	<i>Waste</i>	<i>Other</i>
2017	34 057.78	2 024.32	11 150.45	4 485.49	1 121.16	NO
2018	33 998.93	2 044.30	11 041.26	6 593.56	1 139.30	NO
Percentage change 1990–2018	–36.4	–13.5	–16.1	2.1	–35.3	NA

Notes: (1) Denmark did not report emissions or removals in the sector other (sector 6); the corresponding cells in the CRF tables were left blank; (2) totals include indirect CO₂ emissions reported in CRF table 6.

Table I.4

Greenhouse gas emissions and removals from activities under Article 3, paragraphs 3–4, of the Kyoto Protocol by activity, base year^a–2018, for Denmark
(kt CO₂ eq)

	<i>Article 3.7 bis as contained in the Doha Amendment^b</i>	<i>Activities under Article 3.3 of the Kyoto Protocol</i>		<i>FM and elected activities under Article 3.4 of the Kyoto Protocol</i>				
	<i>Land-use change</i>	<i>AR</i>	<i>Deforestation</i>	<i>FM</i>	<i>CM</i>	<i>GM</i>	<i>RV</i>	<i>WDR</i>
FMRL				409.00				
Technical correction				–82.62				
Base year	8.807				5 448.09	1 573.90	NA	NA
2013		8.56	36.50	–2 543.65	3 028.97	1 315.61	NA	NA
2014		–341.86	122.41	–3 741.03	4 093.35	1 417.16	NA	NA
2015		–620.66	256.38	677.04	3 588.46	1 246.10	NA	NA
2016		27.58	154.53	703.31	3 848.83	1 390.53	NA	NA
2017		–600.50	26.39	322.53	3 281.26	1 381.45	NA	NA
2018		–332.29	165.55	554.20	4 667.32	1 470.80	NA	NA
Percentage change base year–2018					–14.3	–6.6	NA	NA

Note: Values in this table include emissions from land subject to natural disturbances, if applicable.

^a The base year for CM and GM under Article 3, para. 4, of the Kyoto Protocol is 1990. For activities under Article 3, para. 3, of the Kyoto Protocol, and FM under Article 3, para. 4, only the inventory years of the commitment period must be reported.

^b The value reported in this column relates to 1990.

- Table I.5 provides information on the Party's accounting quantities for reporting under Article 3, paragraphs 3–4, of the Kyoto Protocol.

Table I.5

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
(kt CO₂ eq)

GHG source/sink activity	Net emissions/removals								Accounting parameters	Accounting quantity ^e
	Base year ^a	2013	2014	2015	2016	2017	2018	Total ^b		
A.1. AR		8.558	-341.863	-620.659	27.575	-600.498	-332.285	-1 859.172		-1 859.172
Excluded emissions from natural disturbances ^d		NA	NA	NA	NA	NA	NA	NA		NA
Excluded subsequent removals from land subject to natural disturbances		NA	NA	NA	NA	NA	NA	NA		NA
A.2. Deforestation		36.496	122.405	256.377	154.533	26.388	165.548	761.748		761.748
B.1. FM								-4 027.604		-5 985.901
Net emissions/removals		-2 543.647	-3 741.031	677.037	703.309	322.530	554.199	-4 027.604		
Excluded emissions from natural disturbances ^d		NA	NA	NA	NA	NA	NA	NA		NA
Excluded subsequent removals from land subject to natural disturbances		NA	NA	NA	NA	NA	NA	NA		NA
Any debits from newly established forest		NA	NA	NA	NA	NA	NA	NA		NA
FMRL ^e									409.000	
Technical corrections to FMRL									-82.617	
FM cap									19 822.068	-5 985.901
B.2. CM (if elected)	5 448.088	3 028.973	4 093.346	3 588.459	3 848.831	3 281.256	4 667.319	22 508.184		-10 180.343
B.3. GM (if elected)	1 573.902	1 315.612	1 417.163	1 246.102	1 390.530	1 381.452	1 470.796	8 221.656		-1 221.757
B.4. RV (if elected)	NA	NA	NA	NA	NA	NA	NA	NA		NA
B.5. WDR (if elected)	NA	NA	NA	NA	NA	NA	NA	NA		NA

^a Net emissions and removals from CM, GM, RV and/or WDR, if elected, in the Party's base year as established in decision 9/CP.2.^b Cumulative net emissions and removals for all years of the commitment period reported in the annual submission under review.^c The accounting quantity is the total quantity of units to be issued or cancelled for a particular activity.^d The Party indicated that it does not intend to exclude emissions from natural disturbances.^e As inscribed in the appendix to the annex to decision 2/CMP.7 in kt CO₂ eq per year.

3. Table I.6 provides an overview of key relevant data from Denmark's reporting under Article 3, paragraphs 3–4, of the Kyoto Protocol.

Table I.6

Key relevant data for Denmark under Article 3, paragraphs 3–4, of the Kyoto Protocol from its 2020 annual submission

<i>Parameter</i>	<i>Data values</i>
Periodicity of accounting	(a) AR: annual accounting (b) Deforestation: annual accounting (c) FM: annual accounting (d) CM: annual accounting (e) GM: annual accounting (f) RV: not elected (g) WDR: not elected
Elected activities under Article 3, paragraph 4, of the Kyoto Protocol	CM and GM
Election of application of provisions for natural disturbances	No
3.5% of total base-year GHG emissions, excluding LULUCF and including indirect CO ₂ emissions	2 477.758 kt CO ₂ eq (19 822.068 kt CO ₂ eq for the duration of the commitment period)
Cancellation of AAUs, CERs and ERUs and/or issuance of RMUs in the national registry for:	
1. AR	Issue 988 617 RMUs
2. Deforestation	Cancel 146 298 units
3. FM	Cancel 294 261 units
4. CM	Issue 4 447 918 RMUs
5. GM	Issue 2 176 464 RMUs

Note: Values in this table reflect the difference in the accounting quantities for activities under Article 3, para. 3, and FM and any elected activities under Article 3, para. 4, of the Kyoto Protocol as reported in table I.5 between this report and the previously published review report for the Party.

Annex II

Information to be included in the compilation and accounting database

Tables II.1–II.6 include the information to be included in the compilation and accounting database for Denmark. Data shown are from the Party's annual submission, including the latest revised estimates submitted, adjustments (if applicable) and the final data to be included in the compilation and accounting database.

Table II.1

Information to be included in the compilation and accounting database for 2018, including on the commitment period reserve, for Denmark

(t CO₂ eq)

	<i>Original submission</i>	<i>Revised submission</i>	<i>Adjustment</i>	<i>Final value</i>
CPR	242 440 102	–	–	242 440 102
Annex A emissions				
CO ₂	34 932 475	–	–	34 932 475
CH ₄	7 332 632	–	–	7 332 632
N ₂ O	5 398 146	–	–	5 398 146
HFCs	487 346	–	–	487 346
PFCs	7	–	–	7
Unspecified mix of HFCs and PFCs	NO, NA	–	–	NO, NA
SF ₆	73 184	–	–	73 184
NF ₃	NO, NA	–	–	NO, NA
Total Annex A sources	48 223 790	–	–	48 223 790
Activities under Article 3, paragraph 3, of the Kyoto Protocol				
AR	–332 285	–	–	–332 285
Deforestation	165 548	–	–	165 548
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol				
FM	554 199	–	–	554 199
CM	4 667 319	–	–	4 667 319
CM for the base year	5 448 088	–	–	5 448 088
GM	1 470 796	–	–	1 470 796
GM for the base year	1 573 902	–	–	1 573 902

Table II.2

Information to be included in the compilation and accounting database for 2017 for Denmark

(t CO₂ eq)

	<i>Original submission</i>	<i>Revised submission</i>	<i>Adjustment</i>	<i>Final value</i>
Annex A emissions				
CO ₂	35 015 027	–	–	35 015 027
CH ₄	7 244 871	–	–	7 244 871
N ₂ O	5 597 829	–	–	5 597 829
HFCs	419 437	–	–	419 437
PFCs	1 094	–	–	1 094
Unspecified mix of HFCs and PFCs	NO, NA	–	–	NO, NA
SF ₆	75 454	–	–	75 454
NF ₃	NO, NA	–	–	NO, NA
Total Annex A sources	48 353 712	–	–	48 353 712
Activities under Article 3, paragraph 3, of the Kyoto Protocol				

	<i>Original submission</i>	<i>Revised submission</i>	<i>Adjustment</i>	<i>Final value</i>
AR	-600 498	–	–	-600 498
Deforestation	26 388	–	–	26 388
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol				
FM	322 530	–	–	322 530
CM	3 281 256	–	–	3 281 256
CM for the base year	5 448 088	–	–	5 448 088
GM	1 381 452	–	–	1 381 452
GM for the base year	1 573 902	–	–	1 573 902

Table II.3

Information to be included in the compilation and accounting database for 2016 for Denmark(t CO₂ eq)

	<i>Original submission</i>	<i>Revised submission</i>	<i>Adjustment</i>	<i>Final value</i>
Annex A emissions				
CO ₂	37 286 637	–	–	37 286 637
CH ₄	7 217 322	–	–	7 217 322
N ₂ O	5 537 970	–	–	5 537 970
HFCs	518 347	–	–	518 347
PFCs	8	–	–	8
Unspecified mix of HFCs and PFCs	NO, NA	–	–	NO, NA
SF ₆	104 172	–	–	104 172
NF ₃	NO, NA	–	–	NO, NA
Total Annex A sources	50 664 455	–	–	50 664 455
Activities under Article 3, paragraph 3, of the Kyoto Protocol				
AR	27 575	–	–	27 575
Deforestation	154 533	–	–	154 533
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol				
FM	703 309	–	–	703 309
CM	3 848 831	–	–	3 848 831
CM for the base year	5 448 088	–	–	5 448 088
GM	1 390 530	–	–	1 390 530
GM for the base year	1 573 902	–	–	1 573 902

Table II.4

Information to be included in the compilation and accounting database for 2015 for Denmark(t CO₂ eq)

	<i>Original submission</i>	<i>Revised submission</i>	<i>Adjustment</i>	<i>Final value</i>
Annex A emissions				
CO ₂	35 490 351	–	–	35 490 351
CH ₄	7 165 805	–	–	7 165 805
N ₂ O	5 387 834	–	–	5 387 834
HFCs	464 830	–	–	464 830
PFCs	18	–	–	18
Unspecified mix of HFCs and PFCs	NO, NA	–	–	NO, NA
SF ₆	121 398	–	–	121 398
NF ₃	NO, NA	–	–	NO, NA
Total Annex A sources	48 630 236	–	–	48 630 236
Activities under Article 3, paragraph 3, of the Kyoto Protocol				
AR	-620 659	–	–	-620 659
Deforestation	256 377	–	–	256 377

	<i>Original submission</i>	<i>Revised submission</i>	<i>Adjustment</i>	<i>Final value</i>
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol				
FM	677 037	–	–	677 037
CM	3 588 459	–	–	3 588 459
CM for the base year	5 448 088	–	–	5 448 088
GM	1 246 102	–	–	1 246 102
GM for the base year	1 573 902	–	–	1 573 902

Table II.5

Information to be included in the compilation and accounting database for 2014 for Denmark(t CO₂ eq)

	<i>Original submission</i>	<i>Revised submission</i>	<i>Adjustment</i>	<i>Final value</i>
Annex A emissions				
CO ₂	37 849 488	–	–	37 849 488
CH ₄	7 238 568	–	–	7 238 568
N ₂ O	5 377 632	–	–	5 377 632
HFCs	623 673	–	–	623 673
PFCs	2 663	–	–	2 663
Unspecified mix of HFCs and PFCs	NO, NA	–	–	NO, NA
SF ₆	154 005	–	–	154 005
NF ₃	NO, NA	–	–	NO, NA
Total Annex A sources	51 246 029	–	–	51 246 029
Activities under Article 3, paragraph 3, of the Kyoto Protocol				
AR	–341 863	–	–	–341 863
Deforestation	122 405	–	–	122 405
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol				
FM	–3 741 031	–	–	–3 741 031
CM	4 093 346	–	–	4 093 346
CM for the base year	5 448 088	–	–	5 448 088
GM	1 417 163	–	–	1 417 163
GM for the base year	1 573 902	–	–	1 573 902

Table II.6

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

	<i>Original submission</i>	<i>Revised submission</i>	<i>Adjustment</i>	<i>Final value</i>
Annex A emissions				
CO ₂	42 081 600	–	–	42 081 600
CH ₄	7 271 931	–	–	7 271 931
N ₂ O	5 280 132	–	–	5 280 132
HFCs	685 292	–	–	685 292
PFCs	3 695	–	–	3 695
Unspecified mix of HFCs and PFCs	NO, NA	–	–	NO, NA
SF ₆	149 900	–	–	149 900
NF ₃	NO, NA	–	–	NO, NA
Total Annex A sources	55 472 550	–	–	55 472 550
Activities under Article 3, paragraph 3, of the Kyoto Protocol				
AR	8 558	–	–	8 558
Deforestation	36 496	–	–	36 496
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol				
FM	–2 543 647	–	–	–2 543 647

	<i>Original submission</i>	<i>Revised submission</i>	<i>Adjustment</i>	<i>Final value</i>
CM	3 028 973	—	—	3 028 973
CM for the base year	5 448 088	—	—	5 448 088
GM	1 315 612	—	—	1 315 612
GM for the base year	1 573 902	—	—	1 573 902

Annex III

Additional information to support findings in table 2

Missing categories that may affect completeness

The categories for which estimation methods are included in the 2006 IPCC Guidelines that were reported as “NE” or for which the ERT otherwise determined that there may be an issue with the completeness of the reporting in the Party’s inventory are the following:

- (a) 1.A.3.d domestic navigation (other fossil fuels) (N₂O) (see ID# E.8 in table 5);
- (b) For Greenland: 4(II) forest land – drainage and rewetting (CO₂, CH₄ and N₂O) (see ID# G.2 in table 3);
- (c) For the Faroe Islands: 2.D.1 lubricant use (CO₂) (see ID# G.3 in table 3); 5.B.1 composting (CH₄ and N₂O) (see ID# W.17 in table 5); 5.A solid waste disposal (CH₄) (see ID# G.3 in table 5); and 5.D wastewater treatment and discharge (CH₄ and N₂O) (see ID# G.3 in table 5).

Annex IV

Reference documents

A. Reports of the Intergovernmental Panel on Climate Change

IPCC. 2000. *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*. J Penman, D Kruger, I Galbally, et al. (eds.). Hayama, Japan: IPCC/Organisation for Economic Co-operation and Development/International Energy Agency/Institute for Global Environmental Strategies. Available at <https://www.ipcc-nggip.iges.or.jp/public/gp/english/>.

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IPCC. 2014. *2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands*. T Hiraishi, T Krug, K Tanabe, et al. (eds.). Geneva: IPCC. Available at <https://www.ipcc.ch/publication/2013-supplement-to-the-2006-ipcc-guidelines-for-national-greenhouse-gas-inventories-wetlands/>.

B. UNFCCC documents

Annual review reports

Reports on the individual reviews of the 2013, 2014, 2015, 2016 and 2018 annual submissions of Denmark, contained in documents FCCC/ARR/2013/DNK, FCCC/ARR/2014/DNK, FCCC/ARR/2015/DNK, FCCC/ARR/2016/DNK and FCCC/ARR/2018/DNK, respectively.

Other

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 https://unfccc.int/sites/default/files/resource/AGI%202020_final.pdf.

Annual status report for Denmark for 2020. Available at https://unfccc.int/sites/default/files/resource/asr2020_DNK.pdf.

C. Other documents used during the review

Responses to questions during the review were received from Ole-Kenneth Nielsen (Aarhus University), including additional material on the methodology and assumptions used. The following references have been reproduced as received:

Aasestad K. 2008. *The Norwegian Emission Inventory 2008. Documentation of methodologies for estimating emissions of greenhouse gases and long-range transboundary air pollutants*. Available at http://www.ssb.no/english/subjects/01/04/10/rapp_emissions_en/rapp_200848_en/rapp_200848_en.pdf.

Boldrin A, Andersen JK and Christensen TH. 2009. *Environmental assessment of garden waste management in Århus Kommune* (Miljøvurdering af haveaffald i Århus kommune). Technical University of Denmark - Miljø. 3R. Available at https://www.researchgate.net/publication/49831352_Environmental_assessment_of_garden_waste_management_in_the_Municipality_of_Aarhus_Denmark.

EEA. 2019. *EMEP/EEA air pollutant emission inventory guidebook 2019: Technical guidance to prepare national emission inventories*. Luxembourg: Publications Office of the European Union. Available at <https://www.eea.europa.eu/publications/emep-eea-guidebook-2019>.

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- Hellwing ALF, Weisbjerg MR and Lund P. 2014. *Note: Calculation of Y_m for dairy cows in Denmark*. Department of Animal Science, Aarhus University, AU Foulum, P.O. Box 50, DK-8830 Tjele, Denmark.
- Johannsen VK, Levin G, Caspersen OH, Nord-Larsen, T and Sørensen IH. 2018. *Validation of land use/land cover changes for Denmark*. Department of Geosciences and Natural Resource Management, University of Copenhagen, Frederiksberg. 23 p. ill. Available at https://static-curis.ku.dk/portal/files/209289237/Validation_of_land_use_land_cover_changes_for_Denmark_report_2018.pdf.
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- Nielsen AH, Vollertsen J, Højmark J, Simon M, Rudelle, EA. 2018. *Hybrid filter for fjernelse af lugt-og drivhusgasser fra septiktanke og iltfri spil-devandsnet*. Publisher: Danish EPA. ISBN: 978-87-93710-18-4. Available at <https://www2.mst.dk/Udgiv/publikationer/2018/05/978-87-93710-18-4.pdf>.
- Nord-Larsen T, and Johannsen VK. 2016. *Danish National Forest Inventory: Design and calculations*. Department of Geosciences and Natural Resource Management, University of Copenhagen. IGN Report. Available at http://static-curis.ku.dk/portal/files/164970017/Danish_National_Forest_Inventory.pdf.
- Nord-Larsen T, Meilby H and Skovsgaard JP. 2017. *Simultaneous estimation of biomass models for 13 tree species: effects of compatible additivity requirements*.
- Skovsgaard JP and Nord-Larsen T. 2012. Biomass, basic density and biomass expansion factor functions for European beech (*Fagus sylvatica* L.) in Denmark. *European Journal of Forest Research*. 131(4): pp.1035-1053.
- Taghizadeh-Toosi A, Christensen BT, Hutchings NJ, Vejlin J, Kätterer T, Glendinin M and Olesen JE 2014. C-TOOL A simple model for simulating whole-profile carbon storage in temperate agricultural soils. *Ecological Modelling*. 292: pp.11–25.
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