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Report on the technical review of the seventh national communication of Denmark

Parties included in Annex I to the Convention were requested by decision 9/CP.16 to submit their seventh national communication to the secretariat by 1 January 2018. According to decision 15/CMP.1, Parties included in Annex I to the Convention that are also Parties to the Kyoto Protocol are required to include in their national communications supplementary information under Article 7, paragraph 2, of the Kyoto Protocol. This report presents the results of the technical review of the seventh national communication and relevant supplementary information under the Kyoto Protocol of Denmark, conducted by an expert review team in accordance with the "Guidelines for the technical review of information reported under the Convention related to greenhouse gas inventories, biennial reports and national communications by Parties included in Annex I to the Convention" and the "Guidelines for review under Article 8 of the Kyoto Protocol".

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Abbreviations and acronyms

AEA	annual emission allocation
BR	biennial report
CHP	combined heat and power
CH_4	methane
CORSIA	Carbon Offsetting and Reduction Scheme for International Aviation
CO_2	carbon dioxide
CO_2 eq	carbon dioxide equivalent
CTF	common tabular format
DKK	Danish kroner
DMI	Danish Meteorological Institute
ERT	expert review team
ESD	effort-sharing decision
EU	European Union
EU ETS	European Union Emissions Trading System
F-gas	fluorinated gas
GDP	gross domestic product
GHG	greenhouse gas
HFC	hydrofluorocarbon
ICAO	International Civil Aviation Organization
IE	included elsewhere
IMO	International Maritime Organization
IPCC	Intergovernmental Panel on Climate Change
IPPU	industrial processes and product use
LULUCF	land use, land-use change and forestry
NA	not applicable
NC	national communication
NE	not estimated
NF_3	nitrogen trifluoride
NIR	national inventory report
NO	not occurring
non-Annex I Party	Party not included in Annex I to the Convention
non-ETS sectors	sectors not covered by the European Union Emissions Trading System
N_2O	nitrous oxide
PaMs	policies and measures
PFC	perfluorocarbon
PSO	public service obligation
reporting guidelines for supplementary information	"Guidelines for the preparation of the information required under Article 7 of the Kyoto Protocol. Part II: Reporting of supplementary information under Article 7, paragraph 2"
SF_6	sulfur hexafluoride
UNFCCC reporting guidelines on NCs	"Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part II: UNFCCC reporting guidelines on national communications"
WAM	'with additional measures'
WEM	'with measures'
WOM	'without measures'

I. Introduction and summary

A. Introduction

1. This is a report on the in-country technical review of the NC7 of Denmark. The review was coordinated by the secretariat in accordance with the "Guidelines for the technical review of information reported under the Convention related to greenhouse gas inventories, biennial reports and national communications by Parties included in Annex I to the Convention", particularly "Part V: UNFCCC guidelines for the technical review of national communications from Parties included in Annex I to the Convention" (annex to decision 13/CP.20), and the "Guidelines for review under Article 8 of the Kyoto Protocol" (annex to decision 22/CMP.1 and annex I to decision 4/CMP.11).[1]

2. In accordance with the same decisions, a draft version of this report was transmitted to the Government of Denmark, which provided comments that were considered and incorporated, as appropriate, into this final version of the report.

3. The review was conducted from 24 to 29 September 2018 in Copenhagen by the following team of nominated experts from the UNFCCC roster of experts: Ms. Diana Barba (Colombia), Mr. Luis Caceres Silva (Ecuador), Mr. Damien Fahey (Ireland), Mr. Ross Hunter (United Kingdom of Great Britain and Northern Ireland) and Mr. Miguel Angel Taboada (Argentina). Mr. Caceres Silva and Mr. Hunter were the lead reviewers. The review was coordinated by Ms. Veronica Colerio and Mr. James Howland (UNFCCC secretariat).

B. Summary

4. The ERT conducted a technical review of the information reported in the NC7 of Denmark in accordance with the UNFCCC reporting guidelines on NCs (decision 4/CP.5) and the reporting guidelines for supplementary information, in particular the supplementary information required under Article 7, paragraph 2, and on the minimization of adverse impacts under Article 3, paragraph 14, of the Kyoto Protocol (annex to decision 15/CMP.1 and annex III to decision 3/CMP.11).

1. Timeliness

5. The NC7 was submitted on 1 January 2018, as per the deadline of 1 January 2018 mandated by decision 9/CP.16. It was resubmitted on 21 January 2018.

2. Completeness, transparency of reporting and adherence to the reporting guidelines

6. Issues and gaps identified by the ERT related to the reported information are presented in table 1. The information reported by Denmark in its NC7, including the supplementary information under the Kyoto Protocol, mostly adheres to the UNFCCC reporting guidelines on NCs.

[1] At the time of the publication of this report, Denmark had submitted its instrument of acceptance of the Doha Amendment, with territorial exclusion of the Faroe Islands and Greenland; however, the Amendment had not yet entered into force. The implementation of the provisions of the Doha Amendment is therefore considered in this report in the context of decision 1/CMP.8, paragraph 6, pending the entry into force of the Amendment.

Table 1
Assessment of completeness and transparency of mandatory information reported by Denmark in its seventh national communication, including supplementary information under the Kyoto Protocol

Section of NC	*Completeness*	*Transparency*	*Reference to description of recommendations*	*Supplementary information under the Kyoto Protocol*	*Completeness*	*Transparency*	*Reference to description of recommendations*
Executive summary	Complete	Transparent	–	National system	Complete	Mostly transparent	Issue 1 in table 6
National circumstances	Complete	Transparent	–	National registry	Complete	Transparent	–
GHG inventory	Complete	Transparent	–	Supplementarity relating to the mechanisms pursuant to Articles 6, 12 and 17	Complete	Transparent	–
PaMs	Complete	Mostly transparent	Issue 3 in table 8	PaMs in accordance with Article 2	Complete	Mostly transparent	Issue 5 in table 8
Projections and the total effect of PaMs	Complete	Transparent		Domestic and regional programmes and/or arrangements and procedures	Complete	Transparent	–
Vulnerability assessment, climate change impacts and adaptation measures	Complete	Transparent	–	Information under Article 10[a]	Complete	Transparent	–
Financial resources and transfer of technology	Mostly complete	Transparent	Issues 1 and 2 in table 15	Financial resources	Complete	Transparent	–
Research and systematic observation	Complete	Transparent	–	Minimization of adverse impacts in accordance with Article 3, paragraph 14	Complete	Mostly transparent	Issue 6 in table 8
Education, training and public awareness	Complete	Transparent	–				

Note: A list of recommendations pertaining to the completeness and transparency issues identified in this table is included in chapter III below. The assessment of completeness and transparency by the ERT in this table is based only on the "shall" reporting requirements.

[a] The assessment refers to information provided by the Party on the provisions contained in Article 4, paragraphs 3, 5 and 7, of the Convention reported under Article 10 of the Kyoto Protocol, which is relevant to Annex II Parties only. Assessment of the information provided by the Party on the other provisions of Article 10 of the Kyoto Protocol is provided under the relevant substantive headings under the Convention, for example research and systematic observation.

3. Summary of reviewed supplementary information under the Kyoto Protocol

7. The supplementary information under Article 7, paragraph 2, of the Kyoto Protocol is incorporated in different sections of the NC7, and the supplementary information under Article 7, paragraph 1, of the Kyoto Protocol is reported in the NIR of the 2018 annual submission. Table 2 provides references to where the information is reported. The technical assessment of the information reported under Article 7, paragraphs 1 and 2, of the Kyoto Protocol is contained in the relevant sections of this report.

Table 2
Overview of supplementary information under the Kyoto Protocol reported by Denmark

Supplementary information	*Reference to the section of NC7*
National registry	3.4
National system	3.3
Supplementarity relating to the mechanisms pursuant to Articles 6, 12 and 17	5.3
PaMs in accordance with Article 2	4.3
Domestic and regional programmes and/or legislative arrangements and enforcement and administrative procedures	4.2
Information under Article 10	3.3, 4, 6, 7, 8 and 9
Financial resources	7
Minimization of adverse impacts in accordance with Article 3, paragraph 14	4.4.3

II. Technical review of the information reported in the seventh national communication, including the supplementary information under the Kyoto Protocol

A. Information on national circumstances and greenhouse gas emissions and removals

1. National circumstances relevant to greenhouse gas emissions and removals

(a) Technical assessment of the reported information

8. The national circumstances of the Kingdom of Denmark, comprising Denmark, Greenland and the Faroe Islands, explain the relationship between its historic and future emission trends and the climate change policy agenda. The changing nature of those circumstances defines the factors that affect the climate policy development and implementation of the Convention. The NC7 contains key data on legislation, population trends, geography and land use, climate and climate change, economic developments, energy, transport, the buildings sector, industry, trade, the services sector, agriculture, forestry, resource efficiency and wastewater.

9. In 2009, the Act on Greenland Self-Government was passed by the Danish Parliament giving the territory jurisdiction over and financial responsibility for almost all aspects of its public affairs. Greenland participates in the Overseas Countries and Territories Association of the EU, which gives it access to European markets. The Act on Greenland Self-Government outlines the future economic relationship between Denmark and Greenland and states that Greenland has the right to utilize the mineral resources found in the territory's

subsoil. During the review, the ERT was informed of future plans of oil and gas exploration in Greenland, which could increase GHG emissions in the future. The Faroe Islands have Home Rule status and are covered by Denmark's ratification of the Convention. However, at the request of the Faroese Government, geographical exemption was applied to the Faroe Islands in Denmark's ratification of the Kyoto Protocol.

10. Since 2007, the Ministry of Energy, Utilities and Climate (formerly the Ministry of Climate and Energy) has had primary responsibility for coordination and implementation of legislation and plans relating to Denmark's climate policy and represents the Party in international negotiations on climate change issues. However, for at least three decades, other ministries have also worked on environmental and climate issues and have drawn up action plans in which the environment is an integral element; for example, sectoral plans for energy, transport and agriculture, and plans for development assistance. In 2007, the structure of the Danish public sector was reformed and the number of Danish municipalities was reduced from 271 to 98. Several municipalities have committed themselves to local targets for reducing GHG emissions, and there are many initiatives to raise awareness of climate change and involve citizens, municipalities, the business community and other stakeholders at both the national and the local level in achieving the targets.

11. Denmark has been a part of the EU Internal Market, through the European Economic Area Agreement, since 1973. It is an industrialized country with arable land and an economy based on manufactured goods, agricultural products and services for the global market. The economy is highly export- and import-intensive, and thus the country is sensitive to global economic trends. The economy is specialized in the tertiary sector, as services account for 35 per cent of total gross value added, while agriculture and industry (i.e. primary and secondary sectors) contribute less than 20 per cent. This situation is not expected to change significantly in the future.

12. The ERT noted that during the period 1990–2016, Denmark's GDP per capita increased by 35.2 per cent, while GHG emissions per GDP unit and GHG emissions per capita decreased by 51.5 and 34.4 per cent, respectively. Table 3 illustrates the national circumstances of Denmark by providing some indicators relevant to emissions and removals.

13. Since 1990, Denmark has shifted significantly from using coal and oil to natural gas and renewable energy sources, increased the use of CHP, and decentralized power production where the combined production is used for district heating. Energy demand has been kept almost constant despite significant economic growth owing to initiatives in the agriculture, waste and industrial sectors to curb GHG emissions. Electricity production is now dominated by wind power, which accounted for 49 per cent of production in 2015. Domestic electricity production dropped by 10 per cent between 2014 and 2015, though this was offset by an increase in net imports, which accounted for 17 per cent of consumption in 2015.

14. Energy production and energy-consuming activities are the main contributors to GHG emissions in Denmark. In 2015, the energy sector (including transport) accounted for 73 per cent of Denmark's total emissions of GHGs (excluding LULUCF), primarily CO_2. The population of Denmark has grown slightly since publication of the NC6, while GHG emissions from the energy sector have decreased significantly, from 50,752.34 kt CO_2 eq (excluding LULUCF) in 2010 to 35,963.52 kt CO_2 eq in 2015. This is a consequence of the increasing contribution of renewable energy to the country's energy supply.

Table 3
Indicators relevant to greenhouse gas emissions and removals for Denmark for the period 1990–2016

						Change (%)	
Indicator	*1990*	*2000*	*2010*	*2015*	*2016*	*1990–2016*	*2015–2016*
GDP per capita (thousands 2011 USD using purchasing power parity)	33.79	42.34	44.00	45.48	45.69	35.2	0.4

						Change (%)	
Indicator	*1990*	*2000*	*2010*	*2015*	*2016*	*1990–2016*	*2015–2016*
GHG emissions without LULUCF per capita (t CO_2 eq)	13.73	13.37	11.63	8.73	9.01	–34.4	3.2
GHG emissions without LULUCF per GDP unit (kg CO_2 eq per 2011 USD using purchasing power parity)	0.41	0.32	0.26	0.19	0.20	–51.5	2.7

Sources: (1) GHG emission data: Denmark's 2018 GHG inventory submission, version 1; (2) population and GDP: World Bank.

Note: The ratios per capita and per GDP unit are calculated relative to GHG emissions without LULUCF; the ratios are calculated using the exact (not rounded) values and may therefore differ from a ratio calculated with the rounded numbers provided in the table.

(b) Assessment of adherence to the reporting guidelines

15. The ERT assessed the information reported in the NC7 of Denmark and identified an issue relating to transparency and adherence to the UNFCCC reporting guidelines on NCs. The findings are described in table 4.

Table 4
Findings on national circumstances relevant to greenhouse gas emissions and removals from the review of the seventh national communication of Denmark

No.	*Reporting requirement, issue type and assessment*	*Description of the finding with recommendation or encouragement*
1	Reporting requirement specified in paragraph 8 Issue type: transparency Assessment: encouragement	The Party reported in its NC7 complete information on its national circumstances but did not include disaggregated indicators to explain the relationship between national circumstances and emissions or removals in Denmark's waste sector (e.g. the amount of waste treated by type of treatment) or transportation sector (e.g. the number of vehicles per mode of transport, travel distances, fleet characteristics). During the review, Denmark provided information on waste management practices and on the composition and amount of waste in each treatment category. These statistics give a clearer and more transparent picture of the waste sector and allow an understanding of where the GHG emissions come from. The ERT encourages Denmark to improve the transparency of its reporting by including in its next NC disaggregated indicators. The ERT noted that overall, the inclusion in the NC of detailed quantitative information that explains the relationship between national circumstances and GHG emissions in the waste and transportation sectors would be useful.

Note: Paragraph number listed under reporting requirement refers to the relevant paragraph of the UNFCCC reporting guidelines on NCs. The reporting on the requirements not included in this table is considered to be complete, transparent and adhering to the UNFCCC reporting guidelines on NCs.

2. Information on greenhouse gas inventory arrangements, emissions, removals and trends

(a) Technical assessment of the reported information

16. Total GHG emissions[2] excluding emissions and removals from LULUCF decreased by 26.9 per cent between 1990 and 2016, whereas total GHG emissions including net

[2] In this report, the term "total GHG emissions" refers to the aggregated national GHG emissions expressed in terms of CO_2 eq excluding LULUCF, unless otherwise specified. Values in this paragraph are calculated on the basis of the 2018 annual submission, version 1.

emissions or removals from LULUCF decreased by 24.3 per cent over the same period. Table 5 illustrates the emission trends by sector and by gas for Denmark.

Table 5
Greenhouse gas emissions by sector and by gas for Denmark for the period 1990–2016

	GHG emissions (kt CO_2 eq)					*Change (%)*		*Share (%)*	
Sector	*1990*	*2000*	*2010*	*2015*	*2016*	*1990–2016*	*2015–2016*	*1990*	*2016*
1. Energy	53 709.77	54 883.34	50 752.34	35 963 52	37 577.50	–30.0	4.5	76.1	72.8
A1. Energy industries	26 531.59	26 303.96	24 471.95	13 110.76	14 263.94	–46.2	8.8	37.6	27.6
A2. Manufacturing industries and construction	5 526.14	6 042.50	4 524.96	3 949.64	4 030.18	–27.1	2.0	7.8	7.8
A3. Transport	10 979.21	12 699.04	13 651.44	12 929.98	13 248.96	20.7	2.5	15.6	25.7
A4. and A5. Other	10 156.27	8 748.33	7 536.47	5 581.65	5 615.39	–44.7	0.6	14.4	10.9
B. Fugitive emissions from fuels	516.56	1 089.50	567.52	391.48	419.03	–18.9	7.0	0.7	0.8
C. CO_2 transport and storage	NO	NO	NO	NO	NO	–	–	–	–
2. IPPU	2 344.09	3 643.88	2 060.01	2 050.02	2 185.73	–6.8	6.6	3.3	4.2
3. Agriculture	12 710.75	11 299.02	10 445.38	10 428.09	10 570.07	–16.8	1.4	18.0	20.5
4. LULUCF	4 788.95	3 526.68	–799.32	4 222.81	5 414.38	13.1	28.2	–	–
5. Waste	1 833.90	1 561.39	1 234.67	1 176.42	1 286.23	–29.9	9.3	2.6	2.5
6. Other	NO	NO	NO	NO	NO		–	–	–
Indirect CO_2	1 163.11	796.51	458.95	302.29	286.94	–75.3	–5.1	–	–
Gas[a]									
CO_2	54 893.65	55 640.36	50 818.14	36 625.42	38 427.33	–30.0	4.9	77.8	74.4
CH_4	7 667.67	7 958.34	7 398.76	6 942.01	7 057.37	–8.0	1.7	10.9	13.7
N_2O	7 994.78	6 998.50	5 246.20	5 251.55	5 367.22	–32.9	2.2	11.3	10.4
HFCs	NA, NE, NO	711.71	974.71	690.80	671.53	–	–2.8	–	1.3
PFCs	NO, NA	22.57	18.66	4.94	4.00	–	–19.2	–	0.0
SF_6	42.41	56.15	35.93	103.33	92.07	117.1	–10.9	0.1	0.2
NF_3	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	–	–	–	–
Total GHG emissions without LULUCF	**70 598.51**	**71 387.63**	**64 492.40**	**49 618.05**	**51 619.52**	**–26.9**	**4.0**	**100.0**	**100.0**
Total GHG emissions with LULUCF	**75 387.46**	**74 914.31**	**63 693.07**	**53 840.86**	**57 033.90**	**–24.3**	**5.9**	**–**	**–**
Total GHG emissions without LULUCF, including indirect CO_2	**71 761.62**	**72 184.14**	**64 951.35**	**49 920.34**	**51 906.46**	**–27.7**	**4.0**	**–**	**–**

	GHG emissions (kt CO_2 eq)					*Change (%)*		*Share (%)*	
Sector	*1990*	*2000*	*2010*	*2015*	*2016*	*1990–2016*	*2015–2016*	*1990*	*2016*
Total GHG emissions with LULUCF, including indirect CO_2	**76 550.57**	**75 710.82**	**64 152.03**	**54 143.15**	**57 320.83**	**–25.1**	**3.9**	**–**	**–**

Source: GHG emission data: Denmark's 2018 annual submission, version 1.
[a] Emissions by gas without LULUCF and without indirect CO_2.

17. The decrease in total emissions was driven mainly by the declines in emissions in the energy (those emissions not related to transport), waste and agriculture sectors.

18. Total Danish GHG emissions have exhibited a downward trend since the mid-1990s. The transport sector's share of total emissions, however, grew steadily from 1990 owing to rising transport needs in the wake of economic development until the global financial crisis of 2008, when the upward trend of emissions from transport was broken. An increased focus on the energy efficiency of cars also contributed to the change in this trend.

19. Between 1990 and 2016, GHG emissions from the energy sector decreased by 30.0 per cent (16,132.26 kt CO_2 eq) owing mainly to decreased energy consumption, fuel switching from coal and oil to natural gas, and increased use of renewable sources. The trend in GHG emissions from fuel combustion showed notable increases in transport (20.7 per cent or 2,269.75 kt CO_2 eq).

20. Between 1990 and 2016, GHG emissions from the IPPU sector decreased by 6.8 per cent (158.37 kt CO_2 eq) owing mainly to structural changes in industry. Between 1990 and 2016, GHG emissions from the agriculture sector decreased by 16.8 per cent (2,140.69 kt CO_2 eq), owing mainly to increased efficiency of agricultural production and stricter environmental regulations. The LULUCF sector was a net source of 5,414.38 kt CO_2 eq in Denmark in 2016; net GHG emissions have increased by 625.43 kt CO_2 eq since 1990. The trend was mainly driven by the age distribution in forests. Between 1990 and 2016, GHG emissions from the waste sector decreased by 29.9 per cent (547.67 kt CO_2 eq), owing mainly to improved landfill management and the diversion of organic waste to incineration plants.

21. In terms of trends for individual GHGs, the overall 30.0 per cent reduction in CO_2 emissions from 1990 to 2016 closely tracks with the trajectory of the largest contributor to these emissions, the energy sector. CH_4 emissions decreased by 8.0 per cent between 1990 and 2016, while N_2O emissions decreased by 32.9 per cent in the same period. Emissions of SF_6 increased by 117.1 per cent between 1990 and 2016, largely owing to the decommissioning of double-glazed windows built in the early 1990s that used SF_6 as an insulating material.

22. The summary information provided on GHG emissions was consistent with the information reported in the 2017 annual submission.///

(b) Assessment of adherence to the reporting guidelines

23. The ERT assessed the information reported in the NC7 of Denmark and recognized that the reporting is complete, transparent and adhering to the UNFCCC reporting guidelines on NCs. No issues relating to the topics discussed in this chapter of the review report were raised during the review.

3. National system for the estimation of anthropogenic emissions by sources and removals by sinks

(a) Technical assessment of the reported information

24. Denmark provided in the NC7 a description of how its national system for the estimation of anthropogenic emissions by sources and removals by sinks of all GHGs not controlled by the Montreal Protocol is performing the general and specific functions defined in the annex to decision 19/CMP.1. The description includes most of the elements mandated

by paragraph 30 of the annex to decision 15/CMP.1. The NC7 also contains a reference to the description of the national system provided in the NIR of the 2017 annual submission. The ERT took note of the review of the changes to the national system reflected in the report on the individual review of the 2017 annual submission of Denmark.

(b) Assessment of adherence to the reporting guidelines

25. The ERT assessed the information reported in the NC7 of Denmark and identified an issue relating to transparency. The findings are described in table 6.

Table 6
Findings on the national system for the estimation of anthropogenic emissions by sources and removals by sinks from the review of the seventh national communication of Denmark

No.	*Reporting requirement, issue type and assessment*	*Description of the finding with recommendation or encouragement*
1	Reporting requirement specified in paragraph 30 Issue type: transparency	The Party reported in its NC7 that the Danish Centre for Environment and Energy is responsible for the national GHG emissions inventory and annual reporting to the UNFCCC but did not include contact information for the designated representative of the Centre or a reference to a relevant report (i.e. the 2017 or 2018 NIR) in which the information could be found. In addition, the NC7 does not include a transparent description of the process for collecting activity data for emission estimates.
	Assessment: recommendation	During the review, Denmark explained that information in section 3.3.2 of the NC7 on the most important institutions involved in the preparation of the national GHG inventory has embedded information on the process for collecting activity data. The Party also stated that there are many references in the NC7 to the 2017 NIR, in which all of the required information on the inventory is included. The ERT noted, however, that section 3.3.2 of the NC7 includes only a general description of the functions of and information produced by relevant institutions involved in the inventory, not a transparent description of a data-collection process or a reference to the 2017 NIR. The ERT recommends that Denmark improve the transparency of its reporting by including in its next NC a reference to the relevant sections of the NIR or another document in which can be found a description of the processes for collecting activity data, for selecting emission factors and the contact information of the designated representative of the entity with overall responsibility for the national GHG inventory, or a description of those elements.

Note: Paragraph number listed under reporting requirement refers to the relevant paragraph of the reporting guidelines for supplementary information. The reporting on the requirements not included in this table is considered to be complete and transparent.

4. National registry

(a) Technical assessment of the reported information

26. In the NC7 Denmark provided information on how its national registry performs the functions in accordance with the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1 and complies with the requirements of the technical standards for data exchange between registry systems. The ERT took note of the review of the changes to the national registry reflected in the report on the individual review of the 2017 annual submission of Denmark.

(b) Assessment of adherence to the reporting guidelines

27. The ERT assessed the information reported in the NC7 of Denmark and recognized that the reporting is complete and transparent. No issues relating to the topics discussed in this chapter of the review report were raised during the review.

B. Information on policies and measures and institutional arrangements

1. Domestic and regional programmes and/or legislative arrangements and procedures related to the Kyoto Protocol

(a) Technical assessment of the reported information

28. For the second commitment period of the Kyoto Protocol, from 2013 to 2020, Denmark committed to contributing to the joint EU effort to reduce GHG emissions by 20 per cent below the base-year level. Implementation of the Kyoto Protocol by Denmark is underpinned by the EU 2020 climate and energy package, which sets emission reduction targets for 2020, including targets for member States for the non-ETS sectors under the ESD. Under the EU ETS, emissions in selected industries and production processes are capped by quantity limits throughout the EU. The reduction limits in other sectors are distributed among the member States.

29. Implementation of the Kyoto Protocol by Denmark is also underpinned domestically by the Danish Energy Agreement 2012, which sets emission reduction policies to 2020, and its predecessors. The overall responsibility for climate change coordination and implementation lies with the Ministry of Energy, Utilities and Climate, and a number of national institutions are also involved in policy implementation.

30. Denmark has legislative arrangements and administrative procedures in place to make information publicly accessible, such as the websites of the Ministry of Energy, Utilities and Climate and the Danish Energy Agency, toolboxes for municipal strategic energy planning and the Climate Data Store of the EU.

31. Denmark has national legislative arrangements and administrative procedures in place that seek to ensure that the implementation of activities under Article 3, paragraph 3, forest management under Article 3, paragraph 4, and any elected activities under Article 3, paragraph 4, of the Kyoto Protocol also contributes to the conservation of biodiversity and the sustainable use of natural resources. Denmark's Forest Act is the key policy for ensuring the implementation of activities under Article 3, paragraph 4, of the Kyoto Protocol. It is implemented by the Danish Environmental Protection Agency, which is under the responsibility of the Ministry of Environment and Food.

(b) Assessment of adherence to the reporting guidelines

32. The ERT assessed the information reported in the NC7 of Denmark and recognized that the reporting is complete, transparent and adhering to the reporting guidelines for supplementary information. No issues relating to the topics discussed in this chapter of the review report were raised during the review.

2. Policies and measures, including those in accordance with Article 2 of the Kyoto Protocol

(a) Technical assessment of the reported information

33. Denmark provided information on its package of PaMs implemented, adopted and planned, by sector and by gas, in order to fulfil its commitments under the Convention and its Kyoto Protocol. Denmark reported on its policy context and legal and institutional arrangements put in place to implement its commitments and monitor and evaluate the effectiveness of its PaMs.

34. Denmark provided information on a set of PaMs similar to those previously reported. The only change related to Denmark's institutional, legal, administrative and procedural arrangements used for domestic compliance, monitoring, reporting, archiving of information and evaluation of the progress made towards its target is that, in October 2016, the Ministry of Energy, Utilities and Climate replaced the Danish Energy Agency in its role of supporting the Minister for Energy, Utilities and Climate with regard to matters relating to climate change.

35. Denmark gave priority to implementing the PaMs that make the most significant contribution to its emission reduction efforts. Denmark provided information on how it believes its PaMs are modifying longer-term trends in anthropogenic GHG emissions and removals in accordance with the objective of the Convention. The ERT noted, however, that the 'frozen policy' approach (see para. 48 below) excludes the effects of existing PaMs in future years after which current budget commitments for policies expire, but where it is highly likely that additional budget commitments will be made in the future and hence the scenario presented is likely to overestimate future emissions. The ERT also noted that Denmark's approach of grouping together large numbers of PaMs for analysis made it difficult to assess which have the most significant impact on GHG emissions and removals. Denmark reported on how it periodically updates its PaMs to reduce greater levels of emissions and on the PaMs that have been discontinued since the previous submission.

36. The implementation of many PaMs requires the involvement of local (municipal) governments. Overall responsibility for most PaMs, however, is retained by the national Government.

37. The key overarching related cross-sectoral policy in the EU is the 2020 climate and energy package, adopted in 2009, which includes the revised EU ETS and the ESD. The package is supplemented by renewable energy and energy efficiency legislation and legislative proposals on the 2020 targets for CO_2 emissions from cars and vans, the carbon capture and storage directive, and the general programmes for environmental conservation, namely the 7th Environment Action Programme and the clean air policy package.

38. In operation since 2005, the EU ETS is a cap-and-trade system that covers all significant energy-intensive installations (mainly large point emissions sources such as power plants and industrial facilities), which produce 40–45 per cent of the GHG emissions of the EU. It is expected that the EU ETS will guarantee that the 2020 target (a 21 per cent emission reduction below the 2005 level) will be achieved for sectors under the scheme. The third phase of the EU ETS started in 2013 and the system now includes aircraft operations (since 2012) as well as N_2O emissions from chemical industries, PFC emissions from aluminium production and CO_2 emissions from some industrial processes that were not covered in the previous phases of the EU ETS (since 2013).

39. The ESD became operational in 2013 and covers sectors outside the EU ETS, including transport (excluding domestic and international aviation, and international maritime transport), residential and commercial buildings, agriculture and waste, together accounting for 55–60 per cent of the GHG emissions of the EU. The aim of the ESD is to decrease GHG emissions in the EU by 10 per cent below the 2005 level by 2020 and it includes binding annual targets for each member State for 2013–2020.

40. Denmark highlighted the EU-wide mitigation actions that are under development, namely the 2030 climate and energy package. This package incorporates four separate EU targets: (1) a binding target of at least a 40 per cent reduction in GHG emissions by 2030 compared with the 1990 level; (2) a binding target to increase the share of renewable energy to at least 27 per cent of energy consumption by 2030; (3) an indicative target of a 27 per cent improvement in energy efficiency by 2030; and (4) an indicative target for supporting the completion of an internal energy market by achieving electricity interconnection of 10 per cent by 2020 and 15 per cent by 2030. This package of measures has been approved by the European Council and was awaiting final approval by the European Parliament at the time of the review.

41. The 2030 EU target for reducing GHG emissions by at least 40 per cent comprises, like the 2020 package, two components: the EU ETS and the ESD. For the EU ETS, the EU has committed to reducing GHG emissions by 43 per cent below the 2005 level. For the ESD, Denmark has committed to reducing its GHG emissions by 39 per cent below the 2005 level by 2030, which represents a significantly greater contribution to the target compared with the average across EU member States. Denmark has also committed to reaching a target of 50 per cent of renewables in its energy use by 2030. According to the information provided during the review on the Danish Energy Agreement 2018 (see para. 44), the political parties to the energy agreement have allocated funding that sets a course towards a renewable energy share of approximately 55 per cent by 2030.

42. Denmark's overarching policy for climate change is contained within the Government Platform, which was adopted in 2016. This platform encompasses a number of climate change related actions, including commitments to reduce GHG emissions, to move further towards energy generation and use being based on renewables and to implement all EU climate policies. In many cases, for example reducing GHG emissions and fossil fuel based energy use, Denmark has committed to undertaking greater action than many other EU member States.

43. While Denmark views its climate change policy and targets as being driven primarily by EU climate policies, the Climate Change Act (Act No. 716 of 25 June 2014) is important supporting domestic legislation. This Act mandates the establishment of an independent Climate Change Council to advise the Government on climate change issues, requires annual climate policy reporting to the Danish Parliament and implements a process for setting national GHG targets. It should be noted that the previous national climate change targets for 2020 have been abolished by the current Government. Denmark now aims to achieve EU targets for 2020 and 2030 and to achieve the Government's long-term target of becoming a climate neutral society by 2050.

44. The Danish energy agreements comprise another key overarching national policy framework. The current agreement describes policies, commitments and actions to be implemented in the energy sector between 2012 and 2020. During the review, Denmark provided information on the recently completed Energy Agreement 2018 for the period 2020–2030, under which climate policy related to the energy sector will further evolve. It includes, for example, targets for greater GHG emission reductions, reducing energy use, improving energy efficiency and greater use of energy from renewable sources. A key area of enhanced focus in the 2018 agreement compared with the 2012 agreement is research into the development and implementation of smart grids. The new agreement also aligns Danish domestic energy policy with EU-level energy policy. It should be noted, however, that at the time of launch of the Energy Agreement 2018, the Danish Government had made funding commitments for policies only up to 2024 but with an annual reserve of DKK 400–500 million for the period 2025–2030, allocated for additional investments in green energy sources, if continued subsidies for renewable energy remain necessary. This includes the procurement of two additional 800 MW offshore wind farms, leading to a total capacity of 2,400 MW under the agreement.

45. Denmark introduced national-level policies to achieve its targets under the ESD and domestic emission reduction targets. The quantitative impacts of key policies are reported as a series of groups rather than individually. The mitigation effect of the implementation of policies focusing on energy efficiency and the use of renewables is the most significant. Compared with a situation without implementation since 1990, these policies are expected to contribute GHG emission reductions of 16.94 and 22.81 Mt CO_2 eq/year in 2020, respectively. Key individual policies include the reduction of fertilizer use in the agriculture sector and the implementation of comprehensive tax regimes in the energy sector. Compared with a situation without implementation until 2001, these policies are expected to contribute GHG emission reductions of 1.90 and 1.20 Mt CO_2 eq/year, respectively, in 2020.

46. Denmark did not highlight any specific domestic mitigation actions that are under development. All PaMs included in the NC7 have been either adopted or implemented. It should, however, be noted that the Government Platform 2016 and Energy Agreement 2018 are significant new packages of policies that set the direction for enhanced action to reduce GHGs in Denmark in the future. During the review, the Party informed the ERT that a new national Climate and Air Proposal was due to be published. This plan will set out policies for each sector alongside the overall pathway that Denmark will follow in order to achieve its targets under the ESD to 2030. The ERT noted the importance of this forthcoming plan. Table 7 provides a summary of the reported information on the PaMs of Denmark.

Table 7
Summary of information on policies and measures reported by Denmark

Sector	*Key PaMs*	*Estimate of mitigation impact by 2020 (kt CO_2 eq)*	*Estimate of mitigation impact by 2030 (kt CO_2 eq)*
Energy	Energy taxes (except for mineral oil)	1 000.00	1 000.00
	Heat pumps as an energy service	–	–
Transport	Energy efficiency of passenger cars	550.00	550.00
	Investments in a new metro line and in bicycle transport facilities	–	–
Renewable energy	All renewable energy mitigation actions since 1990 (policy group)	22 805.00	24 060.00
Energy efficiency	All energy efficiency mitigation actions since 1990 (policy group)	16 944.00	18 793.00
IPPU	No PaMs were reported	NA	NA
Agriculture	Ammonia Action Plan	–	–
LULUCF	All LULUCF mitigation actions since 1990 (policy group)	1 740.00	1 740.00
Waste	Statutory ban on landfilling combustible waste	333.00	333.00
	Subsidy programme for biocovers for landfills	300.00	173.00

Note: The estimates of mitigation impact are estimates of emissions of CO_2 or CO_2 eq avoided in a given year as a result of the implementation of mitigation actions.

47. The description in the NC7 of the baseline against which the quantified effects of PaMs in 2020 and 2030 are measured is not transparent. The description indicates that the baseline is derived from three separate analyses, which are described separately in annexes B2, B3 and B4 to the NC7, but there is no explanation of how these analyses have been integrated. During the review, Denmark provided further information on this matter as well as confirmation that the baseline used is a WOM scenario for 1991–2035 without measures since 1990.

48. When quantifying the effects of PaMs, Denmark applies a 'frozen policy' approach. Under this approach, the effects of PaMs are applicable only in the future years for which specific budgets for their implementation have been committed. After this point, a standardized economic modelling approach is applied wherein the most cost-effective option for achieving an outcome is automatically selected. An example of this is in the energy sector: PaMs included in the Energy Agreement 2012, while relevant beyond 2020, have funding committed only to 2020. Beyond 2020, the modelling approach for energy use would select the reintroduction of fossil fuels rather than the use of renewable energy sources, which it projects to be more expensive. The ERT considers that this can lead to artificial results because it is highly likely that additional budget commitments will be made in the future and hence the scenario presented is likely to overestimate future emissions.

49. Limited information is provided in the NC7 on the costs of implementing policies. What is provided is predominantly an overview of budgets allocated to different policies or overarching strategies, for example the 2012 and 2018 Energy Agreements and the National Green Climate Fund. However, during the review, Denmark highlighted the report *Catalogue of Danish Climate Change Mitigation Measures* and more recent iterations of the analysis contained within it, which provide a significant amount of information on the costs of a wide range of policies.

50. Denmark provided in its NC7 limited information on the way in which progress made by its PaMs to mitigate GHG emissions is monitored and evaluated over time and the related institutional arrangements.

51. The Party provided limited information relating to policies and practices which encourage activities that lead to greater levels of anthropogenic GHG emissions than would otherwise occur. The transition of funding for renewables from PSO schemes to direct funding from the national budget, which will reduce energy costs and as a consequence increase power consumption and potentially increase GHG emissions in the short term, is described in the NC7. Denmark also informed the ERT that exploration for oil, gas and minerals in Greenland is expected to expand in the future, potentially leading to nearly a fourfold increase in Greenland's GHG emissions.

52. In its NC7 Denmark did not provide any information regarding the non-GHG mitigation benefits of PaMs. During the review, the Party provided the ERT with information outlining the co-benefits, particularly for air pollution, that could be expected from all policies that lead to a reduction in the combustion of fossil fuels. An analysis of co-benefits was undertaken in the *Catalogue of Danish Climate Change Mitigation Measures* report highlighted by Denmark during the review, and updates to it, but the method of analysis and the non-GHG parameters are not included in the report. The Party noted that the forthcoming national Climate and Air Proposal (see para. 46 above) is likely to include a new assessment of co-benefits and trade-offs specific to climate change and air quality policies.

(b) Policies and measures in the energy sector

53. **Energy supply**. Policies in the energy supply sector are guided largely by the energy agreements, of which the 2012 version primarily drove the policies reported in the NC7. The major overarching policies expected to be achieved by 2020 are to incorporate at least 35 per cent renewables in final energy consumption, to achieve 70 per cent of electricity generation from renewable sources and to reduce gross final energy demand by 8 per cent. The Energy Agreement 2012 includes policies that have been committed to and funded to 2020. Details of the Energy Agreement 2018, including information on the policies that have been committed to and funded to 2024, were provided by Denmark during the review.

54. To achieve the targets in energy supply, various taxes and subsidies have been implemented, including taxes on the use of fossil fuels (including coal, oil and gas) for heat generation and energy products, a long-standing tax on electricity consumption and subsidies for renewable fuels. Key measures are taxes on fossil fuels for heating, the indirect subsidy for heat generation from CHP plants and the subsidy for electricity from wind, biomass and solar power. In 2015, total subsidies provided for environmentally friendly electricity production were DKK 8.0 billion, divided between wind power (DKK 4.7 billion), small-scale CHP (DKK 2.3 billion) and biomass (DKK 1.0 billion).

55. Another key policy in energy supply is the EU ETS, which covers all large emitters of GHGs in Denmark, including coal-fired power stations. By ensuring all qualifying installations are covered by this scheme and by diligent monitoring by the Danish Energy Agency of their compliance, Denmark contributes to the EU-wide reduction in GHG emissions.

56. The ERT noted the significant progress Denmark continues to make in decarbonizing its energy supply sector. The holistic move away from dependence on fossil fuels, particularly for electricity and heat generation, that has taken place since the early 1990s is a significant achievement. However, the ERT also noted that offshore oil and gas extraction is planned to continue in the future, as well as the intention to significantly increase onshore exploration in Greenland. There is no clear policy reported in the NC7 regarding the minimization or management of GHG emissions from fossil fuel extraction.

57. **Renewable energy sources**. Renewable energy sources feature strongly in the Energy Agreement 2018 (see para. 53 above), which aims to achieve renewable electricity production in Denmark above 100 per cent of electricity consumption. Renewable energy sources are incentivized via a suite of tax-based policies, aimed largely at disincentivizing the use of fossil fuels, and subsidies.

58. The generation of electricity from wind power is a key policy in the renewable energy sector and the Danish Government continues to subsidize its large-scale roll-out, particularly offshore. The largest wind farm in Denmark, the 400 MW Kreigers Flak installation, is due to be commissioned in 2021. The subsidies are implemented through PSO schemes, whereby any additional costs for wind-powered electricity generation compared with that from fossil fuels are recovered from customers. During the review, the Party highlighted that the Government and a majority in the Parliament agreed in 2016 to move funding for wind power from PSO schemes to direct funding from the national budget, thus reducing prices to consumers (see para. 51 above).

59. Another notable policy is the Biomass Agreement, a voluntary agreement with large electricity generation plants to facilitate their use of biomass to replace the existing use of fossil fuels. The Danish Government also supports the development and demonstration of new renewable energy technologies. Part of this support is ensuring there is a domestic market within which these technologies can thrive and promoting innovative research. Recent advancements have been focused on smart grids, which ensure the variable supply from some renewable sources can be managed to provide seamless supply.

60. **Energy efficiency**. Energy efficiency policies encompass a range of mechanisms. Through building rating and appliance labelling, the Danish Government aims to raise consumers' awareness of energy consumption and enable them to make informed choices. During the review, Denmark provided details of the Energy Efficiency PSO, a requirement on energy companies to ensure their customers achieve a certain level of energy savings. The ERT noted that a substantial reduction in funding for this policy is planned in 2020, reducing the budget available from DKK 1.5 billion to DKK 500 million over a three-year cycle. The Better Houses policy supports home retrofits and aims to provide a one-stop shop for homeowners via Better Houses Consultants, who guide homeowners in prioritizing upgrades, with the goal of eventual highly efficient deep refurbishment.

61. Fiscal measures are in place that provide subsidies to homeowners wishing to implement more efficient energy systems. These measures include a programme to replace old oil-burning heaters with modern energy-efficient and low-emission systems. Another measure promotes the use of heat pumps for supplying energy to homes, particularly in rural areas, by providing innovative financial solutions to promote the use of heat pumps, such as homeowners paying for the heat produced by such systems rather than for the up-front installation costs.

62. **Residential and commercial sectors**. Many of the policies focused on the residential and commercial sectors have already been described in paragraphs 53–61 above relating to energy supply and energy efficiency. Both of these sectors have benefited from policies focused on building improvements and the installation of modern heating systems. District CHP and heating systems have promoted the use of renewable energy. In addition, the use of energy in the form of fossil fuels and electricity is subject to significantly high taxes, which helps to further suppress overall energy use in these sectors. A policy is in place requiring businesses to undertake mandatory energy audits every four years.

63. In the residential sector, the amount of energy required to heat each square metre of building space has been declining for many years, owing primarily to increases in energy efficiency. However, during the review, Denmark informed the ERT that this trend has reversed to some extent over the past three years, with heating energy use per square metre of building space now rising. The reason behind this is unknown, but the Ministry of Energy, Utilities and Climate has indicated that investigating the cause is a key research priority.

64. During the review, the Party highlighted some recent analysis that had been done by the Danish Energy Agency to investigate the impact of the increasing number of 'hyperscale' data centres in Denmark. These centres, part of the business sector, are expected to increase in number significantly to 2030 and will place additional requirements on the national electricity supply system – current estimates suggest that they could use as much as 15 per cent of supply by 2030.

65. **Transport sector**. GHG emissions in road transport rose steadily until 2007/2008 before beginning a steady decline. However, the trend has again been slightly upward in the three most recent reporting years. While the efficiency of vehicles has improved substantially

owing to the implementation of EU regulations for new vehicles and vehicle taxation dependent on fuel efficiency, the overall number of vehicles and total kilometres travelled in Denmark have risen. Vehicles are heavily taxed in Denmark, with taxes levied on new vehicle purchases, on annual use and on fuel (diesel and gasoline). Substantial reductions in these taxes are in place for plug-in hybrid and battery electric vehicles, which has resulted in some penetration of these vehicles into the fleet, although this is relatively minor. During the review, the Party reported this figure to be approximately 2,500 such vehicles per year, but subsequently explained that it reached approximately 5,000 vehicles in 2018.

66. The high level of taxation and the structure of taxation rewarding fuel efficiency contribute to reducing the number of vehicles and increasing fuel efficiency and thereby contribute to achieving emission reductions from this sector. While successful in achieving emission reductions, this current structure may present an issue that may need to be addressed to achieve future deep emission reductions in this sector. Government revenue from vehicle taxation is very substantial, with this revenue being crucial to supporting a wide range of public services. With the current structure of taxation, further substantial reductions in emissions (e.g. by introducing further tax reductions for low- or zero-emission vehicles) is expected to reduce revenue significantly. Looking beyond 2020, the road transport sector will produce an increasingly large proportion of Denmark's overall emissions and in order to meet targets that are likely to be confirmed for this period, examination and potential reform of the vehicle taxation system may be required to further reduce emissions and increase the number of low-emission vehicles.

67. Policies have been implemented for other transport sectors. These include large-scale projects to electrify parts of the national rail infrastructure and increase the speed of trains, to further develop the national network of bicycle lanes and, in Copenhagen, to expand the metro system and incorporate a further 24 stations into the network. This latter project will significantly improve public transport infrastructure in the city.

68. The NC7 includes information on how Denmark promotes and implements the decisions of ICAO and IMO to limit emissions from aviation and marine bunker fuels. The Party reported that it has cooperated with other countries in the discussions on the development of the road map and initial IMO strategy for the reduction of GHG emissions, and that it welcomes the implementation of ICAO's CORSIA.

69. **Industrial sector**. GHG emissions from combustion in large industrial installations are covered by the EU ETS. In addition, the Biomass Agreement has facilitated the increased use of a range of biofuels for combustion activities in larger heat and power generation installations. Smaller scale industrial combustion is subject to a range of taxes and subsidies focused on disincentivizing the use of fossil fuels and incentivizing the use of renewable fuels or energy sources. Support services and audits further support the reduction of emissions from industrial combustion activities. These policies are detailed under energy supply and energy efficiency in paragraphs 53–61 above. During the review, Denmark informed the ERT that emissions from industrial combustion had decreased substantially over the past five years owing to a switch from the use of oil to natural gas, renewables and electricity alongside efficiency improvements, particularly those resulting from the implementation of regular audits.

(c) Policies and measures in other sectors

70. **Industrial processes**. Emissions from the industrial processes sector as a proportion of total national GHG emissions are relatively small in Denmark, contributing only approximately 4 per cent in 2016. The only large industrial installation in this sector remaining in Denmark is a cement manufacturing plant, which contributes approximately half of the total emissions for the sector.

71. Large-scale industrial activities are subject to the requirements of the EU ETS. Denmark has also implemented the EU F-gas regulation, which regulates the import, sale and use of F-gases.

72. **Agriculture**. Emissions from agriculture account for 80 per cent of Denmark's total emissions of CH_4, and the total quantity of these emissions has decreased by only 1.1 per cent since 1990. However, this small reduction masks some very significant trends in the

dairy and pig farming sector. Production in these sectors has increased significantly since 1990, in terms of both number of animals and production per animal. During the review, the Party explained that some 20 million pigs per year pass through the Danish agriculture system and milk production per animal is among the highest values in the world. Some advanced and complex GHG emission reduction measures were implemented in the agriculture sector during the period 1990–2016. Biogas plants have been widely installed on large farms and there is a policy in place to subsidize the use of biogas in the energy sector. Focus has recently been placed on reducing the retention time prior to transfer of manure to biogas plants in order to further reduce emissions. The Environmental Approval Act for Livestock Holdings (Act No. 1572, 20 December 2006, revised in 2011) provides for strict requirements and the provision of advice on manure management when constructing new animal housing or renovating existing stock. Measures include acidification and cooling of manure and the installation of air filters.

73. Emissions of N_2O in the agriculture sector have decreased by 28.5 per cent since 1990. The activities that contribute to these emissions are primarily the application of mineral and organic fertilizers to agricultural soils and manure management. While the focus of Action Plans for the Aquatic Environment I and II, the Action Plan for Sustainable Agriculture and the Ammonia Action Plan has been on water and air pollution, they have produced significant co-benefits for N_2O emissions. Policies implemented in the agriculture sector relevant to N_2O emissions include strict controls on the amount of fertilizer applied and on the practices associated with its application, and strict requirements for manure management such as the covering of slurry storage systems. The ERT noted the extreme accuracy with which fertilizer use in Denmark is tracked and the potential use of these data for tracking the effectiveness of policies in this sector.

74. **LULUCF**. LULUCF was a net source in 2015, contributing 4,154 kt CO_2 eq in 2015. A key policy for this sector is the subsidies for landowners from the national Government for afforestation. Increasing forested area is also a key component of the Government's management of state-owned land. During the review, Denmark informed the ERT that approximately 1,900 ha of land per year is afforested. The Party also explained that municipal governments have an important role in the implementation of forestry plans. A government policy for the planting of windbreaks, which is focused on promoting biodiversity, is also in place and is a major contributor to annual afforestation.

75. The ERT noted that extensive information regarding emissions from and the current status of the LULUCF sector in Denmark was provided in the NC7 (chapter 4). The Party may wish to consider reducing the amount of such information in the next NC, instead focusing more on the PaMs implemented in this sector.

76. **Waste management**. Waste management is a small sector in Denmark in terms of GHG emissions, contributing approximately only 2 per cent to annual total emissions. A key measure since 1997 has been the ban on organic waste in landfills. Emissions of CH_4 from landfill sites are now steadily declining as a result of this policy. In addition, Waste 21, Denmark's waste management plan, set targets for 2004 of 64 per cent of all waste to be recycled, 24 per cent to be incinerated and only 12 per cent to be landfilled. These targets were already achieved in 2000. The most recent waste strategy, Denmark Without Waste, focuses on the increased use of waste as a resource and on waste prevention, aiming at an estimated reduction of 820,000 t waste being incinerated by 2022.

77. Policies have also been implemented for the management of landfill, including capturing CH_4 from both closed and open landfills and the roll-out of biocovers, which enable the biological processing of CH_4 into CO_2, at suitable landfills.

(d) Minimization of adverse impacts in accordance with Article 2 and Article 3, paragraph 14, of the Kyoto Protocol

78. In the NC7 Denmark reported information on how it strives to implement PaMs under Article 2 of the Kyoto Protocol in such a way as to minimize adverse effects, including the adverse effects of climate change and effects on international trade and social, environmental and economic impacts on other Parties, especially developing country Parties. Denmark stated in its NC7 that it does not consider that its contributions to international climate change

efforts have adverse effects on other countries; on the contrary, it considers the reduction of GHG emissions resulting from its commitments under the Kyoto Protocol will contribute to limiting climate change in all countries.

79. Regarding further information on how Denmark strives to implement its commitments under Article 3, paragraph 14, of the Kyoto Protocol in such a way as to minimize adverse social, environmental and economic impacts on developing country Parties, the Party stated in its NC7 that it will endeavour to implement PaMs under Article 3, paragraph 14, of the Kyoto Protocol in such a way that adverse effects on other countries are minimized. The Party stated in its 2017 NIR that no changes have occurred since the reporting of information on this matter in the 2011 NIR.

(e) Assessment of adherence to the reporting guidelines

80. The ERT assessed the information reported in the NC7 of Denmark and identified issues relating to completeness, transparency and adherence to the UNFCCC reporting guidelines on NCs. The findings are described in table 8.

Table 8
Findings on policies and measures, including those in accordance with Article 2 of the Kyoto Protocol, from the review of the seventh national communication of Denmark

No.	*Reporting requirement, issue type and assessment*	*Description of the finding with recommendation or encouragement*
1	Reporting requirement[a] specified in paragraph 16	The Party reported only limited information relating to policies and practices which encourage activities that lead to greater levels of anthropogenic GHG emissions than would otherwise occur in its NC7.
	Issue type: transparency Assessment: encouragement	During the review, Denmark explained that no further action has been taken to implement commitments to identify and periodically update policies and practices which encourage activities that lead to greater levels of anthropogenic GHG emissions than would otherwise occur. However, the Party provided quantitative information regarding the statement in NC7 that the change in funding for renewables from a PSO scheme to direct funding from the national budget could lead to a short-term increase in CO_2 emissions: a 1.4 Mt CO_2 eq increase in the EU ETS sectors and a decrease of 0.1 Mt CO_2 eq in the non-ETS sectors. Denmark also informed the ERT during the review that emissions in Greenland are expected to increase significantly (as much as 380 per cent) owing to the proposed expansion of oil, gas and mineral exploration.
		The ERT encourages Denmark to include in its next NC additional information on action taken to implement commitments under Article 4.2(e)(ii).
2	Reporting requirement[a] specified in paragraph 21	The Party reported only limited information on the way in which progress made by its PaMs to mitigate GHG emissions is monitored and evaluated over time and the related institutional arrangements.
	Issue type: transparency Assessment: encouragement	During the review, Denmark provided information outlining the procedural arrangements for evaluating PaMs and for making projections, which also listed the ministries and other agencies or organizations involved in the process and gave a brief overview of how they work together. Reference was made to a number of data sets and metrics that are being used to monitor and evaluate the effects of PaMs over time, for example to one that monitors the effect of energy efficiency policies on the energy required to heat each square metre of building floor space, and one that monitors reductions in the use of fertilizer on agricultural land. Reference was also made to the GHG inventory itself being the overarching mechanism through which progress can be tracked.
		The ERT encourages Denmark to include in its next NC a description of the way in which progress with PaMs to mitigate GHG emissions is monitored and evaluated over time, including the institutional arrangements to do so. The ERT noted that such a description could include for example information on the approach applied and the data sets used. The ERT noted

No.	*Reporting requirement, issue type and assessment*	*Description of the finding with recommendation or encouragement*
		that GHG inventory information does not provide a complete picture of how or indeed whether individual policies are monitored and evaluated over time, as it does not include, for example, description of a periodic process that aims to assess the progress of policies in terms of implementation and effects.
3	Reporting requirement[a] specified in paragraph 22 Issue type: transparency Assessment: recommendation	The Party reported in its NC7 on the National Green Climate Fund, which allocates DKK 375 million from 2017 to 2020 for mitigation initiatives that can contribute to the achievement of Denmark's 2030 GHG emission reduction target. However, the Fund was not included in the NC7 as a specific policy or measure and it was unclear to the ERT whether it had been incorporated into another policies or measures. During the review, Denmark explained that the National Green Climate Fund had not been included either as a stand-alone policy or measure or as part of another policy or measure. The Party indicated that the individual measures under the Fund could be included as specific PaMs in future reporting and provided a table with the individual mitigation impacts. The ERT recommends that Denmark elaborate in its next NC either on the National Green Climate Fund as a stand-alone policy or on the individual measures addressed by the Fund, as appropriate.
4	Reporting requirement[a] specified in paragraph 24 Issue type: transparency Assessment: encouragement	The Party reported only limited information on the costs of implementing policies in its NC7. The Party also did not report any information regarding the non-GHG mitigation benefits of PaMs in its NC7. During the review, Denmark highlighted the report *Catalogue of Danish Climate Change Mitigation Measures* and more recent iterations of the analysis contained within it, which provide a significant amount of information on the costs of a wide range of PaMs. Denmark also provided information during the review outlining the co-benefits, particularly for air pollution, that could be expected from all policies that lead to a reduction in the combustion of fossil fuels and informed the ERT of forthcoming Climate and Air Pollution Plan. The ERT encourages Denmark to include in its next NC the costs of PaMs as contained in the most up-to-date and/or relevant iterations of the analysis presented in the *Catalogue of Danish Climate Change Mitigation Measures*. The ERT further encourages Denmark to include in its next NC information on the non-GHG mitigation benefits of PaMs.
5	Reporting requirement[b] specified in paragraph 35 Issue type: transparency Assessment: recommendation	The Party did not report transparently in its NC7on the steps it has taken to promote and/or implement the decisions of ICAO to limit or reduce GHG emissions not controlled by the Montreal Protocol. Denmark provided a description of progress made by ICAO, but not the steps it has taken to promote or implement its decisions. During the review, Denmark clarified that under the ICAO process it has participated actively in environmental protection, for example through EU cooperation and in decision-making, such as the decision regarding CORSIA. The Party is represented in ICAO through a joint Nordic delegation in which Sweden currently has presidency and is therefore Denmark's representative on the ICAO Council. Denmark participated in the ICAO General Assembly in 2016 and voted to introduce CORSIA, which is now under implementation in the country. The ERT welcomed this information and noted the efforts made by the Party on this matter. The ERT recommends that Denmark improve the transparency of its reporting by elaborating in its next NC the description of its participation in ICAO in order to accurately reflect the steps it has taken to promote and/or implement the decisions of ICAO to limit or reduce GHG emissions not controlled by the Montreal Protocol.

No.	*Reporting requirement, issue type and assessment*	*Description of the finding with recommendation or encouragement*
6	Reporting requirement[b] specified in paragraph 36 Issue type: transparency	The Party did not report transparently on how it strives to implement PaMs under Article 2 of the Kyoto Protocol in such a way as to minimize adverse effects, including the adverse effects of climate change and effects on international trade and social, environmental and economic impacts on other Parties. The ERT noted that this information was very difficult to find via multiple references.
	Assessment: recommendation	During the review, Denmark indicated that this information is in the 2011 NIR. In chapter 15 of the 2017 NIR, which is referenced in annex F to the NC7, it is stated that there have been no changes to the information in the 2011 NIR related to this topic. The ERT recommends that Denmark clarify in its next NC the information on how it strives to implement PaMs under Article 2 of the Kyoto Protocol in such a way as to minimize adverse effects, or provide a reference to the relevant document in which this information can be found with reasonable effort.

Note: The reporting on the requirements not included in this table is considered to be complete, transparent and adhering to the UNFCCC reporting guidelines on NCs.

[a] Paragraph number listed under reporting requirement refers to the relevant paragraph of the UNFCCC reporting guidelines on NCs.

[b] Paragraph number listed under reporting requirement refers to the relevant paragraph of the reporting guidelines for supplementary information.

C. Projections and the total effect of policies and measures, including information on supplementarity relating to the mechanisms pursuant to Articles 6, 12 and 17 of the Kyoto Protocol

1. Projections overview, methodology and results

(a) Technical assessment of the reported information

81. Denmark reported updated projections for 2020 and 2030 relative to actual inventory data for 1990, 1995, 2000, 2005, 2010 and 2015 under the WEM scenario. The WEM scenario reported by Denmark includes implemented and adopted PaMs until 2017, with projected effects until 2035. The Party provided comprehensive and well-organized information on its projections from 2016 to 2035.

82. Denmark provided a definition of its scenarios, explaining that its WEM scenario includes all PaMs implemented, adopted and funded after 1990. The purpose of the WEM scenario is to assess how energy consumption and GHG emissions will evolve in the future if no new policy is introduced. This is often referred to as a 'frozen policy' or a 'business as usual' scenario. In addition to the WEM scenario, Denmark reported the WOM scenario. The WOM scenario excludes all PaMs implemented, adopted or planned after 1990. The definitions indicate that the scenarios were prepared according to the UNFCCC reporting guidelines on NCs.

83. The projections are presented on a sectoral basis, using the same sectoral categories as those used in the reporting on mitigation actions, and on a gas-by-gas basis for CO_2, CH_4, N_2O, PFCs, HFCs and SF_6, with the exception that PFCs, HFCs and SF_6 are grouped in the WOM scenario, for 1990–2035. The projections are also provided in an aggregated format for each sector as well as for a Party total using global warming potential values from the IPCC Fourth Assessment Report.

84. Denmark did not report emission projections for indirect GHGs such as carbon monoxide, nitrogen oxides, non-methane volatile organic compounds or sulfur oxides.

85. Emission projections related to fuel sold to ships and aircraft engaged in international transport were reported separately and were not included in the totals. Denmark reported on factors and activities affecting emissions for each sector.

(b) Methodology, assumptions and changes since the previous submission

86. The methodology used for the preparation of the projections is very similar to that used for the preparation of the emission projections for the NC6. Denmark reported supporting information further explaining the methodologies and the changes made since the NC6 during the review. The methodologies used for the NC6 and NC7 are the same, with updates to key parameters such as forecasted GDP, populations and fuel prices.

87. To prepare its projections, Denmark relied on the following key underlying assumptions: GDP growth, population, international fuel prices and EU ETS carbon prices. These variables and assumptions were reported in CTF table 5. Denmark's population is assumed to grow steadily from 5.7 million in 2015 to 6.1 million in 2030. GDP is assumed to increase from EUR 249 billion in 2015 to EUR 305 billion in 2030. The international fuel prices are sourced from the International Energy Agency's projected fuel prices (from the *World Energy Outlook 2016*[3] New Policies Scenario). The EU ETS carbon prices are derived from a fixed point in 2016.

88. The projections of end-user energy consumption by the business and domestic sectors are based on ADAM[4] and EMMA[5] projections. EMMA is a macroeconomic model that describes final energy consumption broken down into a number of sectors and seven types of energy. In EMMA, energy consumption in the business sector is determined by three factors: production, energy prices and taxes, and energy efficiencies and trends. The projection of production by businesses is based on the latest ADAM projection from the Ministry of Finance. The projection of fuel for electricity and heat production is derived from the Danish Energy Agency's RAMSES[6] simulation model, which uses as its basis the demand for electricity and district heating. In the projection, electricity and heat production are divided between existing and possible new production plants on the basis of technical specifications and prices of fuel and CO_2 allowances. The model also determines electricity prices on the Nordic market and the degree of electricity exchange with the other Nordic countries. Industrial and local small-scale CHP production is not projected in the RAMSES model, therefore a separate (bottom-up) projection is made for this production.

89. The projections of emissions from other sectors (primarily from the extraction of oil and gas and from oil refineries) are based on information on expansion plans and ad hoc assumptions. For these sectors, the projections include both fuel combustion emissions and fugitive emissions.

90. For the projections of space heating by households, the TIMES-DK model is used. The TIMES-DK model is included in the IntERACT hybrid energy–economy model. That is, the technical TIMES-DK model is linked with a macroeconomic model in order to model the development in demand of final energy services.

91. The projection of the use of energy by the transportation sector is based on the Danish Energy Agency's transport model with input from the Danish Transport and Construction Agency on developments in transport performance for road transport and energy consumption by railways, taking into account economic projections from the Ministry of Finance. Assumptions are made with respect to developments in energy efficiency, the share of biofuels and the penetration of electric cars. Projected energy use by rail transport, domestic sea shipping and domestic aviation is based on the average energy used in the past

[3] Summary available at https://www.iea.org/newsroom/news/2016/november/world-energy-outlook-2016.html.

[4] Annual Danish Aggregate Model.

[5] EMMA (Energy and Environmental Models for ADAM) is a macroeconomic model used in the 2017 Energy Projection. EMMA was used for projections of energy consumption and assessments of economic measures in the climate and energy area (https://ens.dk/service/fremskrivninger-analyser-modeller/modeller).

[6] RAMSES is the techno-economic model describing the production of electricity and district heating in an arbitrary number of areas, currently the Nordic countries, which is used for energy projections in Denmark (https://ens.dk/en/our-services/projections-and-models/models).

three years. Energy use by foreign aviation is projected according to the growth rate from the latest EU PRIMES model baseline.

92. The assumptions related to the expected development of livestock production and agricultural area are based on estimates provided by the University of Copenhagen, Department of Food and Resource Economics, and were derived using AGMEMOD.[7]

93. CH_4 emissions within the waste sector are calculated by means of a first-order decay model that is equivalent to using the IPCC tier 2 methodology (2018 NIR). The model calculations are performed using national waste statistics on landfill waste categories. The projections of GHG emissions are based on the official activity data projections available, for example from using the models mentioned in paragraphs 88–92 above.

94. Denmark provided information in its NC7 and CTF table 5 on assumptions and key variables used in the preparation of the projection scenarios, such as population, GDP and fuel prices. The associated methodologies and key parameters are outlined, sector by sector, in the NC7 (chapter 5), and additional information is provided in annex C2 to the NC7. Denmark also provided information on sensitivity analyses.

95. Sensitivity analyses were conducted for a number of important assumptions, such as discount rates, energy prices, energy taxes and number of cattle. Sensitivity was presented qualitatively for each sector and quantitatively for the energy and agriculture sectors. When sensitivities are taken into account, projected non-ETS emissions for 2020 could be between 0.75 Mt CO_2 eq lower and 0.75 Mt CO_2 eq higher than the WEM projection. For 2030, projected non-ETS emissions could be between 1.50 Mt CO_2 eq lower and 1.50 Mt CO_2 eq higher than the WEM projection.

(c) Results of projections

96. The projected emission levels under different scenarios and information on the Kyoto Protocol target and the quantified economy-wide emission reduction target are presented in table 9 and the figure below.

Table 9
Summary of greenhouse gas emission projections for Denmark[a]

	GHG emissions (kt CO_2 eq per year)	*Changes in relation to base-year[b] level (%)*	*Changes in relation to 1990 level (%)*
Kyoto Protocol base year[c]	69 978.07	NA	NA
Quantified emission limitation or reduction commitment under the Kyoto Protocol (2013–2020)[d]	NA	NA	NA
Quantified economy-wide emission reduction target under the Convention[e]	NA	NA	NA
Inventory data 1990[f]	70 356.40	NA	NA
Inventory data 2015[f]	48 331.15	NA	–31.3
WOM projections for 2020[g]	88 224.81	NA	25.4
WEM projections for 2020[g]	45 090.06	NA	–35.9
WOM projections for 2030[g]	97 854.55	NA	39.1
WEM projections for 2030[g]	51 269.36	NA	–27.1

[7] Agriculture Member States Modelling.

[a] Emission projections are for Denmark only. Greenland and the Faroe Islands are not part of EU territory, and therefore the EU target is not applicable to these parts of the Kingdom of Denmark.

[b] "Base year" in this column refers to the base year used for the target under the Kyoto Protocol, while for the target under the Convention it refers to the base year used for that target.

[c] The Kyoto Protocol base-year level of emissions is provided in the initial review report, contained in document FCCC/IRR/2016/DNK.

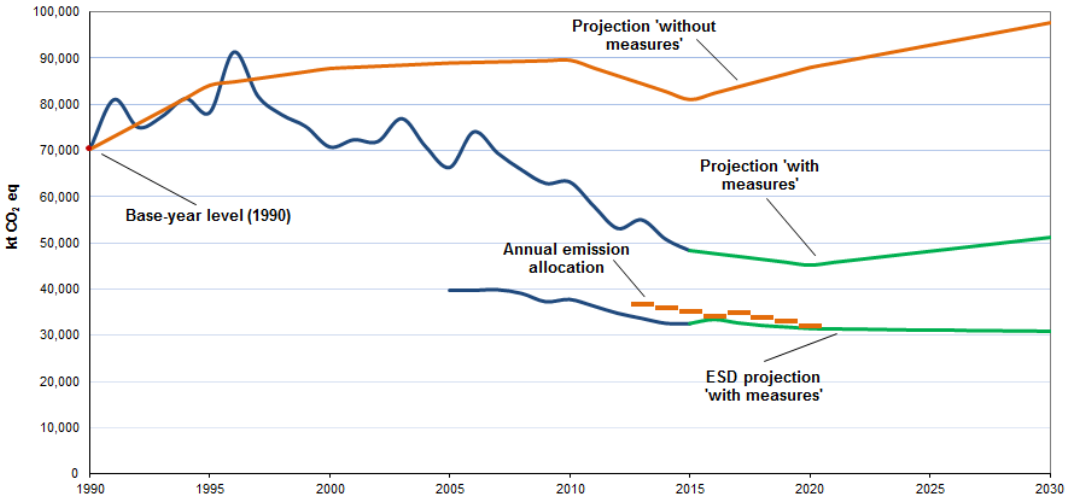
[d] The Kyoto Protocol target for the second commitment period (2013–2020) is a joint target of the EU and its 28 member States and Iceland. The target is to reduce emissions by 20 per cent compared with the base-year (1990) level by 2020. The target for non-ETS sectors is 20.0 per cent for Denmark under the ESD. The value presented in this line is based on annex II to European Commission decision 2013/162/EU and as adjusted by Commission implementing decision 2013/634/EU, which established the assigned amount for the EU member States and divided by eight (years) to calculate the annual emission level.

[e] The quantified economy-wide emission reduction target under the Convention is a joint target of the EU and its 28 member States. The target is to reduce emissions by 20 per cent compared with the base-year (1990) level by 2020.

[f] From Denmark's BR3 CTF table 6.

[g] From Denmark's NC7.

Greenhouse gas emission projections reported by Denmark[a]



Sources: (1) data for 1990–2015: Denmark's 2017 annual inventory submission, version 1; total GHG emissions excluding LULUCF; (2) data for 2016–2030: Denmark's BR3 CTF tables 6(a) and 6(b); total GHG emissions excluding LULUCF; projections were provided for EU ETS and non-ETS sectors by the Party during the review.

[a] Emission projections are for Denmark only. Greenland and the Faroe Islands are not part of EU territory, and therefore the EU target is not applicable to these parts of the Kingdom of Denmark.

97. Denmark's total GHG emissions excluding LULUCF in 2020 and 2030 are projected to be 45,090.06 and 51,269.37 kt CO_2 eq, respectively, under the WEM scenario, which represents a decrease of 35.9 and 27.1 per cent, respectively, below the 1990 level. The 2020 projections suggest that Denmark will continue contributing to the achievement of the EU target under the Convention (see para. 28 above).

98. Denmark's target for non-ETS sectors is to reduce its emissions by 20.0 per cent below the 2005 level by 2020. Denmark's AEAs, which correspond to its national emission target for non-ETS sectors, change linearly from 36,829 kt CO_2 eq in 2013 to 32,063 kt CO_2 eq for 2020. According to the projections under the WEM scenario, emissions from non-ETS sectors are estimated to reach 31,449 kt CO_2 eq by 2020. The projected level of emissions under the WEM scenario is 1.9 per cent below the AEAs for 2020. The ERT noted that this suggests that Denmark expects to meet its target under the WEM scenario.

99. In a change since its NC6, Denmark no longer has a domestic emission reduction target, so progress towards that is not reported. Denmark presented the WEM scenario by sector for 2020 and 2030, as summarized in table 10.

Table 10
Summary of greenhouse gas emission projections for Denmark[a] presented by sector

	GHG emissions and removals (kt CO_2 eq)					*Change (%)*			
		2020		*2030*		*1990–2020*		*1990–2030*	
Sector	*1990*	*WEM*	*WAM*	*WEM*	*WAM*	*WEM*	*WAM*	*WEM*	*WAM*
Energy (not including transport)	42 885.12	19 422.34	NA	25 807.26	NA	–54.7	NA	–39.8	NA
Transport	10 733.72	12 324.91	NA	12 028.68	NA	14.8	NA	12.1	NA
Industry/industrial processes	2 343.35	1 909.93	NA	1 824.22	NA	–18.5	NA	–22.2	NA
Agriculture	12 630.82	10 572.11	NA	10 701.52	NA	–16.3	NA	–15.3	NA
LULUCF	4 902.13	2 443.58	NA	2 122.58	NA	–50.2	NA	–56.7	NA
Waste	1 763.38	860.77	NA	907.69	NA	–51.2	NA	–48.5	NA
Total GHG emissions without LULUCF	**70 356.40**	**45 090.06**	**NA**	**51 269.36**	**NA**	**–35.9**	**NA**	**–27.1**	**NA**

Source: Denmark's BR3 CTF table 6.

[a] Emission projections are for Denmark only. Greenland and the Faroe Islands are not part of EU territory, and therefore the EU target is not applicable to these parts of the Kingdom of Denmark.

100. According to the projections reported for 2020 under the WEM scenario, the most significant emission reductions are expected to occur in the energy sector, followed by the LULUCF, agriculture, waste and IPPU sectors, amounting to projected reductions of 23,462.78 kt CO_2 eq (54.7 per cent), 2,458.71 kt CO_2 eq (50.2 per cent), 2,058.71 kt CO_2 eq (16.3 per cent), 902.61 kt CO_2 eq (51.2 per cent) and 433.42 kt CO_2 eq (18.5 per cent) between 1990 and 2020, respectively. The only sector in which emissions increase in this period is transport, by 1,591.19 kt CO_2 eq (14.8 per cent).

101. The pattern of projected emissions reported for 2030 under the same scenario changes due to Denmark's 'frozen policy' approach. For the 2020–2030 period, a significant increase in emissions of 32.9 per cent is projected for the energy sector and relatively small increases are projected for agriculture (1.2 per cent) and waste (5.5 per cent). For the same period, projected emissions indicate a decrease of 2.4 per cent for transport, 4.5 per cent for IPPU and 13.1 per cent for LULUCF.

102. The reduction in the use of fossil fuels means that energy-related CO_2 emissions will be reduced significantly towards 2020. The decrease is closely linked to implementation of the energy agreements of 2008 and 2012, and is also attributable to the deployment of and conversion to renewables and to decreased energy consumption as a consequence of energy efficiency improvements. In 2030, emissions under the WEM scenario are expected to increase, primarily owing to Denmark's 'frozen policy' approach, as many of the elements of the energy policy framework that currently keep emissions low do not have funding allocated out to 2030. These include support schemes for new renewable energy capacity and energy-saving efforts. The ERT noted the introduction of the new Energy Agreement 2018, which will seek to continue progress in reducing emissions between 2021 and 2030.

103. Denmark presented the WEM scenario by gas for 2020 and 2030, as summarized in table 11.

Table 11
Summary of greenhouse gas emission projections for Denmark[a] presented by gas

	GHG emissions and removals (kt CO_2 eq)					*Change (%)*			
		2020		*2030*		*1990–2020*		*1990–2030*	
Gas	*1990*	*WEM*	*WAM*	*WEM*	*WAM*	*WEM*	*WAM*	*WEM*	*WAM*
CO_2	54 807.93	32 685.73	NA	39 004.86	NA	–40.4	NA	–28.8	NA
CH_4	7 624.36	6 517.55	NA	6 651.00	NA	–14.5	NA	–12.2	NA
N_2O	7 881.70	5414.54	NA	5 472.81	NA	–31.3	NA	–30.6	NA
HFCs	NA, NO	427.98	NA	123.47	NA	–	NA	–	NA
PFCs	NO, NA	2.68	NA	1.10	NA	–	NA	–	NA
SF_6	42.41	41.58	NA	16.12	NA	–2.0	NA	–62.0	NA
NF_3	NO, NA	NA, NO	NA	NA, NO	NA	–	NA	–	NA
Total GHG emissions without LULUCF	**70 356.40**	**45 090.06**	**NA**	**51 269.36**	**NA**	**–35.9**	**NA**	**–27.1**	**NA**

Source: Denmark's BR3 CTF table 6.

[a] Emission projections are for Denmark only. Greenland and the Faroe Islands are not part of EU territory, and therefore the EU target is not applicable to these parts of the Kingdom of Denmark.

104. For 2020 the most significant reductions are projected for CO_2 and N_2O emissions: 22,122 kt CO_2 eq (40.4 per cent) and 2,467 kt CO_2 eq (31.3 per cent) between 1990 and 2020, respectively.

105. For 2030 the most significant reductions are projected for CO_2 and N_2O emissions: 15,803 kt CO_2 eq (28.8 per cent) and 2,409 kt CO_2 eq (30.6 per cent) between 1990 and 2030, respectively.

106. The projected trend between 2020 and 2030 indicates an increase in CO_2 emissions of 19.3 per cent, CH_4 emissions of 2.0 per cent and N_2O emissions of 1.1 per cent. F-gas emissions are projected to decrease by 70.1 per cent (331 kt CO_2 eq).

(d) Assessment of adherence to the reporting guidelines

107. The ERT assessed the information reported in the NC7 of Denmark and identified issues relating to completeness, transparency and adherence to the UNFCCC reporting guidelines on NCs. The findings are described in table 12.

Table 12
Findings on greenhouse gas emission projections reported in the seventh national communication of Denmark

No.	*Reporting requirement, issue type and assessment*	*Description of the finding with recommendation or encouragement*
1	Reporting requirement specified in paragraph 28 Issue type: completeness Assessment: encouragement	Denmark did not report projections for a WAM scenario. During the review, Denmark explained that its planned policies were generally implemented in a short time frame, which it believes limits the opportunity to create a WAM scenario. The ERT reiterates the encouragement made in the previous review report for Denmark to include in its next NC a WAM scenario, in accordance with the UNFCCC reporting guidelines on NCs, which will provide additional insight into potential measures that could be used to further mitigate emissions.

No.	*Reporting requirement, issue type and assessment*	*Description of the finding with recommendation or encouragement*
2	Reporting requirement specified in paragraph 35 Issue type: completeness Assessment: encouragement	Denmark did not report projections for indirect GHGs such as carbon monoxide, nitrogen oxides, non-methane volatile organic compounds and sulfur oxides. During the review, Denmark explained that data on indirect GHGs are compiled as part of its air pollutant reporting obligations and could be included in the next NC. The ERT encourages Denmark to include in its next NC emission projections for indirect GHGs.
3	Reporting requirement specified in paragraph 43 Issue type: transparency Assessment: encouragement	Denmark did not provide in the NC7 a detailed summary of the strengths and weaknesses of all of the models and approaches it used for preparing its projections, other than the information provided on ADAM/EMMA and RAMSES. During the review, Denmark provided information on the strengths and weaknesses of the TIMES-DK, the National Traffic Model and PRIMES modelling software it also used to prepare its projections. The ERT encourages Denmark to include in its next NC a complete summary of the strengths and weaknesses of the models and approaches it used for preparing its projections for each sector.
4	Reporting requirement specified in paragraph 45 Issue type: transparency Assessment: encouragement	The Party reported a comparison of emission projections in the NC7 and in previous NCs in graphical format. The ERT noted a lack of explanation as to how differences in modelling assumptions, such as energy prices, between the NC7 and prior NCs would influence the projections' results. During the review, Denmark provided information on the differences between the NC7 and NC6 in assumptions for GDP, population, international fuel prices and EU ETS carbon prices, in tabular format. The ERT encourages Denmark to report in its next NC the main differences in the assumptions and methods used to prepare projections, and their results, between the current NC and previous NCs.

Note: Paragraph number listed under reporting requirement refers to the relevant paragraph of the UNFCCC reporting guidelines on NCs. The reporting on the requirements not included in this table is considered to be complete, transparent and adhering to the UNFCCC reporting guidelines on NCs.

2. Assessment of the total effect of policies and measures

(a) Technical assessment of the reported information

108. In the NC7 Denmark presented the estimated and expected total effect of implemented and adopted PaMs and an estimate of the total effect of its PaMs, in accordance with the WEM scenario, compared with a situation without such PaMs. Information is presented in terms of GHG emissions avoided or sequestered, by gas (on a CO_2 eq basis), in 1990, 1995, 2000, 2005, 2010, 2015, 2020 and 2030.

109. Denmark reported that the total estimated effect of its adopted and implemented PaMs is 43,135 kt CO_2 eq in 2020. According to the information reported in the NC7, PaMs implemented in the energy sector will deliver the largest emission reductions, followed by PaMs implemented in the agriculture and waste sectors. Table 13 provides an overview of the total effect of PaMs as reported by Denmark.

Table 13
Projected effects of Denmark's planned, implemented and adopted policies and measures by 2020 and 2030

	2020		*2030*	
Sector	*Effect of implemented and adopted measures (kt CO_2 eq)*	*Effect of planned measures (kt CO_2 eq)*	*Effect of implemented and adopted measures (kt CO_2 eq)*	*Effect of planned measures (kt CO_2 eq)*
Energy (without transport)	39 779	NA	42 883	NA
Transport	–300	NA	200	NA
Industrial processes	800	NA	800	NA
Agriculture	1 778	NA	1 778	NA
Land-use change and forestry	–	NA	–	NA
Waste management	838	NA	717	NA
Cross-sectoral (agriculture and energy)	240	NA	207	NA
Total	**43 135**	**NA**	**46 585**	**NA**

Source: Denmark's NC7 and BR3.
Note: The total effect of implemented and adopted PaMs is defined as the difference between the WOM and the WEM scenario.

(b) Assessment of adherence to the reporting guidelines

110. The ERT assessed the information reported in the NC7 of Denmark and recognized that the reporting is complete, transparent and adhering to the UNFCCC reporting guidelines on NCs. No issues relating to the topics discussed in this chapter of the review report were raised during the review.

3. Supplementarity relating to the mechanisms pursuant to Articles 6, 12 and 17 of the Kyoto Protocol

(a) Technical assessment of the reported information

111. In the NC7 Denmark provided information on how its use of the mechanisms under Articles 6, 12 and 17 of the Kyoto Protocol is supplemental to domestic action. The ERT noted that Denmark does not plan to use the market-based mechanisms to meet its Kyoto Protocol target.

(b) Assessment of adherence to the reporting guidelines

112. The ERT assessed the information reported in the NC7 of Denmark and recognized that the reporting is complete, transparent and adhering to the reporting guidelines for supplementary information. No issues relating to the topics discussed in this chapter of the review report were raised during the review.

D. Provision of financial and technological support to developing country Parties, including information under Articles 10 and 11 of the Kyoto Protocol

1. Financial resources, including under Article 11 of the Kyoto Protocol

(a) Technical assessment of the reported information

113. Denmark reported information on the provision of financial support required under the Convention and its Kyoto Protocol, including on financial support provided, committed and pledged, allocation channels and annual contributions.

114. The Climate Envelope is the main mechanism through which Denmark provides public support to developing countries. It is programmed jointly by the Ministry of Foreign Affairs and the Ministry of Energy, Utilities and Climate. The Government of Denmark presented in 2017 its future strategy for development cooperation and humanitarian action, which will shift from the current strategy to a geographically differentiated and more coordinated approach to development assistance.

115. Denmark indicated what "new and additional" financial resources it has provided and clarified how it has determined such resources as being "new and additional". Denmark's definition for the NC7 is that newly committed (for reporting on commitments) or disbursed (for reporting of disbursement) finance for climate change adaptation or mitigation activities within the reporting period that was not reported to the UNFCCC in the previous reports is considered "new and additional".

116. Denmark described how its resources address the adaptation and mitigation needs of non-Annex I Parties and how it tracks finance for adaptation and mitigation using Rio Markers. It also described how those resources assist non-Annex I Parties to mitigate and adapt to the adverse effects of climate change, facilitate economic and social response measures, and contribute to technology development and transfer and capacity-building related to mitigation and adaptation. Denmark reported information on the assistance that it has provided to developing country Parties that are particularly vulnerable to the adverse effects of climate change to help them to meet the costs of adaptation to those adverse effects. Denmark explained that it addresses this through its focus on least developed countries, which received 60 per cent of its bilateral country-specific climate finance between 2013 and 2016. Denmark explained how these elements were incorporated into representative projects.

117. With regard to the most recent financial contributions aimed at enhancing the implementation of the Convention by developing countries, Denmark reported that its climate finance has been allocated on the basis of priority areas and programmes, such as adaptation and mitigation related actions that contribute to sustainable development, activities and programmes that address the underlying causes of vulnerability and contribute to building resilience against crises, natural disasters and the impacts of climate change, the integration of adaptation and emission reduction considerations into national planning, and policy preparation and implementation, including in support of nationally determined contributions. Some recent projects include adaptation of rural infrastructure to the impacts of climate change in Bangladesh, accelerating green transformation of the agricultural sector with a focus on small-holder farmers in Ethiopia, and construction of a grid-connected large-scale wind farm in the Plurinational State of Bolivia. Table 14 includes some of the information reported by Denmark on its provision of financial support.

Table 14
Summary of information on provision of financial support by Denmark in 2013–2016
(Millions of United States dollars)

Allocation channel of public financial support	*Year of disbursement*			
	2013	*2014*	*2015*	*2016*
Official development assistance	2 719.05	2 948.21	2 494.30	2 235.00

Allocation channel of public financial support	*Year of disbursement*			
	2013	*2014*	*2015*	*2016*
Climate-specific contributions through multilateral channels, including:	0.56	0	16.12	15.10
Global Environment Facility	0	IE	0	0
Least Developed Countries Fund	0	0	0	6.57
Green Climate Fund	0	0	14.86	7.43
Trust Fund for Supplementary Activities	0.56	0	0.15	0
Other	0	0	1.10	1.10
Financial institutions, including regional development banks	20.24	22.91	20.55	19.79
United Nations bodies	12.30	10.84	5.46	8.84
Climate-specific contributions through bilateral, regional and other channels	174.88	198.67	137.42	148.36

Sources: (1) Query Wizard for International Development Statistics, available at http://stats.oecd.org/qwids/; (2) BR3 CTF tables and BR2 CTF tables for 2013–2014.

118. Denmark reported the amount of private sector funding, by recipient country, for 2015 and 2016 mobilized by the Danish Investment Fund for Developing Countries. Denmark reported on the difficulty in collecting information and reporting on private financial flows for mitigation and adaptation activities in non-Annex I Parties, including the challenge of separating private from official finance. During the review, Denmark provided information on three PaMs that promote the scaling up of private investment in mitigation and adaptation activities in developing countries: the establishment of special funding facilities, the Danish Climate Investment Fund and the Danish Sustainable Development Fund, which aim to leverage private capital from institutional investors, the strengthening of the efforts of multilateral development banks to mobilize private investments in mitigation and adaptation in developing countries, and the support and development of enabling policies and regulations conducive to attracting and accelerating private investments in mitigation and adaptation.

(b) Assessment of adherence to the reporting guidelines

119. The ERT assessed the information reported in the NC7 of Denmark and recognized that the reporting is complete, transparent and adhering to the UNFCCC reporting guidelines on NCs. No issues relating to the topics discussed in this chapter of the review report were raised during the review.

2. Technology development and transfer, including information under Article 10 of the Kyoto Protocol

(a) Technical assessment of the reported information

120. Denmark provided information on steps, measures and activities related to technology transfer, access and deployment benefiting developing countries, including information on activities undertaken by the public and private sectors. Denmark provided 12 examples of how it is practising an integrated approach to capacity-building and technology transfer as part of its overall climate support portfolio, including support to improved modelling and energy planning and integration of renewable energy in the energy system in Indonesia and helping to improve Mexico’s frameworks for introducing renewable energy and energy efficiency interventions.

121. Denmark also supported programmes and initiatives such as the Climate Technology Centre and Network, the UNEP DTU Partnership[8] and the Energy Sector Management Assistance Program administrated by the World Bank.

122. Denmark provided information on steps taken to promote, facilitate and finance the transfer of technology to developing countries and to build their capacity in order to facilitate implementation of Article 10 of the Kyoto Protocol.

(b) Assessment of adherence to the reporting guidelines

123. The ERT assessed the information reported in the NC7 of Denmark and identified issues relating to completeness and adherence to the UNFCCC reporting guidelines on NCs. The findings are described in table 15.

Table 15
Findings on technology development and transfer, including information under Article 10 of the Kyoto Protocol, from the review of the seventh national communication of Denmark

No.	*Reporting requirement, issue type and assessment*	*Description of the finding with recommendation or encouragement*
1	Reporting requirement specified in paragraph 55 Issue type: completeness Assessment: recommendation	The Party did not report success and failure stories in relation to technology transfer in its NC7, despite the recommendation made on this matter in the previous review report. During the review, Denmark noted that technology transfer activities are reported in chapter VI of its NC7, and includes information on projects which could be deemed as success stories. It also acknowledged the lack of explicit success and failure stories related to technology transfer and indicated it would strive to provide such information, where feasible, in future submissions. The ERT reiterates the recommendation made in the previous review report that Denmark improve the completeness of its reporting by including in its next NC, where feasible, success and failure stories in relation to technology transfer, using table 6 of the UNFCCC reporting guidelines on NCs as a template with which to report this information.
2	Reporting requirement specified in paragraph 56 Issue type: completeness Assessment: recommendation	The Party reported information on steps, measures and activities related to technology transfer, access and deployment benefiting developing countries in its NC7. However, the steps taken by the Government to support the deployment and enhancement of the endogenous capacities and technologies of developing countries were not reported. During the review, Denmark explained that much of the capacity-building it supports is inherently endogenous. Examples include helping municipalities in Mozambique incorporate climate change resilience and mainstreaming of climate change concerns into all relevant aspects of municipal planning and development, and training of energy managers and piloting of the introduction of energy-saving technologies and processes in more than 50 companies in Bangladesh. The ERT recommends that Denmark improve the completeness of its reporting by including in its next NC information on the support provided for the development and enhancement of the endogenous capacities and technologies of non-Annex I Parties.

Note: Paragraph number listed under reporting requirement refers to the relevant paragraphs of the UNFCCC reporting guidelines on NCs. The reporting on the requirements not included in this table is considered to be complete, transparent and adhering to the UNFCCC reporting guidelines on NCs.

[8] The partnership, formerly known as the UNEP Risoe Centre, operates under a tripartite agreement between Denmark's Ministry of Foreign Affairs, the Technical University of Denmark (DTU) and the United Nations Environment Programme (UNEP).

E. Vulnerability assessment, climate change impacts and adaptation measures

1. Technical assessment of the reported information

124. In the NC7, Denmark provided the required information on the expected impacts of climate change in the country; the adaptation policies covering regional, sectoral and cross-sectoral vulnerabilities and considerations; and an outline of the actions taken to implement Article 4, paragraph 1(b) and (e), of the Convention regarding adaptation. Denmark provided a description of climate change vulnerability and impacts on individual sectors and industries and highlighted the adaptation response actions taken and planned at different levels of Government. Climate change impacts in Denmark were described for these sectors: construction and housing, coasts and ports, transport, water, agriculture, forestry, fisheries, energy and tourism. Adaptation measures for coastal protection and erosion control build on the work of an interministerial committee established at the beginning of 2017 to support municipalities and property owners in establishing cost-effective and holistically planned flood and erosion protection. The adaptation measures include (1) establishing a new flood and erosion task force; (2) developing a central Government risk analysis tool for coastal protection and erosion control, which will be based on information from previous events and guidance; (3) mapping all dykes with the benefit of access to up-to-date information about their height and strength; (4) identifying areas at risk of flooding and erosion and ensuring that remediation measures are put in place by municipalities; (5) processing coastal protection cases more simply and more quickly than is currently the case for municipalities and property owners, who will have greater freedom to choose various methods of coastal protection; (6) preparing guidelines for development projects in coastal areas; and (7) investigating the possibility of buyouts for homes repeatedly exposed to situations resulting in claims for compensation.

125. Impetus has been given to addressing adaptation matters with the adoption of policies to address vulnerability to climate change, including an action plan for a 'climate-proof' Denmark, launched in December 2012 following the first Danish strategy for adaptation to a changing climate launched in March 2008 and the Danish Flood Risk Act (Act No. 1505 of 27 December 2009), implementing the EU directive on the assessment and management of flood risks (directive 2007/60/EC), which provide further direction to government agencies on enhancing preparedness for climate change. The Government of Greenland is initiating the following projects aimed at mainstreaming adaptation efforts in the management and development of various sectors: (1) a first assessment of opportunities for climate change adaptation in the fisheries and hunting industry (undertaken in September 2012); (2) an integrated adaptation and mitigation assessment of the shipping sector (completed for political deliberation in 2015); and (3) the latest assessment of opportunities for climate change adaptation in the agriculture sector (completed for political deliberation in June 2017), which focused on how climate change can affect livestock, grass production and watering. The expected impacts of climate change in Denmark are based on the latest Danish and European scenario calculations focusing on climate change towards the end of this century, which in turn are based on the scenarios used by the IPCC. Changes are expected to increase towards the end of this century and to take the form of higher temperatures, more precipitation in winter, more frequent and more extreme weather events, and sea level rise. During the review, Denmark explained the various initiatives aimed at preventing and controlling flood events and announced that new data sets on climate change impacts (rain, temperature, storms, etc.) are being developed by DMI for assisting the mapping of flood-prone areas (expected in late 2019). Table 16 summarizes the information on vulnerability and adaptation to climate change presented in the NC7 of Denmark.

Table 16
Summary of information on vulnerability and adaptation to climate change reported by Denmark

Vulnerable area	*Examples/comments/adaptation measures reported*
Agriculture and food security	*Vulnerability*: Increased winter precipitation and rising water levels are expected to cause poorer agricultural exploitation. Longer periods of drought are expected to increase the need for irrigation and watering. Rising temperatures are expected to result in more plant

Vulnerable area	*Examples/comments/adaptation measures reported*
	diseases and pests, and to change conditions for exotic diseases in animals such as sheep and cattle. *Adaptation*: Artificial watering is available for farms. As for most European countries, Denmark implements comprehensive vaccination programmes against vector-borne diseases such as bluetongue that attack ruminants.
Biodiversity and natural ecosystems	*Vulnerability*: Increased precipitation is expected to increase the nutrient load in aquatic environments and the hydraulic impact of watercourses. In coastal areas, higher storm-surge water levels are expected to lead to the loss of coastal habitats. The warmer climate is expected to change the species composition and increase substance conversion because biological activity increases at higher temperatures. Changes in the Arctic cryosphere are expected to impact ecosystems because of changes in the energy balance, atmospheric and ocean circulation, freshwater distribution and storage, the sea level and the storage and release of large quantities of GHGs. These changes are in turn expected to affect the economy, infrastructure, health, and indigenous and non-indigenous livelihoods, culture and identity. In 2017, the Arctic Monitoring and Assessment Programme of the Arctic Council released a synthesis and assessment report of recent climate change and related changes in snow, water, ice and permafrost in the Arctic. The 2017 report is a follow-up to the first report, issued in 2011, and the Arctic Climate Impact Assessment of 2005. *Adaptation*: A basis for thorough multi-year analyses and targeted process studies was created by a comprehensive cross-disciplinary programme – Greenland Ecosystem Monitoring – of long-term data collection on multiple aspects of ecosystem responses to climate variability and on long-term trends.
Coastal zones	*Vulnerability*: Sea level rise and higher storm-surge water levels are expected to increase the risk of erosion and coastal recession, result in more frequent flooding of low-lying coastal areas, make activity at ports more difficult and put port infrastructure under pressure. *Adaptation*: A long tradition of legislation prevents building in river valleys, along the coast and in forests. In 2017, the Danish Government implemented several initiatives to support municipalities and property owners in establishing cost-effective and holistically planned flood and erosion protection.
Drought	*Vulnerability*: Longer periods of drought are expected in summer and these will put pressure on the water supply, especially in areas that supply water for larger cities and to irrigate fields. *Adaptation*: In drought-affected areas, it is likely that groundwater extraction will be adjusted or limited to irrigated fields and to cities in order to maintain water flow in watercourses. The NC7 does not indicate how this would be managed.
Fisheries	*Vulnerability*: Rising sea temperatures and increased precipitation are expected to impact fish stocks and composition, and production conditions. *Adaptation*: Increased winter temperatures will enable the application of alternative farming methods and farming of other species.
Forests	*Vulnerability*: Rising temperatures change the species composition of forests, and increased temperatures in summer increase the risk of forest fires. *Adaptation*: The Danish fire and rescue service is responsible for limiting and mitigating damage and injury to people, property and the environment. These responsibilities are assessed on an ongoing basis against the need for development in terms of equipment and human resources, and training. This may result in a greater number of and more comprehensive tasks for the Danish fire and rescue service, including fire guarding, fire extinction and fire damping operations as well as the provision of emergency drinking water supplies.
Human health	*Vulnerability*: Heatstroke and dehydration are expected during heatwaves. Infections and other health issues are expected to occur when temperatures increase and in connection with flooding.

Vulnerable area	*Examples/comments/adaptation measures reported*
	Adaptation: Extra attention is planned by health officials for the elderly, patients in hospitals, individuals suffering from certain diseases, infants and young children, who are all at higher risk during heatwaves.
Infrastructure and economy	*Vulnerability*: More extreme rainfall events and rising water levels are expected to lead to more flooding, thus affecting construction and housing, road and rail networks, and bridges. *Adaptation*: Implementation of the Danish Flood Risk Act identified flood risks and improved preparedness for future flood events and improved flood risk management. The preparation of risk management plans under the Act was built on a multilayer concept with emphasis on prevention, protection and preparedness; was based on hazard, vulnerability and risk maps; was coordinated with municipal climate adaptation plans; and considered flood-related climate impacts. Ten flood-prone areas were selected as a first step. Risk areas are coherent areas that contain a certain minimum real estate value potentially becoming flooded and a certain number of addresses. The thresholds were a political decision and were set at DKK 2 billion (EUR 265 million) real estate value and 500 addresses. One risk area was later appointed because of a flood-prone power plant and high-risk chemical plants.
Water resources	*Vulnerability*: More precipitation is expected to increase annual groundwater recharge. Long periods of drought are expected to bring the water supply under pressure. In coastal areas, higher sea levels are expected to add salt water to the groundwater. *Adaptation*: Groundwater extraction will be adjusted to maintain water flow in watercourses. Coastal areas are protected by initiatives implemented to support municipalities and property owners in establishing cost-effective and holistically planned flood and erosion protection.

126. Denmark provided a detailed description of international adaptation activities, including its participation in multilateral climate funds for mitigation and adaptation, which also aim to mobilize private funds for climate-relevant projects, and its bilateral cooperation on adaptation with developing countries in Africa (Ethiopia, Kenya, Mozambique and South Africa), Asia (China, India, Malaysia, Turkey and Viet Nam), Latin America (Brazil, Chile, Guatemala and Mexico) and Eastern Europe (Ukraine). Adaptation projects included those on renewable energy transition, sustainable energy transition, climate-resilient technologies, green technologies and climate-adapted technologies in the agriculture sector.

2. Assessment of adherence to the reporting guidelines

127. The ERT assessed the information reported in the NC7 of Denmark and recognized that the reporting is complete, transparent and adhering to the UNFCCC reporting guidelines on NCs. No issues relating to the topics discussed in this chapter of the review report were raised during the review.

F. Research and systematic observation

1. Technical assessment of the reported information

128. Denmark provided information on its general policy and funding relating to research and systematic observation and both domestic and international activities, including its contribution to the four core projects of the World Climate Research Programme: Climate and Cryosphere; Climate and Ocean Variability, Predictability and Change; Global Energy and Water Exchanges; and Stratosphere–Troposphere Processes and their Role in Climate. Denmark also contributes actively to IPCC activities. During the review, the Party made a presentation on climate research at DMI, including the advances being made by projects on atmosphere and ice sheet modelling, Arctic climate system modelling, global climate

modelling (the EC-EARTH–PISM[9] coupled model) and Earth system modelling in Greenland and the influence of the Greenland ice sheet.

129. Denmark has implemented international and domestic policies and programmes on climate change research, systematic observation and climate modelling that aim to advance capabilities to predict and observe the physical, chemical, biological and human components of the Earth's system over space and time. Danish climate research has more extensive international publication activity compared with that of some other countries, and it has significant impact, as measured by the number of citations. Danish ice core and palaeoclimatology research is particularly visible in the international arena. Other research aims at developing new technologies and efficient planning in areas such as crops, water systems, coastal protection, sewerage, construction, fishing, aquaculture and energy for Denmark's adaptation to climate change. In Arctic areas, shipping, tourism and mineral extraction are also relevant. Notable studies and research projects, and their responsible institutions, are (1) climate processes in the research fields of climate, meteorology, oceanography and glaciology (DMI and University of Copenhagen); (2) the effects of historical climate change on the hydrological cycle, especially in relation to groundwater conditions and groundwater's interaction with surface water (University of Southern Denmark and Geological Survey of Denmark and Greenland); (3) climate modelling and the climate of the future, including regional dynamic ocean models for calculating changes in ocean and sea ice (DMI); and (4) DMI's contribution to the Coupled Model Intercomparison Project, phase 5, under the World Climate Research Programme, and the results of the simulations using the Representative Concentration Pathway scenarios, which fed into the IPCC Fifth Assessment Report (this work continues and DMI will contribute to phase 6 of the project, which will feed into future IPCC reports).

130. In terms of activities related to systematic observation, Denmark reported on national plans, programmes and support for ground- and space-based climate observing systems, including satellite and non-satellite climate observation. Denmark also reported on collaboration related to the maintenance of a consistent and comprehensive observation system, one of which is that the Department of Bioscience and the Department of Environmental Science of Aarhus University, with its several ecosystem monitoring sites and an atmospheric monitoring site in Greenland, recently joined the Integrated Carbon Observation System. At these sites, GHG emissions and concentrations are monitored and the data are subsequently used for research and input to climate assessments (e.g. Snow, Water, Ice and Permafrost in the Arctic, IPCC). Some relevant policies contributing to global observation systems and data management efforts relate to atmospheric climate observations (including measurements of the composition of the atmosphere), stratospheric observations, oceanographic climate observations, terrestrial observations related to climate change, observations of the Greenland ice sheet, systematic observations in the Faroe Islands, and development assistance for the establishment and maintenance of observation and monitoring systems. Research and observations relating to the climate are ongoing at several institutes and organizations and cover disciplines from natural sciences to the evaluation of PaMs, including their societal aspects.

131. The NC7 reflects actions taken to support capacity-building and the establishment and maintenance of observation systems and related data and monitoring systems in developing countries. Denmark provided funding for scientists from developing countries working on global climate change research. The Party had ongoing activities through 2014 that supported and provided assistance for the establishment and maintenance of observation and monitoring systems, meteorological networks and climatic forecasting in developing countries, including in the Gambia, Ghana, the Niger and Zambia.

2. Assessment of adherence to the reporting guidelines

132. The ERT assessed the information reported in the NC7 of Denmark and identified an issue relating to completeness and adherence to the UNFCCC reporting guidelines on NCs. The findings are described in table 17.

[9] EC-EARTH–Parallel Ice Sheet Model.

Table 17
Findings on research and systematic observation from the review of the seventh national communication of Denmark

No.	*Reporting requirement, issue type and assessment*	*Description of the finding with recommendation or encouragement*
1	Reporting requirement specified in paragraph 62	The Party did not report on the identification of opportunities for and barriers to free and open international exchange of data and information and on action taken to overcome such barriers in its NC7.
	Issue type: completeness Assessment: encouragement	During the review, Denmark explained that Danish barriers to free and open international exchange of meteorological data are mostly either financial or technical, and it provided information on a recent Government action to overcome both types of barriers with respect to free and open exchange of DMI data as part of the new Danish Digital Growth Strategy. The DMI data will be released in phases over the period 2019–2023.
		The ERT encourages Denmark to include in its next NC information on the identification of opportunities for and barriers to free and open international exchange of data and information and on action taken to overcome such barriers.

Note: Paragraph number listed under reporting requirement refers to the relevant paragraph of the UNFCCC reporting guidelines on NCs. The reporting on the requirements not included in this table is considered to be complete, transparent and adhering to the UNFCCC reporting guidelines on NCs.

G. Education, training and public awareness

1. Technical assessment of the reported information

133. In the NC7 Denmark provided information on its actions relating to education, training and public awareness at the domestic and international level. The Party provided information on the general policy on education, training and public awareness; primary, secondary and higher education; public information campaigns; training programmes; education materials; resource or information centres; the involvement of the public and non-governmental organizations; and its participation in international activities. Examples of some of Denmark's educational programmes include "The Ice School", a set of educational materials on the Greenland ice sheet for 6th to 10th grade students, a two-year interdisciplinary MSc programme at the University of Copenhagen on "Climate Change Impacts, Mitigation and Adaptation", and a public awareness campaign "New Energy" on the green transition by 2050 by the Danish Energy Agency.

134. Denmark, in the context of the Aarhus Convention and national policies related to education, training and public awareness, has developed several initiatives related to climate change education at the national and international level. The Party explained that, at the time of the preparation of the NC7, it was developing a public discussion in the media and elsewhere about climate change and national policies on this subject. Information on climate change is available on the websites of relevant ministries and public organizations, including information on initiatives, programmes and projects developed by the national universities. Ministries and institutions that provide information on climate change are the Ministry of Energy, Utilities and Climate, the Danish Energy Agency, DMI, the Geological Survey of Denmark and Greenland, the Ministry of Transport, Building and Housing, the Ministry of Environment and Food, and the Ministry of Taxation.

135. The principal universities involved in climate change education in Denmark are the University of Copenhagen, Aarhus University, Aalborg University, Roskilde University and the Technical University of Denmark, the latter which is part of (1) Nordic Five Tech, an alliance that brings together the five leading technical universities in the Nordic countries and whose other members are Aalto University (Finland), Chalmers University of Technology (Sweden), KTH Royal Institute of Technology (Sweden) and Norwegian University of Science and Technology; and (2) EuroTech Universities, a partnership of five leading European universities of science and technology.

2. Assessment of adherence to the reporting guidelines

136. The ERT assessed the information reported in the NC7 of Denmark and identified an issue relating to completeness and adherence to the UNFCCC reporting guidelines on NCs. The findings are described in table 18.

Table 18
Findings on education, training and public awareness from the review of the seventh national communication of Denmark

No.	*Reporting requirement, issue type and assessment*	*Description of the finding with recommendation or encouragement*
1	Reporting requirement specified in paragraph 65 Issue type: completeness Assessment: encouragement	Denmark provided extensive information and examples of public participation in actions and policy preparations on climate change in its NC7. However, it did not report on the extent of public participation in the preparation and/or domestic review of the NC. The ERT encourages Denmark in its next NC to provide information on the extent of public participation in the preparation and/or domestic review of the national communication.

Note: Paragraph number listed under reporting requirement refers to the relevant paragraph of the UNFCCC reporting guidelines on NCs. The reporting on the requirements not included in this table is considered to be complete, transparent and adhering to the UNFCCC reporting guidelines on NCs.

III. Conclusions and recommendations

137. The ERT conducted a technical review of the information reported in the NC7 of Denmark in accordance with the UNFCCC reporting guidelines on NCs. The ERT concludes that the reported information mostly adheres to the UNFCCC reporting guidelines on NCs and that the NC7 provides an overview of the national climate policy of Denmark.

138. The information provided in the NC7 includes all of the elements of the supplementary information under Article 7 of the Kyoto Protocol. Supplementary information under Article 7, paragraph 1, of the Kyoto Protocol on the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol was provided by Denmark in its 2018 annual submission.

139. Denmark's total GHG emissions excluding LULUCF covered by its quantified economy-wide emission reduction target were estimated to be 26.9 per cent below its 1990 level, whereas total GHG emissions including LULUCF were 24.3 per cent below its 1990 level, in 2016. Emission decreases were driven by improvements in energy efficiency and the replacement of fossil fuels with renewable energy. Those factors outweighed increases in emissions from transport.

140. Denmark's main policy framework relating to energy and climate change is the Government Platform, implemented in 2016, and the Energy Agreement 2012, recently supplanted by the Energy Agreement 2018, which focuses on meeting the 2030 goals. Key legislation supporting Denmark's climate change goals includes the Danish Climate Change Act (2014). The mitigation actions with the most significant mitigation impact are those related to energy efficiency and renewable energy.

141. The GHG emission projections provided by Denmark include those under the WOM and WEM scenarios. In the two scenarios, emissions are projected to be 25.4 per cent above and 35.9 per cent below the 1990 level in 2020, respectively. According to the projections under the WEM scenario, Denmark's emissions from non-ETS sectors are estimated to reach 31,449 kt CO_2 eq by 2020. The projected level of emissions under the WEM scenario is 1.9 per cent below the AEAs for 2020. On the basis of the reported information, the ERT concludes that Denmark expects to meet its 2020 target for non-ETS sectors.

142. The projections indicate that Denmark is on track meet its Kyoto Protocol target for the second commitment period (ESD contribution equivalent to 20.0 per cent reduction compared with the 2005 level by 2020).

143. The NC7 contains information on how the Party's use of the mechanisms under Articles 6, 12 and 17 of the Kyoto Protocol is supplemental to domestic action. Denmark is not planning to make use of the Kyoto Protocol mechanisms to meet its Kyoto Protocol target.

144. Denmark continued to provide climate financing to developing countries in line with its climate finance programme, Climate Envelope, which is the main mechanism through which the Party provides public support to developing countries. This mechanism is programmed jointly by the Ministry of Foreign Affairs and the Ministry of Energy, Utilities and Climate. Denmark presented in 2017 its future strategy for development cooperation and humanitarian action. The Party has increased its contributions by 7 per cent since the NC6, and its public financial support in 2015 and 2016 totalled USD 179.55 and 192.09 million per year, respectively. For those years, Denmark's support provided for mitigation action was higher than its support provided for adaptation. The biggest share of financial support made through bilateral and regional channels went to projects in the agriculture and energy sectors. Some funds were allocated for activities that are cross-cutting across mitigation and adaptation and for other activities, as reported in CTF table 7(b). For 2016, the corresponding support was also directed mostly to the energy and agriculture sectors. Denmark provided information on steps, measures and activities related to technology transfer, access and deployment benefiting developing countries, including information on activities undertaken by the public and private sectors. The Party provided examples of how it is practising an integrated approach to capacity-building and technology transfer as part of its overall climate support portfolio.

145. Denmark's vulnerability assessment focuses on construction and housing, coasts and ports, transport, water, agriculture, forestry, fisheries, energy, tourism, nature and health. The impacts on these vulnerable areas underscore the implications of increased temperature, sea level rise, coastal erosion, floods and changes in rainfall. Denmark has focused on climate change adaptation since 2008 when it launched the first Danish strategy for adaptation to a changing climate, followed by an action plan for a 'climate-proof' Denmark, launched in 2012.

146. Denmark undertakes extensive research and systematic observation in climate change, and its publication activity has significant impact; in particular, its ice core and palaeoclimatology research is internationally recognized. Climate-related research in Denmark has grown within an already existing framework of institutional activities that are integrated into a consolidated network of research and technological institutes and universities. All of these increase knowledge related to aspects of climate change, such as climate processes, paleoclimatology, climate modelling for the future, effects of climate change, economic evaluation of climate change impacts and possibilities for mitigation. Efforts in systematic observation include monitoring stations in Denmark, Greenland and the Faroe Islands.

147. Denmark has a long tradition of involving the public in climate change issues and policies. Public awareness of climate issues is high. The Danish Government makes available a significant amount of information on climate change, and on mitigation policies and programmes, on its various websites. The University of Copenhagen, Aarhus University, Aalborg University and the Technical University of Denmark all have climate-related programmes.

148. In the course of the review, the ERT formulated the following recommendations for Denmark to improve its adherence to the UNFCCC reporting guidelines on NCs and its reporting of supplementary information under the Kyoto Protocol:[10]

(a) To improve the completeness of its reporting by:

(i) Providing, where feasible, success and failure stories in relation to technology transfer, using table 6 of the UNFCCC reporting guidelines on NCs as a template with which to report this information (see issue 1 in table 15);

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

(ii) Providing information on the support provided for the deployment and enhancement of the endogenous capacities and technologies of non-Annex I Parties (see issue 2 in table 15);

(b) To improve the transparency of its reporting by:

(i) Referencing the relevant sections of the NIR or another document in which can be found a description of the processes for collecting activity data, for selecting emission factors and the contact information of the designated representative of the entity with overall responsibility for the national GHG inventory, or providing a description of these two elements (see issue 1 in table 6);

(ii) Elaborating information on the National Green Climate Fund as a stand-alone policy or on the individual measures addressed by the Fund, as appropriate (see issue 3 in table 8);

(iii) Elaborating the description of its participation in ICAO in order to accurately reflect the steps it has taken to promote and/or implement the decisions of ICAO to limit or reduce GHG emissions not controlled by the Montreal Protocol (see issue 5 in table 8);

(iv) Clarifying the information on how it strives to implement PaMs under Article 2 of the Kyoto Protocol in such a way as to minimize adverse effects, or a reference to the relevant document in which this information can be found with reasonable effort (see issue 6 in table 8).

IV. Questions of implementation

149. During the review the ERT assessed the NC7, including the supplementary information provided under Article 7, paragraph 2, of the Kyoto Protocol, and the information on the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol, with regard to timeliness, completeness and transparency. No question of implementation was raised by the ERT during the review.

Annex

Documents and information used during the review

A. Reference documents

2018 GHG inventory submission of Denmark. Available at https://unfccc.int/process-and-meetings/transparency-and-reporting/reporting-and-review-under-the-convention/greenhouse-gas-inventories-annex-i-parties/national-inventory-submissions-2018.

2017 GHG inventory submission of Denmark. Available at https://unfccc.int/process/transparency-and-reporting/reporting-and-review-under-the-convention/greenhouse-gas-inventories-annex-i-parties/submissions/national-inventory-submissions-2017.

BR3 of Denmark. Available at https://unfccc.int/sites/default/files/resource/8057126_Denmark-NC7-BR3-2-NC7-DNK-Denmarks-NC7-and-BR3_1January2018-12MB.pdf

BR3 CTF tables of Denmark. Available at https://unfccc.int/sites/default/files/resource/35812749_Denmark-BR3-3-DNK_2018_v2.0-BR3sCTFrev1-Approved_10October2018.xlsx.

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

"Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part II: UNFCCC reporting guidelines on national communications". FCCC/CP/1999/7. Available at http://unfccc.int/resource/docs/cop5/07.pdf.

"Guidelines for the preparation of the information required under Article 7 of the Kyoto Protocol". Annex to decision 15/CMP.1. Available at http://unfccc.int/resource/docs/2005/cmp1/eng/08a02.pdf.

"Guidelines for the preparation of the information required under Article 7 of the Kyoto Protocol". Annex III to decision 3/CMP.11. Available at http://unfccc.int/resource/docs/2015/cmp11/eng/08a01.pdf.

"Guidelines for review under Article 8 of the Kyoto Protocol". Annex to decision 22/CMP.1. Available at http://unfccc.int/resource/docs/2005/cmp1/eng/08a03.pdf.

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

NC7 of Denmark. Available at https://unfccc.int/sites/default/files/resource/8057126_Denmark-NC7-BR3-2-NC7-DNK-Denmarks-NC7-and-BR3_1January2018-12MB.pdf.

Report on the individual review of the annual submission of Denmark submitted in 2016. FCCC/ARR/2017/DNK. Available at https://unfccc.int/sites/default/files/resource/dnk.pdf.

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 Denmark. FCCC/IRR/2016/DNK. Available at https://unfccc.int/resource/docs/2017/irr/dnk.pdf.

Report on the technical review of the sixth national communication of Denmark. FCCC/IDR.6/DNK. Available at https://unfccc.int/sites/default/files/resource/docs/2014/idr/dnk06.pdf.

Revisions to the guidelines for review under Article 8 of the Kyoto Protocol. Annex I to decision 4/CMP.11. Available at http://unfccc.int/resource/docs/2015/cmp11/eng/08a01.pdf.

Compilation of economy-wide emission reduction targets to be implemented by Parties included in Annex I to the Convention. Available at: https://unfccc.int/topics/mitigation/workstreams/pre-2020-ambition/compilation-of-economy-wide-emission-reduction-targets-to-be-implemented-by-parties-included-in-annex-i-to-the-convention.

B. Additional information provided by the Party

Responses to questions during the review were received from Mr. Erik Rasmussen (Ministry of Energy, Utilities, and Climate), including additional material. The following documents were provided by Denmark:

Interministerial working group, 2013, Catalogue of Danish Climate Change Mitigation Measures. Available at: https://ens.dk/sites/ens.dk/files/Analyser/dk_climate_change_mitigation_uk.pdf.

Danish Ministry of Energy, Utilities and Climate, 2018, Energy – for a Green Denmark.

Danish Energy Agency, 2018, Analysis of Hyperscale Data Centres in Denmark, English Summary Report.

Muldowney J, et al, Marginal Abatement Cost Curves for Agricultural Climate Policy: State of-the Art, Lessons Learnt and Future Potential. Journal of Cleaner Production 182 (2018) pp. 705–716.