COMPLIANCE COMMITTEE **CC/ERT/ARR/2009/24**
15 April 2009

Report of the individual review of the greenhouse gas inventories of Denmark submitted in 2007 and 2008

Note by the secretariat

The report of the individual review of the greenhouse gas inventories of Denmark submitted in 2007 and 2008 was published on 15 April 2009. For purposes of rule 10, paragraph 2, of the rules of procedure of the Compliance Committee (annex to decision 4/CMP.2, as amended by decision 4/CMP.4), the report is considered received by the secretariat on the same date. This report, FCCC/ARR/2008/DNK, contained in the annex to this note, is being forwarded to the Compliance Committee in accordance with section VI, paragraph 3, of the annex to decision 27/CMP.1.

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Report of the individual review of the greenhouse gas inventories of Denmark submitted in 2007 and 2008*

* In the symbol for this document, 2008 refers to the year in which the inventory was submitted, and not to the year of publication.

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I. Overview

A. Introduction

1. This report covers the centralized review of the 2007 and 2008 greenhouse gas (GHG) inventory submissions of Denmark, coordinated by the UNFCCC secretariat, in accordance with decision 22/CMP.1. In accordance with the conclusions of the Subsidiary Body for Implementation at its twenty-seventh session, the focus of the review is on the most recent (2008) submission.[1] The review took place from 8 to 13 September 2008 in Bonn, Germany, and was conducted by the following team of nominated experts from the UNFCCC roster of experts: generalists – Ms. Hongmin Dong (China) and Ms. Lisa Hanle (United States of America); energy – Mr. Dario Gomez (Argentina) and Mr. Pavel Fott (Czech Republic); industrial processes – Mr. Domenico Gaudioso (Italy) and Mr. Kiyoto Tanabe (Japan); agriculture – Mr. Donald Kamdonyo (Malawi) and Mr. Rob Sturgiss (Australia); land use, land-use change and forestry (LULUCF) – Mr. Harry Vreuls (Netherlands) and Mr. Xiaoquan Zhang (China); and waste – Mr. Seungdo Kim (Republic of Korea) and Mr. Takashi Morimoto (Japan). Mr. Gomez and Mr. Tanabe were the lead reviewers. The review was coordinated by Mr. Javier Hanna and Mr. Tomoyuki Aizawa (UNFCCC secretariat).

2. In accordance with the "Guidelines for review under Article 8 of the Kyoto Protocol" (decision 22/CMP.1), a draft version of this report was communicated to the Government of Denmark, which provided comments that were considered and incorporated, as appropriate, into this final version of the report.

B. Inventory submission and other sources of information

3. The 2008 inventory was submitted on 15 April 2008; it contains a complete set of common reporting format (CRF) tables for the period 1990–2006 and a national inventory report (NIR). This is in line with decision 15/CMP.1. The Party indicated that the 2008 submission is also its voluntary submission under the Kyoto Protocol.[2] In its 2007 submission, which was submitted on 15 April 2007, Denmark included a complete set of CRF tables for the period 1990–2005 and an NIR. It may be noted that the submission date was the same for the CRF tables and the NIR for both the 2007 and the 2008 submissions. Where needed the expert review team (ERT) also used the 2006 submission, additional information provided during the review and other information. The full list of materials used during the review is provided in the annex to this report.

C. Emission profiles and trends

4. In 2006 (as reported in the 2008 annual inventory submission), the main GHG in Denmark was carbon dioxide (CO_2), accounting for 81.8 per cent of total GHG emissions[3] expressed in CO_2 eq, followed by nitrous oxide (N_2O) (9.2 per cent) and methane (CH_4) (7.8 per cent). Hydrofluorocarbons (HFCs) accounted for 1.2 per cent, while perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6) collectively accounted for less than 0.1 per cent of the overall GHG emissions in the country. Total GHG emissions amounted to 71,182.48 Gg CO_2 eq and increased by 1.8 per cent between the base year[4] and 2006. Over this period, declining emissions in the agriculture, waste, and solvent and product use sectors were offset by increases in emissions from the energy and industrial processes sectors and the

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[1] FCCC/SBI/2007/34, paragraph 104.

[2] Parties may start reporting information under Article 7, paragraph 1, of the Kyoto Protocol from the year following the submission of the initial report, on a voluntary basis (decision 15/CMP.1).

[3] 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.

[4] Base year refers to the base year under the Kyoto Protocol, which is 1990 for CO_2, CH_4 and N_2O, and 1995 for HFCs, PFCs and SF_6. The base year emissions do not include any possible emissions from deforestation; however, if applicable, these are taken into account when the assigned amount is calculated.

other sector (emissions from Greenland). In 2005 (as reported in the 2007 annual submission), total GHG emissions amounted to 64,643.22 Gg CO_2 eq. The shares of gases reported demonstrated a lower contribution of CO_2 (79.0 per cent) and higher percentages of N_2O (10.9 per cent) and CH_4 (8.7 per cent) than those in 2006 (2008 annual submission).

5. The energy sector accounted for 79.9 per cent of the total GHG emissions in 2006, followed by agriculture (13.5 per cent), industrial processes (3.5 per cent), waste (1.9 per cent), other (1.0 per cent), and solvent and other product use (0.2 per cent). The other sector comprises emissions from Greenland. Comparing emissions in 2005 and 2006 by sector, the most remarkable differences were in the energy sector, which accounted for 79.9 per cent of total GHG emissions in 2006 (77.5 per cent in 2005), and the agriculture sector, which accounted for 13.5 per cent of total GHG emissions in 2006 (15.3 per cent in 2005). These differences are mainly associated with the inherent variability of the Danish electricity market as described in paragraph 30. The trends in total emissions, as well as emissions by gas and by sector, are consistent with trends seen in other countries with similar national circumstances.

6. Tables 1 and 2 show GHG emissions by gas and by sector, respectively.

D. Key categories

7. Denmark has reported a key category tier 1 analysis for the latest year, both level and trend assessment, as part of its 2008 submission. Denmark has introduced two main changes to the key category analysis, namely including the LULUCF sector for the first time and changing the level of aggregation of the analysis. The ERT welcomes these changes and finds that they are consistent with the Intergovernmental Panel on Climate Change (IPCC) *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC good practice guidance) and the *IPCC Good Practice Guidance for Land Use, Land-Use Change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF). The ERT recommends that, consistent with the IPCC good practice guidance and the "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories" (hereinafter referred to as the UNFCCC reporting guidelines), Denmark also provide a key category analysis for 1990 and the latest year in the NIR. Denmark is encouraged to carry out a tier 2 key category analysis in the next annual submission. During the review, Denmark indicated that the relatively short space of time between the draft review report becoming available and the deadline for the next annual submission made the timely implementation of this recommendation difficult or impossible.

Table 1. Greenhouse gas emissions by gas, 1990–2006

Greenhouse gas emissions	Gg CO_2 eq								Change base year–2006 (%)
	Base year[a]	1990	1995	2000	2003	2004	2005	2006	
CO_2	53 342.30	53 342.30	61 063.11	53 739.39	60 090.75	54 623.10	50 973.84	58 233.14	9.2
CH_4	5 711.65	5 711.65	5 987.59	5 902.66	5 982.90	5 789.11	5 644.42	5 530.16	–3.2
N_2O	10 569.35	10 569.35	9 414.75	8 324.29	7 612.13	7 340.17	6 785.51	6 526.98	–38.2
HFCs	217.75	0.00	217.75	606.49	700.17	754.30	810.53	840.52	286.0
PFCs	0.50	0.00	0.50	17.89	19.34	15.90	13.90	15.68	3 022.7
SF_6	107.37	44.45	107.37	59.23	31.38	33.15	21.76	36.00	–66.5

[a] Base year refers to the base year under the Kyoto Protocol, which is 1990 for CO_2, CH_4 and N_2O, and 1995 for HFCs, PFCs and SF_6. The base year emissions do not include any possible emissions from deforestation; however, if applicable, these are taken into account when the assigned amount is calculated.

Table 2. Greenhouse gas emissions by sector, 1990–2006

Sectors	Gg CO_2 eq								Change base year–2006 (%)
	Base year[a]	1990	1995	2000	2003	2004	2005	2006	
Energy	52 083.04	52 083.04	59 911.44	52 367.82	58 936.04	53 257.64	49 629.00	56 902.52	9.3
Industrial processes	2 470.92	2 189.81	2 675.37	3 367.21	3 213.12	3 060.02	2 500.20	2 497.97	1.1
Solvent and other product use	148.10	148.10	138.90	112.65	93.93	101.12	117.23	139.29	–6.0
Agriculture	13 043.72	13 043.72	11 937.79	10 607.30	9 996.56	10 027.41	9 952.28	9 605.14	–26.4
LULUCF	NA	551.16	–1 669.73	1 630.22	–2 290.70	–824.78	–633.59	–1 802.32	NA
Waste	1 548.40	1 548.40	1 563.34	1 497.97	1 527.84	1 411.65	1 354.88	1 326.29	–14.3
Other	654.67	654.67	564.24	697.01	669.17	697.90	696.37	711.27	8.6
Total (with LULUCF)	NA	70 218.92	75 121.35	70 280.18	72 145.96	67 730.96	63 616.37	69 380.16	NA
Total (without LULUCF)	69 948.87	69 667.75	76 791.08	68 649.96	74 436.66	68 555.74	64 249.96	71 182.48	1.8

Abbreviations: LULUCF = land use, land-use change and forestry, NA = not applicable.

[a] Base year refers to the base year under the Kyoto Protocol, which is 1990 for CO_2, CH_4 and N_2O, and 1995 for HFCs, PFCs and SF_6. The base year emissions do not include any possible emissions from deforestation; however, if applicable, these are taken into account when the assigned amount is calculated.

8. The key category analyses performed by the Party and those performed by the secretariat[5] produced similar results, with the primary differences reflecting the fact that Denmark conducts the analysis at a more disaggregated level and does not include emissions from Greenland. For the level assessment, Denmark includes CH_4 emissions from stationary combustion as a key category, unlike the secretariat, while the secretariat identifies the other sector as a key category, unlike Denmark. Two new categories identified as key categories from Denmark's level assessment in the 2008 annual submission are CO_2 from forest land remaining forest land and CO_2 from cropland remaining cropland. For the trend assessment, CH_4 emissions from wastewater handling is included as a key category by Denmark but not the secretariat, while only the secretariat identifies land converted to forest land as a key category. New key categories identified from the trend analysis in the 2008 annual submission are CO_2 related to forest land remaining forest land, CO_2 related to cropland remaining cropland, N_2O emissions from manure management, and CH_4 emissions from wastewater handling.

9. Denmark has not identified any key categories using a qualitative approach. The ERT encourages Denmark to do so in future, consistent with the IPCC good practice guidance.

E. Main findings

10. Denmark's 2007 and 2008 submissions are of good quality and in line with the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Revised 1996 IPCC Guidelines), the IPCC good practice guidance and the IPCC good practice guidance for LULUCF. LULUCF has been included in the key category and uncertainty analyses for the first time in the 2008 submission, which is a significant improvement. The ERT welcomes the planned methodological and data improvements in the LULUCF sector that are expected in the 2009 submission, which will further sharpen the accuracy of the inventory estimates and help to refine the uncertainty analysis.

11. Denmark currently includes the CRF summary 2 table as an annex to the NIR, along with a discussion of the methodologies followed to estimate GHG emissions from Greenland. The rest of the NIR includes emissions from Denmark only. Consistent with the conclusions and recommendations of the previous ERT, the ERT continues to recommend that Denmark fully incorporate emissions data and methods used in Greenland into the relevant sectors discussed in the NIR, as well as into the cross-cutting analyses (e.g. key category analysis, quality assurance/quality control (QA/QC), uncertainty, and recalculations). The ERT also recommends that Denmark continue to report CRF summary table 2 specifically for Greenland territory in an annex to the NIR, as this would significantly improve transparency and would be very helpful for the assessment of emissions during the commitment period because of the different targets for the European territory of Denmark and for Greenland. The ERT recognized that Denmark may face difficulties in fully implementing this recommendation.

F. Cross-cutting issues

1. Completeness

12. The inventory is complete for Denmark and Greenland in terms of years and geographical coverage. The sources that are not estimated ("NE") are minor (e.g. poultry and fur farming, fugitive emissions in Greenland). However, geographical coverage of sources and sinks from Greenland are not transparently documented, making it difficult to assess completeness. The ERT recommends that

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

Denmark review whether some additional categories in the LULUCF and industrial processes sectors should be listed as "NE". (Specific recommendations are included in the relevant sections of the report below.) The N_2O emissions from solvent and other product use were reported for the first time in the 2008 submission.

13. The ERT welcomes the inclusion of the CRF summary 2 table for Greenland in the NIR, as this enhances transparency. However, the ERT noted that Denmark has not fully incorporated emissions data and methods used in Greenland into the relevant sector discussions in the NIR. In response to a question raised by the ERT, Denmark has indicated that incorporating emissions from Greenland into the inventory is problematic owing to differences in methodology. Despite these differences, the ERT reiterates the recommendations of the previous review that the emissions data for Greenland presented in annex 6.2.1, and information on the methods used, be incorporated into the main discussion in the NIR, and that these emissions also be considered in the relevant sectors for the purposes of cross-cutting issues such as key category analysis, uncertainty analysis and recalculations.

2. Transparency

14. Overall, transparency has been improved since the 2007 submission, in response to previous ERT recommendations. For example, the Party has increased transparency in the energy sector by providing information in graphical or tabular form (for example information on emission factors (EFs), net calorific values and the national energy balance). The ERT noted that transparency in the NIR for the agriculture sector could be improved through the provision of additional information to identify and describe key model parameters and calculations.

15. The ERT welcomes the inclusion in the 2008 submission of data from the European Union emissions trading scheme (EU ETS), particularly for coal- and residual oil-fired power plants, cement production, and sugar refining. The ERT also welcomes Denmark's intention to incorporate additional plant-specific data as they become available. The use of higher-tier methods and plant-specific data is consistent with the IPCC good practice guidance. The ERT encourages Denmark to transparently document in the NIR how it incorporates the EU ETS data in a way that demonstrates completeness, accuracy and time-series consistency for each source category.

3. Recalculations and time-series consistency

16. The ERT noted that recalculations reported by Denmark of the time series 1990–2005, which excludes Greenland and the Faroe Islands, have been undertaken to ensure accuracy of data and time-series consistency. Most recalculations were carried out to incorporate revised activity data (AD) or to address previous data handling errors in the energy, agriculture, waste and LULUCF sectors. In the industrial processes sector, minor recalculations have been carried out, primarily to take into account the separate reporting of yellow bricks and expanded clay products in the 2008 submission, based on available data. The justification for recalculations is generally well described in the NIR; however, CRF table 8 (b) has not been completed. The ERT recommends that Denmark document the reasons for all recalculations in CRF table 8 (b) and that the Party include this information in its next annual submission. During the review, Denmark informed the ERT that efforts would be made to carry out recalculations for Greenland to increase the transparency of reporting at summary 2 level.

17. Trends are generally well described in the NIR, the one exception being the decline in the implied emission factor (IEF) for cement production between 2005 and 2006. Denmark reports in the 2008 submission that it is aware of the inconsistency of estimates of forest area in 1990 and 2000 and reports that it expects to address this in its future inventory submissions by drawing on data from the new National Forest Inventory and a new land-use matrix.

4. Uncertainties

18. Denmark has conducted a tier 1 level and trend quantitative uncertainty analysis and transparently discusses in the QA/QC plan (see para. 20 below) how the uncertainty analysis is integrated into the planning of quality management. For the first time, Denmark has included preliminary uncertainty estimates for LULUCF in the 2008 submission. The Party notes that the assessment of uncertainty will improve significantly in future submissions once the new National Forest Inventory has provided the first national estimates of stocks of wood and the amount of harvested wood.

19. Denmark presents some changes in uncertainty default factors in the 2008 submission. AD uncertainty values for sources of emissions in the transport sector have declined, except the values for navigation (large vessels), which have increased. The discussion of changes in AD for the sources in the energy sector supports the change in uncertainty values. There are also changes in the uncertainty values of the EFs and AD for agricultural soils in the 2008 submission. Assumptions underlying the uncertainty estimates are generally well documented in the energy and waste sectors, and the ERT encourages Denmark to continue its efforts to document the uncertainty analysis fully in all sectors. The ERT supports the Party's intention to improve the underlying uncertainty analysis by developing country-specific uncertainty values.

5. Verification and quality assurance/quality control approaches

20. Denmark has developed a QA/QC plan and provides a comprehensive description of it in the 2008 submission, as well as a discussion of the implementation of the overall plan, the QA/QC applied to individual categories and the identification of where additional improvements need to be made. Denmark transparently incorporates uncertainty into its QA/QC plan. Given the high level of detail, the ERT recommends that Denmark consider summarizing the plan in the NIR and moving the finer details to an annex to the NIR. The ERT also recommends that Denmark update the QA/QC plan, following any change in procedures.

21. During the review, the ERT requested information on the types of QA/QC procedure applied to data from Greenland. Denmark initially responded by stating that the Danish Inventory Agency has no responsibility for the quality of the Greenland inventories and that the QA/QC procedures for the Danish emissions data are not applied to the emissions from Greenland, which represents a significant gap in the application of QA/QC procedures with regard to data reported from Denmark. Based on further clarification, Denmark provided a comprehensive plan for applying QA/QC procedures to emissions from Greenland, as described in paragraphs 90–93 below. The ERT welcomes this plan and encourages Denmark to implement it and report all relevant information in the next annual submission.

22. The ERT questioned whether additional information could be provided in the QA/QC plan and the NIR on the role and involvement of external data providers in the inventory preparation process. Denmark indicated that the documentation of the QC activities of external providers for some categories has already been initiated and that the Party intends to incorporate this information into the QA/QC plan in future inventory submissions. For the data already reported to the EU ETS by plants and for the data included by Denmark in its annual submission under the energy and industrial processes sectors, QA/QC is conducted at the plants in accordance with guidelines developed jointly by the European Union (EU) and the Danish Energy Authority. The plants compile the data and prepare a report, which is verified by an accredited verifier. The ERT recommends that Denmark include QA/QC procedures for external data suppliers in the QA/QC plan.

6. Follow-up to previous reviews

23. Denmark has made a number of improvements in response to previous reviews, particularly in relation to the transparency of the NIR and consistency in CRF nomenclature. For example, the discussion of GHG emission trends now deals with each CRF subsector separately, and discussion

throughout the NIR now emphasizes CRF nomenclature over the selected nomenclature for sources of air pollution (SNAP) of the core inventory of air emissions (CORINAIR). Furthermore, Denmark incorporates data from the EU ETS into the inventory emissions estimates. Finally, in agriculture, Denmark presents AD in tabular format which increases transparency.

24. However, the ERT noted that several recommendations from previous reviews have not yet been implemented. As well as the recommendation to improve the reporting of emissions estimates from Greenland (see para. 12 above), these recommendations include:

(a) Improving the reporting of emissions estimates from Greenland by including them under the relevant sectors as opposed to reporting as a separate annex;

(b) Reporting emissions from Greenland under the relevant sectors instead of reporting these emissions under the category other;

(c) Improving the discussion of non-energy use of fuels in the energy chapter of the NIR;

(d) Improving background documentation, particularly by providing the average composition profile of town gas in the energy sector.

G. Areas for further improvement

1. Identified by the Party

25. The 2008 NIR identifies several areas for improvement. Generally, Denmark is striving to continue improving the documentation of EFs and the implementation of QA/QC, and developing category-specific QA/QC plans (e.g. for stationary combustion and agriculture). In future annual submissions, Denmark plans to introduce more country-specific uncertainty estimates, where possible, and the Party plans to further incorporate data from the EU ETS. The Party intends to make major category-specific improvements in the agriculture sector (where data currently contained in spreadsheets will be incorporated into a database to support data management) and in the LULUCF sector (where data from the new National Forestry Inventory will be incorporated).

2. Identified by the expert review team

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

(a) The strengthening of the national system to ensure adherence to decision 15/CMP.1 with respect to having a single national entity responsible for the national inventory of the Party (in this case Denmark, including Greenland);

(b) The incorporation of emissions from Greenland into the respective category discussions in the NIR and under the respective cross-cutting issues and procedures (e.g. key category analysis, uncertainty, QA/QC and recalculations);

(c) The incorporation of emissions data from the EU ETS in a manner that ensures that the data conform with the Revised 1996 IPCC Guidelines and the IPCC good practice guidance, and that ensures completeness, accuracy and time-series consistency for each category;

(d) The provision of tier 2 uncertainty estimates in order to identify where improvements to the inventory should be focused;

(e) The undertaking of a tier 2 key category analysis.

27. Recommended improvements relating to specific source or sink categories are presented in the relevant sector chapters of this report.

II. Energy

A. Sector overview

28. The energy sector is the main sector in the GHG inventory of Denmark. In 2006, it accounted for 56,902.52 Gg CO_2 eq, or 79.9 per cent of total GHG emissions. (It should be noted that this excludes emissions from Greenland in fuel combustion categories, which are reported under the other sector instead of the energy sector). Within the sector, 52.5 per cent of the emissions were from energy industries, followed by 23.9 per cent from transport, 12.5 per cent from other sectors, and 10.0 per cent from manufacturing industries and construction. Oil and natural gas accounted for 0.9 per cent, and the category other accounted for 0.2 per cent.

29. In 2005 (as reported in the 2007 annual submission), emissions from the energy sector accounted for 50,075.35 Gg CO_2 eq, or 77.5 per cent of total GHG emissions. Emissions from the sector decreased by 3.9 per cent between 1990 and 2005. The biggest fall in emissions occurred in the energy industries subcategory. Within the sector, 45.1 per cent of the emissions in 2005 were from energy industries, followed by 27.1 per cent from transport, 14.9 per cent from other sectors, and 11.3 per cent from manufacturing industries and construction. Oil and natural gas accounted for 1.1 per cent, and the category other accounted for 0.5 per cent.

30. The difference in the emission levels between 2005 and 2006 is largely attributable to an increase in CO_2 emissions from energy industries. This variability is part of the inherent fluctuations in GHG emissions from the Danish energy sector, which are mainly a consequence of electricity trade (import versus export) and of variations between years in outdoor temperature. Emission trends are discussed in the NIR, which reports a net electricity export of 24,971 TJ in 2006, as a result of Denmark's neighbouring countries generating insufficient hydropower, and a net electricity import in 2005.

31. The NIR and the CRF contain emissions estimates for all direct GHGs, indirect GHGs and sulphur oxides (SO_X) from practically all subcategories of the energy sector in Denmark, while emissions from Greenland are reported in aggregate under the other sector. However, annex 6.2.1 of the NIR reports that in 2006, the energy sector in Greenland accounted for 685.22 Gg CO_2 eq, or 96.3 per cent of the overall GHG emissions in Greenland. The ERT reiterates previous recommendations that Denmark include these disaggregated emissions from the energy sector of Greenland in the corresponding energy categories of the CRF tables.

32. Overall, the inventory is transparent. However, the ERT recommends that Denmark list the 11 annexes of the NIR in the table of contents at the beginning of the NIR. In the energy sector chapter, the ERT recommends that the table of contents in annex 3A include the list of appendices, since these contain relevant information for the sector.

33. Recalculations of emissions from the energy sector in 2005 resulted in an overall decrease in reported emissions estimates of 446.35 Gg CO_2 eq, or 0.9 per cent (from 50,075.35 Gg CO_2 eq in the 2007 submission to 49,629.00 Gg CO_2 eq in the 2008 submission). The largest changes were made in the categories of transport (–332.72 Gg CO_2 eq or –2.5 per cent) and stationary combustion – other sector (–134.45 Gg CO_2 eq or –1.8 per cent). As a consequence, the emission trend for 1990–2005 was amended from –3.9 to –4.7 per cent. The recalculations reflect updated fuel consumption data, for both stationary and mobile combustion. In addition, CH_4 and N_2O EFs were updated for road transport to reflect new data provided by the COPERT IV model.

34. A specific QA/QC plan has been implemented for the energy sector and is well explained in the NIR. The ERT noted that QC checks of the plant-specific EFs have not been undertaken. Although the NIR indicates that most factors are provided by companies that have carried out some QA/QC work, the ERT recommends that the Danish inventory team perform its own QA/QC work on this information.

35. In general terms, the methodology and EFs used in the 2007 and 2008 submissions are the same. Changes in certain EFs are estimated annually, which include the following categories: stationary combustion (CO_2 EFs for natural gas and municipal waste, and CH_4 EFs for both natural gas- and biogas-fuelled engines), mobile combustion (updated CH_4 and N_2O EFs from road transport provided by the developers of the COPERT IV model) and fugitive emissions (CO_2 EFs from natural gas flaring, and CH_4 EFs from natural gas transmission and from oil storage). Denmark has acted upon recommendations from the previous review to improve its energy sector reporting, notably by: providing more disaggregated information on GHG emission trends at the subcategory level; including plant-specific CO_2 EFs available under the EU ETS; and providing a short description of Danish energy statistics and the process used to allocate the data for the different CORINAIR SNAP categories.

B. Reference and sectoral approaches

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

36. CO_2 emissions from fuel combustion were calculated using the reference approach and the sectoral approach. For the year 2006, the CO_2 emissions estimates made using the sectoral approach are 0.3 per cent higher than the estimates made using the reference approach. An explanation for this is provided in the documentation box of table 1.A(c) of the CRF. In addition, the NIR provides explanations for the fluctuations in the results of the differences between the two approaches over the years.

2. International bunker fuels

37. For aviation, there are some discrepancies between the AD used to estimate emissions in the national inventory and those reported in the International Energy Agency (IEA) data. Denmark explained to the ERT that Danish reports to the IEA treat the fuel use associated with flights from Denmark to Greenland and the Faroe Islands as international fuel use, whereas in the GHG inventory this fuel use is considered national. The ERT agrees with Denmark's allocation of fuel use to the domestic and international categories of both aviation and navigation according to the IPCC good practice guidance.

3. Feedstocks and non-energy use of fuels

38. Emissions from the non-energy use of bitumen, lubricants and white spirit are estimated in the reference approach but have not yet been estimated in the sectoral approach. The NIR reports that the total consumption of fuel for non-energy purposes equated to 12.3 PJ in 2006, corresponding to about 1.5 per cent of the total fuel consumption in Denmark. To improve accuracy and completeness, the ERT recommends that Denmark estimate and report these emissions in future annual submissions, at least until 2010 and beyond. During the initial review, Denmark informed the ERT that industrial processes that use fuels as feedstock do not occur in the country. The ERT reiterates previous recommendations that Denmark improve the discussion of this aspect in the energy chapter of the next NIR.

C. Key categories

1. Public electricity and heat production: solid fuels – CO_2

39. Plant-specific data reported under the EU ETS have been used for the first time in the 2008 submission to estimate CO_2 emissions from a number of facilities, mainly coal-fired power plants. The ERT welcomes the incorporation of this type of data into the national GHG inventory following previous recommendations. However, the ERT noted that when the plant-specific EFs were used to estimate CO_2 emissions, the corresponding IEF dropped from constantly equal to 95 kg/GJ in the period 1990–2005 to 92.6 kg/TJ in 2006. This is a consequence of a constant EF value of 95.0 kg CO_2/GJ having been used between 1990 and 2005 and plant-specific data with IEFs in the range of 90.01–95.31 kg/GJ being used for 2006. To improve accuracy and transparency and to ensure

conformity with the Revised 1996 IPCC Guidelines and the IPCC good practice guidance, the ERT recommends that Denmark:

(a) Provide sufficient background information on plant-specific data such as the methods used by the plants to estimate the carbon content, oxidation factor and calorific value of the fuel, the origin of the coal used and the corresponding physical properties, and if possible cross-checks of the information reported by the plant with that obtained from the fuel supplier;

(b) Assess time-series consistency and explain the reason for the recent variability of CO_2 EFs;

(c) Verify the information provided by the plants as more data become available.

2. Stationary combustion: gaseous fuels – CO_2

40. Emissions from the use of town gas are estimated using the EF for natural gas. During the initial review, Denmark informed the ERT that it intends to improve the documentation in the NIR that supports this assumption that the properties of town gas and natural gas are almost the same, including fuel characteristics, and EFs for CO_2 and CH_4. However, in the 2008 submission it only states that this assumption has been verified on the basis of information provided by one of the major suppliers of town gas. The ERT reiterates previous recommendations that Denmark improve the background documentation, particularly by providing the average composition profile of town gas.

3. Road transport: liquid fuels – CO_2

41. Since 2006, bioethanol has been used in gasoline blends for road transport. Denmark has taken this development into account in terms of the carbon (neutral) and energy content of the bioethanol. As a consequence, the relative contribution of bioethanol in the gasoline blend has been reflected in the CO_2 EF for 2006. The ERT commends Denmark for this work.

D. Non-key categories

Road transport: liquid fuels – CH_4 and N_2O

42. The change of non-CO_2 EFs associated with the use of bioethanol in gasoline blends has not been taken into account when estimating the corresponding emissions. The ERT suggests that Denmark assess probable changes to these EFs in its next annual submission.

III. Industrial processes and solvent and other product use

A. Sector overview

43. In 2006, the industrial processes sector accounted for 2,497.97 Gg CO_2 eq, or 3.5 per cent of total GHG emissions, and the solvent and other product use sector accounted for 139.29 Gg CO_2 eq, or 0.2 per cent of total GHG emissions. (It should be noted that this excludes emissions of HFCs and SF_6 from Greenland, which are reported under the other sector instead of the industrial processes sector.) Emissions from the industrial processes sector increased by 1.1 per cent between the base year and 2006, while emissions from solvent and other product use decreased by 6.0 per cent. The increase in overall emissions from industrial processes was mainly caused by an increase in HFC emissions from consumption of halocarbons and SF_6 (in refrigeration and air conditioning equipment) and an increase in CO_2 emissions from cement production; N_2O emissions from nitric acid production decreased the base year and 2006.

44. Within the industrial processes, and solvent and other product use sectors, 52.9 per cent of GHG emissions were from cement production (CO_2), followed by 33.6 per cent from consumption of

halocarbons and SF_6 (HFCs, PFCs and SF_6 – mainly HFCs from refrigeration and air conditioning equipment and foam blowing). Limestone and dolomite use (CO_2) accounted for 2.8 per cent, and lime production (CO_2) accounted for 2.6 per cent. The remaining 8.0 per cent was from other subcategories in the mineral products (CO_2), and the solvent and other product use sector (CO_2 and N_2O).

45. Reporting of emissions under these sectors is considered almost complete, although CO_2 emissions from food and drink is reported as "NE" and the ERT has detected some other potential "NE" categories such as iron and steel production (CO_2 emissions from iron foundries) and some subcategories in the solvent and other product use sector (N_2O). Many categories relevant to fluorinated gas (F-gas) emissions are reported as either not applicable ("NA") or not occurring ("NO").

46. Almost all the methods, AD and EFs used in the 2008 inventory submission are identical to, or consistent with, those used in the 2007 inventory submission. However, a new method has been used in the 2008 submission to estimate CO_2 emissions from cement production for the year 2006 as explained in paragraph 47 below. Denmark has included estimates of HFC and PFC emissions from the production of fibre optics (consumption of halocarbons and SF_6), and N_2O emissions from the use of N_2O for anaesthesia for the first time in the 2008 inventory submission. The ERT commends Denmark for these efforts.

B. Key categories

1. Cement production – CO_2

47. The ERT noted that the methods used by Denmark to estimate CO_2 emissions from cement production for 1990–1998, 1999–2005 and 2006 are not identical. The IEF for 2006 is notably lower than IEFs used for the previous years; in fact, it is the lowest of all reporting Parties. During the review, Denmark explained that CO_2 emissions from cement production in 2006 were calculated and reported by the relevant company according to the guidelines set up by the EU regarding EU ETS, and the calculations were verified by an accredited body. However, the ERT noted that this explanation and the information given in the NIR are not sufficient to explain the lack of time-series consistency of these IEFs. In investigating this matter, Denmark found that the CO_2 emissions reported in the NIR and CRF for the years 1998–2005 were incorrect. This apparent inconsistency in the time series may be identified as a problem during the first commitment period. The ERT therefore strongly recommends that Denmark report correct emissions estimates, make efforts to analyse the causes of the decrease in the IEF in recent years and provide an explanation in the NIR in its next annual submission. During the review, Denmark informed the ERT that the next submission would include revised CO_2 emissions estimates for cement production for the period 1998–2005 (i.e. inclusion of actual CO_2 emissions calculated by the relevant cement production company), information on clinker production for the period 1998–2007, and a calculated EF expressed as kg CO_2/kg clinker.

2. Nitric acid production – N_2O

48. Emissions from nitric acid production in 2005 and 2006 are reported as "NO" in the CRF. Denmark explained in the NIR that this is because nitric acid production ceased in mid-2004.

3. Consumption of halocarbons and SF_6 – HFCs

49. The emission of HFCs increased rapidly in the early 1990s and has increased less sharply in recent years. Denmark explained to the ERT that the initial rapid increase was associated with the phasing out of ozone-depleting substances in the period 1992–1994 and beyond. Denmark explained in the NIR that the slowing of the rate of emissions in recent years seems to be due to regulations restricting the use of F-gases that have been in place since 1 March 2001 in the form of taxation and a ban on the use of these gases in new installations. The ERT encourages Denmark to further analyse the cause of the

overall trend and inter-annual changes in emissions from each subcategory in this category, and to provide further explanation of this in the NIR in its next annual submission.

50. According to the NIR, a comparison of potential and actual emissions was only carried out in 1995–1997 and, for all three years, the potential emissions are approximately higher than actual emissions by a factor of 3. However, there is no further explanation in the NIR of the difference between potential and actual emissions. The ERT encourages Denmark to compare potential and actual emissions for the whole time series and to analyse the reason for any differences, with a view to improving its determination of EFs over time.

C. Non-key categories

1. Iron and steel production – CO_2

51. CO_2 emissions from iron and steel production in 2002, 2003, 2004 and 2006 are reported as "NA, NO" in the CRF. Denmark explained in the NIR that this is due to the ceasing of electro-steelwork operations. However, the ERT found that "NE" should be also used for this category, because Denmark stated in the NIR that the CO_2 emissions from iron foundries have not yet been included and that it hopes to investigate and include them in the future. The ERT welcomes Denmark's plan to include this source, and recommends that Denmark make efforts to carry out this plan, or otherwise report this category as "NE" in the next annual submission. During the review, Denmark informed the ERT that the use of notation keys would be corrected in the next submission and work on establishing the EF for CO_2 from iron foundries is currently being undertaken, the results of which are planned to be included in the 2010 submission.

2. Solvent and other product use (other) – N_2O

52. For N_2O from fire extinguishers, aerosol cans and other uses, emissions are reported as "NA" in the CRF. However, AD for these subcategories are reported as "NE", which implies that emissions should also have been reported as "NE". The ERT encourages Denmark to collect data on AD (e.g. sales data) for these subcategories and to estimate and report N_2O emissions. Otherwise, "NA" should be corrected to "NE" and a clear explanation should be provided in the NIR in the next annual submission as to why these emissions have not been estimated. During the review, Denmark informed the ERT that the use of notation keys would be corrected in the next submission, and that AD and emissions for these subcategories would be investigated for future reporting.

IV. Agriculture

A. Sector overview

53. In 2006, the agriculture sector accounted for 9,605.14 Gg CO_2 eq, or 13.5 per cent of total GHG emissions. (It should be noted that this excludes emissions from enteric fermentation and manure management from sheep in Greenland, which are reported under the other sector instead of the agriculture sector.) Emissions from the sector decreased by 26.4 per cent between 1990 and 2006. The key drivers for the fall in emissions are a decline in dairy and other cattle herds and in the use of synthetic fertilizer; changes in the diet of dairy cattle; and a decline in the rate of nitrogen (N) leaching and run-off.

54. Within the agriculture sector, 56.7 per cent of the emissions were from agricultural soils, followed by 27.1 per cent from enteric fermentation and 16.3 per cent from manure management. The inventory can be considered complete, as only the following two minor categories are reported as "NE": enteric fermentation from poultry and fur farming, and CH_4 emissions from agricultural soils. Prescribed burning of savannas, rice cultivation and field burning of agricultural residues do not occur in Denmark.

55. Denmark's estimation methodologies are more complex and make greater use of models than is the case with most other Parties. The ERT commends Denmark for its investment in higher-tier estimation methods for this sector. This investment has enabled Denmark to prepare estimates which take account of a much larger number of variables that influence actual emissions than would otherwise be the case and which, in principle, allow Denmark to make more accurate estimates of emissions for all agriculture subcategories.

56. One of Denmark's primary planned improvements is to invest in a database to replace the existing system of linked spreadsheets for data from this sector. The ERT strongly recommends that Denmark pursue this development as a method to store data and that the Party consider the possibility of using such a system as a tool for consolidating its models and methods for estimating emissions.

B. Key categories

1. Enteric fermentation – CH_4

57. Denmark uses country-specific methods to estimate the energy intake of, and CH_4 generated by, dairy and other cattle, and IPCC default methods for other livestock categories. Estimates of energy intake are based on data from Danish feeding plans designed to optimize energy consumption, using country-specific models. To provide an ongoing QC check of the results obtained using the country-specific model, the ERT recommends that Denmark also prepare estimates using the tier 2 method described in the IPCC good practice guidance and that the Party report on the results in future NIRs. During the review, Denmark informed the ERT that the recommended QC check would be reported in the 2010 submission.

58. Denmark uses a country-specific model to estimate the CH_4 generated from energy intake. As with the estimates of energy intake, the differences between these estimates and the results obtained from the IPCC good practice guidance in 2006 are relatively minor (the country-specific estimates are 12 per cent higher), and, in this case, have narrowed over time. This narrowing reflects the assumption that maize silage, which has recently become the primary diet of dairy cattle, generates less CH_4 than the sugar beet it has replaced.

59. Critical aspects of the implementation of this country-specific method include the selection and transparency of models and the availability of data to implement the model on a national scale. Denmark should ensure that the actual model used for calculations has been published and, to enhance transparency, that the NIR includes details of the key model parameters. Ensuring a reliable flow of data at the national level is also an important aspect of the implementation of models. Currently, the estimations of Y_m rely on unpublished data obtained from the Danish Cattle Federation. The ERT recommends that Denmark include a summary of the data used to estimate Y_m and that it consider providing a comparison with similar data published by Statistics Denmark in the NIR in its next annual submission. During the review, Denmark informed the ERT that a summary of data used to estimate Y_m would be included in the next annual submission and an updated description of key model parameters would be included in the 2010 submission.

2. Manure management – CH_4

60. CH_4 emissions from manure management were estimated using tier 2 methodologies where appropriate, country-specific volatile solid excretion rate (VS), IPCC default values for CH_4-producing capacity (Bo) and a CH_4 correction factor. For liquid slurries, however, Denmark does not use the default CH_4 correction factor provided by the IPCC good practice guidance, which it argues is not appropriate for Danish conditions. Instead, Denmark uses a factor taken from the Revised 1996 IPCC Guidelines on the basis of two laboratory studies, the application of which, Denmark acknowledges, is not representative. To ensure consistency with the IPCC good practice guidance, the ERT recommends that the Party review the latest international literature and country studies, and consider whether the CH_4

correction factor currently selected could be justified more strongly in the NIR or, alternatively, whether the factor should be revised in its next annual submission. During the review, Denmark informed the ERT that the recommendation would not be implemented in the next annual submission because of the short space of time between the draft review report becoming available and the deadline for the next annual submission, but that an investigation regarding the CH_4 correction factor would be undertaken for the 2010 submission.

3. Manure management – N_2O

61. Denmark uses the IPCC methods and default factors for this category. However, the IEF declines slightly over time as a result of a small reduction in emissions due to the treatment of slurries for biogas. Given that this process is not described in the IPCC good practice guidance, the ERT recommends that Denmark include information from supporting studies on key model parameters in the NIR to enhance transparency and understanding of the methods used in its next annual submission.

4. Direct emissions from agricultural soils – N_2O

62. The IPCC tier 1a methodology has been used to calculate direct N_2O emissions from agricultural soils. While total direct emissions from agricultural soils have declined significantly, mainly because of the decline in synthetic fertilizer use, emissions from the application of manure have not fallen to any significant extent. This is due in part to a decline of 22.0 per cent since 1990 in the $Frac_{GASM}$ value, as a consequence of new regulations, which have resulted in emissions being reallocated from manure management to the direct emissions from agricultural soils category.

5. Indirect emissions from agricultural soils – N_2O

63. Indirect emissions from agricultural soils have declined by 41.4 per cent since 1990, owing to the decline in the use of synthetic fertilizer and a decline of 13.9 per cent since 1990 in the $Frac_{LEACH}$ value. The decline in $Frac_{LEACH}$ was calculated from the application of two models reported in a paper only available in Danish. Consequently, the ERT recommends that Denmark include details of key model parameters from supporting studies in its next annual submission to enhance transparency and understanding of the models used.

V. Land use, land-use change and forestry

A. Sector overview

64. In 2006, the LULUCF sector accounted for 1,802.32 Gg CO_2 eq in removals, offsetting 2.5 per cent of the total reported Danish emissions. The LULUCF sector was a source of emissions of 551.16 Gg CO_2 eq in 1990 and became a sink in 2006. Within the sector there are two sinks: forest land, by far the larger of the two (2,757.66 Gg CO_2 eq) in removed CO_2 in 2006, and wetlands (13.81 Gg CO_2 eq). There are also two sources: cropland, which accounted for 888.16 Gg CO_2 eq in 2006, followed by grassland, which accounted for 80.99 Gg CO_2 eq in 2006. This pattern was the same in the 2007 submission, which reported that overall, LULUCF accounted for 1,453.11 Gg CO_2 eq removals in 2005.

65. Recalculations have been carried out for the years 2003–2005. Recalculations of emissions and removals in the LULUCF sector in 2005 resulted in an overall decrease of 819.52 Gg CO_2 eq in removed emissions reported (from 1,453.11Gg CO_2 eq in the 2007 submission to 633.59 Gg CO_2 eq in the 2008 submission). The largest change was made to the estimate for cropland emissions, which increased by 818.92 Gg CO_2 eq (from 308.07 Gg CO_2 eq to 1,126.98 Gg CO_2 eq). The NIR states that these recalculations reflect the correction of an error in data on mineral soils and the adoption of a method that uses a five-year average.

66. A full land-use matrix for 1990 and 2005 is still missing, but in the NIR the Party states that this will be available in the next year's submission (2009). During the review, Denmark informed the ERT that the development of the land-use matrix has been delayed and that it would be made available as soon as possible. The ERT encourages Denmark to develop this matrix as soon as possible.

67. The LULUCF categories of settlements and other land are reported as "NE". For Greenland and the Faroe Islands, all LULUCF categories are reported as zero. During the review, the Party provided the ERT with an updated CRF summary table for Greenland containing the notation keys "NO" and "NE". The ERT recommends that Denmark estimate emissions and removals for Greenland and the Faroe Islands in future submissions.

B. Key categories

1. Forest land remaining forest land – CO_2

68. The source for AD for forest land and for forest land remaining forest land is the forestry census. This is problematic because, as is explained in the NIR, figures from this source for 1990 and 2000 cannot be compared directly owing to the differing number of respondents in the two censuses. Furthermore, the forestry census provides no guidelines on the crown cover or the heights of trees. Denmark is aware of this problem and, has initiated work on the land-use matrix. The ERT urges the Party to prioritize this work and to use the new information produced in its next annual submission. The ERT advises the Party to document the creation of the land-use matrix and the new forest information in a report written in English and/or an annex to the NIR. During the review, Denmark informed the ERT that the development of the land-use matrix has been delayed and that it would be made available as soon as possible.

69. Carbon stock changes for dead organic matter and for soils are reported as "NE" or "NO". The Party indicates in the NIR that the new National Forestry Inventory might make it possible to estimate carbon stock changes in the litter pool according to the IPCC good practice guidance for LULUCF. Also, a new project to resample forest soils to get information on soil emissions has been initiated; associated results are expected in 2008 or 2009. The ERT welcomes these activities.

2. Cropland remaining cropland – CO_2

70. Due to errors in the data, estimates for emissions from cropland remaining cropland in 2003, 2004 and 2005 were recalculated. For 2004, this results in a change from –321.22 Gg CO_2 eq in the 2007 submission to –2,579.57 Gg CO_2 eq in the 2008 submission. Estimates for grassland on mineral soils are still reported under cropland. The ERT welcomes Denmark's intention to report this category under grassland in future submissions.

C. Non-key categories

1. Grassland – CO_2

71. Denmark reports in the NIR that the change in the reported area of grassland from 2005 onwards is a result of changes in data collection rather than changes in actual area. The Party informed the ERT that it is planning to change the definition of grassland and reclassify most of the permanent grassland data from Statistics Denmark to the cropland category. This means that a recalculation for the whole time series should be performed in 2009 or 2010. The ERT recommends that Denmark carry out this work in combination with the creation of the land-use matrix.

2. Wetlands – N_2O

72. The Party informed the ERT that the re-established wetlands category consists of agricultural land (68 per cent), which was reported, and the remaining wetlands (32 per cent), which were not

reported. The Party provided the ERT with a definition of wetlands. Established wetlands are defined as areas designed to remove leaching N or increase the natural value of an area, whereas raised water tables are areas of land where drainage has been stopped so that the water table is 10–30 cm below the soil surface in summer and around or just below the soil surface in winter (i.e. not totally waterlogged). The ERT recommends that Denmark include this definition in the NIR in its next annual submission.

3. Land converted to forest land – CO_2

73. Changes in soil carbon pools following afforestation have been included for the first time in the 2008 submission. Although such changes concern only the organic top layer of mineral soils, the ERT welcomes this improvement in reporting.

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

74. Denmark did not report voluntarily on activities under Article 3, paragraph 3, of the Kyoto Protocol or the elected activities such as forest management, cropland management and grazing land management under Article 3, paragraph 4, of the Kyoto Protocol. In annex 11 of the NIR, the Party stated that further information relating to activities under Article 3, paragraphs 3 and 4, will be reported on 15 April 2010, and annually from then on.

75. During the review and in connection with two questions raised by the ERT about the requirements of the national system regarding Greenland territory (see paras. 90–93 below), Denmark informed the ERT that future reporting of activities under Article 3, paragraph 3, of the Kyoto Protocol would be documented and included for Greenland territory in the 2010 submission. In addition, Denmark provided the ERT with the clarification that the elected activities of forest management, cropland management and grazing land management under Article 3, paragraph 4, of the Kyoto Protocol concern only Denmark and not Greenland territory.

76. The proposed changes in the election of activities under Article 3, paragraph 4, of the Kyoto Protocol only concerning Denmark were not reflected in the Party's initial report. Nor were they reflected in the initial review report,[6] published on 2 November 2007.

77. The ERT noted that the election of activities under Article 3, paragraph 4, of the Kyoto Protocol following the initial review was recorded in the compilation and accounting database for Denmark, including for Greenland territory, reflecting the territorial coverage of Denmark in its ratification of the Kyoto Protocol.

78. Therefore, the ERT urges Denmark to resolve the issue of reporting elected activities under Article 3, paragraph 4, of the Kyoto Protocol for Greenland territory as soon as possible but not later than 15 April 2010, when these activities have to be reported on a mandatory basis under Article 7 of the Kyoto Protocol. The ERT recommends that Denmark report information on activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol that is specific for Greenland territory in an annex to the NIR, as is the case with CRF summary table 2 (see para. 11 above), because this will significantly improve transparency and will be very helpful for the assessment of emissions during the commitment period because of the different targets for the European territory of Denmark and for Greenland.

[6] FCCC/IRR/2007/DNK.

VII. Waste

A. Sector overview

79. In 2006, the waste sector accounted for 1,326.29 Gg CO_2 eq, or 1.9 per cent of total GHG emissions. (It should be noted that this excludes emissions from solid waste disposal on land and waste incineration in Greenland, which are reported under the other sector instead of the waste sector.) Emissions from the sector decreased by 14.3 per cent between 1990 and 2006. The key driver for the fall in emissions is solid waste disposal on land is the reduction in CH_4 emissions achieved through the Danish recycling action plans.

80. Within the sector, most of the emissions (77.5 per cent) came from solid waste disposal on land, while wastewater handling accounted for 22.5 per cent.

81. The following two categories are reported as "NE": CH_4 emissions from sludge of industrial wastewater, and CH_4 and N_2O emissions from sludge of domestic and commercial wastewater. CO_2 emissions from managed waste disposal on land is also reported as "NE"; however, the Revised 1996 IPCC Guidelines and the IPCC good practice guidance do not provide a method for estimating GHG emissions from this category.

B. Key categories

1. Solid waste disposal on land – CH_4

82. To estimate emissions from solid waste disposal on land, Denmark applied the IPCC tier 2 method with country-specific EFs by waste type and CH_4 generation constant (k). The ERT encourages Denmark to obtain more suitable waste composition data reflecting the current situation and to explain how the specific k value of 0.693 per year was arrived at.

2. Wastewater handling – CH_4

83. Denmark applied a country-specific methodology in line with the Revised 1996 IPCC Guidelines to calculate emissions of CH_4 from wastewater handling. Denmark separately estimated the CH_4 emissions from domestic and industrial contributions in line with a suggestion made by the previous ERT. The present ERT encourages Denmark to improve the discussion on the derivation of CH_4 emissions in the NIR in its next annual submission. During the review, Denmark informed the ERT that the Party has undertaken work concerning the documentation of AD for TOC (biodegradation of organic matter in influent wastewater) and sludge disposal categories used to derive the net emissions of CH_4. Denmark also informed the ERT that this information will not be included in the NIR before 2010 because of the restructuring of AD responsibilities, resulting in data being available at the plant level, which have to be quality assured against earlier data received at the national level.

C. Non-key categories

Wastewater handling – N_2O

84. To estimate N_2O emissions from wastewater handling, Denmark applied a well-designed, country-specific methodology in line with the Revised 1996 IPCC Guidelines and the IPCC good practice guidance. The ERT recommends that Denmark clarify some country-specific data and methodologies in the NIR in the next annual submission. During the review, Denmark informed the ERT that work concerning the improvement of the N_2O EF has been undertaken and that the results would be included in the 2010 submission.

VIII. Other sectors

85. In both the 2007 and the 2008 submissions, Denmark reported emissions from Greenland as aggregate estimates in sector 7 in the CRF tables. In 2006, Greenland accounted for 711.27 Gg CO_2 eq, or 1.0 per cent of total GHG emissions (Denmark and Greenland). Emissions from Greenland increased by 8.6 per cent between the base year and 2006.

86. In both the 2007 and 2008 submissions, the methodology used to estimate the sectoral emissions from Greenland is presented in annex 6.2.1 of the NIR, which includes information under the following sectors and categories: energy (all fuel combustion categories), industrial processes (consumption of halocarbons and SF_6), agriculture (enteric fermentation and manure management from sheep) and waste (solid waste disposal on land and waste incineration).

87. In the 2007 submission, sectoral emissions from Greenland for only the years 1990, 1995 and 2005 are reported in annex 6.2.1 of the NIR by means of CRF short summary table 1.B (IPCC table 7). In the 2008 submission, more detailed information, which includes sectoral emissions from Greenland for all years of the period 1990–2006, is provided in annex 6.2.1 of the NIR in the form of CRF summary table 2. The ERT welcomes this improvement, which is in line with recommendations from the initial review, but notes that in spite of the Party now being able to estimate these sectoral emissions, Denmark still reports them in aggregate in the CRF tables. The ERT reiterates previous recommendations that the Party fully incorporate the emissions from Greenland into the relevant sectors, together with data for Denmark.

88. From the information provided in annex 6.2.1 of the NIR, the ERT noted that in 2006 most of the emissions from Greenland came from energy (all fuel combustion categories), which accounted for 685.22 Gg CO_2 eq. The remaining emissions reported were: 11.33 Gg CO_2 eq from agriculture (enteric fermentation and manure management from sheep); 9.09 Gg CO_2 eq from waste (solid waste disposal on land and waste incineration); and 5.63 Gg CO_2 eq from industrial processes (consumption of halocarbons and SF_6). Table cells for the remaining categories were left blank, without notation keys. During the review, Denmark provided a CRF summary 2 table for Greenland using preliminary notation keys. The ERT recommends that Denmark incorporate finalized notation keys in a CRF summary 2 table in the NIR in the next annual submission.

IX. Other issues

1. Changes to the national system

89. The Party has not reported on any changes to its national system in the 2008 submission. However, the ERT noted that the Danish national system did not fully conform with two mandatory requirements regarding Greenland territory as discussed in paragraphs 90–93 below.

90. Denmark, under the requirement for the specific functions of its single national entity (the National Environmental Research Institute (NERI)), has not clearly defined or allocated specific responsibilities in the development process of components of the national inventory regarding Greenland territory, including those relating to the choice of methods, data collection, processing and archiving, and QA/QC. In the course of the review, Denmark informed the ERT that:

(a) From 1 October 2008, the new Agency of Climate and Infrastructure of the Greenland Home Rule administration is responsible for collecting AD and calculating emissions estimates for Greenland and that, in connection with this, efforts are under way to prepare a formal agreement on specific responsibilities to be allocated in the development process of components of the national inventory;

(b) Complete information on the institutional arrangements, the collection of AD, the selection of EFs, methods used and the calculation of emissions estimates would be provided in a full methodology description in an annex to the NIR in future annual submissions;

(c) The processing of the raw data into emissions estimates and the archiving of both the raw data and the resulting calculations would be documented;

(d) A proposal has been made to extend QA/QC support to the Greenlandic GHG inventory experts with the aim of improving the documentation of methods, AD and EFs, including the provision of references for these data;

(e) The future work on the development of Denmark's inventory is planned to be carried out by GHG emission experts in Greenland in cooperation with NERI. Part of this work will be the preparation of an annual status note to the Danish Ministry for Climate and Energy and the Agency of Climate and Infrastructure of the Greenland Home Rule administration (see para. 92 (c) below).

91. The ERT welcomes these plans, and encourages Denmark to implement them and report all relevant information in the next annual submission.

92. Denmark has not included Greenland in its QA/QC plan, which describes specific QC procedures to be implemented during the inventory development process, and facilitates the overall QA procedures to be conducted. In the course of the review, Denmark informed the ERT that:

(a) Work is under way on an agreement to formalize cooperation between Greenland and Denmark, which should make it possible to put in place QA/QC procedures for Greenlandic data as part of the work to be undertaken by Greenlandic experts (see para. 90 (a) above);

(b) A chapter on QA/QC would be included in an annex to the NIR from 2010 onwards;

(c) An annual status note is to be prepared by NERI for the Greenland Home Rule administration, describing the availability, completeness, transparency and uncertainty of the data supplied by Greenland. The note will include a summary of planned improvements;

(d) Information on completeness, uncertainty and recalculations will be included in the future NIR.

93. The ERT acknowledges these planned improvements and encourages their early implementation.

2. Changes to the national registry

94. The Party included a report on changes to its national registry in the 2008 submission. These changes include a new registry administrator and changes regarding the functioning of the registry made to fulfil the requirements for registries as evaluated in the Independent Assessment Report (IAR). Denmark provided the name and contact information of the new registry administrator, the Danish Energy Agency; however, the ERT noted that the link provided in the NIR to the website of the national registry did not work. Denmark subsequently provided a working link.

95. The ERT considers these changes to be broadly in accordance with the requirements of national registries as defined in decision 13/CMP.1. However, the information presented in the NIR was not sufficient for the ERT to determine whether recommendations made by the previous ERT and those in

the IAR were implemented. Consistent with decision 15/CMP.1, the ERT encourages Denmark to transparently report this information in its next annual submission under the Kyoto Protocol.

3. Commitment period reserve

96. Denmark has not reported its commitment period reserve in the 2008 submission. In response to questions raised by the ERT during the review, Denmark reported its commitment period reserve to be 249,155,060 t CO_2 eq based on the assigned amount specified in the initial review report.[7] The ERT agrees with this figure. Denmark stated that it would include information on its commitment period reserve in future annual submissions.

X. Conclusions and recommendations

97. The inventory generally covers all sectors and most sources and sink categories, and is complete in terms of years and gases, although geographical coverage is not sufficient. Denmark has submitted an NIR following the structure set out in the UNFCCC reporting guidelines, and has submitted CRF tables for all years of the inventory time series. However, the ERT concluded that Denmark could further improve the completeness of the inventory by reporting emissions estimates for activities that are known to occur in the country but are not already reported (see paras. 12, 45, 52 and 54 above).

98. The ERT noted that the 2008 annual submission has been improved by the inclusion of more comprehensive information on uncertainty estimates, particularly for LULUCF, and the inclusion of a description of QA/QC and verification procedures. As described above, the Party intends to further improve the discussion of QA/QC by including information on the QA/QC and verification procedures for data from Greenland.

99. The inventory is generally in line with the Revised 1996 IPCC Guidelines, the IPCC good practice guidance and the IPCC good practice guidance for LULUCF. The ERT identified instances of under- and overestimates of emissions (see paras. 38, 39, 40 and 47 above). In addition, Denmark continues to use tier 1 methods and constant IPCC default EFs for a number of key categories. The ERT reiterates the recommendations from the previous review to report emissions from Greenland in the relevant sector instead of under the category other, and requests that Denmark resolve this problem and provide a report in its next annual submission.

100. The national system of Denmark is functioning well and reflects the high quality of Danish inventories. However, Denmark should ensure that its national system is fully able to carry out the functions related to the activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol.

101. The key recommendations of the ERT are that Denmark:

(a) Improve the reporting of emissions estimates from Greenland by including them in the relevant sector as opposed to a separate annex;

(b) Report emissions from Greenland under the relevant sectors instead of under the category other;

(c) Strengthen its national system to ensure adherence to decision 15/CMP.1 with respect to having a single national entity responsible for the national inventory of Denmark (including Greenland);

(d) Incorporate emissions data from the EU ETS in a manner that ensures that the data conform with the Revised 1996 IPCC Guidelines and the IPCC good practice guidance, and that ensures completeness, accuracy and time-series consistency for each category;

[7] FCCC/IRR/2007/DNK.

(e) Provide tier 2 uncertainty estimates in order to identify where improvements to the inventory should be focused, and undertake a tier 2 key category analysis;

(f) Perform its own QA/QC work on plant-specific EFs, and in particular provide sufficient background information on plant-specific data such as the methods used by the plants in their calculations;

(g) Improve the discussion of non-energy use of fuels in the energy chapter of the next NIR;

(h) Improve background documentation, including the average composition profile of town gas;

(i) Make efforts to analyse the causes of the decrease in the IEF of CO_2 emissions from cement production in recent years and provide an explanation for this in the next NIR;

(j) Continue developing a database for the agriculture sector to replace the existing method for storing data, and consider the possibility of using such a system as a tool for consolidating its models and methods for estimating emissions;

(k) Apply full a land-use matrix for all the years from 1990 onwards, and document both the creation of the land-use matrix and the new forest information that is produced in a report written in English and/or an annex to the NIR.

XI. Questions of implementation

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

Annex

Documents and information used during the review

A. Reference documents

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

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

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

"Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories". FCCC/SBSTA/2006/9. Available at <http://unfccc.int/resource/docs/2006/sbsta/eng/09.pdf>.

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

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

"Guidelines for the preparation of the information required under Article 7 of the Kyoto Protocol" Decision 15/CMP.1. Available at <http://unfccc.int/resource/docs/2005/cmp1/eng/08a02.pdf#page=54>.

"Guidelines for review under Article 8 of the Kyoto Protocol". Decision 22/CMP.1. Available at <http://unfccc.int/resource/docs/2005/cmp1/eng/08a03.pdf#page=51>.

Status report for Denmark 2007. Available at <http://unfccc.int/resource/docs/2007/asr/dnk.pdf>.

Status report for Denmark 2008. Available at <http://unfccc.int/resource/docs/2008/asr/dnk.pdf>.

Synthesis and assessment report on the greenhouse gas inventories submitted in 2007. Available at <http://unfccc.int/resource/webdocs/sai/2007.pdf>.

Synthesis and assessment report on the greenhouse gas inventories submitted in 2008. Available at <http://unfccc.int/resource/webdocs/sai/2008.pdf>.

FCCC/ARR/2006/DNK. Report of the individual review of the greenhouse gas inventory of Denmark submitted in 2006. Available at <http://unfccc.int/resource/docs/2007/arr/dnk.pdf>.

FCCC/IRR/2007/DNK. Report of the review of the initial report of Denmark. Available at <http://unfccc.int/resource/docs/2007/irr/dnk.pdf>.

Initial report of Denmark. Available at <http://unfccc.int/files/national_reports/initial_reports_under_the_kyoto_protocol/application/pdf/aareporttounfccc-20dec2006.pdf>.

B. Additional information provided by the Party

Responses to questions during the review were received from Mr. Erik Lyck (Danish National Environmental Research Institute), including additional material on the methodology and assumptions used. The following documents were also provided by Denmark:

Aalborg Portland. 2006. *Environmental Report 2005*.

Aalborg Portland. 2007. *Environmental Report 2006*. Available at <http://www.aalborgportlandgroup.com/default.aspx?m=2&i=118>.

2004/156/EC: Commission Decision of 29 January 2004 establishing guidelines for the monitoring and reporting of greenhouse gas emissions pursuant to Directive 2003/87/EC of the European Parliament and of the Council (Text with EEA relevance) (notified under document number C(2004) 130).

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