United Nations FCCC/ARR/2010/NOR

Framework Convention on Climate Change

Distr.: General
21 July 2011

English only

Report of the individual review of the annual submission of Norway submitted in 2010*

* In the symbol for this document, 2010 refers to the year in which the inventory was submitted, and not to the year of publication.

Contents

I. Introduction and summary

A. Overview

1. This report covers the centralized review of the 2010 annual submission of Norway, coordinated by the UNFCCC secretariat, in accordance with decision 22/CMP.1. The review took place from 20 to 25 September 2010 in Bonn, Germany, and was conducted by the following team of nominated experts from the UNFCCC roster of experts: generalists – Mr. Paul Filliger (Switzerland) and Mr. Manfred Ritter (Austria); energy – Mr. Cesar Bermúdez Insua (Spain), Mr. Simon Eggleston (United Kingdom of Great Britain and Northern Ireland) and Mr. Sergiy Skybyk (Ukraine); industrial processes – Ms. Pia-Kristiina Forsell (Finland), Ms. Maria Jose Lopez (Belgium) and Ms. Siriluk Chiarakorn (Thailand); agriculture – Mr. Sorin Deaconu (Romania), Ms. Hongmin Dong (China) and Mr. Chhemendra Sharma (India); land use, land-use change and forestry (LULUCF) – Ms. Jennifer Jenkins (United States of America) and Ms. Tracy Johns (United States of America); and waste – Ms. Maryna Bereznytska (Ukraine) and Mr. Hiroyuki Ueda (Japan). Ms. Dong and Mr. Eggleston were the lead reviewers. The review was coordinated by 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 Norway, which provided comments that were considered and incorporated, as appropriate, into this final version of the report.

B. Emission profiles and trends

3. In 2008, the main greenhouse gas (GHG) in Norway was carbon dioxide (CO_2), accounting for 81.3 per cent of total GHG emissions[1] expressed in CO_2 eq, followed by methane (CH_4) (9.1 per cent) and nitrous oxide (N_2O) (6.9 per cent). Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6) collectively accounted for 2.6 per cent of the overall GHG emissions in the country. The energy sector accounted for 73.0 per cent of total GHG emissions, followed by the industrial processes sector (16.4 per cent), the agriculture sector (8.0 per cent), the waste sector (2.2 per cent) and the solvent and other product use sector (0.3 per cent). Total GHG emissions amounted to 54,407.80 Gg CO_2 eq and increased by 9.4 per cent between the base year[2] and 2008. Emissions from the energy sector increased by 34.4 per cent between 1990 and 2008, while all other sectors showed a decrease in emissions (industrial processes by 34.8 per cent, waste by 33.2 per cent, agriculture by 3.0 per cent and the solvent and other product use sector by 0.8 per cent).

4. Tables 1 and 2 show GHG emissions from Annex A sources, emissions and removals from the LULUCF sector under the Convention and emissions and removals from activities under Article 3, paragraph 3, and, if any, Article 3, paragraph 4, of the Kyoto Protocol (KP-LULUCF), by gas and by sector, respectively. In table 1, CO_2, CH_4 and N_2O emissions included in the rows under Annex A sources do not include emissions and removals from the LULUCF sector.

[1] 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.

[2] "Base year" refers to the base year under the Kyoto Protocol, which is 1990 for all gases. The base year emissions include emissions from Annex A sources only.

Table 1

Greenhouse gas emissions from Annex A sources and emissions/removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, by gas, base year to 2008[a]

			Gg CO_2 eq								*Change*
		Greenhouse gas	*Base year*	*1990*	*1995*	*2000*	*2005*	*2006*	*2007*	*2008*	*Base year–2008 (%)*
Annex A sources		CO_2	34 802.23	34 802.23	37 804.87	41 595.42	42 901.77	43 314.39	45 167.52	44 237.38	27.1
		CH_4	4 655.32	4 655.32	4 894.08	4 786.06	5 052.21	4 918.58	5 062.40	4 934.65	6.0
		N_2O	4 719.46	4 719.46	4 393.24	4 479.85	4 676.42	4 321.85	4 150.28	3 767.97	–20.2
		HFCs	0.02	0.02	25.82	238.36	481.80	520.24	565.00	623.92	3 404 145.1
		PFCs	3 370.40	3 370.40	2 007.74	1 317.90	828.65	742.50	820.91	772.74	–77.1
		SF_6	2 199.78	2 199.78	607.79	934.42	312.03	212.09	76.24	71.13	–96.8
KP-LULUCF	Article 3.3[b]	CO_2								–196.57	
		CH_4								IE, NO	
		N_2O								IE, NA, NO	
	Article 3.4[c]	CO_2	NA							–30 826.70	NA
		CH_4	NA							0.29	NA
		N_2O	NA							0.04	NA

Abbreviations: KP-LULUCF = land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, IE = included elsewhere, NA = not applicable, NO = not occurring.

[a] "Base year" for Annex A sources refers to the base year under the Kyoto Protocol, which is 1990 for all gases. The "base year" for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol is 1990.

[b] Activities under Article 3, paragraph 3, of the Kyoto Protocol, namely afforestation and reforestation, and deforestation. Only the inventory years of the commitment period must be reported.

[c] Elected activities under Article 3, paragraph 4, of the Kyoto Protocol, including forest management, cropland management, grazing land management and revegetation. For cropland management, grazing land management and revegetation, the base year and the inventory years of the commitment period must be reported.

Table 2
Greenhouse gas emissions by sector and activity, base year to 2008

			Gg CO_2 eq							*Change*
		Sector	*Base year*[a]	*1990*	*1995*	*2000*	*2005*	*2006*	*2007*	*2008*	*Base year–2008 (%)*
Annex A		Energy	29 562.31	29 562.31	32 308.49	35 638.34	38 403.30	39 204.60	40 941.60	39 730.80	34.4
		Industrial processes	13 683.45	13 683.45	10 944.77	11 550.98	10 049.12	9 147.89	9 156.13	8 916.04	–34.8
		Solvent and other product use	191.18	191.18	186.74	181.74	194.02	184.88	191.93	189.74	–0.8
		Agriculture	4 490.63	4 490.63	4 562.93	4 491.93	4 340.82	4 203.84	4 288.59	4 356.09	–3.0
		Waste	1 819.64	1 819.64	1 730.60	1 489.01	1 265.61	1 288.44	1 264.11	1 215.13	–33.2
		Other	NA	NA	NA	NA	NA	NA	NA	NA	NA
		LULUCF	NA	–11 282.39	–10 663.10	–12 550.17	–26 052.08	–26 493.93	–27 695.65	–28 556.26	153.1
		Total (with LULUCF)	**NA**	**38 464.82**	**39 070.43**	**40 801.84**	**28 200.80**	**27 535.72**	**28 146.70**	**25 851.53**	**NA**
		Total (without LULUCF)	**49 747.21**	**49 747.21**	**49 733.54**	**53 352.00**	**54 252.88**	**54 029.65**	**55 842.35**	**54 407.80**	**9.4**
KP-LULUCF	Article 3.3[b]	Afforestation & reforestation								–104.01	
		Deforestation								–92.56	
		Total (3.3)								**–196.57**	
	Article 3.4[c]	Forest management								–30 807.61	
		Cropland management	NA							NA	NA
		Grazing land management	NA							NA	NA
		Revegetation	NA							NA	NA
		Total (3.4)	**NA**							**–30 807.61**	**NA**

Abbreviations: KP-LULUCF = land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, LULUCF = land use, land-use change and forestry, NA = not applicable.

[a] "Base year" for Annex A sources refers to the base year under the Kyoto Protocol, which is 1990 for all gases. The "base year" for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol is 1990.

[b] Activities under Article 3, paragraph 3, of the Kyoto Protocol, namely afforestation and reforestation, and deforestation. Only the inventory years of the commitment period must be reported.

[c] Elected activities under Article 3, paragraph 4, of the Kyoto Protocol, including forest management, cropland management, grazing land management and revegetation. For cropland management, grazing land management and revegetation, the base year and the inventory years of the commitment period must be reported.

5. Table 3 provides information on the most important emissions and removals and accounting parameters that will be included in the compilation and accounting database.

Table 3
Information to be included in the compilation and accounting database in t CO_2 equivalent

	As reported	*Adjustment*[a]	*Final*[b]	*Accounting quantity*[c]
Commitment period reserve	225 519 117		225 519 117	
Annex A emissions for current inventory year				
CO_2	44 237 381		44 237 381	
CH_4	4 934 651		4 934 651	
N_2O	3 767 973		3 767 973	
HFCs	623 915		623 915	
PFCs	772 744		772 744	
SF_6	71 131		71 131	
Total Annex A sources	**54 407 796**		**54 407 796**	
Activities under Article 3, paragraph 3, for current inventory year				
3.3 Afforestation and reforestation on non-harvested land for current year of commitment period as reported	–103 806		–103 806	
3.3 Afforestation and reforestation on harvested land for current year of commitment period as reported	–202		–202	
3.3 Deforestation for current year of commitment period as reported	–92 560		–92 560	
Activities under Article 3, paragraph 4, for current inventory year[d]				
3.4 Forest management for current year of commitment period	–30 807 609		–30 807 609	
3.4 Cropland management for current year of commitment period				
3.4 Cropland management for base year				
3.4 Grazing land management for current year of commitment period				
3.4 Grazing land management for base year				
3.4 Revegetation for current year of commitment period				
3.4 Revegetation in base year				

[a] "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).
[b] "Final" includes revised estimates, if any, and/or adjustments, if any.
[c] "Accounting quantity" is included in this table only for Parties that chose annual accounting for activities under Article 3, paragraph 3, and elected activities under Article 3, paragraph 4, if any.
[d] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more of these activities.

II. Technical assessment of the annual submission

A. Overview

1. Annual submission and other sources of information

6. The 2010 annual inventory submission was submitted on 15 April 2010; it contains a complete set of common reporting format (CRF) tables for the period 1990–2008 and a national inventory report (NIR). A revised version of the NIR was submitted on 25 June 2010. Norway also submitted information required under Article 7, paragraph 1, of the Kyoto Protocol, including information on: activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, accounting of Kyoto Protocol units, changes in the national system and in the national registry, and minimization of adverse impacts under Article 3, paragraph 14, of the Kyoto Protocol. The standard electronic format (SEF) tables were submitted on 15 April 2010. The annual submission was submitted in accordance with decision 15/CMP.1.

7. Norway officially submitted revised emission estimates on 8 November 2010 in response to questions raised by the expert review team (ERT) during the course of the review. Norway submitted revised information for KP-LULUCF on 1 November 2010, in response to questions raised by the ERT during the review. Where necessary, the ERT also used the previous year's submission during the review.

8. In addition, the ERT used the standard independent assessment report (SIAR), parts I and II, to review information on the accounting of Kyoto Protocol units (including the SEF tables and their comparison report) and on the national registry.[3]

9. During the review, Norway provided the ERT with additional information and documents which are not part of the annual submission but are in many cases referenced in the NIR. The full list of information and documents used during the review is provided in annex I to this report.

Completeness of inventory

10. The 2010 inventory submission is complete in terms of years, sectors and gases, in line 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 "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). Some minor categories are still not included in the 2010 inventory submission, such as a number of carbon stock changes in different pools and subcategories in the LULUCF sector (e.g. the carbon stock change in dead organic matter and the carbon stock change in soils for land converted to forest land). However, fewer subcategories were reported as not estimated ("NE") under the LULUCF sector in the 2010 inventory submission than in the 2009 inventory submission, and in the other sectors all categories are estimated except for N_2O from industrial wastewater. The ERT encourages Norway to continue to make efforts to estimate emissions for the subcategories that are currently reported as "NE". The ERT noted the detection of a blank cell in CRF table 1.A(b) as

[3] The SIAR, parts I and II, is prepared by an independent assessor in line with decision 16/CP.10 (paras. 5(a), 6(c) and 6(k)), under the auspices of the international transaction log (ITL) administrator using procedures agreed in the Registry System Administrators Forum. Part I is a completeness check of the submitted information relating to the accounting of Kyoto Protocol units (including the SEF tables and their comparison report) and to national registries. Part II contains a substantive assessment of the submitted information and identifies any potential problem regarding information on the accounting of Kyoto Protocol units and the national registry.

reported in the 2010 status report for Norway. The ERT recommends that Norway fill in the blank cell in the CRF table for its next annual submission. The ERT commends Norway for making progress on the completeness of its inventory and for submitting, for the first time, data for several categories as recommended in previous review reports (e.g. CH_4 and N_2O from oil flaring and potential emissions of SF_6).

2. A description of the institutional arrangements for inventory preparation, including the legal and procedural arrangements for inventory planning, preparation and management

Overview

11. The ERT concluded that the national system continued to perform its required functions.

12. The Party described the changes to the national system since the previous annual submission and these changes are discussed in chapter II.G of this report.

Inventory planning

13. The NIR and annex VI to the NIR describe the national system (including the institutional arrangements) for the preparation of the inventory. The Climate and Pollution Agency (formerly the Norwegian Pollution Control Authority) has overall responsibility for the national inventory. Other organizations, including Statistics Norway and the Norwegian Forest and Landscape Institute, are also involved in the preparation of the inventory. Statistics Norway is responsible for the official statistics on emissions to air. The Norwegian Forest and Landscape Institute is responsible for the calculations of emissions and removals from the LULUCF sector. Data collection and data management are secured through three main Acts: the Pollution Control Act, the Greenhouse Gas Emission Trading Act and the Statistics Act. The three core institutions work together to fulfil the requirements for the national system. The allocation of responsibilities for producing estimates of emissions and removals, quality assurance/quality control (QA/QC) and archiving is clearly presented in annex VI to the NIR. To ensure that the institutions comply with their responsibilities, Statistics Norway and the Norwegian Forest and Landscape Institute have signed agreements with the Climate and Pollution Agency, which, as the single national entity, is also responsible for the official consideration and approval of the inventory. A detailed QA/QC plan defines the responsibilities, the procedures for QA/QC, data collection, assessment of key categories, uncertainty calculations, recalculations and archiving, and the access to archived data. Archiving is performed within the three core institutions, a practice that was established several years ago.

Inventory preparation

Key categories

14. Norway has reported tier 2 key category analyses, both level and trend assessment, and a tier 1 level assessment, as part of its 2010 annual submission. The key category analysis performed by the Party and that performed by the secretariat[4] produced slightly

[4] 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 Land Use, Land-Use Change and Forestry*. 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.

different results, owing to the different tiers of analysis and disaggregation of categories. Norway has included the LULUCF sector in its key category analysis, which was performed in accordance with 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). Norway identified 39 key categories using the tier 2 method (including LULUCF) and added seven categories resulting from the tier 1 assessment. In addition, two key categories were identified using a qualitative approach (coal mining and handling, and carbon capture and storage). The results of the key category analysis have been documented in CRF table 7. For the sake of transparency, the ERT reiterates the recommendation made in previous review reports that, in CRF table 7, Norway tick "L" instead of "Q" for those key categories that were identified on the basis of the tier 1 level assessment. The distinction between the results of the tier 2 key category analysis and the tier 1 key category analysis and the categories defined by qualitative criteria could be clarified with notes (e.g. identified by tier 1 key category analysis) in the comments column of CRF table 7, as proposed during the review in Norway's response to a question raised by the ERT.

15. The NIR states that each autumn the Climate and Pollution Agency, Statistics Norway and the Norwegian Forest and Landscape Institute plan the projects for the improvement of the inventory, taking into account the key category analysis as an important basis for this planning.

16. Norway has not identified key categories for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol in the NIR but in KP-LULUCF CRF table NIR-3. The ERT recommends that Norway include this information in the NIR of its next annual submission under the Kyoto Protocol, following the guidance on establishing the relationship between the activities under the Kyoto Protocol and the associated key categories in the UNFCCC inventory, as provided in chapter 5.4.4 of the IPCC good practice guidance for LULUCF.

Uncertainties

17. In the NIR, Norway has provided a tier 2 uncertainty analysis for each category and for the inventory as a whole (both excluding and including LULUCF) in accordance with the IPCC good practice guidance and the UNFCCC reporting guidelines. However, the uncertainty analysis in chapter 1.7 of the NIR and annex II to the NIR has not been updated since the 2006 inventory submission, even though some recalculations have been conducted. Furthermore, Norway has not followed the recommendations made in previous review reports to include in its NIR table 6.2 of the IPCC good practice guidance and an explanation for its uncertainty estimates for CH_4. In response to a question raised by the ERT, Norway explained that the information is not yet available and that a tier 2 analysis cannot provide information at the same level of disaggregation as table 6.2 of the IPCC good practice guidance. Considering the purpose of the uncertainty analysis, it is necessary to provide information on the uncertainty of each of the disaggregated categories in order to prioritize inventory developments and to reduce the level of uncertainty of the inventory. The ERT reiterates the recommendations made in previous review reports that the Party, in its next annual submission, update its uncertainty estimates if necessary, include the above-mentioned table 6.2 and provide a discussion of its uncertainty estimates for CH_4.

Recalculations and time-series consistency

18. Recalculations have been performed and reported in accordance with the IPCC good practice guidance. The ERT noted that recalculations reported by the Party for the time series 1990 to 2007 have been undertaken to take into account: emissions of CH_4 and N_2O from well testing of crude oil offshore; new tier 2 methods for estimating emissions of CH_4 from enteric fermentation; revised figures for N_2O emissions from cultivated organic soils;

revised figures for CH_4 emissions from waste disposal; the reallocation of categories and various revisions of emission factors (EFs); and the use of revised estimation methods for the whole LULUCF sector. The recalculations have resulted in the overall improvement of the inventory. The magnitude of the impact includes an increase in the estimated total GHG emissions for 1990 (by 0.1 per cent) and for 2007 (by 1.4 per cent). This implies that the emission trend from 1990 to 2007 changes from an increase of 10.8 per cent to an increase of 12.3 per cent. In some cases the rationale for these recalculations is not provided in a transparent manner in either the NIR or in CRF table 8(b). The ERT reiterates the recommendation made in previous review reports that Norway provide more detailed explanations of the rationale for its recalculations and recommends that the rationale for recalculations be documented in a more transparent way.

Verification and quality assurance/quality control approaches

19. Norway provided information on QA/QC procedures in line with the UNFCCC reporting guidelines. An elaborated QA/QC plan is in place, in accordance with decision 19/CMP.1 and the IPCC good practice guidance. The plan is described in an annex to the NIR. The plan includes general QC procedures (tier 1) as well as category-specific procedures (tier 2) for key categories and for those individual categories for which significant revisions to methodologies and/or data have occurred. Category-specific procedures are described and implemented.

20. Not all parts of the NIR have been updated since the previous annual submission (e.g. the uncertainty analysis) and some recommendations have not been implemented (e.g. the provision of the rationale for recommendations, and the improvement of CRF table 7). Therefore, the ERT recommends that Norway strengthen its QA/QC procedures in order to improve the issues identified during the present review for its next annual submission.

Transparency

21. Norway reports several categories as included elsewhere ("IE") in CRF table 9(a). The number of categories reported as "IE" is about the same as in the previous annual submission. In most cases, a satisfactory explanation has been provided. Nevertheless, the ERT encourages Norway to make efforts to further reduce the number of categories reported as "IE", in order to increase the comparability and transparency of its inventory. In addition, the ERT found that the transparency of some sectoral chapters should be improved. Therefore, the ERT reiterates the recommendation made in previous review reports that Norway elaborate these sectoral chapters with a view to improving its descriptions of the methodologies used, where they are different from the IPCC methodologies. Some minor inconsistencies in the use of the notation keys were observed in the reporting on the energy sector (e.g. in relation to fugitive emissions from oil and natural gas) and on the waste sector. Therefore, the ERT recommends that Norway improve its use of the notation keys in its future annual submissions.

Inventory management

22. Norway has an inventory production plan with clearly defined responsibilities and milestones. All three core institutions are involved in the production process and in the archiving of background information. The NIR states that, due to the differences in the character of data collected, Norway has chosen to keep archiving systems in the three core institutions, which means that not all information is archived at a single location. These archiving systems are, however, consistent and operate under the same rules. Although the data are archived separately, all data could be accessed efficiently during a review. In addition, Norway stated that the Climate and Pollution Agency will build up a library with the most important methodology reports. In response to a question raised by the ERT

regarding the status of this library, Norway stated that it is still intending to build up this library and that it will hopefully be ready for the next annual submission. The ERT concludes that Norway's archiving system is well suited to the national circumstances and, once the central library is fully realized, it will be in good shape.

3. Follow-up to previous reviews

23. Norway has made several improvements in response to recommendations made in previous review reports. The major improvements are:

(a) The NIR has been prepared and structured according to the annotated outline of the NIR, including reporting elements under the Kyoto Protocol (and the ERT commends the Party for this effort, as it is a considerable improvement);

(b) Information has been included on changes in the national system and national registry, as well as on the commitment period reserve;

(c) A chapter has been included on the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol;

(d) Estimates have been included for CH_4 and N_2O from oil flaring from well testing;

(e) Information is now provided regarding the plant-specific production technology for the production of nitric acid;

(f) Completeness has been improved by reducing the number of empty cells in the CRF tables, better use of the notation keys and the availability of more activity data (AD).

24. However, some recommendations made in previous review reports were not implemented, such as the updating and improvement of the uncertainty estimates.

4. Areas for further improvement

Identified by the Party

25. The 2010 NIR contains an extensive list of planned improvements; the most important are that:

(a) Independent peer review will be considered of the 2010 data (reported in 2012);

(b) A new uncertainty analysis, including improvements of uncertainty estimates, is expected to be implemented for the 2011 annual submission;

(c) Emissions from road transportation have been evaluated and a new estimation model will be in operation before 2011;

(d) Several improvements will be implemented for the LULUCF sector, such as the inclusion of the extent of the area of forest and other wooded land at higher altitudes, including forest information for Finnmark county based on the forest inventory to be conducted in 2011, and a survey of deadwood at all forest inventory plots.

Identified by the expert review team

26. The ERT identifies the following cross-cutting issues for improvement, namely that the Party:

(a) Update the uncertainty analysis (see para. 17 above);

(b) Provide rationale for the recalculations (see para. 18 above);

(c) Improve the transparency of the description of methods used in the industrial processes sector and the explanation of the ammonia (NH_3) model used in the agriculture sector;

(d) Implement the plan to undertake a project to understand the differences between the reference approach and the sectoral approach for fuel combustion, identify any problems with the data on fuel or carbon content, and correct the reference approach on the basis of this analysis (see para. 31 below);

(e) Investigate the treatment and allocation of carbon monoxide (CO) gas used for fuel combustion under the chemicals category and provide more detailed documentation in the NIR (see para. 34 below);

(f) Improve the characterization of other land both for the LULUCF sector and for the information on activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol (see paras. 68 and 95 below);

(g) Provide separate estimates for all five carbon pools for each KP-LULUCF activity (see paras. 99, 101 and 102 below);

(h) Use the appropriate notation keys (see paras. 72, 88 and 97 below).

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

B. Energy

1. Sector overview

28. The energy sector is the main sector in the GHG inventory of Norway. In 2008, emissions from the energy sector amounted to 39,730.80 Gg CO_2 eq, or 73.0 per cent of total GHG emissions. Since 1990, emissions have increased by 34.4 per cent. The key driver for the rise in emissions is the increase in emissions from energy industries (by 94.4 per cent since 1990). Within the sector, 38.5 per cent of the emissions were from transport, followed by 33.0 per cent from energy industries, 11.2 per cent from oil and natural gas and 9.1 per cent from manufacturing industries and construction. Other sectors accounted for 7.8 per cent and other (fuel combustion) accounted for 0.3 per cent. The remaining 0.1 per cent was from solid fuels.

29. The ERT noted that while the Party states that it uses country-specific EFs for CO_2 emissions from fuel combustion, these factors date from some references published in 1996 or earlier. As no recent studies have been performed, the ERT cannot tell whether or not these data are still appropriate for Norway. The ERT strongly recommends that these data be reviewed and, if necessary, updated urgently. The ERT further recommends that Norway include a regular, scheduled review of these EFs in its QA/QC plan.

30. The Party reports in the NIR that the emissions data for most of the energy sector (and associated fuel consumption) are reported by individual facilities to the Climate and Pollution Agency. These data are then totalled and used directly in the emissions inventory. The fuel used in the rest of the sector is calculated on the basis of the energy balance table and the subtraction of the data reported by individual facilities (large point sources). Standard EFs are used to estimate emissions from this residual part of the sector. In principle, the use of plant-specific data can improve emissions inventories; however, the NIR does not specify the fraction of measured and estimated plant-level data in each category, how these facility-level data are produced (e.g. type of measurements or estimation procedure) or how they are checked by the emission inventory. Furthermore, it is

unclear from the NIR whether the use of the standard EF for the residual part of the sector (usually the smaller plant) is appropriate. Therefore the ERT strongly recommends that the Party provide this information in the next NIR, together with some summary statistics on the fraction of emissions in each category that are estimated from measured or estimated plant-level data.

2. Reference and sectoral approaches

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

31. Norway continues to have considerable difficulty reconciling the reference and sectoral approaches, as noted in previous review reports. Norway has revised the reference approach, but the difference in the estimates between the two approaches in 2008 is still 20.7 per cent. While the difference has been reduced somewhat for earlier years of the time series, it is still significant (over 10 per cent in 1991, 1992, 1999, 2000, 2001, 2003 and 2008). This problem occurs for all solid, liquid and gaseous fuels. Norway attributes this problem to inaccuracies in the oil and gas production and export statistics, to the large non-energy use of coal, coke, natural gas and liquefied petroleum gas, as well as to relatively large statistical errors. Norway states that there is an uncertainty of 0.3 per cent for crude oil production; however, the ERT noted that this would result in an uncertainty of less than 3 per cent for the national consumption of crude oil, whereas the difference in energy consumption between the sectoral and reference approaches as reported is 29.8 per cent. In addition, although the differences in energy consumption between the two approaches are 11.6 per cent and –12.4 per cent for solid and gaseous fuels, respectively, the differences in the associated carbon emissions are 1.9 per cent and 3.4 per cent, respectively. In response to questions raised during the review, Norway informed the ERT that the difference for gaseous fuels is due to an error in the carbon EF, while the difference in solid fuels is possibly due to the treatment of stored carbon, but the Party noted that this discrepancy is not fully understood. The ERT recommends that Norway implement its plan to undertake a project to understand these differences, identify any problems with the data on fuel or carbon content, and correct the reference approach on the basis of this analysis in its next annual submission.

32. The apparent fuel consumption reported to the UNFCCC corresponds to that reported to the International Energy Agency (IEA), within 3 per cent for all years of the time series except 2007 (7 per cent). The 1990–2008 growth rate of the total apparent fuel consumption is 56 per cent as reported in the CRF tables compared with 59 per cent as reported to the IEA. The Party reported to the ERT that the figure for export of crude oil in 2007 in the CRF tables is incorrect and that this should be corrected in its next annual submission.

Country-specific issues

33. Norway identified CO_2 from carbon capture and storage as a key category using qualitative criteria. The ERT acknowledges the additional details provided in the NIR and in an annex to the NIR regarding Norway's carbon capture and storage project.

3. Key categories

Stationary combustion: solid fuels – CO_2

34. CO_2 implied emission factors (IEFs) for the reported period (from 1990 to 2008) for chemicals (172.66–997.21 t/TJ) have been identified as being outside of the IPCC default range (94.6–106.7 t/TJ) and the highest of all reporting Parties (17.39–997.21 t/TJ). In response to questions raised during the review, Norway informed the ERT that emissions data are reported by the major plants and that the estimation of the residual fuel

consumption is based on the energy balance tables, subtracting the fuel consumption of the major plants. CO gas derived from the use of coke as reducing agent in the production of pig iron was used as fuel and this leads to the unusual IEF. There is no information in the NIR on the use of CO as a fuel or its production. The ERT reiterates the recommendation made in the previous review report that Norway investigate the treatment and allocation of CO gas and provide more detailed documentation in the NIR of its next annual submission, making corrections where necessary.

35. During the review, the Party informed the ERT that the CO gas was included in the energy balance tables under other gas, while in the CRF tables it was included under solid fuels, because these CO gases are derived from solid fuels. In order to improve transparency, the ERT recommends that Norway include data on the production and use of CO as a fuel in the NIR of its next annual submission.

Stationary combustion: liquid fuels – CO_2

36. The CO_2 IEFs for petroleum refining for the period 1990–2008 (44.15–59.21 t/TJ) have been identified as being the lowest of the values reported by all Parties for each year (44.15–83.51 t/TJ). The values are lower than the IPCC default values (63.07–100.83 t/TJ). During the review, Norway informed the ERT that it had problems assigning energy use and its emissions to combustion (petroleum refining) and feedstock/process emissions (refining/storage for fugitive emissions from oil), although figures for both energy use and emissions are reported by the plants. The ERT reiterates the recommendation made in the previous review report that, in its next annual submission, Norway provide an explanation for the low CO_2 IEFs for petroleum refining.

Stationary combustion: gaseous fuels – CO_2

37. The CO_2 IEFs for public electricity and heat production for 2004 (44.71 t/TJ), 2005 (39.27 t/TJ) and 2008 (48.05 t/TJ) have been identified as being the lowest of the values reported by all the Parties for each year (39.27–69.87 t/TJ). The values are lower than the IPCC default value (56.1 t/TJ). Also, the CO_2 IEF for 2007 (58.08 t/TJ) is the second highest of the values reported by the Parties for 2007 (54.76–66.80 t/TJ) and is higher than the IPCC default value. The ERT noted that most gas power plants in Norway are adjacent to gas-processing plants and they continuously measure mass and gas composition (by coriolis flow meters and on-line gas chromatography). In the energy accounts, consumption is converted first to volume and then to energy units. The ERT encourages Norway to utilize these data for improving the quality of its estimates to the extent possible.

38. During the review, the Party reported that the low IEFs for 2004, 2005 and 2008 were due to errors and stated that, for 2004–2005, new information on lower emissions was included without correcting the consumption data for one plant. For 2008, incorrect (too high) consumption was entered for a new plant. The Party stated that it would correct the errors. It has not yet been able to ascertain the cause of the high IEF for 2007 but is continuing to work to determine the reason for it. The ERT recommends that the Party determine the reason for the high IEF for 2007, review and check these data for all years of the time series, ensure that adequate QA/QC measures are in place to eliminate future errors and report on this in its next annual submission.

Road transportation: liquid fuels – N_2O

39. Emissions from road transportation are calculated using a tier 2 approach, with CO_2 estimated from the fuel sold and CH_4 and N_2O estimated from a Norwegian model based on vehicle kilometres driven. During the review, Norway informed the ERT that the references in the NIR for the EFs were wrong and that more recent data were used. The N_2O IEF for gasoline-fuelled vehicles is one of the highest of all reporting Parties (5.99 kg/TJ for 2008).

The Party informed the ERT that it is in the process of replacing the currently used EFs with EFs from the Handbook Emission Factors for Road Transport (HBEFA)[5] and the HBEFA model will be used for the next annual submission. This model will use updated EFs for road transportation and so will address the issues identified by the ERT during the review. The ERT recommends that Norway ensure that the correct references for the EFs are given in the NIR and that the HBEFA model is used for its next annual submission.

Fugitive emissions from oil and natural gas: CO_2 and CH_4

40. Norway has a large offshore oil and gas industry with correspondingly emissions, amounting 10 per cent of the energy sector emissions. Most of the data on these emissions have been compiled from facility reports, but it is not clear from the NIR how much of these data are measured and how much are estimated. The ERT recommends that Norway provide more information on the source of the emissions data.

41. Emissions from oil exploration (1.B.2.a.i), oil production (1.B.2.a.ii) and natural gas exploration (1.B.2.b.i) are reported under venting of oil and gas combined (1.B.2.c.iii). Emissions from natural gas transmission (1.B.2.b.iii) and natural gas distribution (1.B.2.b.iv) are reported under other leakage of natural gas (1.B.2.b.v). Emissions from natural gas production/processing (1.B.2.b.ii) are split between other leakage of natural gas (1.B.2.b.v) and venting of oil and gas combined (1.B.2.c.iii). The ERT recommends that, in its next annual submission, Norway report these emissions under the correct categories in order to improve the transparency and comparability of the data.

42. In addition, the AD in CRF table 1.B.2 are reported several times as "NE" for categories which have emission estimates. The ERT regards this as misleading and recommends that the Party replace these, either with AD or more appropriate notation keys, such as not applicable ("NA") or "IE".

4. Non-key categories

Natural gas – other leakage: CH_4

43. Currently, leakage from distribution of natural gas to residential and commercial users is reported as "NE". During the review, the Party informed the ERT that, currently, this activity is very small, but it is growing. The gas is distributed mostly in gas tanks, with some distributed via local pipeline systems. The NIR states that it is assumed that there is no significant leakage from this distribution, but the ERT recommends that Norway estimate the leakage in line with the IPCC tier 1 methodology, especially because the activity is likely to grow.

44. During the review, in response to a request from the ERT, Norway prepared an estimation for this category as a part of its official submission on 8 November 2011. The ERT agreed with the data reported by Norway.

C. Industrial processes and solvent and other product use

1. Sector overview

45. In 2008, emissions from the industrial processes sector amounted to 8,916.04 Gg CO_2 eq, or 16.4 per cent of total GHG emissions, and emissions from the solvent and other product use sector amounted to 189.74 Gg CO_2 eq, or 0.3 per cent of total GHG emissions. Since 1990, emissions have decreased by 34.8 per cent in the industrial processes sector and decreased by 0.8 per cent in the solvent and other product use sector. The key drivers

[5] Available at <http://www.hbefa.net/e/index.html>.

for the fall in emissions from the industrial processes sector are a reduction in emissions of PFCs from the production of aluminium, a reduction in emissions of SF_6 from the production of magnesium and a reduction in N_2O emissions from the production of nitric acid. The decrease in the emissions of PFCs from aluminium production is a result of a shift from the use of Soederberg to prebaked technology. The share of aluminium production from prebaked technology increased to 85 per cent in 2008. The reduction in SF_6 emissions from the production of magnesium is due to the closing down of production of cast magnesium in 2002, improvements in gas-insulated switchgear (since the signing of a voluntary agreement in 2002 with the users (electricity plants and distributors) and producers (one factory)) and the almost end of the use of SF_6 as a tracer gas in the offshore sector and in scientific experiments. N_2O emissions from nitric acid production have decreased by almost 55.0 per cent since 1990 (this decrease is mainly observed in 2008) due to the introduction of abatement technology such as N_2O decomposition by extension of the reactor chamber in all Norwegian production lines. Within the industrial processes sector, 62.9 per cent of the emissions were from metal production, followed by 15.7 per cent from chemical production, 11.4 per cent from mineral products and 7.8 per cent from consumption of halocarbons and SF_6. The remaining 2.2 per cent were from the category other.

46. Overall, Norway's inventory for the industrial processes sector is complete. The ERT welcomes the inclusion of estimates of the emissions from the brick-making industry in the emissions inventory for the first time in 2010.

47. Norway performed many recalculations for several categories in order to improve the quality of the inventory. These recalculations are systematically mentioned in the NIR, but the reasons for the recalculations and the approaches used are not provided. The ERT recommends that Norway document all recalculations in its NIR according to the IPCC good practice guidance in order to enhance the transparency of the inventory.

48. Also to improve transparency, the ERT recommends that Norway include in the NIR more detailed information on the methods, AD, EFs and assumptions used to prepare and report all the estimates, in order to ensure that users of the reported information are able to replicate the estimation process.

2. Key categories

Lime production – CO_2

49. The ERT noted that the CO_2 IEFs for the whole time series (0.378–0.468 t/t) are the lowest of the values reported by all Parties for each year (0.387–0.892 t/t). The 2010 annual submission was the first time that Norway provided AD in the CRF tables. The AD reported by Norway are the input of limestone and dolomite (and not the lime produced). For two of the production plants, the input of limestone is determined by totalling the production volumes of lime (weighed on a scale for trucks). Analysis of the content of calcium oxide in lime is then used to calculate the input of limestone. For the third plant, the amounts of limestone and dolomite going into the production process are weighed in batches. The weights of these batches are then totalled to obtain an annual figure. This means that Norway is reporting the limestone and dolomite used as a raw material as AD instead of the lime produced, and this is the reason why the IEFs are the lowest of the values reported by all Parties for each year. To improve comparability and accuracy, the ERT recommends that Norway report the volume of lime produced as AD in the CRF tables and correct the information provided in the NIR.

Iron and steel production – CO_2

50. In Norway's 2010 annual submission, the CO_2 emissions from pig iron and steel production have been reported separately for the first time. The ERT welcomes this change, which improves transparency and comparability among the reporting Parties. However, the reported CO_2 emissions from pig iron production come from the chemical reaction of ilmenite and coal, which produces titanium dioxide (TiO_2) slag as the main product and pig iron as a by-product. The ERT considers that the main production process is to produce TiO_2 slag rather than pig iron. In order to improve transparency and comparability, the ERT recommends that Norway include CO_2 emissions from this process (currently reported under pig iron) under other (chemical production).

51. During the review, Norway provided more information concerning the methodologies used to allocate CO_2 emissions from steel production between the energy and industrial processes sectors, but this information was not accurately included in the 2010 NIR. To improve transparency, the ERT recommends that Norway include the calculation methodology and a description of how it has allocated the emissions between the energy and industrial processes sectors in the NIR of its next annual submission.

52. In order to allocate CO_2 emissions from steel production to the energy and industrial processes sectors, for those years for which this allocation is not provided by the production plant, the Party has used several plant-specific EFs for different years in the time series (e.g. the plant-specific EFs for 1998 are used for 1990 and 1992–1997 and the plant-specific EFs for 2005 are used for 2002–2004). Although the ERT considers this a minor issue, given that the total (energy and industrial process) emissions are provided by the plant for the whole time series (except 1992), the ERT encourages Norway to investigate ways to improve the time-series consistency of its estimates of emissions from steel production for both the energy and industrial processes sectors.

Ferroalloys production – CO_2

53. In its 2010 annual submission, Norway reported CO_2 emissions from limestone and dolomite used in ferroalloys production under the category ferroalloys production. In the NIR, Norway explains that this allocation of emissions is the one described in the *2006 IPCC Guidelines for National Greenhouse Gas Inventories*. Norway states that it has considered changing the reporting procedure but that this would make the reporting more complicated without improving the accuracy of the inventory. The ERT noted the recommendation made in the previous review report that, to enhance transparency and comparability, Norway allocate the emissions from limestone and dolomite used in ferroalloys production to the limestone and dolomite use category. However, the situation is complex in Norway – given the various products and processes and the use of CO gas, it does not fit in well with the UNFCCC reporting guidelines. Given the need to be transparent, the ERT recommends that Norway continue with its current reporting and include in the NIR a table with information on emissions from limestone and dolomite consumption and other AD for ferroalloys production, and that it use notation keys and notes in the CRF tables and the NIR to transparently explain the reporting.

Aluminium production – CO_2

54. The ERT noted that the inter-annual change in the CO_2 IEF between 1990 (1.63 t/t) and 1991 (1.59 t/t) is relatively large. The value for 1991 is 2.6 per cent lower than the value for 1990. Furthermore, all the inter-annual changes except that for 1995/1996 are relatively large. During the review, Norway informed the ERT that, for this category, Norway is using data reported from different plants and for different years (e.g. for prebaked technology, the figures show that the IEF is dependent on the net paste consumption, which determines the amount of carbon (C)/t aluminium). The use of

Soederberg technology is declining and this explains the decrease in the amount of carbon/t aluminium and why the production of aluminium is growing faster than the resulting CO_2 emissions. The ERT commends Norway for this additional information and recommends that Norway include, in the NIR of its next annual submission, information on the emission trend and the shares of the different technologies for this category.

D. Agriculture

1. Sector overview

55. In 2008, emissions from the agriculture sector amounted to 4,356.09 Gg CO_2 eq, or 8.0 per cent of total GHG emissions. Since 1990, emissions have decreased by 3.0 per cent. The key driver for the fall in emissions is the decrease in the total animal population. Within the sector, 45.9 per cent of the emissions were from agricultural soils, followed by 43.8 per cent from enteric fermentation and 10.1 per cent from manure management. The remaining 0.2 per cent were from field burning of agricultural residues. CH_4 emissions accounted for 51.2 per cent of the sectoral emissions; N_2O accounted for 48.8 per cent.

56. The reporting for the agriculture sector is complete, covering all categories and gases. There is no rice cultivation or prescribed burning of savannas in Norway, and the notation key for not occurring ("NO") was reported for these categories in the CRF tables.

57. The NIR contains information on methods, EFs and relevant parameters, uncertainty analysis, QA/QC procedures, recalculations and sources of AD for each category. However, the ERT noted that transparency could be improved by including the AD (actual figures) and background information on the development of country-specific parameters in the NIR. The ERT recommends that Norway provide AD and background information on the development of country-specific parameters for each category in the next annual submission.

58. There have been recalculations of the estimates of CH_4 from enteric fermentation, resulting from changing the EF for reindeer, and of N_2O emissions from agricultural soils, as a result of improving the NH_3 model and the availability of revised area data for cultivated histosols. The recalculations performed for the 2010 annual submission resulted in a 0.2 per cent decrease in the estimate of total agricultural emissions for 2007 compared with that reported in the 2009 annual submission.

2. Key categories

Enteric fermentation – CH_4

59. The Party applied the tier 2 methodology to estimate emissions from cattle and sheep, and the tier 1 methodology with IPCC default EFs was used to estimate emissions from other animals, except reindeer, for which the EF used by Sweden and Finland was applied. This is in line with the IPCC good practice guidance.

60. In applying the tier 2 approach, Norway takes into consideration the lifetime of the animals, which is consistent with the IPCC good practice guidance. However, the approach could be better explained in the NIR. The ERT reiterates the recommendation made in the previous review report that Norway provide detailed AD and values for the parameters used for EF determination in its next annual submission.

Manure management – CH_4 and N_2O

61. Country-specific equations and parameters (such as manure production, and volatile solid excretion per day on a dry-matter weight basis (VS)) were used to estimate emissions

for this category and detailed information on applied values of related parameters was provided in the NIR. Country-specific equations were used for estimating CH_4 emissions. The ERT noted an inconsistency in the reporting of VS between the NIR and the CRF tables. In the NIR, the volatile solid fraction is reported as a percentage, but the IPCC good practice guidance and the relevant CRF table both refer to volatile solid production using a unit of kg/animal/year. The ERT recommends that Norway check the calculations of the EF.

62. All cells of CRF table 4.B(a) were filled in with "0". In response to a question raised by the ERT, Norway indicated that all data were deleted in the 2008 annual submission and most were replaced by 0 values, but it noted that the methane conversion factors should be 5 per cent for sheep and goats, 2 per cent for reindeer and 8 per cent for other animals, as reported in the NIR. The allocation of manure was reported as "NE" for cool climate regions and "NO" for other climate regions, and Norway indicated that the reporting will be corrected in the next annual submission. The ERT recommends that Norway correct the errors and check the calculations in its next annual submission.

63. Norway applied the IPCC methods, using country-specific data for the nitrogen (N) excreted by different categories of animals, to estimate N_2O emissions from manure management. The NIR provides data sources and a table which lists the N excretion for each animal species. However, the ERT noted that the NIR could be improved by including background information on the estimation of N excretion. The ERT recommends that Norway increase the transparency of the estimations of N-excretion rates by providing an explanation of the methods used to derive the data for N excretion, in the NIR of its next annual submission.

Agricultural soils – N_2O

64. Norway applied a tier 1 method from the IPCC good practice guidance, using country-specific parameters, to estimate emissions for this category. The country-specific NH_3 model was applied to estimate the fraction that volatilizes as NH_3 from manure management and fertilizer application. The NIR includes limited information on the NH_3 model and justification for its application. The ERT reiterates the recommendation made in the previous review report that Norway provide more information on the NH_3 model (such as principle, basic equations and assumptions) in its next annual submission.

65. The N_2O emissions from cultivation of histosols were recalculated using a revised area for the time series instead of a constant area of histosols, resulting in a decrease in the estimated N_2O emissions for the period 1993–2007. The NIR states that the estimation of the area is based on measurements of the carbon in the soils and it provides information on the procedure and data sources used for the estimation of the area. The ERT recommends that Norway provide the original and updated area data for cultivated histosols for the whole time series and include information to justify the change in its next annual submission.

E. Land use, land-use change and forestry

1. Sector overview

66. In 2008, net removals from the LULUCF sector amounted to 28,556.26 Gg CO_2 eq. This amount offsets 52.5 per cent of Norway's GHG emissions from Annex A sources for 2008. Since 1990, net removals have increased by 153.1 per cent. The largest share of this increase can be attributed to the category forest land. The key driver for the rise in removals is an active forest management policy. The annual harvest levels are much lower than the annual increments, thus causing an accumulation of wood and other tree component

biomass, yielding an ongoing increase in standing volume and gross increment, while CO_2 emissions due to harvesting and natural losses have remained stable. Within the sector, 31,097.05 Gg CO_2 eq removals were from forest land and there were emissions of 1,869.39 Gg CO_2 eq from grassland, emissions of 540.77 Gg CO_2 eq from settlements and emissions of 108.01 Gg CO_2 eq from cropland. Wetlands accounted for 3.43 Gg CO_2 eq emissions and other accounted for 19.18 Gg CO_2 eq emissions. Emissions and removals of CO_2 from other land have been reported as "NA", "NE" and "NO".

67. Norway used land-use categories and methodologies which are consistent with the IPCC good practice guidance for LULUCF. Norway used data from its national forest inventory (NFI) to establish the total area of forest land, cropland, grassland, wetlands, settlements and other land. These data, which have a five-year cycle starting from 1986, were supplemented by other statistical data, particularly data on agricultural areas collected by Statistics Norway.

68. In 2008, forest land covered 30 per cent of Norway's total land area, while 58 per cent was categorized as other land. The changes in the areas covered by the different land-use categories continue to be small. For instance, the area of forest land increased by only 2.3 per cent between 1990 and 2008; the areas of grassland and settlements slightly increased, while the areas of cropland and wetlands decreased over the same period. Norway has responded to a suggestion made in the previous review report by providing, in table 7.5 of the NIR, a preliminary calculation of the areas of other land that could be reclassified as another land type in future annual submissions, following the completion of an extension to the current NFI. Considering the proportion of Norway's land that is categorized as other land and the potential for some of this to become forest land, the ERT recommends that Norway continue its effort to improve the characterization of other land and encourages Norway to report on progress in this area in the NIR of its next annual submission.

69. Norway has improved its LULUCF inventory by updating AD for dead organic matter and soils and recalculating the time series. Some inconsistencies in the use of the notation keys have been noted. The ERT recommends that Norway select notation keys on the basis of the definitions given in the UNFCCC reporting guidelines and apply these selections consistently to the notation keys used in its CRF tables.

2. Key categories

Forest land remaining forest land – CO_2

70. Norway used a tier 3 stock change method to estimate the change in carbon stocks in living biomass, which is consistent with the IPCC good practice guidance for LULUCF. The method combines the use of data from the NFI with modelling. Norway used another tier 3 method for dead organic matter and soils, a dynamic soil model called Yasso. In response to recommendations made in previous review reports, Norway has improved the relevant section of its NIR by providing further information on this model, which it uses to describe the accumulation of deadwood and soil organic matter in forest soils. The NIR (section 3.1.1) provides a description of the model, including references to published scientific literature.

Cropland remaining cropland – CO_2

71. CO_2 emissions from soils in Norway occur mainly as a result of the cultivation of histosols (organic soils) and the application of lime to cropland soils (including liming of lakes). Norway assumed the total area of organic soils to be 85,000 ha, with improvements to this estimate planned to be reported in the next NIR. Of this total, Norway estimates that 10 per cent is found in cropland. In response to a recommendation made in the previous

review report, Norway has used a country-specific tier 2 method and national data to estimate the change in carbon stocks in organic soils. Citing a lack of the necessary data to move to tier 2, Norway continues to use a tier 1 method for estimating CO_2 emissions from liming. Norway has, however, improved this estimate in response to a recommendation made in the previous review report to explore using a tier 2 method by specifically defining the form of lime application (limestone) as well as applying a country-specific EF. The ERT commends Norway for the improvement in its reporting of this key category, while encouraging Norway to explore options for moving to a tier 2 method for estimating emissions from liming.

72. The ERT noted a problem with the use of the notation keys within this category. Norway has used the notation key "NE" for some categories, but responded to questions about this raised by the ERT by stating that the notation key should be changed to "NA" due to lack of data. The ERT noted that the notation key "NA" is inappropriate for instances where there is a lack of data. In this case, the notation key "NE" should be used, which Norway has done, but an indication of why emissions or removals have not been estimated should also be included in both the CRF tables and the NIR. The ERT recommends that Norway include these explanations in its next annual submission.

73. Norway reports the area of organic soils in CRF table 5.B as 8.5 kha for the entire time series. However, as reported under the agriculture sector (CRF table 4.D) this area has decreased over time from 8.5 kha to 7.0 kha. The ERT noted that it is possible that the agriculture sector tables draw from data that could be used to improve the accuracy of the estimates for this LULUCF key category. The ERT recommends that Norway compare data used to record changes in this area in CRF table 4.D and provide an explanation for this difference, and, if necessary, harmonize the reporting of this land area across the two sectors.

Grassland remaining grassland – CO_2

74. Norway reports net carbon stock change in organic soils as a constant value for the period 1990–2008 (–510.00 Gg C). Around 90 per cent of the organic soils used in agricultural production in Norway (76,500 ha) are assumed to be found in grassland. CO_2 emissions from histosols (organic soils) were considered to be a key category on the basis of the level and trend assessments. Therefore, the ERT recommends that Norway explain, in its next annual submission, why the net carbon stock change in organic soils (i.e. the loss of carbon) was constant from 1990 to 2008.

75. Norway used a tier 2 method, with country-specific EFs, to estimate CO_2 emissions from histosols. The country-specific EFs were stratified into high and mixed organic soils, with the corresponding values of 10 Mg C/ha/year and 5 Mg C/ha/year based on expert judgement. The IPCC default value for cold temperate climates is 1.0 Mg C/ha/year, which is considerably lower than the country-specific values applied by Norway. In response to a recommendation made in the previous review report, Norway has provided information supporting these values, including a comparison with values used by neighbouring countries. The ERT noted this new information as an improvement to the NIR.

Land converted to settlements – CO_2

76. CO_2 emissions from living biomass in forest land converted to settlements is considered to be a key category on the basis of the trend assessment. Norway used a tier 3 method (modelling) to estimate the carbon stock changes in living biomass for forest land converted to settlements. In response to a recommendation made in the previous review report, Norway has provided additional information on the model used to estimate the carbon stock changes in living biomass for this category.

3. Non-key categories

Land converted to forest land – CO_2

77. The ERT noted that the net carbon stock change in living biomass between 1999 (0.0019 Mg C/ha) and 2008 (0.143 Mg C/ha) is significant. The value for 2008 is 73 times higher than the value for 1999. The inter-annual changes for the entire 2000–2008 period are significant (18.8–174.6 per cent). Norway, during the review, responded to questions regarding these changes by stating that there were changes in the inventory method and variations in land conversion between forest inventories, as well as variations in ecological parameters and changes in land management. The ERT noted that this explanation is not specific enough to assess these changes relative to the causes. The ERT recommends that Norway explain in more detail, in the NIR of its the next annual submission, how the change in the inventory method influenced these fluctuations, as well as the contribution of this change in inventory method relative to the other causes listed.

Emissions from drainage of soils and wetlands – N_2O

78. Norway used the IPCC default EFs to estimate N_2O emissions from the drainage of soils and wetlands. The method used is consistent with the IPCC good practice guidance for LULUCF. The estimated emissions reported were from organic soils in forest land and peatland areas in wetlands. Norway has noted the potential importance of emissions from reservoirs. There is an ongoing national project (SINTEF and STATKRAFT) to estimate emissions from reservoirs, but Norway was unable to provide any additional information on the timing of expected results or reporting on these results. The ERT reiterates the recommendation made in the previous review report that Norway report on N_2O emitted from flooded lands (wetlands) as soon as data become available, and that Norway provide an update on the related projects and expected timelines in the NIR of its next annual submission.

Other land – CO_2

79. Norway assumed that all other land was unmanaged and that no carbon stock changes occurred. However, the ERT noted that land converted to unmanaged land requires the calculation of emissions and noted that it is good practice to estimate carbon stock changes for land converted from managed to unmanaged land. Norway has provided some supplementary information on carbon stock changes for forest land converted to other land and has stated that these carbon stock changes will be reported in the NIR of its next annual submission. The ERT recommends that Norway provide emission estimates for all categories of land conversions from managed to unmanaged lands in its next annual submission.

80. In response to recommendations made in the previous review report, Norway has provided additional information on current investigations into areas of land classified as other land that have the potential to be reclassified as another land type, including forest. The ERT welcomes this additional information and commends Norway for its efforts to improve its classification of land areas. However, since the accurate classification of forest land is a requirement for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, the ERT recommends that Norway continue to improve its classification of other land and report on additional progress in its next annual submission.

F. Waste

1. Sector overview

81. In 2008, emissions from the waste sector amounted to 1,215.13 Gg CO_2 eq, or 2.2 per cent of total GHG emissions. Since the base year, emissions have decreased by 33.2 per cent. The key driver for the fall in emissions is the drop in CH_4 emissions from solid waste disposal on land, owing mainly to measures implemented to reduce the amount of organic matter deposited and to increase the collection and destruction of landfill gas (CH_4). This effect was realized due to legislative and taxation policy applied in the country from 1999. Within the sector, 86.7 per cent of the emissions were from solid waste disposal on land, followed by 13.3 per cent from wastewater handling. The remaining 0.01 per cent was from waste incineration. In 2008, most of the sectoral emissions were CH_4, which accounted for 87.5 per cent, while N_2O accounted for 12.5 per cent of the sectoral emissions.

82. The CRF tables include estimates for most gases and categories of emissions from the waste sector for all years of the 1990–2008 period and the NIR provides detailed descriptions of all the categories estimated. Only N_2O emissions from industrial wastewater and sludge handling are reported as "NE", as there is no estimation methodology provided in the Revised 1996 IPCC Guidelines or the IPCC good practice guidance. The NIR is generally transparent; however, some references and actual values of EFs used are not shown. The CRF tables provided include some minor inconsistencies caused by the use of the notation keys.

83. Recalculations of estimated CH_4 emissions from solid waste disposal on land for the whole 1990–2007 period were reported in the CRF tables and described in the NIR. These recalculations were caused by the continuous process of improvement of Norway's waste statistics and by incorporating consistent modern and historical statistical AD for the category solid waste disposal on land.

84. According to page 264 of the Party's NIR, internal checks of the time series have been conducted as part of the category-specific QA/QC and verification procedures for the key category of solid waste disposal on land. The ERT asked the Party to provide copies of the archived documents prepared by the inventory agency which show the results of these internal checks of the time series. Norway did not submit such documents, explaining that these internal checks so far have not been documented. The ERT encourages Norway, as a part of its general QC procedures in line with chapter 8.10.1 of the IPCC good practice guidance, to document and archive all information required to produce the estimates in its national emissions inventory, including QA/QC plans and the outcomes of QA/QC procedures.

2. Key categories

Solid waste disposal on land – CH_4

85. The method and parameters used to estimate emissions for this category have been described in the NIR in a transparent manner. Norway used a combination of country-specific EFs and the IPCC default EFs for the calculation. Recalculations of CH_4 emissions from solid waste disposal on land, which were caused by the continuous process of improvement of Norway's waste statistics and incorporating consistent modern and historical statistical AD, were reported by the Party for the whole 1990–2007 period. The ERT welcomes the improvements in the accuracy of the AD for solid waste and encourages Norway to make further efforts in this direction.

86. In 2008, a total of 85 landfills had installed a landfill gas extraction system and approximately 22 Gg CH_4 had been recovered. Methane recovery units are reported by the

landfills via an electronic web portal to the Norwegian Climate and Pollution Agency database. During the review, the reference to this web portal was provided to the ERT. The ERT welcomes the efforts made by the Party to collect data on recovery and recommends that Norway include more detailed information on methane recovery units, information sources and references in the NIR of its next annual submission.

87. The collection and destruction of landfill gas (CH_4) by flaring and combustion with energy recovery is the main driver for the decrease in CH_4 emissions from solid waste disposal on land in Norway. During the review, the Party informed the ERT that it does not include landfill gas extracted, flared and combusted with energy recovery in the energy balance and that it does not cross-check with recovered amounts reported or employ other measures to check the consistency of these data. The ERT recommends that Norway develop a category-specific QC procedure for cross-checking and describe the results of this QC procedure in the NIR of its next annual submission.

88. Emissions of CH_4 from unmanaged solid waste disposal sites are reported in CRF table 6.A,C as "IE". However, the Party informed the ERT that there have been no unmanaged landfills since 1970. The ERT reiterates the suggestion made in the previous review report that the Party replace the notation key "IE" with "NO" for unmanaged waste disposal sites, both deep (>5 m) and shallow (<5 m), in CRF table 6.A,C.

89. The ERT noted that the inter-annual change in the CH_4 IEF between 2007 (0.125 t/t municipal solid waste (MSW)) and 2008 (0.118 t/t MSW) is relatively high compared with that for other Parties. The value for 2008 is 6.3 per cent lower than the value for 2007. The ERT noted that the CH_4 IEF for 2007 should have been 0.126 t/t MSW and for 2008 it should have been 0.120 t/t MSW, taking into account the information in the NIR. In response to a question raised by the ERT, Norway stated that there was a mistake in the reported emissions of CH_4 recovery for those years (for 2007 the estimate of emissions reported is 187 t lower than it should have been and for 2008, 1,700 t lower). The ERT recommends that the Party correct this mistake in its next annual submission. The ban on disposal of biodegradable waste in landfills has been gradually implemented since 2002, thus the number of landfills given exemption from the regulations has been continuously reduced. More biodegradable waste was sorted and sent for recovery in 2008 compared with in 2007.

Wastewater handling – N_2O

90. The NIR gives transparent information on the country-specific method, the sources of AD and the sources and values of the EFs used to estimate emissions for this category. Emissions of N_2O from domestic and commercial wastewater were calculated on the basis of the country-specific method, using data on population connected to large wastewater treatment plants. The emissions from human sewage not treated in treatment plants were estimated in accordance with the IPCC tier 1 method.

3. Non-key categories

Wastewater handling – CH_4

91. The IPCC default methodology was used to estimate CH_4 emissions from domestic wastewater and from industrial wastewater. The information provided in the NIR is limited. The ERT recommends that Norway improve the transparency of the assumptions on EFs for the category by providing the necessary information in the NIR.

92. It is stated in the NIR that there is CH_4 recovered from industrial wastewater, but in CRF table 6.B recovery from industrial and domestic wastewater is reported as "IE" and "NO". The ERT recommends that Norway revise this information and either change the

description in its NIR for this category or change the notation keys in the CRF tables in its next annual submission.

Waste incineration – CH_4 and N_2O

93. Waste incineration with energy recovery is reported by Norway under the energy sector in accordance with the Revised 1996 IPCC Guidelines. The emissions from hospital waste incineration, cremation and landfill gas flaring without energy recovery are reported under this category. For calculating the estimates, Norway used a method based on volume of incinerated material and EFs. Information on AD and EFs used is reported in the NIR; however, the references for EFs included in table 8.4 of the NIR are not included in the NIR. During the review, Norway provided the information that the EFs for landfill gas flaring are from the report "SFT 96:16 Utslipp ved håndtering av kommunalt avfall" (Emissions from handling of municipal waste), written by The Norske Veritas. References for the EFs for cremation were not submitted during the review. In order to improve the transparency of the emission estimates for this category, the ERT recommends that Norway provide the references mentioned, in the NIR of its next annual submission.

G. Supplementary information required under Article 7, paragraph 1, of the Kyoto Protocol

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

Overview

94. Norway has provided its definition of forest, including selections for all parameters required. Norway has elected the activity forest management under Article 3, paragraph 4, of the Kyoto Protocol, and has defined all forest as managed. It has elected commitment period accounting.

95. Norway bases its identification of lands subject to afforestation, reforestation and deforestation on data from the NFI, which has been carried out from 1986 to the present, and has clarified how the definitions of afforestation, reforestation and deforestation are applied to the NFI. All land-use changes to and from forest taking place after 1990 are considered human induced. Norway has not reported carbon stock changes individually for each of the five carbon pools, as required for all activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol. Norway currently reports land under the category other land that is likely to be reclassified as forest or other land uses in future inventories. It plans to report, by 2014, the results of a sampling project to more accurately identify land currently categorized as other. The ERT recommends that Norway report progress on this land identification project in every annual submission in order to ensure this information will meet the definition of the IPCC good practice guidance for LULUCF.

96. Norway has not included uncertainty estimates for these activities, noting that these will be prepared for the annual submission in 2014. According to the IPCC good practice guidance for LULUCF, uncertainty estimates should be included in the annual inventory during the first commitment period. The ERT recommends that Norway include the results of a corresponding uncertainty analysis in its next annual submission.

97. Norway's land-use transition matrix is based on changes in the land-use classes of the sample plots surveyed in the NFI in a given year. It uses a 20-year approach to land-use class transitions. In several instances, Norway has used the notation key "NA" in the CRF tables for KP-LULUCF where information is not available. The ERT recommends that Norway improve its use of the notation keys and, when the notation key "NE" is used,

provide additional information in the CRF tables and the NIR on why the information is not included.

Activities under Article 3, paragraph 3, of the Kyoto Protocol

Afforestation and reforestation – CO_2, CH_4 and N_2O

98. In line with the reporting requirements for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, Norway used a tier 3 methodology to estimate the carbon stock changes in living biomass in land converted to forest land, and thus also for afforestation and reforestation. However, as noted in paragraph 95 above, Norway does not provide estimates for the carbon pools litter, deadwood and soils, as these estimates are included in the estimates for forest management, owing to a lack of the information needed to disaggregate the data for these pools between the activities.

99. In response to a question raised by the ERT during the review, Norway provided preliminary estimates for carbon stock changes in soils and deadwood and plans for obtaining final estimates for carbon stock changes in soils and deadwood (and litter) for the annual submission in 2014. The ERT noted this information and concluded that these preliminary estimates are acceptable as of during the review. The ERT strongly recommends that Norway continue its exploration of methods to disaggregate the results for the five carbon pools, and that it provide, in the NIR of its next annual submission, the information which it provided during the review week and any further update on the process relating to lands subject to afforestation, reforestation and deforestation, even though, in the next annual submission, it would still be preliminary information only.

Deforestation – CO_2, CH_4 and N_2O

100. Norway has provided information on the identification of lands subject to deforestation and how deforestation will be distinguished from other disturbances. As the information on the activity of deforestation overlaps with several subcategories under the Convention reporting (forest land converted to cropland, forest land converted to grassland, forest land converted to settlements, and forest land converted to other land), and only one of these subcategories is a key category (forest land converted to settlements), the tier of the estimation methods among the subcategories varies and Norway used a tier 1 method to estimate emissions from deforestation.

101. In addition, Norway does not provide estimates for the carbon pools litter, deadwood and soils for lands subject to deforestation, as these estimates are included under these pools for forest management, due to a lack of the information needed to disaggregate the data for these pools between the activities. In response to a question raised by the ERT during the review week, Norway provided plans for obtaining final estimates for carbon stock changes in soils and deadwood (and litter) for the annual submission in 2014, and preliminary estimates for carbon stock changes in soils and deadwood. The ERT noted this information and concluded that these preliminary estimates are acceptable as of during the review. The ERT strongly recommends that Norway continue its exploration of methods to disaggregate the results for the five carbon pools, and that it provide, in the NIR of its next annual submission, the information which it provided during the review week and any further an update on the process relating to lands subject to afforestation, reforestation and deforestation, even though, in the next annual submission, it would still be preliminary information only.

Activities under Article 3, paragraph 4, of the Kyoto Protocol

Forest management – CO_2, CH_4 and N_2O

102. Norway notes that all forests are subject to forest management and that therefore this activity is the same as the subcategory forest land remaining forest land under the Convention reporting, which is a key category and estimated using a tier 3 method. Norway reports all five carbon pools for this activity; however, the estimates include carbon stock changes in lands subject to afforestation, reforestation and deforestation, which cannot be disaggregated due to a technical limitation. As mentioned in paragraphs 99 above, the ERT strongly recommends that Norway continue its exploration of methods to disaggregate the results for the five carbon pools, and that it provide, in the NIR of its next annual submission, the information which it provided during the review week and any further update on the process relating to lands subject to afforestation, reforestation and deforestation, even though, in the next annual submission, it would still be preliminary information only.

2. Information on Kyoto Protocol units

Standard electronic format and reports from the national registry

103. Norway has reported information on its accounting of Kyoto Protocol units in the required SEF tables, as required by decisions 15/CMP.1 and 14/CMP.1. The ERT took note of the findings included in the SIAR on the SEF tables and the SEF comparison report.[6] The SIAR was forwarded to the ERT prior to the review, pursuant to decision 16/CP.10. The ERT reiterated the main findings contained in the SIAR.

104. Information on the accounting of Kyoto Protocol units has been prepared and reported in accordance with chapter I.E of the annex to decision 15/CMP.1, and reported in accordance with decision 14/CMP.1 using the SEF tables. This information is consistent with that contained in the national registry and with the records of the international transaction log (ITL) and the clean development mechanism registry and meets the requirements set out in paragraph 88(a–j) of the annex to decision 22/CMP.1. The transactions of Kyoto Protocol units initiated by the national registry are in accordance with the requirements of the annex to decision 5/CMP.1 and the annex to decision 13/CMP.1. No discrepancy has been identified by the ITL and no non-replacement has occurred. The national registry has adequate procedures in place to minimize discrepancies.

National registry

105. The ERT took note of the SIAR and its finding that the reported information on the national registry is complete and has been submitted in accordance with the annex to decision 15/CMP.1. The ERT also took note of the SIAR and its finding that the national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1, and continues to adhere to the technical standards for data exchange between registry systems in accordance with decisions 16/CP.10 and 12/CMP.1. The national registry also has adequate security, data safeguard and disaster recovery measures in place and its operational performance is adequate.

[6] The SEF comparison report is prepared by the ITL administrator and provides information on the outcome of the comparison of data contained in the Party's SEF tables with corresponding records contained in the ITL.

Calculation of the commitment period reserve

106. Norway has reported its commitment period reserve in its 2010 annual submission. Norway reported that its commitment period reserve has not changed since the initial report review (225,519,117 t CO_2 eq), as it is based on the assigned amount and not on the most recently reviewed inventory. The ERT agrees with this figure.

3. Changes to the national system

107. Norway reported that there are changes in its national system since the previous annual submission. The Party reported the following changes in the national system:

(a) The national entity with overall responsibility for the inventory and reporting has changed its name from the Norwegian Pollution Control Authority to the Climate and Pollution Agency;

(b) The inventory production plan has been changed;

(c) The description of the LULUCF model in section 4.5 of annex IV to the NIR has been changed to reflect further development of the model since 2006.

108. The ERT concluded that the Party's national system continues to be in accordance with the requirements of national systems outlined in decision 19/CMP.1.

4. Changes to the national registry

109. Norway reported that there are changes in its national registry since the previous annual submission. The Party reported the following changes in the national registry:

(a) The secondary contact for the national registry was changed;

(b) The IT supplier was changed;

(c) Software changes were implemented.

110. The ERT concluded that the Party's national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1, and continues to adhere to the technical standards for data exchange between registry systems in accordance with relevant decisions of the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol (CMP).

5. Minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol

111. Norway has reported information on the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol, as requested in chapter I.H of the annex to decision 15/CMP.1, in its 2010 annual submission. The reported information is considered complete and transparent.

112. Norway reports the information in the context of its economic, energy and environmental policy, through which Norway strives to have a market-based approach, where prices reflect costs, including externalities. With regard to GHG emissions, the costs of externalities are reflected through the use of levies and the establishment of the emissions trading scheme. These instruments put a price on GHG emissions.

113. An important issue reported by Norway is the development of carbon capture and storage as a mitigation option. As a petroleum producer, Norway strives to reduce the emissions from the production and refining of petroleum. Two national carbon capture and storage projects are already in operation and one has been newly approved. Norway has taken steps to disseminate information and lessons learned. These efforts are made both

through international forums, such as the Carbon Sequestration Leadership Forum, and through bilateral cooperation with both developing and developed countries.

114. In the field of cooperation with developing countries, Norway describes its "Norwegian Oil for Development" initiative, which aims to assist developing countries, upon their request, in their efforts to manage petroleum resources in a way that generates economic growth and promotes the welfare of the whole population in an environmentally sustainable way.

III. Conclusions and recommendations

115. Norway made its annual submission on 15 April 2010. The annual submission contains the GHG inventory (comprising CRF tables and an NIR) and supplementary information under Article 7, paragraph 1, of the Kyoto Protocol (information on: activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, Kyoto Protocol units, changes to the national system and the national registry, and the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol). This is in line with decision 15/CMP.1.

116. The ERT concludes that the inventory submission of Norway has been prepared and the information reported in accordance with the UNFCCC reporting guidelines. The inventory submission is complete and the Party has submitted a complete set of CRF tables for the years 1990–2008 and an NIR; these are complete in terms of geographical coverage, years and sectors, and mostly complete in terms of categories and gases. A few categories, particularly in the LULUCF sector and one category in the waste sector, were reported as "NE".

117. The information required under Article 7, paragraph 1, of the Kyoto Protocol has been prepared and reported in accordance with decision 15/CMP.1.

118. The Party's inventory is generally in line with the UNFCCC reporting guidelines, the Revised 1996 IPCC Guidelines, the IPCC good practice guidance and the IPCC good practice guidance for LULUCF. When the Party implements the major recommendations described in paragraph 26 above, its inventory will be fully in line with those guidelines and guidance.

119. The ERT concluded that Norway's annual submission on KP-LULUCF is in accordance with the requirements of paragraphs 5 to 9 of the annex to decision 15/CMP.1. However, the Party will remain unable to fully meet the requirements of KP-LULUCF accounting until its annual submission in 2014, when it will have fully implemented its improvements to the characterization of other land (see para. 95 above) and when it will be able to estimate independently all five carbon pools for KP-LULUCF activities (see paras. 99, 101 and 102 above).

120. Norway has reported information on its accounting of Kyoto Protocol units in accordance with chapter I.E of the annex to decision 15/CMP.1, and used the required reporting format tables as required by decision 14/CMP.1.

121. The national system continues to perform its required functions as set out in the annex to decision 19/CMP.1.

122. The national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1, and continues to adhere to the technical standards for data exchange between registry systems in accordance with relevant decisions of the CMP.

123. Norway has reported the information requested in chapter I.H of the annex to decision 15/CMP.1, "Minimization of adverse impacts in accordance with Article 3, paragraph 14", as part of its 2010 annual submission. The reported information is considered complete and transparent.

124. In the course of the review, the ERT formulated a number of recommendations relating to the completeness of the annual submission (including information under Article 7, paragraph 1) and the transparency of the information presented in Norway's annual submission. The key recommendations are that Norway:

(a) Update the uncertainty analysis (see para. 17 above);

(b) Provide rationale for the recalculations (see para. 18 above);

(c) Improve the transparency of the description of methods used in the industrial processes sector and the explanation of the NH_3 model used in the agriculture sector;

(d) Implement the plan to undertake a project to understand the differences between the reference approach and the sectoral approach for fuel combustion, identify any problems with the data on fuel or carbon content, and correct the reference approach and/or the sectoral approach on the basis of this analysis (see para. 31 above);

(e) Investigate the treatment and allocation of CO gas used for fuel combustion under the chemicals category and provide more detailed documentation in the NIR (see para. 34 above);

(f) Improve the characterization of other land for both the LULUCF sector and the information on activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol (see paras. 68 and 95 above);

(g) Estimate all five carbon pools independently for each KP-LULUCF activities (see paras. 99, 101 and 102 above);

(h) Use the appropriate notation keys (see paras. 72, 88 and 97 above).

IV. Questions of implementation

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

Annex I

Documents and information used during the review

A. Reference documents

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

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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>.

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FCCC/ARR/2009/NOR. Report of the individual review of the annual submission of Norway submitted in 2009. Available at <http://unfccc.int/resource/docs/2009/arr/nor.pdf>.

UNFCCC. *Standard independent assessment report*, parts I and II. Available at <http://unfccc.int/kyoto_protocol/registry_systems/independent_assessment_reports/items/4061.php>.

B. Additional information provided by the Party

Responses to questions during the review were received from Mr. Eilev Gjerald (Norwegian Pollution Control Authority), including additional material on the methodologies and assumptions used.

Annex II

Acronyms and abbreviations

AD	activity data
CH_4	methane
CMP	Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol
CO_2	carbon dioxide
CO_2 eq	carbon dioxide equivalent
CRF	common reporting format
EF	emission factor
ERT	expert review team
GHG	greenhouse gas; unless indicated otherwise, GHG emissions are the sum of CO_2, CH_4, N_2O, HFCs, PFCs and SF_6 without GHG emissions and removals from LULUCF
HFCs	hydrofluorocarbons
IE	included elsewhere
IEA	International Energy Agency
IEF	implied emission factor
IPCC	Intergovernmental Panel on Climate Change
ITL	international transaction log
kg	kilogram (1 kg = 1,000 grams)
KP-LULUCF	land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol
LULUCF	land use, land-use change and forestry
Mg	megagram (1 Mg = 1 tonne)
MSW	municipal solid waste
N	nitrogen
NA	not applicable
NE	not estimated
NIR	national inventory report
NO	not occuring
N_2O	nitrous oxide
PFCs	perfluorocarbons
QA/QC	quality assurance/quality control
SEF	standard electronic format
SF_6	sulphur hexafluoride
SIAR	standard independent assessment report
TJ	terajoule (1 TJ = 10^{12} joule)
TiO_2	titanium dioxide
UNFCCC	United Nations Framework Convention on Climate Change