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Report on the individual review of the annual submission of Norway submitted in 2018*

Note by the expert review team

Summary

Each Party included in Annex I to the Convention must submit an annual greenhouse gas inventory covering emissions and removals of greenhouse gas emissions for all years from the base year (or period) to two years before the inventory due date (decision 24/CP.19). Parties included in Annex I to the Convention that are Parties to the Kyoto Protocol are also required to report supplementary information under Article 7, paragraph 1, of the Kyoto Protocol with the inventory submission due under the Convention. This report presents the results of the individual inventory review of the 2018 annual submission of Norway, conducted by an expert review team in accordance with the "Guidelines for review under Article 8 of the Kyoto Protocol". The review took place from 17 to 22 September 2018 in Oslo.

* In the symbol for this document, 2018 refers to the year in which the inventory was submitted, not to the year of publication.

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Contents

Abbreviations and acronyms

2006 IPCC Guidelines	*2006 IPCC Guidelines for National Greenhouse Gas Inventories*
AAU	assigned amount unit
AD	activity data
Annex A sources	source categories included in Annex A to the Kyoto Protocol
AR	afforestation and reforestation
ARR	annual review report
Article 8 review guidelines	"Guidelines for review under Article 8 of the Kyoto Protocol"
C	carbon
CCS	carbon dioxide capture and storage
CER	certified emission reduction
CH_4	methane
CM	cropland management
CO_2	carbon dioxide
CO_2 eq	carbon dioxide equivalent
CPR	commitment period reserve
CRF	common reporting format
C3F8	octafluoropropane
DOM	dead organic matter
EF	emission factor
ERT	expert review team
ERU	emission reduction unit
EU ETS	European Union Emissions Trading System
FAO	Food and Agriculture Organization of the United Nations
FM	forest management
FMRL	forest management reference level
GE	gross energy
GHG	greenhouse gas
GM	grazing land management
HFC	hydrofluorocarbon
ICP	International Co-operative Programme on Assessment and Monitoring of Air Pollution Effects on Forests operating under the UNECE Convention on Long-range Transboundary Air Pollution
IE	included elsewhere
IEA	International Energy Agency
IEF	implied emission factor
IPCC	Intergovernmental Panel on Climate Change
IPPU	industrial processes and product use
KP-LULUCF activities	activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol
Kyoto Protocol Supplement	*2013 Revised Supplementary Methods and Good Practice Guidance Arising from the Kyoto Protocol*
LECA	lightweight expanded clay aggregate
LPG	liquefied petroleum gas
LULUCF	land use, land-use change and forestry
MCF	methane correction factor
N	nitrogen
NA	not applicable
NE	not estimated
NEA	Norwegian Environment Agency

NEU	non-energy use
NF_3	nitrogen trifluoride
NIBIO	Norwegian Institute of Bioeconomy Research
NIR	national inventory report
N_2O	nitrous oxide
NO	not occurring
NPD	Norwegian Petroleum Directorate
PFC	perfluorocarbon
QA/QC	quality assurance/quality control
RMU	removal unit
RV	revegetation
SEF	standard electronic format
SF_6	sulfur hexafluoride
SN	Statistics Norway
SOC	soil organic carbon
SOC_{REF}	reference soil organic carbon stocks
SOM	soil organic matter
SWDS	solid waste disposal sites
TINE	Norwegian Dairy Product Cooperative
UNFCCC Annex I inventory reporting guidelines	"Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual greenhouse gas inventories"
UNFCCC review guidelines	"Guidelines for the technical review of information reported under the Convention related to greenhouse gas inventories, biennial reports and national communications by Parties included in Annex I to the Convention"
WDR	wetland drainage and rewetting
Wetlands Supplement	*2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands*
WWTP	wastewater treatment plants
Ym	methane conversion factor

I. Introduction[1]

1. This report covers the review of the 2018 annual submission of Norway organized by the secretariat in accordance with the Article 8 review guidelines (adopted by decision 22/CMP.1 and revised by decision 4/CMP.11). In accordance with the Article 8 review guidelines, this review process also encompasses the review under the Convention as described in the UNFCCC review guidelines, particularly in part III thereof, namely the "UNFCCC guidelines for the technical review of greenhouse gas inventories from Parties included in Annex I to the Convention" (decision 13/CP.20). The review took place from 17 to 22 September 2018 in Oslo and was coordinated by Mr. Vitor Góis Ferreira (secretariat). Table 1 provides information on the composition of the ERT that conducted the review of Norway.

Table 1
Composition of the expert review team that conducted the review of Norway

Area of expertise	*Name*	*Party*
Generalist	Mr. Glen Thistlethwaite	United Kingdom of Great Britain and Northern Ireland
Energy	Mr. Haakon Marold	Australia
IPPU	Ms. Mausami Desai	United States of America
Agriculture	Mr. Braulio Pikman	Brazil
LULUCF	Mr. Sandro Federici	San Marino
Waste	Mr. Sabin Guendehou	Benin
Lead reviewers	Mr. Guendehou	
	Mr. Thistlethwaite	

2. The basis of the findings in this report is the assessment by the ERT of the Party's 2018 annual submission in accordance with the Article 8 review guidelines. The ERT notes that the individual inventory review of Norway's 2017 annual submission did not take place during 2017 owing to insufficient funding for the review process.

3. The ERT has made recommendations that Norway resolve the findings related to issues,[2] including issues designated as problems.[3] Other findings, and, if applicable, the encouragements of the ERT to Norway to resolve them, are also included.

4. 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.

5. Annex I shows annual GHG emissions for Norway, including totals excluding and including the LULUCF sector, indirect CO_2 emissions and emissions by gas and by sector. Annex I also contains background data related to emissions and removals from KP-LULUCF activities, if elected, by gas, sector and activity for Norway.

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

[1] At the time of publication of this report, Norway had submitted its instrument of ratification of the Doha Amendment; however, the Amendment had not yet entered into force. The implementation of the provisions of the Doha Amendment is therefore considered in this report in the context of decision 1/CMP.8, paragraph 6, pending the entry into force of the Amendment.

[2] Issues are defined in decision 13/CP.20, annex, paragraph 81.

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

II. Summary and general assessment of the 2018 annual submission

7. Table 2 provides the assessment by the ERT of the annual submission with respect to the tasks undertaken during the review. Further information on the issues identified, as well as additional findings, may be found in tables 3 and 5.

Table 2
Summary of review results and general assessment of the inventory of Norway

Assessment			*Issue or problem ID#(s) in table 3 and/or 5*[a]
Date of submission	Original submission: 13 April 2018 (NIR), 13 April 2018, version 1 (CRF tables), 13 April 2018 (SEF-CP1-2017 and SEF-CP2-2017)		
Review format	In country		
Application of the requirements of the UNFCCC Annex I inventory reporting guidelines and Wetlands Supplement (if applicable)	1. Have any issues been identified in the following areas:		
	(a) Identification of key categories	No	
	(b) Selection and use of methodologies and assumptions	Yes	L.12, L.17
	(c) Development and selection of EFs	Yes	E.35, E.37, I.27, L.13, L.14, L.17, L.18, L.19, L.20, W.15, KL.6
	(d) Collection and selection of AD	Yes	G.9, G.10, E.2, E.3, E.4, E.6, E.20, E.34, I.24, L.7, L.8
	(e) Reporting of recalculations	No	
	(f) Reporting of a consistent time series	Yes	L.7, L.9, KL.3
	(g) Reporting of uncertainties, including methodologies	Yes	G.11, A.6
	(h) QA/QC	QA/QC procedures were assessed in the context of the national system (see para. 2 in this table)	
	(i) Missing categories/completeness[b]	Yes	E.39, L.21, W.12, W.14, W16, KL.9
	(j) Application of corrections to the inventory	No	
Significance threshold	For categories reported as insignificant, has the Party provided sufficient information showing that the likely level of emissions meets the criteria in paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines?	No	L.11, W.14, W.17
Description of trends	Did the ERT conclude that the description in the NIR of the trends for the different gases and sectors is reasonable?	Yes	
Supplementary information under the Kyoto Protocol	2. Have any issues been identified related to the national system:		
	(a) The overall organization of the national system, including the effectiveness and reliability of the institutional, procedural and legal arrangements	Yes	G.8

Assessment			*Issue or problem ID#(s) in table 3 and/or 5*[a]
	(b) Performance of the national system functions	Yes	G.9, G.10
	3. Have any issues been identified related to the national registry:		
	(a) Overall functioning of the national registry	No	
	(b) Performance of the functions of the national registry and the technical standards for data exchange	No	
	4. Have any issues been identified related to reporting of information on ERUs, CERs, AAUs and RMUs and on discrepancies reported in accordance with decision 15/CMP.1, annex, chapter I.E, in conjunction with decision 3/CMP.11, taking into consideration any findings or recommendations contained in the standard independent assessment report?	No	
	5. Have any issues been identified in matters related to Article 3, paragraph 14, of the Kyoto Protocol, specifically problems related to the transparency, completeness or timeliness of reporting on the Party's activities related to the priority actions listed in decision 15/CMP.1, annex, paragraph 24, in conjunction with decision 3/CMP.11, including any changes since the previous annual submission?	No	
	6. Have any issues been identified related to the reporting of LULUCF activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, as follows:		
	(a) Reporting requirements in decision 2/CMP.8, annex II, paragraphs 1–5	No	
	(b) Demonstration of methodological consistency between the reference level and reporting on FM in accordance with decision 2/CMP.7, annex, paragraph 14	No	
	(c) Reporting requirements of decision 6/CMP.9	No	
	(d) Country-specific information to support provisions for natural disturbances, in accordance with decision 2/CMP.7, annex, paragraphs 33 and 34	NA	
CPR	Was the CPR reported in accordance with the annex to decision 18/CP.7, the annex to decision 11/CMP.1 and decision 1/CMP.8, paragraph 18?	Yes	
Adjustments	Has the ERT applied an adjustment under Article 5, paragraph 2, of the Kyoto Protocol?	No	
	Did the Party submit a revised estimate to replace a previously applied adjustment?	NA	Party does not have a previously applied adjustment
Response from the Party during the review	Has the Party provided the ERT with responses to the questions raised, including the data and information necessary for the assessment of conformity with the UNFCCC Annex I inventory reporting guidelines and any further guidance adopted by the Conference of the Parties?	Yes	

Assessment			*Issue or problem ID#(s) in table 3 and/or 5*[a]
Recommendation for an exceptional in-country review	On the basis of the issues identified, does the ERT recommend that the next review be conducted as an in-country review?	No	
Question of implementation	Did the ERT list any question of implementation?	No	

[a] The ERT identified additional issues and/or problems in all sectors that are not listed in this table but are included in table 3 and/or 5.

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

III. Status of implementation of issues and/or problems raised in the previous review report

8. Table 3 compiles all the recommendations made in previous review reports that were included in the previous review report, published on 27 March 2017.[4] For each issue and/or problem, the ERT specified whether it believes the issue and/or problem has been resolved by the conclusion of the review of the 2018 annual submission and provided the rationale for its determination, which takes into consideration the publication date of the previous review report and national circumstances.

Table 3
Status of implementation of issues and/or problems raised in the previous review report of Norway

ID#	*Issue and/or problem classification*[a, b]	*Recommendation made in previous review report*	*ERT assessment and rationale*
General			
G.1	QA/QC and verification (G.13, 2016) (G.13, 2015) Transparency	Update NIR figure 1.1 on "Overview of institutional responsibilities and cooperation" in order to give an accurate picture of QA responsibilities.	Resolved. The 2018 NIR (figure 1.1) presents an accurate overview of the QA/QC responsibilities, with further details provided in the NIR (section 1.2.3 and annex V).
G.2	QA/QC and verification (G.14, 2016) (G.14, 2015) Transparency	Update the information in the NIR regarding government audits of facilities included in the EU ETS.	Resolved. Text additional to that provided in the 2016 NIR was added in annex V, section 6.4.1, of the NIR, explaining the QA procedures for facilities within the EU ETS.
G.3	QA/QC and verification (G.15, 2016) Adherence to the UNFCCC Annex I inventory reporting guidelines	Correct the identified errors in NIR table 1.1 and the inconsistency between NIR table 10.4 and CRF table 10s6.	Addressing. The NIR table 1.1 headings are now correct. However, inconsistencies remain between the data presented on the reported trends by gas for 1990–2015 in NIR table 10.7 (formerly table 10.4) and CRF tables 10. The ERT notes that all data in the "Previous submission" row of NIR table 10.7 are correct, but that some data in the "This submission" row are incorrect. The ERT calculated the trends in emission data excluding LULUCF for 1990–2015 in the latest submission, which differ from the data presented in NIR table 10.7. The correct values to be reported are CO_2, +25.09 per cent;

[4] FCCC/ARR/2016/NOR. The ERT notes that the individual inventory review of Norway's 2017 annual submission did not take place during 2017. As a result, the latest published ARR reflects the findings of the review of the Party's 2016 annual submission.

ID#	*Issue and/or problem classification*[a, b]	*Recommendation made in previous review report*	*ERT assessment and rationale*
			CH_4, –10.80 per cent; N_2O, –38.36 per cent; and HFCs, +2,808,391.00 per cent.
G.4	Inventory management (G.18, 2016) (G.17, 2015) Transparency	Remove from the NIR the outdated reference to the improvements made to archiving procedures.	Resolved. The outdated reference to improvements to archiving procedures have been removed from the NIR (p.14).
G.5	Significance threshold (G.19, 2016) Completeness	Accurately assess whether a category is insignificant in accordance with the procedures set out in decision 24/CP.19, annex I, paragraph 37(b), using the national totals in the latest annual submission, without LULUCF and including indirect CO_2 emissions.	Resolved. Norway reports that the significance threshold was calculated using 2016 annual emissions, excluding LULUCF emissions of 53,242.5 kt CO_2 eq (NIR, p.29). The assessment of the significance threshold is therefore accurate.
G.6	Key category analysis (G.21, 2016) (G.20, 2015) Adherence to the UNFCCC Annex I inventory reporting guidelines	Report the key category analysis in accordance with the 2006 IPCC Guidelines (volume 1, table 4.9) and use the appropriate term "approach" instead of "tier" to report the key category analysis in a transparent way.	Resolved. The terminology in annex 1 on key category analysis has been revised, and cumulative columns have been included in NIR tables AI-3–6.
G.7	Other (G.24, 2016) (G.23, 2015) Transparency	Provide a transparent description of the reporting of indirect N_2O emissions in the NIR (including the information that only indirect N_2O emissions from the energy and IPPU sectors are included in the memo items and that the agriculture sector is treated differently).	Resolved. A description of the scope of the reporting of indirect N_2O emissions is included in the NIR (section 9.1), including the information that indirect N_2O emissions from the energy, IPPU and waste sectors, as well as from the burning of crop residues, are included as memo items, while indirect emissions from other categories in the agriculture sector are included in the national totals.
Energy			
E.1	1. General (energy sector) – all fuels – CH_4 and N_2O (E.1, 2016) (E.1, 2015) (21, 2014) (19, 2013) Transparency	Report the CH_4 and N_2O EFs in energy units in the NIR.	Resolved. In the NIR (section 3.2.1.3), all factors are now given on an energy (per TJ) basis.
E.2	Fuel combustion – reference approach – all fuels – CO_2 (E.2, 2016) (E.2, 2015) (26, 2014) Accuracy	Continue work to analyse the reasons for the differences between the reference and sectoral approach.	Addressing. The NIR (section 3.6.2) provides information on the work undertaken on energy statistics to date by SN in order to reduce statistical differences in the energy balance. The ERT notes, however, delays in these plans. SN published a revised energy balance in June 2017 covering only 2010–2016, but the revised energy balance data for before 2016 were not calculated and published on the same timescale. Consequently, none of the revised energy balance data (for 2010–2016) were incorporated into the inventory for the 2018 submission. During the review week, Norway clarified that research is ongoing to further improve the new energy balance data in order to derive a full, consistent time series of data for 1990–2017

ID#	Issue and/or problem classification[a, b]	Recommendation made in previous review report	ERT assessment and rationale
			ahead of the 2019 submission (see ID#s G.9, G.10 and E.33 in table 5).
E.3	Fuel combustion – reference approach – solid fuels – CO_2 (E.4, 2016) (E.4, 2015) (26, 2014) Accuracy	Improve the data-collection procedures for solid fuels (coal and coke oven coke).	Not resolved. Solid fuels were not prioritized in the ongoing project by SN to produce a new energy balance.
E.4	Fuel combustion – reference approach – all fuels – CO_2 E.16, 2016) (E.16, 2015) Accuracy	Continue to implement improvements to reduce the differences between the reference and the sectoral approach and provide in the NIR a detailed account of the measures that have been undertaken.	Addressing. This issue is being addressed by SN through the ongoing project to produce a new energy balance to underpin the estimation of emissions across the energy sector (discussed in NIR section 3.6.2), but not all improvements have been implemented (see ID#s E.2 above and G.8 and E.34 in table 5).
E.5	Fuel combustion – reference approach – solid fuels – CO_2 (E.17, 2016) (E.17, 2015) Transparency	Report on the time frame and progress of the revised energy balance system, highlighting the resulting reduction in statistical differences for solid fuels.	Addressing. Time frames for the implementation of the new energy balance are discussed in the NIR (section 3.6.2). However, information on the progress on reducing statistical differences for solid fuels, which (as noted in ID# E.3 above) has not been prioritized to date in the ongoing project to improve the energy balance, is not specifically reported.
E.6	Comparison with international data – all fuels – CO_2 (E.5, 2016) (E.5, 2015) (26, 2014) Accuracy	Continue the work to analyse the reasons for the differences between the inventory and IEA statistics.	Addressing. SN is addressing this issue through the ongoing project to produce a new energy balance to underpin the estimation of emissions across the energy sector (discussed in NIR section 3.6.2), but not all improvements have been implemented (see ID#s E.2 above and G.8 and E.34 in table 5).
E.7	Comparison with international data – all fuels – CO_2, CH_4 and N_2O (E.18, 2016) (E.18, 2015) Comparability	Transparently describe the technical solution that aims to improve the consistency between the energy balance and the IEA reporting, including by providing any preliminary results in the submission, and then improve the alignment of the energy balance and the IEA reporting.	Addressing. The NIR (section 3.6.2) presents an overview of the project to improve energy data and the reconciliation between the energy balance used for the inventory and that reported to IEA. This includes a section on the new platform for the energy balance and energy accounts (NIR, p.176). During the review, SN explained that the new platform will comprise a common energy data set with different output queries to deliver the reporting outputs needed for the inventory, IEA and other uses (e.g. national accounts). The system will include mapping tables to link core energy data to outputs, and the ERT understands that this new system will facilitate analysis and transparent documentation of differences between the inventory energy balance and IEA statistics. The ERT notes that, in the 2018 submission, no progress had been made on improving the alignment of the energy balance with the IEA reporting. During the review week, SN clarified that this project is ongoing, and that the new

ID#	*Issue and/or problem classification*[a, b]	*Recommendation made in previous review report*	*ERT assessment and rationale*
			energy platform will be used for the 2019 submission.
E.8	Comparison with international data – liquid fuels – CO_2 (E.19, 2016) (E.19, 2015) Comparability	Finalize the revision of methods for the allocation of jet kerosene to domestic and international consumption and report consistent data for residual fuel oil and gas/diesel oil used for international bunkers.	Resolved. Revised data for residual fuel oil and gas/diesel oil are consistently reported in CRF tables 1.A(b) and 1.D.
E.9	Feedstocks, reductants and other NEU of fuels – liquid fuels – CO_2 (E.6, 2016) (E.6, 2015) (29, 2014) Transparency	Document in the NIR the approach used to estimate CO_2, CH_4 and N_2O emissions from feedstocks and NEU of lubricants, gasoline, residual fuel oil and gas/diesel oil for the entire time series and report in CRF table 1.A(d) where the emissions are included.	Addressing. NIR sections 3.2.11 and 3.6.3 provide information on emissions from feedstocks and NEU of petroleum products. The ERT notes that the 2018 NIR also includes text on the AD and EFs used for NEU of gas/diesel oil, gasoline and residual fuel oil, as well as for lubricants. However, the ERT also notes that Norway did not transparently report the emissions from these NEU sources in CRF table 1.A(d), in which "associated CO_2 emissions" are reported as "NE" for lubricants and gas/diesel oil and as "NO" for gasoline and residual fuel oil, and no information is provided in the "reported under" column.
E.10	Feedstocks, reductants and other NEU of fuels – liquid fuels – CO_2 (E.7, 2016) (E.7, 2015) (29, 2014) Comparability	Improve QC procedures to ensure the consistency of the information reported on feedstocks, reductants and NEU in different CRF tables.	Not resolved. As noted in ID# E.9 above, CRF table 1.A(d) does not include complete information regarding the estimated emissions and the reporting allocations for emissive components of NEU of fuels. This reporting does not enable the ERT to assess the consistency of the reporting on feedstocks, reductants and NEU in other CRF tables in the energy and IPPU sectors, such as the emissions reported under category 1.A.5 in CRF table 1.A(a)s4. Therefore, until the transparency issue referred to above is addressed, the ERT considers this issue not to have been resolved.
E.11	Feedstocks, reductants and other NEU of fuels – gaseous, liquid and solid fuels – CO_2 (E.8, 2016) (E.8, 2015) (30, 2014) (27, 2013) (60, 2012) Comparability	Review and revise the reporting in CRF table 1.A(d) and improve QC procedures to ensure the consistency of the reporting.	Not resolved. The ERT notes that Norway reports a quantity of fuel used for NEU for other bituminous coal, LPG and petroleum coke, but reports CO_2 emissions from the NEU of these fuels as "NE" in CRF table 1.A(d) and does not specify in the "Reported under" column where the emissions from the NEU of these fuels are included in the inventory.
E.12	Feedstocks, reductants and other NEU of fuels – gaseous, liquid and solid fuels – CO_2 (E.9, 2016) (E.9, 2015) (30, 2014) (27, 2013) (60, 2012) Transparency	Provide in the NIR, for fuels for which the fraction of carbon stored is smaller than 1.00, balances showing that all NEU of fuels is accounted for under the IPPU sector.	Addressing. The NIR (section 3.2.11) provides information on some fuels for which the fraction of carbon stored is smaller than 1. However, for other fuels where part of the NEU is accounted for under IPPU, no information is provided.

ID#	*Issue and/or problem classification*[a, b]	*Recommendation made in previous review report*	*ERT assessment and rationale*
E.13	Feedstocks, reductants and other NEU of fuels – liquid fuels – CO_2 (E.20, 2016) (E.20, 2015) Transparency	Report on the time frame and progress of the revised energy balance system, including any improvements in the consistency of the information on feedstocks, reductants and NEU of fuels reported in the CRF tables.	Resolved. Time frames for the implementation of the new energy balance are discussed in NIR section 3.6.2.
E.14	1.A.1.a Public electricity and heat production – gaseous fuels – CO_2 (E.10, 2016) (E.10, 2015) (31, 2014) Transparency	Explain in the NIR the reason for the observed inter-annual fluctuations in the CO_2 IEF for natural gas.	Resolved. The NIR (section 3.2.2.4) provides information on IEF levels and trends. Relative contributions of plants with different plant-specific factors explain the observed inter-annual fluctuations in the CO_2 IEF for natural gas.
E.15	1.A.1.a Public electricity and heat production – solid fuels – CO_2 (E.11, 2016) (E.11, 2015) (32, 2014) Accuracy	Explain in the NIR the reason for the observed inter-annual changes in the CO_2 IEF for solid fuels, and the use of an EF that is below the IPCC default value.	Resolved. The NIR (section 3.2.2.4) provides information on IEF levels and trends, with variable and high EFs (particularly for blast furnace gas) explaining the observed inter-annual fluctuations in the CO_2 IEF for solid fuels.
E.16	1.A.2.c Chemicals – solid fuels – CO_2 (E.12, 2016) (E.12, 2015) (33, 2014) Transparency	Explain in the NIR the reason why the CO_2 IEF for solid fuels in the subcategory chemicals is the highest of all reporting Parties.	Resolved. The NIR (section 3.2.3.4) provides information on IEF levels and trends, with the use of carbon monoxide rich blast furnace gas driving the high IEF.
E.17	1.A.2.d Pulp, paper and print – biomass fuels – CO_2 (E.23, 2016) Transparency	Describe in the NIR the types of biomass fuel consumed, and the impact of any changes in the fuel mix on the trends in the IEF.	Resolved. The NIR (section 3.2.3.4) provides information on the types of biomass fuel consumed, and the impact of any changes in the fuel mix on the trends in the IEF.
E.18	1.A.2.f Non-metallic minerals – biomass fuels – CO_2, CH_4 and N_2O (E.24, 2016) (E.23, 2015) Completeness	Report AD and CO_2 emissions from charcoal consumption in the CRF tables, and include in the NIR documentation and explanations.	Resolved. Charcoal consumption and resulting CO_2 emissions are included in CRF table 1.A(a) under category 1.A.2.f (non-metallic minerals). The EFs used are reported in NIR section 3.2.1. Specific information on EF trends is provided in section 3.2.3.4 of the NIR.
E.19	1.A.2.g Other (manufacturing industries and construction) – biomass fuels – CO_2, CH_4 and N_2O (E.25, 2016) Transparency	Report a value or report the notation key "NO" for the AD if biomass is not consumed for mining (excluding fuels) and quarrying in 2014.	Resolved. Norway reports "NO" for this category from 2014 onward in CRF table 1.A(a) for subcategory 1.A.2.g.iii (mining (excluding fuels) and quarrying).
E.20	1.A.3.b Road transportation – liquid fuels – CH_4 and N_2O (E.26, 2016) (E.24, 2015) Accuracy	Derive updated AD representative of annual consumption of LPG in road transportation in order to confirm that emissions have not been underestimated; alternatively, demonstrate that the current approach of keeping AD flat does	Addressing. SN is addressing this issue through the ongoing project to produce a new energy balance to underpin the estimation of emissions across the energy sector (discussed in NIR section 3.6.2) (see ID# E.2 above). During the review, Norway clarified that the new energy balance will include a revised AD time series for LPG, and that the estimated emissions from

ID#	Issue and/or problem classification[a, b]	Recommendation made in previous review report	ERT assessment and rationale
		not lead to an underestimation of emissions for 2014.	LPG use in road transportation will be revised in future submissions, following completion of the energy balance improvement project. The ERT believes that future ERTs should consider this issue further to ensure that emissions in this category are not underestimated.
E.21	1.A.3.d Domestic navigation – 1.A.5.b Mobile – gaseous fuels – N_2O (E.28, 2016) (E.26, 2015) Transparency	Include in the NIR the methods and data used to estimate N_2O emissions from navigation with liquefied natural gas fuelled ships (see also 1.A.5.b (mobile – gaseous fuels – N_2O)).	Resolved. Revised estimates are provided in CRF table 1.A(a) for categories 1.A.3.d (domestic navigation) and 1.A.5.b (other – mobile). The method and the source of AD and EFs used are described in NIR sections 3.2.7.2 to 3.2.7.4.
E.22	1.A.3.e.i Pipeline transport – gaseous fuels – CO_2, CH_4 and N_2O (E.29, 2016) (E.27, 2015) Transparency	Describe in the NIR the Party's reasons why it has determined that reporting CO_2, CH_4 and N_2O emissions from pipeline transport under energy industries leads to a more accurate estimate.	Resolved. The NIR (section 3.2.8.2) provides information on the treatment of emissions from pipeline transport and the specific reasons for the reporting approach. The ERT agrees with the approach.
E.23	1.A.5.b Mobile – liquid fuels – CO_2, CH_4 and N_2O (E.30, 2016) (E.28, 2015) Transparency	Include a description of oxidized during use factors used in the estimation of emissions of lubricants used in two-stroke engines to explain the trends in the CO_2, CH_4 and N_2O IEFs.	Resolved. Norway stated that the IEF trends were attributable to errors in calculation that have now been corrected. Revised data are included in CRF table 1.A(a).
E.24	1.B.1.a Coal mining and handling – solid fuels – CO_2 and CH_4 (E.22, 2016) (E.22, 2015) Transparency	Provide information in the NIR to demonstrate that the mine referred to by the Party was fully flooded as a result of a fire in 2008 and that the assumption of zero emissions for this mine is consistent with IPCC good practice.	Resolved. The NIR (section 3.3.1) provides information on the flooded mine and resultant emissions showing that the estimates are in accordance with the 2006 IPCC Guidelines.
E.25	1.B.2 Oil, natural gas and other emissions from energy production – gaseous and liquid fuels – CO_2 and CH_4 (E.15, 2016) (E.15, 2015) (35, 2014) Comparability	Review the use of notation keys for AD for the subcategories oil exploration and for natural gas exploration, transmission, distribution and other leakage at industrial plants and power stations.	Resolved. Revised notation keys and additional AD are included in CRF table 1.B.2. Norway included in section 3.4.1.4 the rationale for its use of notation keys in reporting fugitive emissions.
E.26	1.B.2 Oil, natural gas and other emissions from energy production – gaseous fuels and liquid fuels – CO_2 and CH_4 (E.31, 2016) (E.29, 2015) Comparability	Investigate and ensure the appropriate use of notation keys for the subcategories under category 1.B.2, specifically ensure that there is a logical relationship between the AD reported and the emissions. As part of this investigation, check that the notation keys used in the NIR (table 3.28) also match the data and notation keys used in the	Addressing. Revised notation keys and additional AD are included in CRF table 1.B.2. The information in NIR table 3.27 (formerly NIR table 3.28) has been updated. For oil exploration, AD are now presented; for gas exploration, the notation key for AD and emissions is consistent ("IE"); and for natural gas transmission, storage and distribution, AD are now reported. However, for category 1.B.2.b.6 (natural gas – other), emissions of CO_2 and CH_4 are reported

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		corresponding categories in the CRF tables.	in CRF table 1.B.2 and the AD are presented as "NE", which is inconsistent with NIR table 3.27, according to which the CO_2 emissions are derived from "AD × EF". In addition,CH_4 emissions from the category distribution of oil products (1.B.2.a.5) are reported as "NE" in NIR table 3.27 but "NA" in CRF table 1.B.2.
E.27	1.B.2 Oil, natural gas and other emissions from energy production – gaseous and liquid fuels – CO_2 and CH_4 (E.32, 2016) (E.30, 2015) Transparency	Implement the planned improvement to include AD for the subcategories where no emissions are reported because they are reported elsewhere (e.g. number of wells drilled in subcategories 1.B.2.a.1 and 1.B.2.b.1).	Addressing. Norway reports in CRF table 1.B.2 the AD for the number of wells drilled for category 1.B.2.a.1 (oil – exploration), but reports "IE" in for category 1.B.2.b.1 (natural gas – exploration). During the review, Norway explained that it does not have any information on whether offshore exploration wells are drilled with the expectation of finding oil or gas. While the ERT acknowledges that to report AD on well drilling or venting separately for oil and gas may require access to information from the industry, the ERT maintains its recommendation that Norway continue to look into the possibility of obtaining more disaggregated data, and report on progress thereof in the next annual submission in order to improve the transparency and comparability of reporting.
E.28	1.B.2 Oil, natural gas and other emissions from energy production – gaseous fuels – CO_2 and CH_4 (E.33, 2016) (E.31, 2015) Comparability	Report emissions at the level of data entry in CRF table 1.B.2, providing AD and CO_2 and CH_4 emission estimates (or notation keys) for all subcategories, as appropriate.	Not resolved. Although Norway included in the NIR (section 3.4.1.4) the rationale for reporting fugitive emissions, it continues to report notation keys "IE" for the same categories in the 2016 submission.
E.29	1.B.2.b Natural gas – gaseous fuels – CO_2 and CH_4 (E.34, 2016) (E.32, 2015) Transparency	Include in the NIR relevant details describing the methods, data and EFs used to estimate fugitive emissions of CH_4 from natural gas distribution and separately report CO_2 emissions from natural gas distribution. If this is not possible, report the notation key "IE" as indicated by the Party during the review and provide the justification for reporting "IE", along with information on where those emissions are included.	Resolved. AD are now included in CRF table 1.B.2. Norway reports CH_4 emissions from natural gas distribution, and continues to report "IE" for CO_2 emissions from this category. Explanations are provided in CRF table 1.B.2 and the NIR (p.147) as to where these CO_2 emissions are reported (in category 1.A). The methods are transparently described in the NIR (section 3.4.3).
E.30	1.C.1 Transport of CO_2 – gaseous fuels – CO_2 (E.35, 2016) (E.33, 2015) Transparency	Provide, in the NIR, the details of the monitoring undertaken to demonstrate that there are no fugitive emissions associated with pipeline transport of CO_2.	Resolved. The NIR (section 3.5.3.2) provides information on the monitoring undertaken for the pipeline transport of CO_2 (see ID# E.39 in table 5).
E.31	1.C.2 Injection and storage – gaseous fuels – CO_2 (E.36, 2016) (E.34,	Describe in the NIR the method used to estimate diffuse CO_2 emissions from injection and storage at the two CCS facilities	Resolved. The NIR (sections 3.5.3.2 and 3.5.3.2) provides information on the methods used to estimate diffuse CO_2 emissions from injection and storage at the two CCS facilities. Further, NIR tables 3.33, 3.34, 3.35 and 3.36 present the underlying parameters and the time

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	2015) Transparency	and report in the NIR the trends in the underlying data.	series trends for CO_2 injected and vented from the two CCS facilities.
E.32	1.C.2 Injection and storage – gaseous fuels – CO_2 (E.37, 2016) (E.35, 2015) Comparability	Apply the correct notation key to report fugitive CO_2 emissions from the geological storage formation (i.e. change "IE" to "NO" if Norway continues to detect no leaks from the formation).	Resolved. Norway explains in the NIR (section 3.5.1) that reported emissions result primarily from the venting of CO_2 captured when the injection facilities are not operating. Further, Norway reports fugitive emissions of CO_2 from storage as "NO" across the time series in CRF table 1.C.
E.33	International bunkers and multilateral operations – liquid fuels – CO_2 (E.21, 2016) (E.19, 2016) Accuracy	Continue investigations to determine whether there are any issues with allocation between international and domestic activity at the reference level, and improve the alignment of reporting between CRF tables 1.A(b) and 1.D.	Resolved. Revised data are included in CRF tables 1.A(b) and 1.D, which are now consistent.
IPPU			
I.1	2.A.3 Glass production – CO_2 (I.12, 2016) (I.12, 2015) Adherence to the UNFCCC Annex I inventory reporting guidelines	Report in the NIR the correct EFs for limestone and dolomite use for category 2.A.3.	Resolved. The NIR (section 4.2.3.4, p.190) provides the corrected EFs for estimating emissions from limestone and dolomite use for this category.
I.2	2.A.4 Other process uses of carbonates – CO_2 (I.13, 2016) (I.13, 2015) Transparency	Report in the NIR the amount of limestone and dolomite consumption, along with the relevant EFs used for estimating CO_2 emissions from non-metallurgical magnesium production.	Resolved. The NIR (section 4.2.6.3, p.194) provides the amount of limestone and dolomite consumption (table 4.10), along with the relevant EFs discussed in section 4.2.6.4.
I.3	2.A.4 Other process uses of carbonates – CO_2 (I.14, 2016) (I.14, 2015) Transparency	Provide in the NIR the AD and the corrected EFs used for estimating emissions from LECA production and sulfuric acid neutralization.	Addressing. The NIR (section 4.2.7.4, pp.195 and 196) provides corrected EFs for carbonates (including clay and fly ash), and table 4.11 (section 4.2.7.3) provides AD on limestone and dolomite consumption. AD on clay used in LECA production and fly ash used in acid neutralization are not included in NIR table 4.11 (although quantities used are limited).
I.4	2.A.4 Other process uses of carbonates – CO_2 (I.15, 2016) (I.15, 2015) Transparency	Describe clearly in the NIR the calculation of emissions from LECA production, including emissions from the use of clay.	Resolved. The NIR (section 4.2.7.2, pp.195 and 196) provides information describing the calculation of emissions from LECA production, including minor emissions from the use of clay via the provision of relevant consumption-based EFs.
I.5	2.A.4 Other process uses of carbonates – CO_2 (I.16, 2016) Transparency	Correct the AD for the amount of limestone and dolomite used for liming, as reported in the dolomite and limestone national balances, reported in the NIR (tables 4.4 and 4.6).	Resolved. The NIR includes corrected information on the amounts of limestone and dolomite used for liming in tables 4.5 and 4.6.

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I.6	2.B.5 Carbide production – CO_2 (I.17, 2016) (I.16, 2015) Transparency	Provide an explanation in the NIR for the trends observed in CO_2 emissions from carbide production, including the large decrease in CO_2 emissions between 2002 and 2003, which was identified to be the result of a decrease in the production of silicon carbide.	Resolved. The NIR (section 4.3.3.1, p.204) describes carbide emission and production trends.
I.7	2.B.8 Petrochemical and carbon black production – CO_2 and CH_4 (I.18, 2016) (I.18, 2015) Transparency	Report more information on the AD for subcategory 2.B.8.c (ethylene dichloride and vinyl chloride monomer) in the NIR.	Resolved. The NIR (section 4.3.8.3, p.212) describes relevant AD.
I.8	2.C.2 Ferroalloys production – CO_2 (I.19, 2016) (I.19, 2015) Accuracy	Correct the amount of dolomite used for 2013 in the NIR (table 4.3) and provide an explanation in the NIR regarding the decline in the amount of dolomite used for ferroalloys production between 2012 (34 kt dolomite) and 2013 (to be corrected to 6 kt dolomite).	Resolved. The reported use of dolomite in the production of ferroalloys was re-examined, including contacting the plants that were reporting information, and it was discovered that the reported use of dolomite was in fact the use of ore materials. This has been corrected and the revision was explicitly addressed and reported in the 2017 NIR (section 4.4.27, p.227); the decline in dolomite use from 2012 to 2013 is now smaller and has been increasing in recent years. Trends are sufficiently described in the 2018 NIR (pp.218 and 219).
I.9	2.C.4 Magnesium production – SF_6 (I.20, 2016) (I.20, 2015) Comparability	Change the notation key for the amount of magnesium produced for 2007–2014 from "NE" to "NO" in CRF table 2(II).B-Hs1.	Resolved. The notation key has been corrected in CRF table 2(II).B-Hs1 for 2007–2014.
I.10	2.C.6 Zinc production – CO_2 (I.21, 2016) (I.20, 2015) Transparency	Provide in the NIR a detailed explanation of the methodology used for estimating CO_2 emissions from zinc production, including the use of the electrolytic production process.	Resolved. The NIR (section 4.4.5.2, p.230) explains that the methodology used for estimating emissions is a mass-balance approach for both roasting and sintering of ore materials.
I.11	2.F.1 Refrigeration and air conditioning – PFCs (I.9, 2016) (I.9, 2015) (41, 2014) Completeness	Either estimate PFC emissions from refrigeration for 2009–2012 or justify that "NO" is the appropriate notation key for actual emissions of PFCs.	Resolved. Norway reports PFC emissions for the period 2010–2014. For 2009 and years 2015 onward, "NO" is reported. An explanation for using "NO" is provided in the NIR (section 4.7.1.2, p.252), according to which as many PFCs are imported as are collected for destruction, so no emissions result from the existing stock.
I.12	2.F.1.a – Commercial refrigeration – HFCs (I.10, 2016) (I.10, 2015) (42, 2014) Completeness	Investigate whether the reported amounts of HFC-143 in commercial refrigeration in 2005 and 2006 and of HFC-134 in commercial refrigeration in 2004 and 2008 are misclassifications or if they are real uses, and correct	Resolved. Norway explained in the NIR (section 4.7.1.2, p.251) that reporting of HFC-143 for only 2005 and 2006 and HFC-134 for only 2004 and 2008 for the amount of gas filled into new manufactured products is correct. "NO" is the appropriate notation key for reporting HFC-143 and HFC-134 for the other years in question because neither gas is used regularly in Norway,

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		the information and the data accordingly.	although both are imported periodically to be used in equipment testing, leading to variation. Any new import of these gases will be reflected in the registers of the Norwegian Directorate of Customs and Excise as both gases are covered by the tax on HFCs.
I.13	2.F.1.a – Commercial refrigeration – HFCs (I.11, 2016) (I.11, 2015) (42, 2014) (49, 2013) Completeness	Either justify that "NO" is the appropriate notation key for reporting HFC-134 or estimate HFC-134 emissions from filling new manufactured products for 2008 onward.	Resolved. HFC-134 is not used regularly in Norway but was imported in some years for equipment testing. "NO" is therefore considered to be the appropriate notation key for reporting HFC-134 used in new manufactured products for 2008 onward. Any new import of this gas will be reflected in the registers of the Norwegian Directorate of Customs and Excise as the gas is covered by the tax on HFCs. This information is reflected in the NIR (section 4.7.1.2, p.252).
I.14	2.F Product uses as substitutes for ozone-depleting substances – HFCs (I.22, 2016) (I.21, 2015) Comparability	Change the notation keys in CRF table 2(II) for subcategories 2.F.2 (foam blowing), 2.F.3 (fire extinguishers), 2.F.4 (metered dose inhalers) and 2.F.5 (solvents) from "C" (confidential) to "IE" and supply the reasons for changes in a cell comment in CRF Reporter so that CRF table 9 shows that these emissions are included under subcategory 2.F.6 to protect confidential information.	Resolved. The notation keys in CRF table 2(II) have been updated to "IE" for the subcategories identified. Further, explanations have been included in CRF table 9 indicating that these emissions are included under subcategory 2.F.6 (product uses as substitutes for ozone-depleting substances – other applications) to protect confidential information.
I.15	2.F.1 Refrigeration and air conditioning – HFCs (I.23, 2016) (I.22, 2015) Transparency	Explain in the NIR the reason for the decrease in the product life factor for HFC-134a from 100 per cent in the base year to a lower value in recent years.	Resolved. According to the explanation provided in the NIR (section 4.7.1.2, p.251), the product life factor for HFC-134a decreased because new cars are no longer manufactured in Norway. Thus, the total amount of chemicals imported in bulk every year is assumed to be equal to the amount needed for refilling in the most recent years. Very high product life factors (up to 100 per cent) were reported at the start of the time series because no bank of chemicals had been accumulated.
I.16	2.F.1 Refrigeration and air conditioning – HFCs (I.24, 2016) Transparency	Document in the NIR the reason for the observed declining trend in C3F8 emissions from stock in commercial refrigeration, including why emissions are reported as "NO" for the most recent year(s).	Resolved. The explanation is included in the NIR (section 4.7.1.2, p.252) (see also ID# I.11 above).
I.17	2.F.6 Other applications (product uses as substitutes for ozone-depleting substances) – HFCs (I.25, 2016) (I.23, 2015) Accuracy	Contact the manufacturer in question and confirm that the observed decline in the quantity of HFCs used in new manufactured products is accurate and provide the results of this communication with the manufacturer, along with an explanation in the NIR, if appropriate, confirming that the	Resolved. During the review week, Norway clarified that corrections have been made to the import data so there are no longer inter-annual fluctuations. An explanation and information on recalculations were provided in the 2017 NIR, noting that there was an error in the 2014 AD.

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		inter-annual fluctuation in the quantity of HFCs filled into new manufactured products between 2012 and 2014 is due to the drop in the amount of HFCs in 2013 as reported from the major manufacturer.	
I.18	2.G.1 Electrical equipment – SF_6 (I.26, 2016) (I.24, 2015) Transparency	Explain in CRF table 9 and in the NIR that SF_6 emissions from manufacturing have been included in the emissions from stock to protect confidential information.	Resolved. CRF table 9 and the NIR (section 4.8.1.2, p.259) have been updated to indicate that emissions from manufacturing were included in the emissions from stock to protect confidential information.
I.19	2.H Other (IPPU) – CO_2 (I.27, 2016) (I.25, 2015) Transparency	Include the amount of limestone used to calculate the CO_2 emissions from pulp and paper in NIR table 4.6 (total balance of limestone).	Resolved. Table 4.5 of the NIR includes the amount of limestone used to calculate CO_2 emissions from pulp and paper.
Agriculture			
A.1	3. General (agriculture) – CH_4 and N_2O (A.2, 2016) (A.2, 2015) (59, 2014) Transparency	Include in table 6.5 of the NIR the key calculation parameters for cattle less than one year old.	Resolved. The NIR (table 5.7) provides the key calculation parameters (carcass weight and average age) for cattle less than one year old, including heifers and bulls.
A.2	3. General (agriculture) – CH_4 and N_2O (A.8, 2016) (A.8, 2015) Transparency	Provide documentation in the NIR to support the methods, AD, EFs and assumptions used to estimate CH_4 and N_2O emissions from small pigs and grown boar for categories 3.A, 3.B and 3.D.	Resolved. Reference to the parameters (EFs) for small pigs can be derived from section 5.2.4 (p.275) of the NIR. Further, AD on the population of small pigs are provided in annex IX (table AIX-1) to the NIR. For grown boars, the NIR (section 10.2.3, and chapter 5) provides information on the recalculation of the volatile solids excretion rate for boars (which are included with swine and sows). The NIR states that the boar population is included as part of the swine population reported in table 3.B (manure management) as a subdivision, and quantitative information on the population is provided in annex IX.
A.3	3.A.1 Cattle – CH_4 (A.9, 2016) (A.9, 2015) Accuracy	Provide detailed information on how cattle populations used in the Norwegian inventory are estimated and demonstrate that the data sources used in the inventory are the most appropriate national data sources, in particular taking into consideration that different population values are reported by FAO.	Resolved. The differences between FAO figures and CRF figures are explained in the NIR (section 5.2.4), including the sources of information. Specifically, according to the NIR, animal statistics used in the emissions inventory differ from the statistics delivered to FAO essentially because they are used for different purposes. To be used in the GHG inventory, livestock statistics are rearranged so that the categories fit the recommended methodology and the various EFs used in the emission estimations. NIBIO provides figures to FAO, while the CRF figures provided by SN include (1) different dates for counting purposes (31 July and 31 December) and (2) for the number of dairy cows and heifers

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			for replacement, annual statistics from the TINE cow recording system, which is presumed by Norway to more accurately gauge the number of animal-years of dairy cows than the figures held by SN and NIBIO. The ERT concludes that the Party has sufficiently demonstrated that the data sources used in the national GHG inventory are the most appropriate national sources (see ID# A.5 in table 5).
A.4	3.A.1 Cattle – CH_4 (A.10, 2016) (A.10, 2015) Transparency	Incorporate the following information in the NIR: slaughter weight, slaughter age, and GE and Ym for finished heifers less than one year old, finished heifers greater than one year old, finished bulls less than one year old, finished bulls greater than one year old and heifers for breeding.	Resolved. Norway provided information on GE and Ym for all animal type subcategories, as well as descriptions of the models used for the determination of the two parameters (GE and Ym) and related AD in annex IX to the NIR. In addition, figure AIX-2 provides the average daily gain and weight as a function of the age of the animal.
LULUCF			
L.1	4. General (LULUCF) (L.1, 2016) (L.1, 2015) (74, 2014) Adherence to the UNFCCC Annex I inventory reporting guidelines	Use notation keys consistent with the UNFCCC Annex I inventory reporting guidelines to improve the comparability and transparency of the inventory.	Resolved. The use of notation keys is consistent with UNFCCC reporting guidelines (decision 14/CP.19) (see also ID# L.2 below).
L.2	4. General (LULUCF) (L.2, 2016) Transparency	Describe in the NIR that the Party uses the notation key "IE" for total unmanaged land because the conversion of these land areas is already included under wetlands (unmanaged) and other land in CRF table 4.1.	Resolved. Norway provided information in the NIR (p.335) on the use of the notation key "IE" for total unmanaged land. Nonetheless, the disaggregation of unmanaged land according to the respective land category is an issue, as noted in ID# L.24 in table 5.
L.3	4.A.2.4 Settlements converted to forest land – CO_2 (L.3, 2016) (L.2, 2015) Transparency	Provide in the NIR a clear explanation of the reasons for land being converted from settlements to forest land.	Resolved. The NIR (p.362) explains the reasons for land being converted from settlements to forest land.
L.4	4.B.2.5 Other land converted to cropland – CO_2 (L.4, 2016) (L.3, 2015) Adherence to the UNFCCC Annex I inventory reporting guidelines	Use either a notation key or a value to complete all cells in CRF table 4.B related to the estimation of carbon stock change and emissions from other land converted to cropland for the entire time series and include an explanation in the NIR.	Resolved. Conversion of other land to cropland does not occur; the notation key "NO" has thus been reported for all carbon stock changes for the entire time series. This is explained in the NIR (p.370).
L.5	4.F.2 Land converted to other land – CO_2 (L.5, 2016) (L.4, 2015) Adherence to the UNFCCC Annex I inventory reporting guidelines	Use either a notation key or a value to complete all cells in CRF table 4.F related to the estimation of carbon stock change and emissions from forest land and cropland converted to other land for the entire time series and include an explanation in the NIR.	Resolved. All cells of CRF table 4.F now contain either notation keys or values. "NO" is reported for all cells in CRF table 4.F related to the estimation of carbon stock change and emissions from forest land and cropland converted to other land, for the entire time series. According to the NIR (p.390), only grassland and settlements were converted to

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			other land during the inventory period; no other conversions occurred.
L.6	4.G Harvested wood products – CO_2 (L.6, 2016) (L.5, 2015) Adherence to the UNFCCC Annex I inventory reporting guidelines	Complete CRF table 4.G and the additional information box on factors used to convert from product units to carbon. The ERT notes that Parties can do this by setting a custom node year within the data entry screen for harvested wood products in the CRF Reporter software.	Resolved. CRF table 4.G is complete and contains information on conversion factors.
Waste			
W.1	5.A Solid waste disposal on land – CH_4 (W.1, 2016) (W.1, 2015) (80, 2014) (87, 2013) (137, 2012) Transparency	Include information on the amount of waste deposited in SWDS categorized by type of waste during the period 1945–2012.	Resolved. The amounts of waste deposited in municipal and industrial SWDS are presented in tables 7.2 and 7.3 of the NIR for 1945–2016.
W.2	5.A.1 Managed waste disposal sites – CH_4 (W.4, 2016) (W.4, 2015) Transparency	Present all parameters used for the calculation of emissions from SWDS, including the fraction of degradable organic carbon that decomposes, in both the NIR and CRF table 5.A.	Resolved. The variables used for the calculation of the fraction of degradable organic carbon that decomposes (0.5) that are used by Norway are reported in the NIR (table 7.4) and in CRF table 5.A.
W.3	5.A.1 Managed waste disposal sites – CH_4 (W.5, 2016) (W.5, 2015) Transparency	Present in the NIR the industrial solid waste disposal data used in the calculation model.	Resolved. The amounts of industrial waste deposited in industrial SWDS are presented in NIR table 7.3.
W.4	5.A.1 Managed waste disposal sites – CH_4 (W.6, 2016) (W.6, 2015) Adherence to the UNFCCC Annex I inventory reporting guidelines	Correct the degradable organic carbon value for wood in the NIR.	Resolved. Norway reported in the NIR (table 7.4) a degradable organic carbon value of 0.43 for wood, which is the IPCC default. The same value is used in the first-order decay model in the 2006 IPCC Guidelines.
W.5	5.B.2 Anaerobic digestion at biogas facilities – CH_4 (W.7, 2016) (W.7, 2015) Transparency	Present in the NIR information regarding the weight basis (wet or dry) of the CH_4 EF and the amount of waste treated at biogas facilities.	Resolved. The EF for CH_4 emissions from biogas facilities are presented on a wet basis in table 7.7 of the NIR (the EF is the default in the 2006 IPCC Guidelines). Table 7.5 of the NIR provides data for the amount of waste treated at biogas facilities.
W.6	5.C.1 Waste incineration – CO_2 (W.2, 2016) (W.2, 2015) (82, 2014) (94, 2013) (149, 2012) Transparency	Transparently provide information on AD for waste incineration in the NIR.	Resolved. Table 3.11 of the NIR (p.91) provides information on the amount of waste combusted at waste incineration plants for energy production, and table 7.9 (p.435) provides data on the amount of hospital waste incinerated in hospital incinerators.
W.7	5.D Wastewater treatment and discharge – CH_4 and	Present total organic product data in the NIR and in CRF table 5.D.	Not resolved. Norway reports "NE" for total organic product in CRF table 5.D and data are not provided in the NIR. Norway indicates that

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	N_2O (W.8, 2016) (W.8, 2015) Transparency		total organic product data will be reported in the next annual submission.
W.8	5.D.1 Domestic wastewater – CO_2 and CH_4 (W.10, 2016) (W.10, 2015) Comparability	Use the appropriate notation key for reporting the amount of CH_4 flared in 1990.	Resolved. For the amount of CH_4 flared in 1990, "NO" is reported in CRF table 5.D.
W.9	5.D.2 Industrial wastewater – CO_2, CH_4 and N_2O (W.3, 2016) (W.3, 2015) (78, 2014) (92, 2013) Completeness	Implement the planned improvement to include emissions from the combustion of CH_4 recovered from wastewater treatment plants and used in the pulp and paper industry for years beyond 2009–2012.	Resolved. Emissions from the combustion of CH_4 recovered from wastewater treatment plants and used for energy purposes are included in the inventory (CRF table 5.D) for the period 1991–2016 (recovery began only in 1991) (NIR p.438).
W.10	5.D.2 Industrial wastewater – CH_4 (W.9, 2016) (W.9, 2015) Accuracy	Investigate the possible double counting and describe the outcome of the investigation in the NIR.	Resolved. Norway clarified that two industrial pulp and paper plants use anaerobic treatment and CH_4 is recovered and used for energy purposes. The ERT concludes that the CH_4 recovered is subtracted from the waste sector and emissions are properly reported in the energy sector, thereby avoiding double counting.
W.11	5.D.2 Industrial wastewater – CH_4 (W.9, 2016) (W.9, 2015) Accuracy	Apply equation 6.4 from the 2006 IPCC Guidelines to estimate CH_4 emissions from industrial wastewater, considering that the amount of CH_4 that is flared or recovered for energy use should be subtracted from total emissions.	Resolved. Norway reported CH_4 emissions from industrial wastewater treatment in line with the 2006 IPCC Guidelines.
W.12	5.D.2 Industrial wastewater – N_2O (W.11, 2016) (W.11, 2015) Transparency	Provide in the NIR information consistent with decision 24/CP.19, annex I, paragraph 37(b), to demonstrate the insignificance of N_2O emissions from industrial wastewater.	Addressing. During the review, Norway provided country-specific data on the amount of missing N from industrial wastewater. This amount represents 1 per cent of the total amount of N treated. No information is provided in the 2018 NIR (see also ID# W.16 below).
KP-LULUCF			
KL.1	FM – CO_2, N_2O and CH_4 (KL.1, 2016) (KL.1, 2015) Adherence to the UNFCCC Annex I inventory reporting guidelines	Report in the relevant CRF table the FMRL in accordance with footnote 9, applying any technical corrections, as necessary, in accordance with decision 2/CMP.7, annex, paragraphs 14 and 15.	Resolved. Norway explained during the review week that information on the FMRL and its technical correction had mistakenly not been entered in CRF Reporter but is now visible in CRF table 4(KP-I)B.1.1 (but not in CRF table "accounting").
KL.2	FM – CO_2 (KL.2, 2016) (KL.2, 2015) Accuracy	Ensure that the technical correction is correctly calculated as compared with the FMRL contained in the annex to decision 2/CMP.7.	Resolved. The technical correction is correctly reported in the NIR (section 11.5.5) and CRF table 4(KP-I)B.1.1.

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

[b] The review of the 2017 annual submission of Norway did not take place during 2017 and, as such, the 2017 ARR was not available at the time of this review. Therefore, the recommendations reflected in table 3 are taken from the 2016 ARR. For the same reason, 2017 is excluded from the list of years in which the issue has been identified.

IV. Issues identified in three successive reviews and not addressed by the Party

9. In accordance with paragraph 83 of the UNFCCC review guidelines, the ERT noted that the issues included in table 4 have been identified in three successive reviews, including the review of the 2018 annual submission of Norway, and have not been addressed by the Party.

Table 4
Issues identified in three successive reviews and not addressed by Norway

ID#	*Previous recommendation for the issue identified*	*Number of successive reviews issue not addressed*[a]
General		
	No such general issues were identified	
Energy		
E.2	Continue work to analyse the reasons for the differences between the reference and sectoral approach	3 (2014–2018)
E.3	Improve the data-collection procedures for solid fuels (coal and coke oven coke)	3 (2014–2018)
E.6	Continue the work to analyse the reasons for the differences between the inventory and IEA statistics	3 (2014–2018)
E.9	Document in the NIR the approach used to estimate CO_2, CH_4 and N_2O emissions from feedstocks and NEU of lubricants, gasoline, residual fuel oil and gas/diesel oil for the entire time series and report in CRF table 1.A(d) where the emissions are included	3 (2014–2018)
E.10	Improve QC procedures to ensure the consistency of the information reported on feedstocks, reductants and NEU in different CRF tables	3 (2014–2018)
E.11	Review and revise the reporting in CRF table 1.A(d) and improve QC procedures to ensure the consistency of the reporting	5 (2012–2018)
E.12	Provide in the NIR, for fuels for which the fraction of carbon stored is smaller than 1.00, balances showing that all NEU of fuels is accounted for under the IPPU sector	5 (2012–2018)
IPPU		
	No such issues for the IPPU sector identified	
Agriculture		
	No such issues for the agriculture sector were identified	
LULUCF		

ID#	*Previous recommendation for the issue identified*	*Number of successive reviews issue not addressed*[a]
	No such issues for the LULUCF sector were identified	
Waste		
	No such issues for the LULUCF sector were identified	
KP-LULUCF		
	No such issues for KP-LULUCF activities were identified	

[a] The review of the 2017 annual submission of Norway did not take place during 2017. Therefore, the year 2017 is not taken into account when counting the number of successive years in table 4. In addition, as the reviews of the 2015 and 2016 annual submissions were held in conjunction with each other, they are not considered "successive" years and 2015/2016 is considered as one year.

V. Additional findings made during the individual review of the 2018 annual submission

10. Table 5 contains findings made by the ERT during the individual review of the 2018 annual submission of Norway that are additional to those identified in table 3.

Table 5
Additional findings made during the individual review of the 2018 annual submission of Norway

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?[a] If yes, classify by type*
General			
G.8	National system	The NIR (chapter 13) presents information on the changes in the national system since the previous annual submission. In particular, SN is implementing a staff reorganization, with the team of experienced staff based in Oslo being replaced by a new team based in Kongsvinger; this change has been planned since 2016 and was being implemented during 2018. During the review week, the ERT discussed with SN the risk of loss of institutional memory, especially with regard to data processing and the use of models. This is particularly applicable to areas where the inventory system is still evolving, such as the energy balance (see ID#s G.9 and E.34 below), and to future research and improvement tasks where the detailed technical knowledge of the current team may be lost or unavailable to the new team. This raises questions as to whether Norway would meet the mandatory requirements in accordance with the guidelines for national systems (annex to decision 19/CMP.1 in conjunction with decisions 3/CMP.11 and 4/CMP.11) in coming years, in particular as regards the role of the national system in ensuring sufficient capacity and making suitable arrangements for the technical competence of the staff involved in the development of the national inventory (decision 19/CMP.1, annex, paragraph 10(b)). The ERT concluded from discussions during the review week that, in order for the national system to meet those requirements, the SN staff and resourcing plan has to be updated and implemented to provide training and support to the new team of inventory compilers so that it, in turn, can provide the necessary resources for other key teams, including the new energy balance team. The ERT recommends that Norway implement the proposed updates to the resourcing plan and provide training to the new team to mitigate the risks to the functions of the national system that have been identified by SN, and report on progress in subsequent annual submissions. In addition, noting that NEA is the single national entity with overall responsibility for inventory delivery and quality, the ERT also recommends that NEA support the functions of the national system through the NEA–SN agreement, which specifies the roles and responsibilities of SN as inventory agency for several sectors, to scrutinize the SN inventory staff and resourcing plan and to ensure that sufficient resources are available across the organizations to deliver a high-quality inventory and maintain continuous improvement. The ERT further recommends that Norway report in the NIR on the actions taken by NEA in that regard, such as documenting the review and acceptance by NEA of the SN resourcing plan as a means of delivering an inventory in accordance with the guidelines for national systems.	Yes. Adherence to the reporting guidelines under Article 7, paragraph 1, of the Kyoto Protocol
G.9	National system	The ERT notes that Norway's 2018 submission reported significant differences in energy use and CO_2 emissions between the reference approach and the sectoral approach for most years across the time series (1990–2016). Across all fuel types, the difference in CO_2 emission estimates ranges from –10.4 per cent for 1996 to +49.5 per cent for 2000; between 1998 and 2015 the reference approach estimates were 18 per cent higher than the sectoral approach estimates	Yes. Adherence to the reporting guidelines under Article 7, paragraph

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and/or a problem?[a] If yes, classify by type
		on average. The differences between the reference and sectoral approach were visible across all major fuel types: gaseous fuels (–26.8 per cent for 1990 to +48.8 per cent for 2001); liquid fuels (–6.4 per cent for 1996 to +72.9 per cent for 2000); and solid fuels (–30.7 per cent for 1992 to +85.8 per cent for 2011). Similar situations have been identified in previous reviews and it has been recommended that Norway implement improvements to address these differences and/or transparently describe the reasons for them in the NIR.	1, of the Kyoto Protocol
		The ERT notes, in particular, that in the in-country review in 2012 a list of potential problems and further questions was raised and a plan agreed to seek to resolve these differences. In spite of the plan and reiteration of recommendations in subsequent reviews, the ERT concludes that the issue remains unresolved in the 2018 submission.	
		The comparison of both approaches is part of the UNFCCC Annex I inventory reporting guidelines, and is a verification step to ensure the quality of a Party's annual submission. Large differences identified by the comparison may indicate potential problems with the accuracy of inventory estimates; if the sectoral approach does not reconcile well with the apparent consumption data for primary fuels, this may indicate that there may be a systematic error in the derivation of the national fuel consumption data used to report total national CO_2, CH_4 and N_2O emissions.	
		The 2018 NIR indicates that differences between the approaches are due primarily to large "statistical differences in the energy balance", and the SN team clarified during the review week that these differences are thought to relate largely to oil export data. During the review week, Norway provided a detailed insight into its ongoing work to improve the energy balance and energy data quality. A new 1990–2016 energy balance has been under development since the 2018 submission but was not completed by the review week – many tasks were yet to be undertaken to resolve known issues. The SN energy balance team presented a list of over 100 incomplete tasks, some of which were geared towards addressing known issues, including the tracking of oil export shipments, resolving customs export data with refinery shipment data and resolving statistical differences in secondary petroleum fuels. In the light of the ongoing research, known data issues and large differences between the approaches, the ERT concludes that Norway has not provided sufficient information to ensure that the data on domestic consumption of fuels used for the 2018 submission were complete and accurate. Further, the ERT notes that the timely and accurate completion of energy balance improvements may be compromised by the transfer of responsibilities to the new SN team in 2018.	
		The ERT informed Norway that the underlying issues include insufficient AD and a lack of resources to access, evaluate and process the AD required to implement improvements to the energy balance, indicating that the national system had been failing to identify and address institutional arrangements and resource constraints to ensure better data supply and data processing capacity.	
		Noting that the large differences between the reference and sectoral approach are a persistent issue, having been identified in several reviews, the ERT concludes that, in its efforts to resolve the problem of the differences, Norway has not met the mandatory requirements under the guidelines for national systems (annex to decision 19/CMP.1 in conjunction with decisions 3/CMP.11 and 4/CMP.11) in:	
		(a) Ensuring sufficient capacity for data collection (decision 19/CMP.1, annex, paragraph 10(b));	

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and/or a problem?[a] If yes, classify by type
		(b) Collecting sufficient AD to support the methods (decision 19/CMP.1, annex, paragraph 14(c)); (c) Improving the quality of AD (decision 19/CMP.1, annex, paragraph 13); (d) Implementing QA/QC activities for the energy sector (decision 19/CMP.1, annex, paragraph 12(c) and (d)). The ERT included this issue in its list of potential problems and further questions raised and recommended that Norway enhance its national system in order to ensure that the national GHG inventory is able to perform all functions pursuant to the guidelines for national systems for the estimation of anthropogenic GHG emissions by sources and removals by sinks under Article 5, paragraph 1, of the Kyoto Protocol, as contained in the guidelines for national systems. In particular, the ERT recommended that Norway enhance the functions and arrangements in its national system to ensure that improvements are made to the national energy balance and the assurance of accuracy and completeness of the national inventory, through further improvement of the supply-side and demand-side statistics across all fossil fuels. The ERT acknowledged that making such improvements for the 2019 annual submission would be very challenging, and recommended that all planned actions should be concluded no later than the 2021 annual submission, with a report on progress included in all intervening submissions. In the list of potential problems and further questions raised, the ERT also recommended that Norway develop and report on a workplan to enhance the functionality of its national system and resolve the problems identified above. The workplan should address the objectives, characteristics and general and specific functions of the national system of Norway, particularly the requirements stipulated in paragraphs 10(b), 14(c), 13, 12(c) and 12(d) of the annex to decision 19/CMP.1. The ERT specified that the workplan include at least: (a) Clearly defined roles and responsibilities for the delivery of the action plan across all relevant organizations; (b) Information on planned developments of the national system to strengthen institutional agreements with data providers such as NPD, the Norwegian Customs Service, individual companies and trade organizations; (c) Information on the additional resource allocation (human, financial, information technology, training) to be committed to implement the planned improvements, for all participating institutions and organizations; (d) A clear and detailed project schedule with time frames, milestones and interim reporting on progress, including the identification of criteria to be reported against to enable all stakeholders to assess the success of the action plan; (e) Task descriptions for planned activities, such as actions to (1) identify and address any gaps in data reporting, (2) improve the accuracy and completeness of oil export data, (3) improve the disaggregation of fuel use data for national navigation and international shipping, (4) improve the information on national consumption and export of secondary petroleum fuels, (5) implement adequate quality-checking routines and completeness checks of AD supplied to inform the energy balance, where appropriate, and (6) improve data disaggregation for individual primary	

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and/or a problem?[a] If yes, classify by type
		and secondary fuels, where appropriate (i.e. to address instances of data aggregation and minimize the risk of data misallocation within reporting systems that have an impact on the differences observed between the approaches). In response to the list of potential problems and further questions raised by the ERT, Norway presented a workplan stating that SN and NEA would work to improve the performance of the national system, the national energy balance and the accuracy of the national inventory. Further, an outline of the system being developed for the new energy balance was presented, including details of methods being developed to reduce errors and improve data consistency. Norway also stated in its response that additional resource allocations would be made for the team delivering the energy balance, and that the provision of human and financial resources would be evaluated on an ongoing basis. Further, Norway set out task descriptions for planned activities to address the findings of the ERT, including gathering and analysing new AD and improving quality controls and the routines underpinning the energy balance development. The ERT notes that since the review week, Norway has published a new energy balance (on 26 November 2018, followed by a corrected version two days later). This provides encouragement that the 2019 submission may include an improved energy balance data set. The ERT also notes that the publication of the new energy balance demonstrates progress towards improving the performance of the national system, and the capacity and commitment of lead institutions to support the timely implementation of the workplan. The ERT reviewed the Party's response and the structure and content of the proposed workplan and considers that these elements generally cover the issues raised by the ERT in the description of the potential problem. The ERT considers that through full implementation of the proposed workplan, including the provision of an appropriate level of additional resources to the SN team leading the development of the energy balance, the potential problem will be adequately addressed. The ERT notes, however, that the same assessment was made after the 2012 in-country review and that, while progress has been made, it is evident that the necessary improvements to the Norwegian national system and energy balance have not yet been completed. The ERT concludes that further specificity and elaboration of the recommendations is needed to ensure that the issue is fully resolved and that Norway implements the workplan in accordance with the proposed timelines indicated in response to the list of potential problems and further questions raised. Therefore: (a) The ERT recommends that Norway (NEA and SN) conduct regular reviews and evaluations of the level and quality of the resources committed to the work to improve the energy balance, including to assess whether the SN team has the skills and capabilities to deliver the work in accordance with the workplan schedule, and that the Party report on these assessments in future submissions and ensure that financial and human resources are deployed to deliver the workplan on time. The ERT notes Norway's commitment to the ongoing evaluation of resource allocation, including specific consideration of the resource allocation at all biannual national system meetings and steering group meetings for the duration of the plan, and encourages the Party to maintain that approach to the communication and agreement of resource needs between NEA and SN. The ERT also recommends that Norway report on these evaluations and any updates in future NIRs;	

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?[a] If yes, classify by type*
		(b) The ERT recommends that Norway report on progress in the implementation of the workplan in each NIR submitted in the period 2019 through 2021 (or earlier if the workplan is fully implemented at an earlier date and the differences between the reference and sectoral approach are addressed), to include full details of the planned and ongoing activities to resolve all the problems identified, as set out in the response to the list of potential problems and further questions raised by the ERT, including (1) consolidation of the new energy balance routines and associated quality controls, (2) research to evaluate the statistical differences in the data on refined petroleum products, (3) analysis of petroleum product sales statistics and import data with respect to ships combining domestic and international routes, (4) analysis and documentation to set out the progress as far as is practicable in relation to the statistical differences for 1990–2009, (5) research and data improvement for solid and gaseous fuels to reduce statistical differences and discrepancies between the reference and sectoral approach, and (6) development of upstream data provision by data suppliers so that energy balance data handling and quality controls can be streamlined to reduce the need for complex data processing and bespoke analysis by the SN energy balance team;	
		(c) In its response, Norway indicated that there would be regular meetings among workplan stakeholders, and that a steering group would be established to consider the need for key data providers such as NPD and the Norwegian Tax Administration to play a more active role in the Norwegian national system. On the basis of discussions during the review week, the ERT recommends that Norway proceed with such enhancements to the national system in order to keep upstream data providers and other stakeholders informed of energy balance and inventory data requirements;	
		(d) The ERT further recommends that the progress reports in each NIR submitted in the period 2019 through 2021 (or earlier if the workplan is fully implemented at an earlier date and the differences between the reference and sectoral approach are addressed) include (1) an overview of the workplan schedule, setting out the timelines for the delivery of each task to meet interim and final project deadlines, (2) statements on the status of each workplan task in relation to the workplan schedule and task outcomes, (3) updates on the organization responsible for the delivery of each task, (4) resources (human, financial and other) allocated to each task, including the strengthening of such resources based on consultations between NEA and SN on their evaluation of the level and quality of resources committed to the energy balance, and (5) details of the contribution and engagement of other stakeholders required to support the delivery of the tasks, in particular upstream data providers such as NPD, the tax office, refiners, and oil and gas companies.	
G.10	National system	During the review week, the SN energy balance team explained to the ERT that extensive research has been conducted in recent years with a view to improving the estimates for primary petroleum fuels. This research has included engagement with NPD as well as the Norwegian tax authorities and detailed tracking of oil movement data from several data sources to identify the key points or levels within data reporting systems and facilitate a complete assessment of national primary petroleum fuel production and transport. This research has clarified many aspects of the upstream petroleum data reporting systems, and the SN energy balance team now has a good understanding of the structure and data flows within key data sets, such as the NPD-managed DISKOS data set for upstream fuel production data, which covers oil shipments from oil companies. Further, the SN team, being aware of the scope and limitations of these data sets, has sought to cross-check them with other financial and physical commodity monitoring	Yes. Accuracy

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and/or a problem?[a] If yes, classify by type
		systems as part of its QC of the new primary petroleum fuel data, and has identified gaps in data (e.g. oil shipments from Mongstad terminal were outside the scope of DISKOS when delivered to the terminal using shuttle tankers rather than by pipeline) and taken steps to acquire new data to address those gaps. While minor data gaps may remain, such as oil movements directly from Norwegian installations on the continental shelf that are shipped directly to overseas terminals (e.g. the United Kingdom of Great Britain and Northern Ireland), research continues to minimize them. The ERT commends the SN energy balance team for its detailed research and progress to date. However, in the light of the planned changes in the personnel working on the energy balance (see also ID# G.8 above) and the evident complexity of the task, the ERT notes that the current team's detailed understanding of the primary petroleum fuel data set is at significant risk of being lost. This risk is exacerbated by the lack of transparency in the DISKOS data outputs and supporting documentation, which necessitated the SN team's research in the first place. The ERT notes that uncertainties and/or deficiencies in data for exported oil products are cited as key reasons for the discrepancies between the reference and sectoral approach (see ID#s G.9 above and E.34 below). In recent years, research has been conducted on a range of data inputs to determine how complete they are and how they interrelate. This detailed research has enabled the SN team to combine several data sources into an improved national data set for primary petroleum fuels and to track and report their production, import, export and transfer to refineries and other users. However, this process has yet to be developed into a repeatable documented system that is able to compile a complete primary petroleum fuel data set to underpin the energy balance and inventory estimates. The ERT notes that this point is reflected in Norway's response to the list of potential problems and further questions raised by the ERT, which states that the new energy balance production routines are incomplete (see ID# G.9 above). Therefore, the ERT recommends that Norway, in order to maintain a fully functional national system, comprehensively document and archive the findings of the recent analysis to enhance the primary petroleum fuel statistics and develop a clear documented process to integrate the primary petroleum fuel data into the new energy balance, to ensure that the improvements developed by the current team are embedded in a repeatable data compilation system to deliver a more complete and accurate energy balance, and also that the Party report on the progress of this research in its next annual submission. Further, noting that discrepancies between the reference and sectoral approach are also evident for solid and gaseous fuels, the ERT recommends that Norway advance equivalent research to improve the quality of primary and secondary fuel statistics for solid and gaseous fuels.	
G.11	Uncertainty analysis	In the NIR (annex II, section 2.1.2), Norway states that the input data and the probability density functions used in the uncertainty analysis for the base year are the same data as those applied for the latest reported year. The NIR states: "In reality, due to improved methods, the quality of the end year inventory is higher than that of the 1990 data for several categories. Thus, the analysis may underestimate the uncertainty in 1990 emissions and in the trend". During the review week, Norway clarified that the uncertainty parameters used in its model are in many cases old data that have not been updated to reflect improvements and the use of new methods and models in deriving estimates. For example, the uncertainty parameters were not updated for the 2018 submission to reflect the uncertainties of the new	Yes. Adherence to the UNFCCC Annex I inventory reporting guidelines

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?[a] If yes, classify by type*
		enteric fermentation methods in agriculture. Further, Norway confirmed that the same uncertainty parameters are used for 1990 and the latest reported year. The ERT concludes that the uncertainty analysis is therefore inaccurate. It agrees with the Party that the outputs from the model will underestimate uncertainties for 1990 and the trend and are in some cases inaccurate for the latest reported year. The ERT recommends that Norway update and improve its uncertainty analysis through a comprehensive revision and update of the uncertainty parameters applied for the base year and ensure that the uncertainty estimates for the latest year reflect the methods now used for Norway's inventory.	
G.12	QA/QC and verification	The ERT noted that the SN quality manager for the 2018 submission has changed roles and is working on the inventory within NEA. During the review week, the ERT was informed that the new quality manager of the new SN inventory team had only just been appointed. As noted in previous reviews, it is good practice for the inventory agency to assign the QA role to a specific individual within SN, where most of the inventory compilation and day-to-day quality-checking tasks occur, and to ensure that sufficient training and resources are provided to the team to allow quality-management responsibilities to be met, thereby ensuring the continuous improvement and a high quality of the inventory. Noting the change in personnel in the SN inventory team (see ID# G.8 above), and acknowledging that a high level of inventory QA/QC knowledge is retained within the NEA inventory team, the ERT encourages Norway to ensure that sufficient training and resources are provided with a view to maintaining the quality manager function within SN, and to designate an individual to lead quality management within SN and coordinate QA activities across NEA, SN and NIBIO. The ERT considers that best practice would involve designating individuals to lead QA within each of those three organizations, coordinate QA activities and harmonize quality control systems across all organizations. The ERT recommends that Norway report on its approach to managing QA/QC in its NIR, in particular clarifying how the change in personnel is being managed without affecting the essential QA/QC functions of the inventory agency.	Yes. Transparency
Energy			
E.34	1.A. Fuel combustion – sectoral approach – liquid fuels – CO_2	As noted in ID#s G.9 and G.10 above, Norway's 2018 submission reported significant differences in estimated energy use and CO_2 emissions between the reference and sectoral approach for most years across the time series (1990–2016). Large differences may indicate potential problems with the accuracy of the inventory estimates: if the sectoral approach does not reconcile with the apparent consumption data for primary fuels, there may be a systematic error in the derivation of the national fuel consumption data used for the approach. During the review week, the SN energy balance team indicated that a high priority for the improvement of the national energy balance was to research the downstream oil data systems to seek to reduce statistical differences. In discussions with the ERT, SN outlined its planned improvement actions, which involved consulting and researching data reported by refiners, downstream oil suppliers, importers, blenders and exporters, and the Norwegian Customs Service.	Yes. Accuracy

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?[a] If yes, classify by type*
		Therefore, the ERT recommends that Norway initiate a review and evaluation of the downstream oil market and develop and implement a plan to improve the quality of downstream oil supply data for national consumption and sales to the international market, which should include implementing new or improved data supply mechanisms to secure access to required AD, where necessary; conducting research to improve data quality through the comparison of oil product supply data from customs with information received directly from refiners and other suppliers; conducting research to reduce the uncertainty of the allocation of fuels between national navigation and international shipping; and reporting on progress in the NIR.	
E.35	1.A.2.a Iron and steel – solid fuels – CO_2	The ERT noted that there are large inter-annual variations in the CO_2 IEFs for solid fuels for the production of iron and steel. In response to review questions, Norway noted that inconsistencies in the energy statistics lead to inter-annual variations in the IEFs, and stated during the review that this is a result of inconsistencies in the data reported voluntarily by the iron and steel industry. The ERT recommends that Norway describe in the NIR the methods, AD and emissions voluntarily reported by the iron and steel industry, and how the Party ensures that a complete and consistent time series of information is reported at the national level for this industry. Where large inter-annual fluctuations are identified, the ERT recommends that the Party investigate the underlying reason to ensure accurate reporting of emissions, and describe the reason in the NIR.	Yes. Accuracy
E.36	1.B.2 Oil, natural gas and other emissions from energy production liquid and gaseous fuels– CH_4 and CO_2	The ERT noted that the emission estimates for the exploration and production of both oil (1.B.2.a.1 and 1.B.2.a.2) and natural gas (1.B.2.b.1 and 1.B.2.b.2) are reported in aggregate with other categories, primarily the category venting (combined) (1.B.2.c.iii). This highly aggregated approach to reporting is inconsistent with good practice as set out in the 2006 IPCC Guidelines. The ERT considers that the lack of data resolution by category significantly inhibits the transparency and comparability of the submission, limiting the ERT's ability to perform a technical assessment of the quality of the inventory data and an assessment of the accuracy and completeness of the submission. The ERT noted that the oil and gas industry is of great significance to the Norwegian economy and has been subject to government regulation and numerous studies over many years, and that categories 1.B.2.a (oil) and 1.B.2.c (venting and flaring) are key categories for CO_2 and CH_4, and category 1.B.2.b (natural gas) is a key category for CH_4. During the review week, Norway clarified its approach to emission estimation and reporting, including recent (2016) industry research into fugitive and cold-venting sources. Further, the Party presented information on the emission data reporting system (EEH, previously referred to as Environmental Web), which, from 2017 onward, will collect data from operators for around 20 individual sources of fugitive and cold-venting emissions, in accordance with new guidelines developed for NEA by a Norwegian oil and gas consultancy. The ERT recommends that Norway advance research on fugitive and cold-venting sources from oil and natural gas exploration and production and make further improvements to the data supply and reporting system, where necessary, to enable the Party to significantly improve the level of resolution in the reporting of fugitive, flaring and venting emissions from oil and natural gas systems in order to improve transparency, comparability and accuracy.	Yes. Comparability

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?[a] If yes, classify by type*
		The ERT also recommends that Norway report disaggregated emissions per subcategory and avoid using "IE", or, where this is not possible, provide transparent justification in the NIR for use of this notation key.	
E.37	1.B.2 Oil, natural gas and other emissions from energy production gaseous and liquid fuels– CH_4 and CO_2	The ERT notes that the level of fugitive emissions reported by Norway for subcategories across this category result in generally low IEFs for CH_4 and CO_2 when compared with emissions reported by other Parties with similar offshore oil and gas production facilities and technologies. The ERT also notes that the NIR does not provide a clear justification for the reported level of emissions, and that this issue is compounded by the lack of transparency (see ID# E.38 below). During the review week, Norway outlined research conducted by Norwegian oil and gas industry consultancies to develop new country-specific methods and EFs for oil and gas operators regulated by NPD for the estimation of emissions from fugitive and cold-venting sources. The ERT understands that these new methods and EFs will be used by oil and gas operators to estimate and report emission data for 2017 onward, and may subsequently underpin national inventory estimates in future submissions (most likely from 2020 onward). The ERT recommends that Norway advance its research and make improvements to the data reporting systems used to estimate emissions by subcategory, including from fugitive emissions and from venting and flaring, and include clear justification for the country-specific EFs and methods applied in order to provide evidence of the accuracy and completeness of the time series of emission estimates for all mentioned subcategories. In particular, the NIR should include a description of the methods used by operators for the facility-level reporting of emissions. The ERT also recommends that Norway present information supporting the EFs, in particular a comparison of country-specific EFs and methods with IPCC default EFs and methods, together with relevant information on, for example, mitigation technologies used in the oil and gas exploration and production sector in Norway, and any monitoring of fugitive and venting emissions at oil and gas installations, for CH_4 in particular in order to provide assurance of the completeness and accuracy of the national inventory.	Yes. Accuracy
E.38	1.B.2 Oil, natural gas and other emissions from energy production – CH_4 and CO_2	The ERT notes a lack of transparency in the data reporting systems and the QA/QC procedures conducted on the emission data reported by operators in the upstream oil and gas industry and subsequently used to inform the emission estimates for this category. During the review week, Norway outlined the regulatory system for the upstream oil and gas industry, including emission reporting guidance and systems for operators to use in their annual emission reports to regulators at NPD and NEA. The Party clarified the procedures used to check operator submissions, including the review of operator returns by NPD and NEA staff, to assess the completeness, accuracy and time-series consistency of operator data. Noting that there are several key categories within this category, the ERT recommends that Norway provide in the NIR a full description of the data reporting and QA/QC systems in place and all the measures that are implemented to check reported national fugitive, venting and flaring emission data for accuracy and completeness and ensure that the data meet IPCC data quality objectives. The ERT encourages Norway to include within the description of the QA/QC procedures evidence of quality control and industry, expert and peer review of the studies used to inform operator reporting methodological guidance and EFs for specific sources; insight into the measurement protocols applied by operators in the Norwegian oil and gas	Yes. Transparency

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and/or a problem?[a] If yes, classify by type
		industry to report on fugitive CH_4 emissions; and information on how completeness and time-series consistency are maintained, such as by applying IPCC good practice methods such as extrapolation, interpolation and data overlap.	
E.39	1.C.1.a Pipelines – CO_2	The ERT noted that AD for the transport of CO_2 by pipeline are reported in CRF table 1.C (750.02 kt in 2016), but emissions are reported as "NO". During the review, Norway stated that the uncertainties around measurements of CO_2 entering the pipeline and delivered to the injection site were too high to be used to determine if there were any leaks. The ERT believes that future ERTs should consider this issue further to ensure that emissions for this category are not underestimated. The ERT recommends that Norway estimate emissions for this category in accordance with the 2006 IPCC Guidelines.	Yes. Completeness
IPPU			
I.20	2. General (IPPU)	Norway applies higher-tier methods to estimate emissions for most IPPU categories on the basis of emissions and other data reported by plants participating in regulatory programmes domestically and under the EU ETS. The progress in the integration of plant-specific information into the inventory is commendable; however, the ERT considers that the transparency in the NIR of the information on approaches and data used to develop consistent time series could be enhanced, given that the availability of plant-specific information varies across IPPU categories and across the time series. In accordance with the UNFCCC Annex I reporting guidelines on GHG inventories (decision 24/CP.19, annex, paragraph 18), Parties should document and report the methodologies used for the entire time series. During the review week, Norway shared documentation from 2006 that had previously been annexed to the NIR describing the approaches used for most IPPU categories to develop a consistent time series for the period 1990–2004, including how gaps were filled to ensure time-series consistency. The ERT encourages Norway to enhance transparency in documenting and reporting methods used across the time series to estimate emissions where facility-level reported data are used for an IPPU category, and to update the existing documentation to reflect methods and approaches applied to estimate and report those emissions and ensure consistency over the time series.	Not an issue/problem
I.21	2. General (IPPU)	The ERT notes that plant-specific or tier 3 methods are used to report emissions from some categories, such as those used by facilities for reporting under the EU ETS. However, the NIR does not consistently include descriptions, references and sources of information for specific methodologies, AD and EFs when tier 3 methods are used, as set out in decision 24/CP19, annex, paragraph 41. The ERT considers that Norway transparently reports specific methods, AD and EFs for estimating emissions from the production of cement and ferroalloys in the NIR, but does not provide this information consistently for all categories, including key categories. Therefore, the ERT recommends that Norway review and improve consistency in the presentation of information in the NIR on specific methods and actual AD and EFs where emissions are estimated using aggregated data from plant-specific reporting, considering the good practice guidance in the 2006 IPCC Guidelines. Examples of information that will enhance transparency include (1) for lime production, EFs for limestone, links to EU ETS	Yes. Transparency

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?[a] If yes, classify by type*
		methods, and lime kiln dust quantity, (2) for ammonia production, AD on gas consumption and composite EFs, (3) for nitric acid, references to methods for continuous measurement, (4) for petrochemical production subcategories methanol, ethylene, and ethylene dichloride and vinyl chloride monomer, AD on fuel quantity combusted, and production quantities, (5) for silicon carbide, AD on crude production, and (6) for other categories, other process uses of carbonates (e.g. AD on fly ash and references to EU ETS methods).	
I.22	2.A.3 Glass production – CO_2	Glass production emissions from plants in Norway are estimated on the basis of consumption of carbonates, including limestone, dolomite and soda ash production at specific plants (section 4.2.3.3, p.190, of the NIR and CRF table 2(I).A-Hs1). The ERT noted that table 4.5 of the NIR provides a total balance of limestone for 2014–2016, but that Norway does not report any limestone use for glass production. During the review, Norway informed the ERT that there was no limestone consumption for glass production in 2014–2016, and that it will clarify this in the next NIR by reporting "0" for the relevant years. The ERT encourages Norway to include the information provided during the review (clarification that there was no limestone consumption for glass production in 2014–2016) in the NIR.	Not an issue/problem
I.23	2.B.1 Ammonia production – CO_2	A portion of the CO_2 from ammonia production is recovered and sold for other uses that are not reported under category 2.H.2 (food and beverages production). The ERT noted that the NIR does not describe transparently the specific methods used to estimate the CO_2 recovered and deducted from ammonia production. During the review week, Norway shared information on the specific methods used by the facility for monitoring and estimating the CO_2 recovered from ammonia production, and how those methods prevent the underestimation of emission estimates and double counting with other process and energy emissions. The ERT agreed with the method and reporting of the amount of CO_2 recovered from ammonia production. The ERT recommends that Norway report in the NIR the specific methods used to estimate CO_2 recovered and deducted from ammonia production reported under category 2.H.2, including information on how the Party avoids double counting of emissions with other process and energy emissions.	Yes. Transparency
I.24	2.B.5 Carbide production – CO_2	The ERT noted that the CO_2 IEF for silicon carbide decreased by 7.4 per cent between 1990 (2.66 t/t) and 2016 (2.46 t/t). During the review week, Norway noted that the QA/QC checks and follow-ups carried out by NEA have identified these as irregularities. The ERT concluded that reported production for some years reflects pure production rather than crude production (which is the AD used in the tier 2 method). During the review, Norway informed the ERT that this will be corrected in the next annual submission. The ERT believes that future ERTs should consider this issue further to ensure that emissions for this category are not underestimated. The ERT recommends that Norway correct the AD in the CRF tables for the complete time series and include AD for select years in the NIR under the AD section (see issue ID# I.21 above).	Yes. Accuracy
I.25	2.B.8 Petrochemical and carbon black	The ERT noted that the approaches to allocating fuel combustion emissions, obtained directly or indirectly from feedstock, between the energy and IPPU sectors for the categories ethylene (2.B.8.b) and ethylene dichloride and vinyl chloride monomer (2.B.8.c) are inconsistent with the 2006 IPCC Guidelines (volume 3, chapter 3.9.1), which	Yes. Comparability

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	production – CO_2, CH_4 and N_2O	indicate that "combustion emissions from fuels obtained from the feedstocks should be allocated to the source category in the IPPU sector. However, where the fuels are not used within the source category but are transferred out of the process for combustion elsewhere (e.g. for district heating purposes) the emissions should be reported in the appropriate Energy Sector source category". For methanol (2.B.8.1), the description of its production in the NIR (section 4.3.6.1), does contain information on CO_2 emissions from "other energy combustion" reported under the energy sector. For ethylene, ethylene dichloride and vinyl chloride monomer, only process emissions from relevant fuels are reported in the IPPU sector and the NIR. During the review, Norway clarified that the data are available and process and energy emissions can be allocated consistently with the 2006 IPCC guidelines and decision 24/CP.19, paragraph 9. The ERT recommends that the Party either (1) use methodologies and reporting approaches that are consistent with the 2006 IPCC Guidelines for subcategories 2.B.8.b and 2.B.8.c, allocating combustion emissions from all relevant fuels and emissions obtained from feedstock within the IPPU sector and allocating emissions from other combustion to the energy sector, in addition to documenting how the approach avoids gaps and double counting with the energy sector, or (2) provide information on the country-specific approach used to estimate CO_2 emissions from petrochemical production, justifying the reason for its allocation choice and explaining the circumstances as to why it is unable to calculate the estimates following the 2006 IPCC Guidelines.	
I.26	2.F.1 Refrigeration and air conditioning – HFCs and PFCs	Norway indicated the use of a tier 2 EF approach to estimate emissions for all categories except mobile air conditioning, for which a hybrid mass-balance and EF approach was used. The NIR does not include information on the specific methods (e.g. equations applied), the rationale for the selection of methods (e.g. the use of EF and hybrid methodologies), the assumptions (e.g. the basis for determining the share of HFCs used in mobile air conditioning from bulk imports) or the underlying assumptions informing uncertainty. The documentation provided by Norway during the review week on the methods of estimating HFC and PFC emissions from product use included some of this information. The ERT recommends that Norway include in the NIR the specific methods applied, providing the equations, rationale for the selection of methods and EFs, and underlying assumptions informing the uncertainty of the data used, as well as, if applicable, a link to additional information on the methods used.	Yes. Transparency
I.27	2.F.1 Refrigeration and air conditioning – HFCs and PFCs	In relation to ID# I.26 above, the ERT noted that, in applying the tier 2 approach, Norway continues to use EFs that are consistent with defaults in the 2006 IPCC Guidelines for estimating lifetime emissions. During the review, Norway noted that it had initiated efforts to review whole-of-product-life use practices for some applications, including recovery or recycling rates to improve EFs for estimating HFC emissions. Further, areas for improvement were outlined in the model documentation shared with the ERT during the review. The ERT recommends that Norway implement the identified areas for improvement (e.g. gathering information on recycling rates, including expanding ongoing research and outreach to relevant industry associations on EFs and use practices, and use of blends), especially for more significant applications, and report on progress in the NIR.	Yes. Accuracy

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?[a] If yes, classify by type*
Agriculture			
A.5	3. General (agriculture) – CH_4 and N_2O	The ERT noted that the data sources referred to in NIR section 5.2 (livestock numbers) – including from registers of production subsidies, statistics of approved carcasses, and the cow recording system – are estimated to cover 80–100 per cent of animal populations, and that a correction for the estimated shortage of coverage is taken into account in the livestock numbers that are used within inventory calculations. However, the ERT also noted that the approach to ensuring inventory completeness for livestock populations is not clearly described in the NIR. During the review week, Norway provided the following additional information: (a) The animal numbers from SN production subsidies data are corrected in terms of the estimated coverage of animal populations, and the figures used in the calculations represent the total population; (b) Full-grown sheep are counted before they go to grazing (on 1 January each year). There is a deduction for the number slaughtered. However, the number of grown sheep that die on pasture is not taken into account. Slaughter statistics account for sheep under a year old and do not count the number of sheep under a year old that died on pasture. For 2017 onward, it may be possible to determine the number of sheep that have died on pasture, since new counting dates will be introduced for sheep (see also ID# A.11 below); (c) The number of dairy cows and heifers for breeding is derived annually from the TINE cow recording system. Between 98 and 99 per cent of all dairy cows are registered in this system and the number used in the inventory is adjusted for those that are not. The adjustment is based on the percentage of herds monitored by the cow recording system. The correction and figures are verified by the SN contact person at TINE. The ERT recommends that Norway explain how animal numbers from SN production subsidies are corrected, how full-grown sheep are counted, and how the number of dairy cows and heifers for breeding is derived in the NIR to improve transparency regarding the completeness of livestock figures.	Yes. Transparency
A.6	3. General (agriculture) – CH_4 and N_2O	The ERT notes that the uncertainty of calculated emissions is not expressed for all subcategories (e.g. dairy cows) for which specific methods and models are described in annex IX to the NIR. A value of +/–25 per cent is presented in the NIR for enteric fermentation and the same value is presented specifically for growing and finishing cattle and replacement heifers. During the review week, the Party presented further details on the methods used, including results from quality checks of derived country-specific EFs against IPCC default EFs. The ERT notes that this information on the level and range of country-specific EFs by livestock subcategory could be further developed and incorporated into the NIR to help inform uncertainty estimates. The ERT also notes that, where a country-specific model is used to determine an EF (that departs from the 2006 IPCC Guidelines default values), it is good practice to compare the EFs against IPCC defaults and the EFs of other countries with similar circumstances, and to derive and present uncertainty estimates for the EFs, in order to confirm the validity and adequacy of the model.	Yes. Adherence to the UNFCCC Annex I inventory reporting guidelines

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?[a] If yes, classify by type*
		The ERT recommends that Norway further develop the uncertainty analysis for emission estimation methods at the level of the derived EFs for agriculture subcategories, and update the uncertainty analysis for the sector accordingly to reflect the Norwegian models and data.	
A.7	3. General (agriculture) – CH_4 and N_2O	The ERT noted that the description of how the sheep livestock numbers were derived and used in the emission calculations was not transparent in the NIR. During the review week, Norway provided more detailed explanations of the sheep population data and how they were used in the inventory, and of the recalculations since the 2016 submission. The methods for calculating the number of sheep for these categories have been revised since the review of the 2016 annual submission. This change was made because the number of sheep over one year of age was overestimated, having been counted as sheep under one year as at 1 January. The number of sheep under one year was also probably underestimated, since it was assumed that all registered lambs were slaughtered. In addition, the methods for determining sheep numbers for animals over one year were different for the categories enteric fermentation (3.A) and manure management (3.B). The previous method used neither available data on the number of sheep slaughtered at certain times of the year nor actual average slaughter weight. The method now applied in the 2018 submission for estimating the number of animals was reviewed by experts at the Norwegian Meat and Poultry Research Centre. The method uses data from production subsidies as well as slaughter statistics. To estimate CH_4 emissions from enteric fermentation, the animal population is divided into several subgroups: (a) Lambs slaughtered in January–May: (i) Submissions in 2016 and earlier: total number of lambs slaughtered multiplied by 0.0789; (ii) Subsequent submissions: number of lambs slaughtered in January–May; (b) Lambs slaughtered in June–December: (i) Submissions in 2016 and earlier: total number of lambs slaughtered multiplied by 0.9211; (ii) Subsequent submissions: number of lambs slaughtered in June–December; (c) Sheep under one year for breeding: (i) Submissions in 2016 and earlier: number of lambs under one year registered on 1 June multiplied by 143, divided by 365, minus total number of lambs slaughtered, multiplied by 0.0789; (ii) Subsequent submissions: number of sheep under one year registered on 1 January minus number of lambs slaughtered January–May; (d) Sheep over one year for production:	Yes. Transparency

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?[a] If yes, classify by type*
		(i) Submissions in 2016 and earlier: number of sheep over one year registered on 1 January plus number of sheep under one year registered on 1 January minus number of slaughtered sheep over one year; (ii) Subsequent submissions: number of sheep over one year registered on 1 January minus number of sheep slaughtered in January–May of the same year (sheep slaughtered later in the year are counted as live for the whole year). CH_4 and N_2O EFs and N excretion rates for manure management are estimated to fit an animal year for sheep over one year and for sheep under one year. These numbers are calculated in the following manner: (a) Sheep over one year: (i) Submissions in 2016 and earlier: number of sheep over one year registered on 1 January plus number of sheep under one year registered on 1 January (data source: production subsidies); (ii) Subsequent submissions: number of sheep over one year registered on 1 January minus number of sheep slaughtered in January–May of the same year (sheep slaughtered later in the year are counted as live for the whole year); (b) Sheep under one year: (i) Submissions in 2016 and earlier: number of lambs under one year registered on 1 June multiplied by 143, divided by 365 (data source: production subsidies); (ii) Subsequent submissions: number of sheep under one year registered on 1 January plus number of lambs slaughtered in June–December, multiplied by 143, divided by 365. (Lambs slaughtered before June are assumed to be registered as sheep under one year on 1 January. Practically all lambs slaughtered after June are born in the spring. Expert judgment suggests an average lifetime of 143 days for slaughtered lambs born in the spring.) (Sources: sheep under one year on 1 January: production subsidies; number of lambs slaughtered in June–December: slaughter statistics). The ERT recommends that Norway explain the methods used to estimate the four populations of sheep for estimating CH_4 emissions from enteric fermentation and the two populations used for estimating CH_4 and N_2O emissions and N excretion rates from manure management in the NIR or its annexes (annex IX) to improve the transparency of the submission.	
A.8	3.A.1 Cattle – CH_4	Figure AIX-1 in annex IX to the NIR presents an example of the estimated dry matter intake throughout the lactation cycle. However, the ERT notes that the figure is not transparent, as it contains two time series and one of the curves that represents the intake of roughage in the figure is not referred to. Further, the description in the NIR of how enteric CH_4 emissions from dairy cows are calculated needs improvement to allow replication of the calculations. During the review, clarification was provided on the model and the Nordic feed evaluation system (NorFor), specifically:	Yes. Transparency

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and/or a problem?[a] If yes, classify by type
		(a) Model inputs include: milk yield (in 500 kg intervals, from 5,000 to 12,000 kg energy corrected milk/year); three types of grass silage representing low, medium and high energy content; feed table values for chemical composition (fatty acids) used, four concentrate mixtures differing in energy and protein value; feed table values for chemical composition (fatty acids) used. The model uses an equation for calculating enteric CH_4 as referred to in Storlien et al. (2014); (b) Model outputs: dry matter intake, fatty acid concentration in dry matter, and GE intake and Ym results, covering a wide variation of feed characteristics and production intensities (milk yield). Norway explained that the results from the model simulations were used to develop regression equations between GE and parameters related to diet and animal characteristics (milk yield) and between Ym and parameters related to diet and animal characteristics (milk yield). Based on those regressions, milk yield and concentrate proportion were chosen to be used as parameters to calculate GE and Ym. The ERT recommends that Norway update the NIR with explanations on the inputs and outputs of the NorFor model, as well as on how the model simulations were used to develop regression equations to determine the most appropriate parameters to calculate GE and Ym in order to improve the transparency of the method. The ERT also recommends that Norway revise figure AIX-1 to provide complete information for all parameters presented.	
A.9	3.A.1 Cattle – CH_4	The ERT noted that the description of the methodology used to calculate enteric fermentation emissions from beef cows lacks transparency. As an example, the sequence of calculations, the intermediary equations and how equations are connected are not explained. Also, limited information is provided on the determination of GE and digestible energy (a tier 2 country-specific method) and how this is applied for a lifetime period. The discussions during the review week included a presentation on the model and its mechanics. The ERT recommends that Norway include a more detailed and transparent description in the annual submission of all calculations, including data references and assumptions applied, to determine the country-specific parameters (e.g. GE intake, digestibility) and to estimate CH_4 emissions from enteric fermentation in beef cows. Where the data, assumptions and methods deviate from IPCC defaults, the ERT recommends that Norway present information to justify the use of the country-specific parameters, and to describe the calculation method such that a future ERT may replicate the calculations of parameters and emissions.	Yes. Transparency
A.10	3.A.1 Cattle – CH_4	An explanation provided in the NIR (section 5.2.2, p.273) related to the method of accounting for enteric fermentation CH_4 emissions for heifers and bulls for slaughter implies that the emissions are calculated once over the lifetime of the animal, but the NIR does not include sufficient details on the method used to estimate these emissions in order to verify the results. During the review week, Norway explained the method applied to account for emissions from these livestock. The coefficients for N and volatile solid excretion and formation of CH_4 are based on the development of the animals throughout their lifetime (weight gain, age, feed consumption).	Yes. Transparency

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		According to Norway, it uses the number of animals slaughtered as AD, providing a near-perfect coherence between the definition of the categories counted and the representation of the coefficients. Counting the number of animals slaughtered gives a very precise value of the number of animals. Counting the number of animals as the number of live animals on specific dates (which is the alternative) would remove the possibility of grouping the animals into the five categories of young cattle used in the definitions, because this statistic gives only the number of young cattle as a total. Norway also informed the ERT that, while inter-annual variations in the number of animals slaughtered may skew estimates, emissions missing from a given year are reported in the year before or after. Such corrections can be estimated on the basis of changes in the number of animals. The ERT recommends that the explanations regarding the method applied to account for CH_4 emissions from enteric fermentation in heifers and bulls provided during the review be incorporated into the next NIR to improve transparency.	
A.11	3.A.2 Sheep – CH_4	The ERT identified variations in the time series for GE and Ym for sheep in the NIR (annex IX, table 2.1), which are distinct from the values presented in the CRF tables. For example, in the NIR, the 2016 GE is 75 per cent lower than the 2015 data, and the 2016 Ym value is 20 per cent lower than the 2015 value. Values for before 2005 are similar to those for 2016. The ERT noted that, across the time series, only the data for GE and Ym in 1990 and 2016 in table 2.1 of annex IX were consistent with the CRF data; for all intervening years, the data differ between the CRF tables and the NIR annex. During the review week, Norway confirmed that the correct numbers are those in the CRF tables. The ERT recommends that Norway verify and correct the tables in the NIR to record the correct values for GE and Ym for the entire time series and improve the quality control of the tables presented in the NIR annexes.	Yes. Adherence to the UNFCCC Annex I inventory reporting guidelines
A.12	3.B.1 Cattle – CH_4	The ERT noted that CRF table 3.B(a)s1 has parameters indicated as “NE” (e.g. weight of other cattle), while the emissions for that source are calculated by adopting different country-specific models, as explained in the NIR (section 5.5.1.1, p.285). During the review week, the ERT and the Party noted that, while “NE” is used for missing emission estimates or associated parameters, “NA” should be used where a parameter is not applicable to the calculation method applied. The ERT recommends that the Party revise the notation key used for typical animal mass in CRF table 3.B(a)s1 from “NE” to “NA”.	Yes. Comparability
A.13	3.D Direct and indirect N_2O emissions from agricultural soils – N_2O	Norway uses a tier 2 model to estimate ammonia volatilization (NIR, p.301) and indirect N_2O emissions from soils. The NIR (p.314) refers to planned improvements related to the model used for estimating ammonia emissions from manure, indicating that they are discussed in section 10 (NIR table 10.9). However, the ERT noted that this table has no actions planned for the agriculture sector. The topic was discussed during the review week and Norway clarified that planned improvements were described in chapter 5, under category-specific recalculations, of the 2018 NIR (e.g. section 5.5.5 in table 299) but were mistakenly not included in table 10.9.	Yes. Transparency

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		The ERT recommends that Norway update the reporting on improvements for the agriculture sector in chapter 10 of the NIR such that it is consistent with the category chapters, including actions and priorities.	
LULUCF			
L.7	Land representation – CO_2, CH_4 and N_2O	The ERT notes that, for each year of the time series (1990–2016), the areas reported under land conversion categories in CRF tables 4.A–F should be the cumulative area converted to those categories over a 20-year period. However, the number of years represented by the different converted areas reported by Norway varies: the area reported for 1990 is just the area converted in that year, while for the following years the area reported is the cumulative area since 1990, such that it grows year on year to 2 years in 1991, 3 years in 1992, right up to 20 years in 2009 and so on. Such an approach results in inconsistent GHG emission trends and removals for the land under the various conversion categories. The ERT recommends that Norway report cumulative 20-year conversion areas in CRF tables 4.A–F, which involves calculating annual land use and land-use change matrices for 1971–1989. In the absence of a complete time series of data on land use and land-use change areas, the ERT notes that the 2006 IPCC Guidelines contain techniques for gap-filling (volume 1, chapter 5), such as the surrogate method, where the gross domestic product or urban/rural population can be used as a proxy. However, the ERT acknowledges that when approach 3 for land representation is implemented, an additional level of complexity stems from the need to geolocalize extrapolated data, and that the 2006 IPCC Guidelines do not provide good practice for doing so. In the absence of good practice, the ERT encourages Norway to apply a statistical approach for geolocalizing the gap-filled data on land-use change from 1971 to 1989 in accordance with the dynamic observed in the reported period (1990–2016), and to estimate carbon stock changes and associated GHG fluxes consistent with this dynamic.	Yes. Accuracy
L.8	Land representation – CO_2, CH_4 and N_2O	The ERT notes that, according to the 20-year transition, after 20 years, converted areas of land are transferred to the corresponding land remaining category. However, the ERT also notes that this does not occur for all years and land-use categories in Norway's inventory. For instance, the area converted to forest land in 1990 (2.20 kha) should have been transferred to the category forest land remaining forest land in 2010. Considering that the area of land converted to forest land in 2009 was 54.66 kha and that in 2010 a new area of 4.31 kha was converted to forest land, the area of land converted to forest land to be reported in 2010 should have been 56.77 kha (54.66 minus 2.20 plus 4.31); however, the area reported in CRF table 4.A is 58.54 kha. The ERT concluded during the review week that such an apparent discrepancy may be caused by the use of approach 3 for land representation where a subsequent land-use change occurs in the same unit of land before the transition period has expired. Therefore, the ERT recommends that Norway ensure that for any year X of the GHG inventory time series, (1) the area (A_X) of any land remaining category A is the area of A in the previous year (A_{X-1}) minus the area of A converted in the year X to all other land-use categories (A to OLU_X) plus the area converted to A from all other land-use categories 20 years before that has not been subsequently converted to any other land-use category before the transition period has expired (OLU to A_{X-20}) (i.e. A_X=A_{X-1}-A to OLU_X+OLU to A_{X-20}), and (2) the area of any land	Yes. Accuracy

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		converted from category B to A (B to A_X) is the cumulative area converted to category A from B (B to A) over the 20-year time period from year X to year X-19 (i.e. B to $A_X=\sum_{x-19}^{x}$ B to A). To ensure transparency, the ERT also recommends that Norway report information on the areas of land converted in previous years that have been subject to multiple land-use changes before the transition period (20 years) has expired.	
L.9	Land representation – CO_2, CH_4 and N_2O	The ERT notes that in matrices (CRF table 4.1) for successive inventory years the total area of a land-use category reported at the beginning of year X must be equal to the total final area of that land-use category at year X-1. However, this is not always the case in the time series of CRF tables 4.1 reported by Norway. For instance, the total forest land area at the beginning of 2016 is 12,141.28 kha, while the forest land area at the end of 2015 is reported to be 12,141.14 kha. The discrepancy is observed for all other land-use categories: cropland (937.32 versus 937.39 kha); grassland (231.25 versus 231.26 kha); wetlands (unmanaged) (3,717.04 versus 3,716.97 kha); settlements (691.23 versus 691.22 kha); and other land (14,658.06 versus 14,658.20 kha). The ERT recommends that Norway ensure the equivalence of reported areas so that the area of each land-use category at the beginning of year X is the same (without any rounding) as the final area in year X-1 for the same land-use category.	Yes. Consistency
L.10	Land representation – CO_2, CH_4 and N_2O	Norway uses the national forest inventory areal plots to estimate land use and land-use changes over time. The information reported in the NIR (pp.340–349) does not clarify some elements of the methodology applied, such as the hierarchy of uses in the event of multiple uses of the same land and the calculation of the variance and associated uncertainties of estimated areas of land use and land-use change classes. The ERT recommends that Norway revise the description of the methodology applied for classifying areal plots under land use and land-use change classes, as well as for estimating associated uncertainties.	Yes. Transparency
L.11	4. General (LULUCF) – CO_2, CH_4 and N_2O	Norway reports CO_2 emissions from drainage on land converted to peat extraction and CH_4 and N_2O emissions from biomass burning on managed grassland as negligible (NIR table 1.10). However, it does not report quantitative information on the amount of emissions excluded from each category, or the total amount of emissions excluded from all sectors, as required for the application of the significance threshold set out in decision 24/CP.19, annex, paragraph 37(b). The ERT recommends that Norway quantify the emissions for each excluded category to test its significance against the threshold values. Further, the ERT recommends that Norway sum up all insignificant categories and apply the cumulative test referred to in decision 24/CP.19, annex, paragraph 37(b), and report the results in the NIR.	Yes. Completeness
L.12	4. General (LULUCF) – CO_2 and N_2O	Norway applies a country-specific methodology to estimate SOC changes in mineral soils associated with land-use conversion that is based on a set of values of SOC, one for each land-use category, calculated as the average of the national conditions. Using such values is only valid under the assumption that land-use conversions occur for each land use in equal proportion to the distribution of the SOC content within the land use. The ERT notes that Norway does not provide evidence that this assumption is correct and the estimate is not biased. The ERT also notes that the	Yes. Accuracy

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and/or a problem?[a] If yes, classify by type
		country-specific method does not conform to IPCC good practice since it does not stratify SOC values by climate zone, soil type and management practice so that the uncertainty is reduced as far as practicable. Therefore, the ERT recommends that Norway replace the current method with a methodology consistent with the 2006 IPCC Guidelines. For instance, Norway could calculate a set of SOC_{REF} values stratified by climate zone and soil type using SOC measurements taken in forest land and grassland under natural conditions, and if the SOC_{REF} values are within the uncertainty range of IPCC defaults, apply the IPCC default stock change factors to the SOC_{REF} values to derive SOC content for each combination of land-use and management system as stratified by climate and soil type, before finally applying equation 2.25 from the 2006 IPCC Guidelines to the derived SOC values, whether formulation A (where approach 1 for land representation is applied) or formulation B (where approach 2 or 3 for land representation is applied), to determine the annual net SOC change associated with each conversion of land use.	
L.13	4. General (LULUCF) – CO_2	The ERT notes that the SOC value of forest land (57 t C ha^{-1}) is lower than that of cropland (83 t C ha^{-1}) and grassland (98 t C ha^{-1}) and lower than any IPCC default value for the temperate cold climate zone, while the DOM carbon stock (66 t C ha^{-1} to 61 t C ha^{-1} of litter plus 5 t C ha^{-1} of deadwood) is higher than that reported by any other Party included in Annex I to the Convention. During the review, the ERT determined that the reason is that the litter, fermented and humic strata have been assigned to the DOM pool, while the humic and fermented strata should have been assigned to the SOM pool. The ERT acknowledges, as communicated by Norway during the review week, that forest soils are primarily sandy and around a sixth of forest area is on soil types typically with shallow soil depth (regosols, folisols); that national circumstances make it difficult to distinguish the litter component in boreal forest soils with large organic matter accumulations and slow decomposition of primarily coniferous litter; that the reported mean litter carbon stock of 61 t C ha^{-1} is within the interval provided in table 2.2, volume 4, of the 2006 IPCC Guidelines (7-123 t C ha^{-1}); and that the data currently available from the national forest soil survey do not distinguish the litter stratum from fermented and humic strata. In addition, table 1.1 of the 2006 IPCC Guidelines provides some flexibility in how the litter, fermented and humic strata should be apportioned between the DOM and SOM pools as litter refers to organic matter "in various states of decomposition", which may include residues that are not clearly distinguishable; however, such organic matter must be of "a size greater than the limit for soil organic matter". The ERT recommends that Norway provide in the NIR a definition of litter pool that includes the minimum size of organic matter included in the pool. The ERT encourages Norway to investigate ways to apportion the litter, fermented and humic strata between the DOM and SOM pools to achieve pool definitions that are within the bounds indicated in the definitions of C pools in the 2006 IPCC Guidelines – which could mean assigning the litter stratum to DOM and the fermented and humic strata to SOM – and report on its progress in the NIR.	Yes. Transparency
L.14	4. General (LULUCF) – CO_2	The ERT noted that the EFs for CO_2 applied to drained organic soils vary within the same land-use category without any justification. For instance, the EF for forest land converted to cropland is –7.91 t C ha^{-1} while for all other subcategories of cropland it is –7.90 t C ha^{-1}; the EF for land converted to grassland is –3.61 t C ha^{-1} while for grassland remaining grassland it is –3.60 t C ha^{-1}; the EF for forest land converted to other wetlands is -0.25 t C ha^{-1} while for forest land it is –0.27 t C ha^{-1}; and the EF for wetlands converted to settlements is –7.93 t C ha^{-1} while for	Yes. Accuracy

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?[a] If yes, classify by type*
		forest land converted to settlements and settlements remaining settlements it is –7.90 t C ha^{-1}. In the NIR, Norway indicates that it uses the default values from the 2006 IPCC Guidelines. The ERT recommends that Norway ensure a consistent use of IPCC default factors for drained organic soils across categories, subcategories and subdivisions for all land-use categories and land-use changes.	
L.15	4. General (LULUCF) – CO_2, CH_4 and N_2O	Recalling the various inconsistencies noted, in particular with regard to CRF table 4.1 (see ID# L.9 above), land representation (see ID#s L.7 and L.8 above), use of EFs (see ID# L.14 above) and use of carbon stock change factors (see ID#s L.18, L19, L.20 and L.21 below), the ERT recommends that Norway implement specific QC logical tests to avoid such errors, such as the checks detailed in ID# L.9 above, checks of values assigned to the same factor in different subdivisions, subcategories and categories where applied, and checks of symmetrical processes, such as the gain or loss of annual biomass in cropland and grassland, for which the same absolute value is expected to be used though its sign is opposite.	Yes. Adherence to the UNFCCC Annex I inventory reporting guidelines
L.16	4.A.1 Forest land remaining forest land – CO_2	The ERT notes that the gross annual increment of biomass shows a sudden increase of 22 per cent in the period 1998–2002, from 11.64 Mt C in 1997 to 12.97 Mt C in 2002. Such a sudden increase can be the consequence of generally reduced harvesting, with a preference for overmature and mature forests, in conjunction with the introduction of large areas under regeneration in the exponential phase of tree growth. Information reported in the NIR, however, does not allow the ERT to assess what the drivers of such an abrupt increase might be. Thus, the ERT recommends that Norway report information allowing an assessment of the driver(s) of the gross increment increase in biomass in the period 1998–2002, as well as their individual contribution to the estimated increase.	Yes. Transparency
L.17	4.A.1 Forest land remaining forest land – CO_2 and N_2O	Norway uses the Yasso07 model for estimating SOM and DOM changes in the forest land category. The ERT noted that verification of the model outputs, as required by decision 24/CP.19, annex, paragraph 41, has not been provided. The ERT also noted that (1) a comparison, presented during the review week, of SOC in 1990 with model estimates and measurements taken at the national forestry inventory plots for the International Co-operative Programme on Assessment and Monitoring of Air Pollution Effects on Forests (ICP Forest Level I) shows a large average discrepancy of about 8–10 kg $C \cdot m^{-2}$ (or 60–70 per cent) compared with the Yasso estimates; (2) from 1990 to 2016, the total biomass stock of forest land increased by almost 40 per cent (NIR figure 6.3), driving a 25 per cent increase, as presented during the review, in the carbon inputs to SOM and DOM and a change in the proportions of the various components (e.g. leaves, branches, debris, stumps and species) that has resulted in an increase of circa 300 per cent in the net carbon stock gain for the aggregated SOM and DOM, meaning the average annual decomposition rate has not followed the same carbon input trend (i.e. it has likely increased by a smaller rate); and (3) 1990–2008 averages for temperature and precipitation were applied in the simulation instead of the actual annual values, resulting in a systematic overestimation of the total net carbon stock change, as presented during the review (see Dalsgaard, 2016a), which makes the model outputs incomparable with actual measurements and consequently unverifiable.	Yes. Accuracy

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and/or a problem?[a] If yes, classify by type
		The ERT recommends that Norway revise the use of the model and apply climate data reflecting the trends in temperature and precipitation observed during the reporting period instead of using averages of temperature and precipitation data over a long period of time in order to make the Yasso07 outputs verifiable. The ERT also recommends that Norway verify the Yasso07 outputs using independent estimates. As discussed during the review week, verification could entail collecting a time series of data on SOC content in a subset of national forestry inventory plots representative of countrywide variability of the SOC dynamic in forest land. Pending the start of additional data collection, the ERT recommends that Norway apply alternative means of verification, such as chrono-sequences stratified by climate, topography, soil and forest type and derived from available data (e.g. ICP Forest level I) and data from other countries considered representative of conditions in Norway (e.g. Sweden).	
L.18	4.B Cropland – CO_2	The ERT noted that Norway applies the IPCC default method and factors (2.1 t C ha^{-1}) for net accumulation and a 30-year cultural cycle to estimate biomass carbon stock changes in perennial cropland. However, Norway informed the ERT during the review that it does not use an age-class distribution of its perennial crops, so it is calculating an unrealistic endless time series of net carbon stock gains. Consequently, the ERT recommends that Norway develop an age-class distribution of its land with perennial crops and apply the net carbon stock gain factors to all land younger than 31 years, and estimate a complete loss of biomass carbon stock for any land that in the inventory year exceeds the age of 30 years. In the absence of data, the age class for 1990 can be established assuming equal frequency (i.e. area) for each age class.	Yes. Accuracy
L.19	4.B.2 Land converted to cropland – CO_2	The ERT noted that Norway does not apply the same biomass carbon stock gain in the conversion of different land-use categories to annual cropland, although the same default method from the 2006 IPCC Guidelines is applied. In particular, a value of 7.66 t C ha^{-1} is applied to forest land converted to cropland, a value of 4.69 t C ha^{-1} is applied to settlements converted to cropland, and a value of 0 t C ha^{-1} is applied to both grassland converted to cropland and wetlands converted to cropland. The ERT sees the use of different biomass carbon stock gain factors as inconsistent with the reported use of the IPCC default method, unless different biomass carbon stock values are assigned to different types of annual crop. The ERT recalls that, in the case of conversion to perennial crops, the biomass carbon stock gain in the year of conversion is equal to the annual rate of net gain, and that the same rate of gain is applied to subsequent years until maturity; that is, the year by which the cultural cycle ends and the plantation is renewed. Thus, the ERT recommends that Norway use the IPCC default value (5 t C ha^{-1}) reported in table 5.9, volume 4, of the 2006 IPCC Guidelines, or differentiate it according to the different types of annual crop, and apply it, or the set of values, consistently to each land-use conversion to annual cropland as biomass carbon stock gain for the year in which the land conversion occurs; for the following years, the biomass carbon stock of the annual crop type is assumed constant. Further, the ERT recommends that Norway transparently describe the approach used in the NIR.	Yes. Accuracy
L.20	4.B Cropland – CO_2	The ERT noted that Norway does not calculate the same biomass carbon stock loss in the conversion of annual cropland to different land-use categories, although the IPCC default method is applied. In particular, a value of –1.2 t C ha^{-1} is applied to cropland converted to forest land, and a value of –4.7 t C ha^{-1} is applied to cropland converted to	Yes. Accuracy

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?[a] If yes, classify by type*
		settlements. The ERT sees the use of different biomass carbon stock gain factors as inconsistent with the IPCC default method, unless different biomass carbon stock values are assigned to different types of annual crop. Thus, the ERT recommends that Norway use a single biomass carbon stock value, or differentiate it according to the different types of annual crop, and apply it, or the set of values, consistently to each conversion of annual cropland to other land uses as biomass carbon stock loss for the year in which the land conversion occurs (see also ID# L.19 above).	
L.21	4.C.2 Land converted to grassland – CO_2	The ERT noted that Norway does not calculate and report carbon stock gain of annual biomass in the conversion of any other land-use categories to grassland, although it reports that the IPCC default method is applied. Thus, the ERT recommends that Norway estimate carbon stock gain from annual biomass for all relevant conversions of different land uses to grassland by using a single carbon stock value for annual biomass, or differentiate it according to the different types of grassland, and apply it, or the set of values, consistently to each conversion of land use to grassland as biomass carbon stock gain in the year in which the land conversion occurs.	Yes. Completeness
L.22	4.C Grassland – CO_2 and N_2O	The ERT noted that Norway reports a fraction of forest area that meets the threshold of the forest land-use category under grassland since that forest area is subject to grazing. The ERT also notes that a forest area likely contains significantly different stocks of carbon that have a significantly different dynamic to the other grassland, and that consequently assumptions and data used to estimate conversions to and from grazed forest as well as to estimate carbon stock changes in grazed forest remaining grazed forest are different from those applied for other grassland. The ERT recommends that Norway report grazed forest areas under a subdivision of grassland to ensure a transparent assignment of the factors and methods used to estimate GHG emissions and removals from that forest area, or alternatively report such areas under forest land.	Yes. Comparability
L.23	4.E Settlements – CO_2 and N_2O	The ERT noted that settlement areas were converted to other uses of land in the period 1990–2016. During the review, Norway clarified that "settlements comprise not only houses, roads or other built-up areas but also power lines, tractor roads, open places and gardens, which can regrow if abandoned". The ERT also noted that power lines and tractor roads likely contain significantly different stocks of carbon that have a significantly different dynamic, and that consequently the assumptions and data used to estimate conversions to and from such land-cover types are different from those applied for other cover types in the settlements category and likely similar to those applied for forest land or grassland. Consequently, the ERT recommends that Norway report those land-cover types under one or more subdivisions to ensure a transparent and accurate assignment of the factors and methods used to estimate carbon stock changes.	Yes. Transparency
L.24	4.F Other land – CO_2 and N_2O	The ERT notes that the category "other land" is defined by the IPCC as land without significant carbon stocks. According to this definition, conversions to other land are assumed to cause a complete loss of the carbon stock contained in the previous use of the land. However, Norway also includes in the category "other land" some country-specific land-cover categories that likely contain significant carbon stocks, such as other wooded land with crown	Yes. Comparability

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?[a] If yes, classify by type*
		cover of 5–10 per cent, coastal *calluna* heath and open areas with vegetation, since all those areas are unmanaged. The ERT notes that the above country-specific categories fit the grassland definition, that CRF table 4.1 accommodates the need to report unmanaged grassland areas, and that the monitoring system of Norway is capable of identifying, quantifying and tracking those unmanaged land-cover types over time. The ERT recommends that Norway provide a clear definition of managed land in addition to information on how managed land is distinguished from unmanaged land, and report areas of unmanaged land accordingly. The ERT also recommends that Norway report data in CRF table 4.1 for unmanaged grassland, if any, and report it as a subdivision of grassland remaining grassland in CRF table 4.C. The ERT recalls that, according to good practice set out in the 2006 IPCC Guidelines, any land that has been reported under a managed land category cannot be subsequently transferred to an unmanaged category. Finally, should Norway keep reporting the above land-cover types under "other land", the ERT recommends reporting in the NIR information on the area covered by those land-cover types and ensuring that factors and methods applied for areas of other land converted to any land-use category distinguish between the two different kinds of other land, that is, land without significant carbon stock and unmanaged land with significant carbon stock.	
Waste			
W.13	5. General (waste) – CH_4 and N_2O	Norway reported in the NIR that landfill gas and biogas are used for energy purposes and that associated emissions are reported in the commercial/institutional category (1.A.4.a) of the energy sector. Norway also reported that N_2O emissions from the application of sewage sludge to soil, in particular gardens along roads, are reported in the land-use category settlements in the LULUCF sector. The ERT determined that emissions were properly reported in the energy and LULUCF sectors; however, it was difficult for the ERT to identify the appropriate text addressing these cross-sectoral issues in the energy and LULUCF sectors of the NIR. The ERT recommends that Norway include in its QA/QC activities the verification of cross-sectoral issues to ensure that information included in the NIR on the waste and energy sectors and on the waste and LULUCF sectors is consistent. Doing so would avoid any possible misunderstanding regarding potential omission or double counting of emissions.	Yes. Adherence to the UNFCCC Annex I inventory reporting guidelines
W.14	5.A.1 Managed waste disposal sites – CH_4	The ERT assessed the data-collection system in place in Norway, the QC procedures implemented before archiving the data in the waste accounts database and the approaches used to fill data gaps, and concluded that the waste generated by demolition and infrastructure construction has not been entirely considered in the inventory. During the review week, Norway acknowledged the issue and highlighted that the missing estimate is likely to be insignificant since an expert judgment had taken into account that the relevant waste contains a large amount of wood (biogenic component), while a great deal of it is likely incinerated. Norway also mentioned during the review that a project is being implemented to collect data on the amount of waste generated by demolition and infrastructure construction. The ERT believes that future ERTs should consider this issue further to ensure that emissions from this category are not underestimated.	Yes. Completeness

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?[a] If yes, classify by type*
		The ERT recommends that Norway include the missing emissions attributed to the management of demolition and construction waste or demonstrate that these emissions are insignificant in accordance with decision 24/CP.19, annex, paragraph 37(b).	
W.15	5.B Biological treatment of solid waste – CH_4 and N_2O	Emissions of CH_4 and N_2O from the biological treatment of solid waste are key categories in Norway. However, Norway has applied the 2006 IPCC Guidelines default EFs to estimate GHG emissions for this category. The ERT notes that applying the default EFs for a key category is not in line with the 2006 IPCC Guidelines. During the review week, Norway informed the ERT about a project being implemented to determine country-specific EFs.	Yes. Accuracy
		The ERT recommends that Norway apply, in line with the 2006 IPCC Guidelines, the tier 2 method, using country-specific EFs, to estimate CH_4 and N_2O emissions from the biological treatment of solid waste for the next submission.	
W.16	5.D.1 Domestic wastewater – CH_4	The ERT determined that the MCF values reported by Norway in the NIR (table 7.13, p.444) were not calculated in line with the 2006 IPCC Guidelines. The calculations were based on population instead of the types of WWTP. During the review week, Norway clarified that these values were not MCF but represent the distribution of the population according to WWTP and therefore were not used as MCF values in the emission calculations.	Not an issue/problem
		The ERT encourages Norway to clarify in the next annual submission that these values represent the proportion of the population using WWTP and not the MCF values.	
W.17	5.D.2 Industrial wastewater – N_2O	The wastewater management system in Norway allows some industrial wastewater to be treated in domestic WWTP. The ERT determined that the amount of industrial wastewater treated in domestic WWTP other than high-grade treatment was not accounted for in the inventory and that no explanation was provided in the NIR. During the review week, Norway clarified that the missing N amounted to 114 t and represented approximately 1 per cent of the total N treated in the domestic WWTP. The ERT concluded that the quantity of emissions is likely to be insignificant and below the threshold for application of an adjustment in accordance with decision 22/CMP.1, annex, paragraph 80(b), in conjunction with decision 4/CMP.11.	Yes. Completeness
		The ERT recommends that Norway report N_2O emissions from the industrial wastewater treated in domestic WWTP.	
KP-LULUCF			
KL.3	General (KP-LULUCF) – CO_2, CH_4 and N_2O	The ERT notes that, in a time series of matrices (CRF table NIR–2), the total area of a land-use category at the beginning of year X must be equal to the total final area of that land-use category at year X-1. However, this is not always the case in the time series of CRF table NIR–2 reported in the annual submission of Norway. For instance, comparing the NIR–2 tables for 2015 and 2016, it is observed that the area under FM at the beginning of 2016 is 12,085.48 kha, while at the end of 2015 it is 12,085.33 kha; the area under AR is 57.64 kha in 2016 versus 57.65 in 2015; and the area under CM is 936.37 kha in 2016 versus 936.43 kha in 2015 (see ID# L.9 above).	Yes. Consistency

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and/or a problem?[a] If yes, classify by type
		The ERT recommends that the equivalence of areas between each pair of CRF tables NIR–2 is ensured so that the area of each activity at the start of year X is the same (without any rounding) as the final area in year X-1 for the same activity.	
KL.4	General (KP-LULUCF) – CO_2, CH_4 and N_2O	The ERT noted that Norway reported in its NIR (section 11.3.7) that no emissions and removals have been factored out. However, the ERT also noted that, according to the Kyoto Protocol Supplement, net-net accounting – including projected, historical and zero reference levels – factor out from accounting the removals from (1) elevated CO_2 concentrations above pre-industrial levels, (2) indirect N deposition and (3) the dynamic effects of age structure resulting from activities prior to 1 January 1990. Therefore, the ERT encourages Norway to provide more accurate information on the factoring out of removals as per annex II to decision 2/CMP.8.	Not a problem
KL.5	General (KP-LULUCF) – CO_2, CH_4 and N_2O	The ERT notes that the issue reported in ID# L.13 above concerning SOC changes in mineral soils also affects the estimates of GHG emissions and removals from KP-LULUCF activities and is therefore to be considered a problem of transparency. Therefore, the ERT recommends that Norway clarify the definition of the litter pool in line with changes implemented under the Convention.	Yes. Transparency
KL.6	General (KP-LULUCF) – CO_2, CH_4 and N_2O	The ERT recalls that the following issues affect the estimates of GHG emissions and removals from KP-LULUCF activities and are therefore to be considered problems: (a) ID#s L.12 and L.14 above on SOC changes in mineral and organic soils in land under AR, deforestation, CM and GM; (b) ID# L.17 above on SOC changes in mineral soils in land under FM; (c) ID#s L.18 and L.19 above on perennial and annual crop biomass carbon stock changes in land under deforestation and CM; (d) ID# L.19 above on annual crop biomass carbon stock changes in land under AR and CM. Therefore, the ERT recommends that Norway: (a) Replace the current method used to estimate SOC changes in mineral soils with a good practice methodology consistent with the 2006 IPCC Guidelines and the Kyoto Protocol Supplement; (b) Ensure the consistent use of IPCC default CO_2 EFs for drained soils, for all activities, in line with changes implemented under the Convention; (c) Revise the use of the Yasso07 model in line with changes implemented under the Convention; (d) Revise the methodology used for estimating carbon stock change in perennial crops in line with changes implemented under the Convention.	Yes. Accuracy

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?[a] If yes, classify by type*
		(e) Ensure the consistent use of carbon stock change factors for annual crop biomass in line with changes implemented under the Convention.	
KL.7	AR – CO_2, CH_4 and N_2O	The ERT notes that both FM and AR are direct human-induced activities and that according to Norwegian forest legislation both forest land types, those under FM and AR, are subject to sustainable management activities with no differences, although the frequency and intensity of specific management practices likely differ between forest land under FM and forest land under AR. The ERT also notes that the AR activities have been appositely established to account for emissions and removals in non-forest land converted to forest land, and that the definition covers all drivers of conversion to forest land; that is, plantations or simple promotion of natural seed sources in managed land. However, Norway reports in the NIR (p.476) that "land classified as the activity FM is forest land that has remained forest land since 1990 and land conversions to or from forest that are not caused by human activity", which implies that a quota of afforested land is to be reported under FM. Such a quota is further identified on page 476 as "land-use changes from wetlands or other land to forest land is considered to be the natural expansion of the forest if no direct evidence of management is present. Land-use changes between forest land, wetlands, or other land can either be reported as FM in cases of non-human induced changes, or reported as AR or D for human-induced changes". The ERT encourages Norway to clarify which activities qualify as AR regarding the conversion of other land and wetlands to forest land, noting that because of the AR definitions, those activities cannot be limited to tree plantations and direct seeding.	Not a problem
KL.8	FM – CO_2, CH_4 and N_2O	The ERT notes that Norway reported areas of forest land that match the FM definition under the activity GM because this latter activity is considered of higher relevance by the Party (see also ID# L.22 above). Further, the ERT notes that, as per good practice, FM is always higher than GM in the hierarchical order of KP-LULUCF activities. Therefore, the ERT recommends that Norway clarify why forest land that fulfils the FM definition is reported under GM instead of under the hierarchically higher activity of FM, or report those areas of land that are reported under GM but that meet the definition of FM under FM. Further, in accordance with good practice, the ERT recommends that Norway provide information on the impact on accounted quantities of excluding grazed forest from FM in the NIR.	Yes. Comparability
KL.9	Deforestation – CO_2	The ERT recalls that the issue reported in ID# L.21 above concerning annual grass biomass carbon stock gain also affects the estimates of GHG emissions and removals from deforestation and is therefore to be considered a problem of completeness. Therefore, the ERT recommends that Norway report carbon stock gain for any conversion of forest land to grassland.	Yes. Completeness

[a] Recommendations made by the ERT during the review are related to issues as defined in paragraph 81 of the UNFCCC review guidelines, or problems as defined in paragraph 69 of the Article 8 review guidelines. Encouragements are made to the Party to address all findings not related to such issues or problems.

VI. Application of adjustments

11. The ERT did not identify the need to apply any adjustments to the 2018 annual submission of Norway.

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

12. Norway has elected commitment period accounting and therefore the issuance and cancellation of units for KP-LULUCF activities is not applicable for the 2018 review.

VIII. Questions of implementation

13. No questions of implementation were identified by the ERT during the individual review of the 2018 annual submission.

Annex I

Overview of greenhouse gas emissions and removals for Norway for submission year 2018 and data and information on activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, as submitted by Norway in its 2018 annual submission

1. Tables 6–9 provide an overview of total GHG emissions and removals as submitted by Norway.

Table 6
Total greenhouse gas emissions for Norway, base year[a]–2016
(kt CO_2 eq)

	Total GHG emissions excluding indirect CO_2 emissions		*Total GHG emissions including indirect CO_2 emissions[b]*		*Land-use change Article 3.7 bis as contained in the Doha Amendment[c]*	*KP-LULUCF activities (Article 3.3 of the Kyoto Protocol)[d]*	*KP-LULUCF activities (Article 3.4 of the Kyoto Protocol)*	
	Total including LULUCF	*Total excluding LULUCF*	*Total including LULUCF*	*Total excluding LULUCF*			*CM, GM, RV, WDR*	*FM*
FMRL								–11 400.00
Base year	41 332.60	51 696.96	NA	NA	NA		1 705.14	
1990	41 332.60	51 696.96	NA	NA				
1995	36 200.95	51 136.38	NA	NA				
2000	30 389.36	54 598.16	NA	NA				
2010	28 700.80	55 136.35	NA	NA				
2011	26 193.54	54 181.67	NA	NA				
2012	29 212.76	53 702.58	NA	NA				
2013	27 607.40	53 436.08	NA	NA		1 798.07	1 766.68	–29 934.63
2014	28 686.89	53 246.47	NA	NA		1 691.86	1 775.02	–28 626.29
2015	30 102.43	53 871.24	NA	NA		1 707.73	1 775.00	–27 797.83
2016	28 886.59	53 242.51	NA	NA		1 806.81	1 770.26	–28 396.13

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

[a] "Base year" refers to the base year under the Kyoto Protocol, which is 1990 for all gases except NF_3, for which the base year is 2000. The base year for CM and GM under Article 3, paragraph 4, of the Kyoto Protocol is 1990 for Norway. For activities under Article 3, paragraph 3, of the Kyoto Protocol and FM under Article 3, paragraph 4, only the inventory years of the commitment period must be reported.

[b] The Party did not report indirect CO_2 emissions in CRF table 6.

[c] The value reported in this column refers to 1990.

[d] Activities under Article 3, paragraph 3, of the Kyoto Protocol, namely AR and deforestation.

Table 7
Greenhouse gas emissions by gas for Norway, excluding land use, land-use change and forestry, 1990–2016
(kt CO_2 eq)

	CO_2[a]	*CH_4*	*N_2O*	*HFCs*	*PFCs*	*Unspecified mix of HFCs and PFCs*	*SF_6*	*NF_3*
1990	35 704.39	5 788.38	4 210.81	0.04	3 894.80	NA, NO	2 098.54	NA, NO
1995	38 477.22	5 865.80	3 807.49	92.00	2 314.05	NA, NO	579.82	NA, NO
2000	42 215.88	5 672.57	3 916.57	383.27	1 518.45	NA, NO	891.41	NA, NO
2010	45 823.28	5 353.07	2 588.48	1 064.54	238.39	NA, NO	68.59	NA, NO
2011	44 982.56	5 196.55	2 579.91	1 105.75	262.64	NA, NO	54.26	NA, NO
2012	44 560.82	5 158.36	2 588.54	1 140.81	200.51	NA, NO	53.54	NA, NO
2013	44 302.65	5 183.88	2 557.07	1 155.15	181.04	NA, NO	56.28	NA, NO
2014	43 952.66	5 269.61	2 559.63	1 235.58	178.92	NA, NO	50.07	NA, NO
2015	44 663.73	5 163.02	2 595.40	1 232.90	146.39	NO, NA	69.79	NO, NA
2016	44 031.62	5 078.84	2 518.63	1 363.61	186.17	NO, NA	63.64	NO, NA
Per cent change 1990–2016	**23.3**	**–12.3**	**–40.2**	**3 106 145.1**	**–95.2**	**NA**	**–97.0**	**NA**

Note: Emissions/removals reported in the sector other (sector 6) are not included in the total GHG emissions.
[a] Norway did not report indirect CO_2 emissions in CRF table 6.

Table 8
Greenhouse gas emissions by sector for Norway, 1990–2016
(kt CO_2 eq)

	Energy	*IPPU*	*Agriculture*	*LULUCF*	*Waste*	*Other*
1990	30 146.94	14 497.79	4 808.84	–10 364.36	2 243.40	
1995	32 727.26	11 602.56	4 683.67	–14 935.43	2 122.88	
2000	36 106.94	12 096.42	4 573.56	–24 208.80	1 821.24	
2010	41 105.62	8 184.62	4 335.71	–26 435.54	1 510.40	
2011	40 129.00	8 250.33	4 310.27	–27 988.13	1 492.06	
2012	39 711.22	8 200.02	4 328.37	–24 489.82	1 462.97	
2013	39 348.59	8 268.33	4 385.20	–25 828.68	1 433.96	
2014	39 005.77	8 414.25	4 447.11	–24 559.58	1 379.34	

	Energy	*IPPU*	*Agriculture*	*LULUCF*	*Waste*	*Other*
2015	39 602.17	8 467.14	4 491.12	–23 768.80	1 310.81	
2016	38 844.89	8 628.21	4 518.29	–24 355.92	1 251.12	
Per cent change 1990–2016	**28.9**	**–40.5**	**–6.0**	**135.0**	**–44.2**	**NA**

Notes: (1) Norway did not report emissions/removals in the sector other (sector 6); the corresponding cells in the CRF tables were blank. (2) Norway did not report indirect CO_2 emissions in CRF table 6.

Table 9
Greenhouse gas emissions/removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol by activity, base year[a]–2016, for Norway
(kt CO_2 eq)

	Article 3.7 bis as contained in the Doha Amendment[b]	*Article 3.3 of the Kyoto Protocol*		*FM and elected Article 3.4 activities of the Kyoto Protocol*				
	Land-use change	*AR*	*Deforestation*	*FM*	*CM*	*GM*	*RV*	*WDR*
FMRL				–11 400.00				
Technical correction				–1 490.88				
Base year	NA				1 782.49	–77.35	NA	NA
2013		–569.52	2 367.59	–29 934.63	1 759.48	7.20	NA	NA
2014		–557.23	2 249.09	–28 626.29	1 771.05	3.97	NA	NA
2015		–542.97	2 250.70	–27 797.83	1 773.47	1.53	NA	NA
2016		–519.18	2 325.99	–28 396.13	1 769.89	0.37	NA	NA
Per cent change Base year–2016					**–0.7**	**–100.5**	**NA**	**NA**

Note: Values in this table include emissions on lands subject to natural disturbances, if applicable.
[a] The base year for CM and GM under Article 3, paragraph 4, of the Kyoto Protocol is 1990 for Norway. For activities under Article 3, paragraph 3, of the Kyoto Protocol, and FM under Article 3, paragraph 4, only the inventory years of the commitment period must be reported.
[b] The value reported in this column refers to 1990.

2. Table 10 provides an overview of key relevant data for Norway's reporting under Article 3, paragraphs 3 and 4, of the Kyoto Protocol.

Table 10
Key relevant data for Norway under Article 3, paragraphs 3 and 4, of the Kyoto Protocol in the 2018 annual submission

Key parameters	*Values*
Periodicity of accounting	(a) AR: commitment period accounting (b) Deforestation: commitment period accounting (c) FM: commitment period accounting (d) CM: commitment period accounting (e) GM: commitment period accounting (f) RV: not elected (g) WDR: not elected
Election of activities under Article 3, paragraph 4	CM and GM
Election of application of provisions for natural disturbances	No
3.5% of total base-year GHG emissions, excluding LULUCF	1 817.262 kt CO_2 eq (14 538.096 kt CO_2 eq for the duration of the commitment period)
Cancellation of AAUs, ERUs, CERs and/or issuance of RMUs in the national registry for:	
1. AR in 2016	NA
2. Deforestation in 2016	NA
3. FM in 2016	NA
4. CM in 2016	NA
5. GM in 2016	NA
6. RV in 2016	NA
7. WDR in 2016	NA

Annex II

Information to be included in the compilation and accounting database

Tables 11–14 include the information to be included in the compilation and accounting database for Norway. Data shown are from the original annual submission of the Party, including the latest revised estimates submitted, adjustments (if applicable), as well as the final data to be included in the compilation and accounting database.

Table 11
Information to be included in the compilation and accounting database for 2016, including on the commitment period reserve, for Norway
(t CO_2 eq)

	Original submission	*Revised estimate*	*Adjustment*	*Final*
CPR	314 022 874			314 022 874
Annex A emissions for 2016				
CO_2	44 031 623			44 031 623
CH_4	5 078 839			5 078 839
N_2O	2 518 631			2 518 631
HFCs	1 363 611			1 363 611
PFCs	186 171			186 171
Unspecified mix of HFCs and PFCs	NO, NA			NO, NA
SF_6	63 640			63 640
NF_3	NO, NA			NO, NA
Total Annex A sources	**53 242 514**			**53 242 514**
Activities under Article 3, paragraph 3, of the Kyoto Protocol for 2016				
3.3 AR	–519 178			–519 178
3.3 Deforestation	2 325 988			2 325 988
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol for 2016				
3.4 FM	–28 396 132			–28 396 132
3.4 CM	1 769 889			1 769 889
3.4 CM for the base year	1 782 494			1 782 494
3.4 GM	368			368
3.4 GM for the base year	–77 353			–77 353

Table 12
Information to be included in the compilation and accounting database for 2015 for Norway
(t CO_2 eq)

	Original submission	*Revised estimate*	*Adjustment*	*Final*
Annex A emissions for 2015				
CO_2	44 663 735			44 663 735
CH_4	5 163 015			5 163 015
N_2O	2 595 403			2 595 403
HFCs	1 232 900			1 232 900
PFCs	146 388			146 388
Unspecified mix of HFCs and PFCs	NO, NA			NO, NA

	Original submission	*Revised estimate*	*Adjustment*	*Final*
SF_6	69 794			69 794
NF_3	NO, NA			NO, NA
Total Annex A sources	**53 871 235**			**53 871 235**
Activities under Article 3, paragraph 3, of the Kyoto Protocol for 2015				
3.3 AR	–542 966			–542 966
3.3 Deforestation	2 250 697			2 250 697
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol for 2015				
3.4 FM	–27 797 834			–27 797 834
3.4 CM	1 773 472			1 773 472
3.4 CM for the base year	1 782 494			1 782 494
3.4 GM	1 527			1 527
3.4 GM for the base year	–77 352			–77 352

Table 13
Information to be included in the compilation and accounting database for 2014 for Norway
($t\ CO_2\ eq$)

	Original submission	*Revised estimate*	*Adjustment*	*Final*
Annex A emissions for 2014				
CO_2	43 952 663			43 952 663
CH_4	5 269 615			5 269 615
N_2O	2 559 626			2 559 626
HFCs	1 235 577			1 235 577
PFCs	178 920			178 920
Unspecified mix of HFCs and PFCs	NA, NO			NA, NO
SF_6	50 066			50 066
NF_3	NA, NO			NA, NO
Total Annex A sources	**53 246 467**			**53 246 467**
Activities under Article 3, paragraph 3, of the Kyoto Protocol for 2014				
3.3 AR	–557 230			–557 230
3.3 Deforestation	2 249 089			2 249 089
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol for 2014				
3.4 FM	–28 626 286			–28 626 286
3.4 CM	1 771 054			1 771 054
3.4 CM for the base year	1 782 494			1 782 494
3.4 GM	3 969			3 969
3.4 GM for the base year	–77 353			–77 353

Table 14
Information to be included in the compilation and accounting database for 2013 for Norway
($t\ CO_2\ eq$)

	Original submission	*Revised estimate*	*Adjustment*	*Final*
Annex A emissions for 2013				
CO_2	44 302 654			44 302 654
CH_4	5 183 878			5 183 878
N_2O	2 557 072			2 557 072

	Original submission	*Revised estimate*	*Adjustment*	*Final*
HFCs	1 155 153			1 155 153
PFCs	181 040			181 040
Unspecified mix of HFCs and PFCs	NA, NO			NA, NO
SF_6	56 282			56 282
NF_3	NA, NO			NA, NO
Total Annex A sources	**53 436 079**			**53 436 079**
Activities under Article 3, paragraph 3, of the Kyoto Protocol for 2013				
3.3 AR	–569 522			–569 522
3.3 Deforestation	2 367 595			2 367 595
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol for 2013				
3.4 FM	–29 934 630			–29 934 630
3.4 CM	1 759 482			1 759 482
3.4 CM for the base year	1 782 494			1 782 494
3.4 GM	7 203			7 203
3.4 GM for the base year	–77 352			–77 352

Annex III

Additional information to support findings in table 2

Missing categories that may affect completeness

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

(a) CO_2 emissions from pipelines (1.C.1.a) (see ID# E.39 in table 5);

(b) CO_2 emissions and removals from land converted to grassland (4.C.2) (see ID# L.21 in table 5);

(c) CH_4 emissions from demolition and construction waste at managed waste disposal sites (5.A.1) (see ID# W.14 in table 5);

(d) CO_2 emissions and removals from land under deforestation (see ID# KL.9 in table 5).

Annex IV

Documents and information used during the review

A. Reference documents

Reports of the Intergovernmental Panel on Climate Change

IPCC. 2006. *2006 IPCC Guidelines for National Greenhouse Gas Inventories*. S Eggleston, L Buendia, K Miwa, et al. (eds.). Hayama, Japan: Institute for Global Environmental Strategies. Available at http://www.ipcc-nggip.iges.or.jp/public/2006gl.

IPCC. 2014. *2013 Revised Supplementary Methods and Good Practice Guidance Arising from the Kyoto Protocol*. T Hiraishi, T Krug, K Tanabe, et al. (eds.). Hayama, Japan: Institute for Global Environmental Strategies. Available at http://www.ipcc-nggip.iges.or.jp/public/kpsg.

IPCC. 2014. *2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands*. T Hiraishi, T Krug, K Tanabe, et al. (eds.). Geneva, Switzerland: IPCC. Available at http://www.ipcc-nggip.iges.or.jp/public/wetlands/.

Annual review reports

Reports on the individual reviews of the 2012, 2013, 2014, 2015 and 2016 annual submissions of Norway contained in documents FCCC/ARR/2012/NOR, FCCC/ARR/2013/NOR, FCCC/ARR/2014/NOR, FCCC/ARR/2015/NOR and FCCC/ARR/2016/NOR, respectively.

Report on the review of the report to facilitate the calculation of the assigned amount for the second commitment period of the Kyoto Protocol of Norway, contained in document FCCC/IRR/2016/NOR.

Other

Aggregate information on greenhouse gas emissions by sources and removals by sinks for Parties included in Annex I to the Convention. Note by the secretariat. Available at https://unfccc.int/sites/default/files/resource/AGI%20report_2018.pdf.

Annual status report for Norway for 2018. Available at https://unfccc.int/sites/default/files/resource/asr2018_NOR_1.pdf.

Dalsgaard L, Lange H, Strand LT, et al. 2016a. Underestimation of boreal forest soil carbon stocks related to soil classification and drainage. *Canadian Journal of Forest Research*. 46(12): pp.1413–1425. Available at https://www.nrcresearchpress.com/doi/abs/10.1139/cjfr-2015-0466#citart1.

Dalsgaard L, Astrup R, Antón-Fernández C, et al. 2016b. Modeling soil carbon dynamics in northern forests: effects of spatial and temporal aggregation of climatic input data. *PLoS ONE*. 11(2): pp.e0149902. Available at https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0149902.

Storlien T, Volden H, Almøy T, et al. 2014. Prediction of enteric methane production from dairy cows. *Acta Agriculturae Scandinavica, Section A — Animal Science*. 64(2): pp.98–109. Available at https://www.tandfonline.com/doi/abs/10.1080/09064702.2014.959553.

B. Additional information provided by the Party

Responses to questions during the review were received from Ms. Thea Hellenes Ekre (NEA), including additional material on the methodology and assumptions used. The following documents[1] were also provided by Norway:

[1] Reproduced as received from the Party.

Strand LT, Callesen I, Dalsgaard L and de Wit HA. 2016. Carbon and nitrogen stocks in Norwegian forest soils — the importance of soil formation, climate, and vegetation type for organic matter accumulation. *Canadian Journal of Forest Research*. 46(12): pp.1–15 (2016). Available at www.nrcresearchpress.com/cjfr.

Husdal G, Osenbroch L, Yetkinoglu Ö and Østebrøt A. 2016. Cold venting and fugitive emissions from Norwegian offshore oil and gas activities. *Add novatech as.* Available at http://www.miljodirektoratet.no/no/Publikasjoner/2016/Juni-2016/Cold-venting-and-fugitive-emissions-from-Norwegian-offshore-oil-and-gas-activities--summary-report/.