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Report on the individual review of the annual submission of Norway submitted in 2022*

Note by the expert review team

Summary

Each Party included in Annex I to the Convention must submit an annual inventory of emissions and removals of greenhouse gases for all years from the base year (or period) to two years before the inventory due date (decision 24/CP.19). Parties included in Annex I to the Convention that are Parties to the Kyoto Protocol are also required to report supplementary information under Article 7, paragraph 1, of the Kyoto Protocol with the inventory submission due under the Convention. This report presents the results of the individual review of the 2022 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 12 to 17 September 2022 in Bonn.

* In the symbol for this document, 2022 refers to the year in which the inventory was submitted, not to the year of publication.

Contents

Abbreviations and acronyms

2006 IPCC Guidelines	*2006 IPCC Guidelines for National Greenhouse Gas Inventories*
2019 Refinement to the 2006 IPCC Guidelines	*2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories*
AAU	assigned amount unit
AD	activity data
Annex A source	source category included in Annex A to the Kyoto Protocol
AR	afforestation and reforestation
Article 8 review guidelines	"Guidelines for review under Article 8 of the Kyoto Protocol"
BOD	biochemical oxygen demand
C	carbon
CER	certified emission reduction
CH_4	methane
CM	cropland management
CO_2	carbon dioxide
CO_2 eq	carbon dioxide equivalent
Convention reporting adherence	adherence to the "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual greenhouse gas inventories"
CPR	commitment period reserve
CRF	common reporting format
CSC	carbon stock change
DC	degradable organic component
DOM	dead organic matter
EF	emission factor
ERT	expert review team
ERU	emission reduction unit
EU	European Union
EU ETS	European Union Emissions Trading System
Eurostat	statistical office of the European Union
F-gas	fluorinated gas
FM	forest management
FMRL	forest management reference level
GE	gross energy intake
GHG	greenhouse gas
GM	grazing land management
HFC	hydrofluorocarbon
IE	included elsewhere
IEA	International Energy Agency
IEF	implied emission factor
IPCC	Intergovernmental Panel on Climate Change
IPPU	industrial processes and product use
KP reporting adherence	adherence to the reporting guidelines under Article 7, paragraph 1, of the Kyoto Protocol
KP-LULUCF	activities under Article 3, paragraphs 3–4, of the Kyoto Protocol
LULUCF	land use, land-use change and forestry
MCF	methane conversion factor (agriculture)
MMS	manure management system(s)
MSW	municipal solid waste

N	nitrogen
N_2O	nitrous oxide
NA	not applicable
NE	not estimated
NEA	Norwegian Environment Agency
Nex	nitrogen excretion
NF_3	nitrogen trifluoride
NFI	national forest inventory
NIR	national inventory report
NMVOC	non-methane volatile organic compound
NO	not occurring
PFC	perfluorocarbon
QA/QC	quality assurance/quality control
RMU	removal unit
RV	revegetation
SEF	standard electronic format
SF_6	sulfur hexafluoride
SIAR	standard independent assessment report
SOC	soil organic carbon
SOC_{REF}	reference soil organic carbon stocks
SWDS	solid waste disposal site(s)
UNFCCC Annex I inventory reporting guidelines	"Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual greenhouse gas inventories"
UNFCCC review guidelines	"Guidelines for the technical review of information reported under the Convention related to greenhouse gas inventories, biennial reports and national communications by Parties included in Annex I to the Convention"
WDR	wetland drainage and rewetting
Wetlands Supplement	*2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands*
Y_m	methane conversion rate

I. Introduction

1. This report covers the review of the 2022 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" (annex to decision 13/CP.20). The review took place from 12 to 17 September 2022 in Bonn and was coordinated by Roman Payo and Emma Salisbury (secretariat). Table 1 provides information on the composition of the ERT that conducted the review for Norway.

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

Area of expertise	*Name*	*Party*
Generalist	Olia Glade	New Zealand
	Manfred Ritter	Austria
Energy	Graham Anderson	Germany
	Amir Dillawar	Guyana
	Rianne Dröge	Netherlands
	Awassada Phongphiphat	Thailand
IPPU	Kakhaberi Mdivani	Georgia
	Lorenz Moosmann	EU
	Clemencio Nhamtumbo	Mozambique
Agriculture	Yu'e Li	China
	Mahmoud Medany	Egypt
	Lilia Taranu	Republic of Moldova
LULUCF and KP-LULUCF	Valentin Bellassen	France
	Dinh Hung Nguyen	Viet Nam
	Nele Inge Gabrielle Rogiers	Switzerland
Waste	Qingxian Gao	China
	Gabor Kis-Kovacs	Hungary
Lead reviewers	Qingxian Gao	
	Olia Glade	

2. The basis of the findings in this report is the assessment by the ERT of the Party's 2022 annual submission in accordance with the UNFCCC review guidelines and the Article 8 review guidelines.

3. The ERT has made recommendations that Norway resolve identified findings, including issues [1] designated as problems. [2] Other findings, and, if applicable, the encouragements of the ERT to Norway to resolve related issues, are also included in this report.

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.

[1] Issues are defined in decision 13/CP.20, annex, para. 81.
[2] Problems are defined in decision 22/CMP.1, annex, paras. 68–69, as revised by decision 4/CMP.11.

5. Annex I presents the annual GHG emissions of Norway, including totals excluding and including LULUCF, indirect CO_2 emissions, and emissions by gas and by sector, and contains background data on emissions and removals from KP-LULUCF, if elected by the Party, by gas, sector and activity.

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

II. Summary and general assessment of the Party's 2022 annual submission

7. Table 2 provides the assessment by the ERT of the Party's 2022 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 2022 annual submission of Norway

Assessment			*Issue/problem ID#(s) in table 3 or 5[a]*
Dates of submission	Original submission: NIR, 8 April 2022; CRF tables (version 1), 8 April 2022; SEF tables (SEF-2021-CP1 and SEF-2021-CP2), 8 April 2022		
	Revised submission: CRF tables (version 2), 16 September 2022 (see ID# KL.11 in table 5)		
	Unless otherwise specified, values from the most recent submission are included in this report		
Review format	Centralized		
Application of the requirements of the UNFCCC Annex I inventory reporting guidelines and the Wetlands Supplement (if applicable)	Have any issues been identified in the following areas:		
	(a) Identification of key categories?	No	
	(b) Selection and use of methodologies and assumptions?	Yes	I.21, L.23, W.4, KL.14
	(c) Development and selection of EFs?	Yes	E.18, E.27, E.32, I.12
	(d) Collection and selection of AD?	Yes	E.3, E.17, E.28, I.9
	(e) Reporting of recalculations?	Yes	G.11, E.11, E.20, I.19
	(f) Reporting of a consistent time series?	Yes	E.10
	(g) Reporting of uncertainties, including methodologies?	No	
	(h) QA/QC?	QA/QC procedures were assessed in the context of the national system (see supplementary information under the Kyoto Protocol below)	
	(i) Missing categories, or completeness?[b]	Yes	E.31
	(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?	Yes	
Description of trends	Did the ERT conclude that the description in the NIR of the trends for the different gases and sectors is reasonable?	No	E.29
Supplementary information under the Kyoto Protocol	Have any issues been identified related to the following aspects of the national system:		
	(a) Overall organization of the national system, including the effectiveness and reliability of the institutional, procedural and legal arrangements?	No	

Assessment			*Issue/problem ID#(s) in table 3 or 5[a]*
	(b) Performance of the national system functions?	No	
	Have any issues been identified related to the national registry:		
	(a) Overall functioning of the national registry?	No	
	(b) Performance of the functions of the national registry and the adherence to technical standards for data exchange?	No	
	Have any issues been identified related to the reporting of information on AAUs, CERs, ERUs and RMUs and on discrepancies in accordance with decision 15/CMP.1, annex, chapter I.E, in conjunction with decision 3/CMP.11, taking into consideration any findings or recommendations contained in the SIAR?	No	
	Have any issues been identified in matters related to Article 3, paragraph 14, of the Kyoto Protocol, specifically problems related to the transparency, completeness or timeliness of the reporting on the Party's activities related to the priority actions listed in decision 15/CMP.1, annex, paragraph 24, in conjunction with decision 3/CMP.11, including any changes since the previous annual submission?	No	
	Have any issues been identified related to the following reporting requirements for KP-LULUCF:		
	(a) Reporting requirements of decision 2/CMP.8, annex II, paragraphs 1–5?	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 33–34?	No	
CPR	Was the CPR reported in accordance with decision 18/CP.7, annex; decision 11/CMP.1, annex; and decision 1/CMP.8, paragraph 18?	Yes	
Adjustments	Has the ERT applied any adjustments under Article 5, paragraph 2, of the Kyoto Protocol?	No	
	Has the Party submitted a revised estimate to replace a previously applied adjustment?	NA	Norway does not have a previously applied adjustment
Response from the Party during the review	Has the Party provided the ERT with responses to the questions raised, including the data and information necessary for assessing conformity with the UNFCCC Annex I inventory reporting guidelines and any further guidance adopted by the Conference of the Parties?	Yes	
Recommendation for an exceptional in-country review	On the basis of the issues identified, does the ERT recommend that the next review be conducted as an in-country review?	No	
Questions of implementation	Did the ERT list any questions of implementation?	No	

[a] Further information on the issues identified, as well as additional findings, may be found in tables 3 and 5.
[b] Missing categories for which methods are provided in the 2006 IPCC Guidelines may affect completeness and are listed in annex III.

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

8. Table 3 compiles the recommendations from previous review reports that were included in the most recent previous review report, published on 20 January 2021,[3] and had not been resolved by the time of publication of the report on the review of the Party's 2020 annual submission. The ERT has specified whether it believes the Party had resolved, was addressing or had not resolved each issue or problem by the time of publication of this review report and has provided the rationale for its determination, which takes into consideration the publication date of the most recent previous review report and national circumstances.

Table 3
Status of implementation of recommendations included in the previous review report for Norway

ID#	*Issue/problem classification*[a, b]	*Recommendation from previous review report*	*ERT assessment and rationale*
General			
G.1	CRF tables (G.13, 2020) Convention reporting adherence	Report in the CRF tables and in the NIR the national totals with and without indirect CO_2 emissions in line with paragraph 29 of the UNFCCC Annex I inventory reporting guidelines, making relevant changes to the sectoral level reporting, as necessary (see document FCCC/ARR/2020/NOR, ID#s E.28 and I.11).	Addressing. The Party described in its NIR (chaps. 2 and 9) its current reporting practice for indirect CO_2 emissions, which has not changed since the 2020 annual submission (see also ID#s E.13 and I.2 below). NIR table 2.1 shows total annual indirect CO_2 emissions since 1990 and NIR table 9.2 shows annual indirect CO_2 emissions for each sector since 1990. However, national totals with indirect CO_2 emissions are reported as "NA" in CRF summary tables 2 and 10, and indirect CO_2 emissions by sector are reported as "NA", "IE" or "NE" in CRF table 6. In the NIR (section 9.2), Norway states that because indirect CO_2 emissions are an integral part of its sectoral totals, it is unable to present national totals with and without indirect CO_2 emissions in CRF summary tables 2 and 10, and that filling in these tables and CRF table 6 correctly would necessitate changes to its sectoral reporting. The NIR (chap. 6, pp.9.2–9.3) includes the recommendation of the previous review on the reporting of indirect CO_2 emissions and the separate figures required to be reported in CRF summary tables 2 and 10 and CRF table 6 to improve transparency. During the review, the Party clarified that it plans to implement this recommendation for its 2023 submission.
G.2	National system (G.2, 2020) (G.8, 2018) KP reporting adherence	Report in the NIR on the actions taken by NEA to support the functions of the national system through the NEA–Statistics Norway agreement, to scrutinize the Statistics Norway inventory staff and resourcing plan and to ensure that sufficient resources are available across NEA and Statistics Norway to	Resolved. The Party reported in its NIR (annex XII, section 4.2, pp.AXII-11–AXII-12) on the roles and responsibilities of the three core organizations involved in its inventory: NEA, Statistics Norway and the Norwegian Institute of Bioeconomy Research. Norway described the actions taken by NEA, the entity with overall responsibility for the inventory delivery and quality, to ensure sufficient resources are available for these organizations and the process of allocating resources, which is based on a written agreement between them. An updated version of this agreement, which covers additional responsibilities related to the Paris Agreement, was signed in 2022. Sufficient financial resources are secured for meeting reporting obligations and for improvement projects through annual contracts between NEA and Statistics Norway and between NEA and the

[3] FCCC/ARR/2020/NOR. The ERT notes that the report on the review of Norway's 2021 annual submission has not been published yet owing to insufficient funding for the review process. As a result, the latest previously published annual review report reflects the findings of the review of the Party's 2020 annual submission.

ID#	Issue/problem classification[a, b]	Recommendation from previous review report	ERT assessment and rationale
		deliver a high-quality inventory and maintain continuous improvement, such as by documenting the review and acceptance by NEA of the Statistics Norway resourcing plan as a means of delivering an inventory in accordance with the guidelines for national systems.	Norwegian Institute of Bioeconomy Research. The process for identifying and prioritizing improvement projects for the coming year considers, among other things, the relevant findings of the UNFCCC inventory review process and the budgets of and human resources available at the three core organizations.
G.3	National system (G.3, 2020) (G.9, 2018) KP reporting adherence	Conduct (via NEA and Statistics Norway) 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 Statistics Norway team has the skills and capabilities to deliver the work in accordance with the workplan schedule; report on these assessments in future submissions; and ensure that financial and human resources are deployed to deliver on time the workplan which was provided in response to a list of potential problems and further questions raised by the ERT that conducted the 2018 review.	Resolved. The Party reported in its NIR (annex XII, section 4.2, p.AXII-12) on its activities to improve the energy balance and related capacity-building within Statistics Norway. NIR table AXII.3 documents all activities planned and completed. During the review, the Party clarified that the progress in reporting, as documented in the NIR, shows that sufficient resources have been allocated to the work to improve the energy balance. Further improvements will be conducted under standard QA/QC procedures, with a continued focus on improving energy statistics. The ERT considers that the recommendation has been fully addressed because the workplan on improvements in energy sector reporting has been successfully completed and further improvements will be addressed through the normal QA/QC procedures within the energy sector. The ERT considers that the level and quality of the resources committed is sufficient.
G.4	National system (G.4, 2020) (G.9, 2018) Transparency	Report on the 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 workplan, and any updates.	Resolved. The Party reported in its NIR (annex XII, section 4.2, p.AXII-12) on the additional financial resources that were secured for meeting reporting obligations and for improvement projects through annual contracts between NEA and Statistics Norway and between NEA and the Norwegian Institute of Bioeconomy Research. These contracts specify the improvement projects planned for the upcoming year. The process for identifying and prioritizing improvement projects considers, among other things, the budgets of and human resources available at NEA, Statistics Norway and the Norwegian Institute of Bioeconomy Research. The workplan on improvements in energy sector reporting, which was completed, was provided by Norway in NIR table AXII.3. The ERT considers that the recommendation has been fully addressed.
G.5	National system (G.5, 2020) (G.9, 2018) Transparency	Report on the progress in the implementation of the workplan in each NIR submitted in 2019–2021 (or earlier if the workplan is fully implemented at an earlier date and the	Resolved. The Party reported in its NIR (annex XII, section 5) on the completed workplan on improvements in energy sector reporting and the outcomes of the projects therein. The ERT notes that the differences between the reference and the sectoral approach have been addressed and are documented in the NIR. All recommendations have been addressed and are explained in the NIR. In the NIR, recommendation (a) is addressed in annex XII, chapter 6; (b) in annex XII, sections

ID#	*Issue/problem classification*[a, b]	*Recommendation from previous review report*	*ERT assessment and rationale*
		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: (a) Consolidation of the new energy balance routines and associated quality controls; (b) Research to evaluate the statistical differences in the data on refined petroleum products; (c) Analysis of petroleum product sales statistics and import data with respect to ships combining domestic and international routes; (d) Analysis and documentation to set out the progress as far as is practicable in relation to the statistical differences for 1990–2009; (e) Research and data improvement for solid and gaseous fuels to reduce statistical differences and discrepancies between the reference and sectoral approach; (f) 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 Statistics Norway energy balance team.	6.1–6.2; (c) in annex XII, last paragraph of section 6.2; (d) in annex XII, chapters 6 and 10,; (e) in annex XII, section 6.3; and (f) in annex XII, sections 8.2–8.3.
G.6	National system (G.6, 2020) (G.9, 2018) KP reporting adherence	Proceed with enhancements to the national system (such as conducting regular meetings among workplan stakeholders and establishing a	Resolved. The Party reported in its NIR (annex XII, section 4.2 and chap. 8) on its implementation of enhancements to the national system. In addition to the improvements mentioned in the previous review report (see document FCCC/ARR/2020/NOR, ID# G.6), Norway reported in its NIR more details on the steering group and high-level meetings between the director of Statistics Norway and

ID#	Issue/problem classification[a, b]	Recommendation from previous review report	ERT assessment and rationale
		steering group to consider the need for key data providers such as the Norwegian Petroleum Directorate and the Norwegian Tax Administration to play a more active role in the Norwegian national system) in order to keep upstream data providers and other stakeholders informed of energy balance and inventory data requirements.	data providers, on the quality of reports that are annually sent out to data providers, and on the collaboration between emissions inventory experts and data providers about data quality and potential errors through dedicated meetings (through close collaboration between refineries and oil companies, refinery numbers and sales statistics have improved).
G.7	National system (G.7, 2020) (G.9, 2018) Transparency	Include in the progress reports in each NIR submitted in 2019–2021 (or earlier if the workplan is fully implemented at an earlier date and the differences between the reference and sectoral approach are addressed): (a) An overview of the workplan schedule, setting out the timelines for the delivery of each task to meet interim and final project deadlines; (b) Statements on the status of each workplan task in relation to the workplan schedule and task outcomes; (c) Updates on the organization responsible for the delivery of each task; (d) Resources (human, financial and other) allocated to each task, including the strengthening of such resources based on consultations between NEA and Statistics Norway on their evaluation of the level and quality of resources committed to the energy balance; (e) Details of the contribution and engagement of other stakeholders required to support the delivery of the tasks, in particular upstream data	Resolved. The Party reported in its NIR (annex XII) on its progress in addressing the differences in emissions between the reference and sectoral approach. The outcomes of the relevant project are described in section 3.6 of and annex XIII to the NIR. The remaining differences comprise quantified inconsistencies and known inconsistencies, the latter of which arise from, for example, the handling of waste energy data and the technical infeasibility of including natural gas bunkers in the reference approach. According to the previous review, the recommendation applies for the duration of the workplan and could be resolved when the issues in ID#s G.2–G.6 above have also been resolved following the completion of the workplan. The current ERT noted the completion of the issues in ID#s G.2–G.6 above and that the differences between the sectoral and reference approach have been analysed, addressed and documented in the NIR, thereby resolving the recommendation.

ID#	Issue/problem classification[a, b]	Recommendation from previous review report	ERT assessment and rationale
		providers such as the Norwegian Petroleum Directorate, the Norwegian Tax Administration, refiners, and oil and gas companies.	
G.8	National system (G.8, 2020) (G.10, 2018) KP reporting adherence	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, in order to maintain a fully functional national system, and report on the progress of this research.	Resolved. The Party reported in its NIR (annex XII, chap. 5 and sections 6.1–6.2) that additional data sources identified in the analysis which ran from 2012 to 2015 have been incorporated into the system for producing energy statistics, including for primary petroleum. The two quality control procedures developed during that analysis are now part of the annual quality control. A number of manual tasks have been automated and changes are now logged. The latest energy flow in the Norwegian energy balance, the methods and data source are explained in the NIR (sections 3.2.1.2 and 3.6.1). The ERT considers that the recommendation has been fully addressed even though there are still differences, in particular for liquid fuels. Primary petroleum fuel statistics have improved and are part of a data compilation system that generates, in general, consistent data.
G.9	National system (G.9, 2020) (G.10, 2018) Accuracy	Noting that discrepancies between the reference and sectoral approach are also evident for solid and gaseous fuels, advance research equivalent to that carried out for petroleum fuels to improve the quality of primary and secondary fuel statistics for solid and gaseous fuels.	Resolved. The Party reported the following information on solid and gaseous fuels in its NIR: findings and results from the work on improving the consistency between the reference and the sectoral approach (section 3.6.1); a description of work on the energy balance system (annex XII, section 5); a list of implemented improvements (annex XII, chap. 6); a description of issues regarding coal and gas (annex XII, section 6.3); and a description of the revised use of energy balance data in the reference approach (annex XII, section 7.3). A number of discrepancies remain between the sectoral and the reference approach (e.g. see ID#s E.3, E.4 and E.9 below). However, the ERT considers that this issue is resolved because fewer discrepancies were identified in the current submission than in previous submissions and there is now a system in place that will ensure that this continues in the future.
G.10	Uncertainty analysis (G.12, 2020) (G.11, 2018) Convention reporting adherence	Update and improve the 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 the inventory.	Resolved. The Party reported in its NIR (annex II, chap. 5) and provided further information during the review on the uncertainty analysis improvement project carried out in 2020–2021. The ERT considers that the recommendation has been fully addressed because the uncertainty analysis has been improved and the parameters applied for the base year are now consistent with the other years and the latest year in the time series.

ID#	Issue/problem classification[a, b]	Recommendation from previous review report	ERT assessment and rationale
Energy			
E.1	Fuel combustion – reference approach – all fuels – CO_2 (E.1, 2020) (E.2, 2018) (E.2, 2016) (E.2, 2015) (26, 2014) Accuracy	Continue work to analyse the reasons for the differences between the reference and sectoral approach.	Resolved. The Party reported in its NIR (annex XIII) a comparison of the sectoral and reference approaches and quantitatively compared the results with the statistical differences, transformation differences and other known discrepancies. After adjusting for these, the remaining differences are about 2–4 PJ, or less than 1 per cent of the sectoral approach estimates.
E.2	Fuel combustion – reference approach – all fuels – CO_2 (E.2, 2020) (E.4, 2018) (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.	Resolved. The Party reported in its NIR (annex XII) information on the improvements in the energy balance before and after the 2018 review. The improvements resulted in a difference between the reference and sectoral approaches that can largely be explained by statistical differences. Annex XIII to the NIR indicates that, after adjusting for these, the remaining differences are about 2–4 PJ, or less than 1 per cent of the sectoral approach estimates. Table AXIII.3 shows that the statistical difference itself varied between –35.6 PJ and +249.6 PJ in 1990–2020 (–7.3 and +38.4 per cent of the fuel consumption in the reference approach in 1990–2020). When the statistical difference in energy consumption is compared with the production and import of all fuels in Norway, these statistical differences vary between –0.4 and +2.6 per cent of the total production and import in 1990–2020 (between –0.2 and +0.6 per cent in 2015–2020). The NIR (annexes XII and XIII) includes details on the improvements in the energy balance and a comparison of the reference approach and the sectoral approach. Annex XII also describes the strengthening of the institutional arrangements for the preparation of the energy statistics, including more extensive cooperation with partners responsible for the data and data quality. Regarding continued improvements to the energy statistics, the NIR (annex XII, chap. 10) indicates that work to identify and correct the statistical differences will continue as part of the regular and strengthened QA/QC procedures for the energy balance and emissions inventory. The ERT noted that the 2006 IPCC Guidelines (vol. 2, chap. 6, p.6.13) indicate that for countries that produce and export large amounts of fuel the uncertainty on the residual supply may be significant and could affect the reference approach. The ERT considers that the recommendation is resolved because the Party has improved the energy statistics, resulting in a difference between the sectoral and reference approach that can in large part be explained by the statistical difference in the energy statistics. Furthermore, the Party has strengthened the institutional arrangements for the preparation of the energy statistics, including a more extensive cooperation with partners responsible for the data and data quality, which is necessary for continued improvement of the energy statistics.
E.3	Fuel combustion – reference approach – solid fuels – CO_2 (E.3, 2020) (E.3, 2018) (E.4, 2016) (E.4, 2015)	Improve the data-collection procedures for solid fuels (coal and coke oven coke).	Addressing. The Party reported in its NIR (annex XIII) the improvements in data collection for solid fuels, which resulted in a lower difference between the reference approach and the sectoral approach. For example, for 2018, energy consumption of solid fuels in the reference approach was 143.2 per cent higher than in the sectoral approach in the 2020 submission but this difference decreased to 33.8 per cent in the 2022 submission. When corrected for by the statistical

ID#	Issue/problem classification[a, b]	Recommendation from previous review report	ERT assessment and rationale
	(26, 2014) Accuracy		differences, transformation differences and other known discrepancies, the remaining difference was reduced to 4.8 per cent in 2018 (NIR table AXIII.5). Norway also reported in its NIR (annex XII, section 6.3) that it consistently checked the reported solid fuel consumption data and reduced the statistical differences for blast furnace gas. Further, it reported that a comparison of data on fuel consumption with data on imports at an aggregated level has started but was not included in the 2022 submission. During the review, the Party clarified that the QC on fuel consumption and import statistics was implemented in the energy balance published in June 2022 and will be included in the 2023 submission. The ERT considers that the recommendation has not yet been fully addressed because the Party has not yet implemented the results from the comparison of fuel consumption statistics and import statistics in the CRF tables.
E.4	Fuel combustion – reference approach – solid fuels – CO_2 (E.4, 2020) (E.5, 2018) (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. The Party reported in its NIR (annex XII, section 6.3) that Statistics Norway has performed a QC of coal and blast furnace gas and in the same section also described the improvements in the 2022 submission and the planned improvements for the next annual submission. The Party included in its NIR (annex XII, chap. 9) a description of the checks and improvements to the data collection for solid fuels (see also ID# E.3 above). The ERT considers that the recommendation has not yet been fully addressed because the Party has not yet completed implementation of the revised energy balance system.
E.5	Comparison with international data – all fuels – CO_2 (E.5, 2020) (E.6, 2018) (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.	Resolved. The Party reported in annex XI to its NIR a comparison of the energy data derived from the reference approach and data from Eurostat, including an explanation for the main differences in the data from these sources. In section 3.6.1.2 of the NIR, Norway explained that (1) the reference approach is now generally consistent with the national energy balance published by Statistics Norway, (2) for reporting to IEA and Eurostat it now uses the same data extraction methods and the same database as those used for the energy balance, (3) the energy data reported to IEA and Eurostat are also used for the emissions inventory and (4) some discrepancies still occur owing to different definitions and to timing of when the data are extracted. Norway also explained that the comparison with IEA data is less straightforward than the comparison with Eurostat data because for most liquid fuels, IEA uses net calorific values that differ from those reported by Statistics Norway. The main differences of this comparison are explained in annex XI to the NIR. Table AXI.3 shows a comparison of the apparent consumption in the CRF reference approach and the data published by Eurostat in 2020. The largest differences are shown for naphtha (apparent consumption of –49,443 TJ in CRF table 1.A(b) and –88,718 TJ in Eurostat in 2020) and natural gas liquids (apparent consumption of 364,303 TJ in CRF table 1.A(b) and 383,606 TJ in Eurostat in 2020). This difference is explained by the fact that export of natural gas liquids in CRF table 1.A(b) of 38,813 TJ is included in Eurostat as export of naphtha and the net calorific value of natural gas liquids in CRF table 1.A(b) of 461 TJ/kt is higher than the net calorific value of natural gas liquids reported to Eurostat and IEA of 43.9 TJ/kt. Explanations of other differences are also provided in table AXI.3.

ID#	Issue/problem classification[a, b]	Recommendation from previous review report	ERT assessment and rationale
E.6	Comparison with international data – all fuels – CO_2, CH_4 and N_2O (E.6, 2020) (E.7, 2018) (E.18, 2016) (E.18, 2015) Transparency	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.	Resolved. The Party reported in its NIR (p.3-148) that the reference approach is now generally consistent with the national energy balance published by Statistics Norway (with a few exceptions, which are described in the NIR), and that reporting to IEA and Eurostat now uses the same data extraction methods and the same database as those used for the energy balance. Furthermore, the energy data reported to IEA and Eurostat are the same as those used for the emissions inventory.
E.7	1.A. Fuel combustion – sectoral approach – liquid fuels – CO_2 (E.11, 2020) (E.34, 2018) Transparency	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.	Addressing. The Party reported in its NIR (annex XII, chap. 6) an overview of checks and corrections in the energy balance, including for the downstream oil market. These activities included QC of data streams, cross-checking of AD with alternative data sources (e.g. a comparison of sales statistics with information from the Norwegian Tax Administration, implementation of improvements resulting from an extensive dialogue with the refineries in Norway and checks on imports and exports of fuels used in navigation). The corrections for refineries were implemented for the years after 2010. During the review, the Party clarified that Statistics Norway is not aware of any significant errors in the refinery, import and export data and the petroleum sales statistics in the years before 2010. Where it has seen the need for corrections to the statistics and it has been possible to correct them, Statistics Norway has made some corrections for the years before 2010 for foreign trade, energy use in the manufacturing sector, coal-coke consumption, district heating and district cooling, refineries and natural gas statistics. Norway also explained that the changes Statistics Norway has made should not affect the consistency of reporting. The ERT considers that the Party has addressed all parts of the recommendation except explaining in the NIR how it reduced the uncertainty of the allocation of fuels between national navigation and international shipping.
E.8	1.A Fuel combustion – sectoral approach – all fuels – CO_2, CH_4 and N_2O (E.25, 2020) Transparency	Improve the summary in the NIR concerning the different projects already undertaken, particularly those that are associated with reducing the differences between the reference and sectoral approaches, by clearly distinguishing the timeline and the results of these projects.	Resolved. The Party reported in its NIR (annex XII, chaps. 2–3) on the projects undertaken. Chapter 2 covers projects on the differences between the reference and sectoral approaches up until 2018 in three time frames (conducted before 2012, in 2012–2015 and in 2015–2018), while chapter 3 covers organization of the work in response to the 2018 review.
E.9	1.A Fuel combustion – sectoral approach – all fuels – CO_2	Provide in the NIR an improved discussion of the reliability of the national CO_2 emission estimates for fuel combustion (estimated using the	Addressing. The Party included a discussion in its NIR (annex XII, section 9.2) of the remaining differences in apparent consumption between the reference approach and the sectoral approach. It explained that the remaining differences can largely be explained by statistical differences, and that the statistical difference as a share of oil, gas and coal production is within 1 per cent for most

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	(E.26, 2020) Accuracy	sectoral approach) that better supports the Party's claim of the accuracy and completeness of reported emissions from fuel combustion (category 1.A).	years. For example, in 2018, the total oil, gas and coal production was 8,084 PJ (as calculated from production in CRF table 1.A(b), combined with energy conversion factors presented in NIR table AXIII.1) and the statistical difference in 2018 was 42.9 PJ. The statistical difference as a share of oil, gas and coal production was, therefore, 0.5 per cent for that year (42.9/8,084 times 100). However, the Party did not provide a discussion in its NIR of the remaining differences in CO_2 emissions between the reference approach and the sectoral approach (similar to the comparison of apparent fuel consumption presented in annex XIII to the NIR).
E.10	1.A.2.a Iron and steel – solid fuels – CO_2 (E.12, 2020) (E.35, 2018) Transparency	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.	Not resolved. The Party reported in NIR table 3.3 (p.3-12) that 82 per cent of the CO_2 emissions in 2020 were reported by the iron and steel industry. The NIR does not contain information on the methods, AD and emissions reported by this industry or on how Norway ensures that a consistent time series is ensured. During the review, the Party explained that the energy data have been revised, but that further work is required. The ERT considers that the recommendation is not resolved, because no additional information is included in the NIR about 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.
E.11	1.A.2.a Iron and steel – solid fuels – CO_2 (E.13, 2020) (E.35, 2018) Transparency	Investigate the underlying reason where large inter-annual fluctuations in the CO_2 IEFs are identified to ensure accurate reporting of emissions, and describe the reason in the NIR.	Addressing. The Party recalculated the energy consumption data between the 2021 submission and the 2022 submission, which resulted in a change in the CO_2 IEF for solid fuels (the IEFs range between 119.7 and 206.5 t CO_2/TJ in the 2022 submission). The CO_2 IEF for solid fuels in 2020 (119.7 t CO_2/TJ) is the lowest in the time series and the value decreased by 17.9 per cent compared with the value for 2019 (145.75 t/TJ). However, the NIR does not contain information on the underlying reason for the variability in the IEFs across the time series. During the review, the Party explained that the difference in the CO_2 IEF for solid fuels for these years arose owing to a mismatch between emission and energy data. All AD for blast furnace gas (both that purchased and that produced on site) are allocated to category 1.A.2.a, while emissions are reported in category 1.A.2.a (emissions from purchased blast furnace gas) or category 2.C.1 (iron and steel production) (emissions from blast furnace gas produced on site). In 2020, less purchased blast furnace gas was available than usual so on-site blast furnace gas contributed a larger proportion of energy consumption under category 1.A.2.a, leading to a lower CO_2 IEF than in previous years. Norway indicated that the energy AD will be corrected for the next annual submission, and that no changes are required in the emission data. The ERT considers that a correction of the AD (i.e. removing the AD of blast furnace gas produced on site from category 1.A.2.a) would most likely reduce the inter-annual fluctuation of the CO_2 IEF for solid fuels. The ERT considers that the recommendation has not yet been fully addressed because the Party has not yet included in the NIR a description of the underlying reason for the large inter-annual fluctuation in the CO_2 IEF for solid fuels. However, the ERT considers that the issue is now one of comparability and not of accuracy.
E.12	1.B Fugitive emissions from fuels – all fuels –	Provide verification information in the NIR that not only uses the	Resolved. The Party reported in its NIR (section 3.4.4.2) a comparison of the field-specific CO_2 EF and the default tier 1 CO_2 EF provided in the 2006 IPCC Guidelines (vol. 2, chap. 4, table 4.2.4)

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	CO_2 and CH_4 (E.27, 2020) Convention reporting adherence	comparative assessment with the IPCC tier 1 method and EFs, but also explores the relevant country-specific information that already has available (e.g. on field- and plant-specific EFs collected at various oil and natural gas fields).	for 2019 for fugitive emissions. In section 3.4.4.6 of the NIR, it reported a comparison between the CH_4 and CO_2 emissions, calculated in accordance with the tier 3 methodology and the tier 1 methodology respectively. The results of this latter comparison show that the CO_2 emissions estimated using the field-specific EF are higher than those estimated using the default EF, whereas the opposite is true for the CH_4 emission estimates. An explanation for the fact that the reported CH_4 emissions are lower than those estimated using the default CH_4 EF is included in NIR section 3.4.4.1.
E.13	1.B Fugitive emissions from fuels – all fuels – CO_2, CH_4 and NMVOCs (E.28, 2020) Comparability	Make efforts to report indirect CO_2 emissions in CRF table 6, excluding them from sectoral CRF tables 1.B.1 and 1.B.2.	Not resolved. The Party reported in its NIR (section 9.2, p.9-2) that indirect CO_2 emissions are an integral part of the emission estimates and are reported in the category under which the CH_4 and NMVOC emissions occur. Norway explained that it did not include indirect CO_2 emissions in CRF table 6 in order to achieve correct national totals including indirect CO_2 emissions. During the review, the Party clarified that it plans to implement the recommendation on indirect CO_2 emissions for the 2023 submission. The ERT considers that the recommendation has not yet been fully addressed because indirect emissions have not yet been reallocated from CRF tables 1.B.1–1.B.2 to CRF table 6.
E.14	1.B.2 Oil, natural gas and other emissions from energy production – gaseous and liquid fuels – CO_2 and CH_4 (E.15, 2020) (E.26, 2018) (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 corresponding categories in the CRF tables.	Resolved. The Party reported in NIR table 3.28 (p.3-96) and in CRF table 1.B.2 the same notation key ("NO") for AD and CO_2 and CH_4 emissions for category 1.B.2.a.6, correcting the only pending issue relating to this recommendation in the 2020 submission (see document FCCC/ARR/2020/NOR, ID# E.15).
E.15	1.B.2 Oil, natural gas and other emissions from energy production – gaseous and liquid fuels – CO_2 and CH_4 (E.17, 2020) (E.28, 2018) (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. The Party did not change its reporting. It reported fugitive emissions (from oil exploration and oil production, and natural gas exploration, production and processing) and venting emissions as "IE" and reported those emission aggregately under category 1.B.2.c.iii (venting – combined) in CRF table 1.B.2. The NIR (section 3.4.4.2) contains a detailed description of the methodology for calculating fugitive and venting emissions of CH_4 and NMVOCs, but this level of data detail is not found in the CRF tables. During the review, the Party clarified that it plans to report disaggregated data in the 2023 submission. The ERT considers that the recommendation has not yet been fully addressed because the Party continues to report the emissions from oil exploration and oil production, and natural gas exploration, production and processing as "IE".

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E.16	1.B.2 Oil, natural gas and other emissions from energy production –gaseous and liquid fuels – CO_2 and CH_4 (E.18, 2020) (E.36, 2018) Comparability	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.	Addressing. The Party reported in its NIR (section 3.4.4.2) a detailed description of the methodology for calculating fugitive and venting emissions of CH_4 and NMVOCs that significantly improved the level of resolution in the reporting of fugitive, flaring and venting emissions from oil and natural gas systems (the improvement was also noted in the previous review report). However, the reporting of emission estimates in the subcategories in the CRF tables has not changed since the previous annual submission (see ID# E.15 above). During the review, the Party clarified that it plans to report disaggregated data in the 2023 submission.
E.17	1.B.2 Oil, natural gas and other emissions from energy production –gaseous and liquid fuels – CO_2 and CH_4 (E.20, 2020) (E.37, 2018) Accuracy	Advance the research and make improvements to the data reporting systems used to estimate emissions by subcategory, including fugitive emissions and emissions 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 subcategories, including fugitive emissions and venting and flaring. (In particular, the NIR should include a description of the methods used by operators for the facility-level reporting of emissions.)	Addressing. The Party reported in its NIR (section 3.4.4.2) a detailed description of the methodology for estimating fugitive emissions and emissions from venting and flaring, including a reference to the *Handbook for quantifying direct methane and NMVOC emissions* published by the Norwegian Oil and Gas Association. Furthermore, Norway provided an overview of specific EFs by gas field or oilfield in NIR figure 3.19. The IEFs in the figure vary between approximately 1 and 10,000 t CO_2 eq per million m^3. During the review, the Party clarified that these differences in IEF per field are caused by differences in processes and emission-reducing measures at these fields. The Party also clarified that a new method for estimating venting emissions was implemented for the inventory in the 2020 submission and that the documentation in the NIR has since been improved. The ERT considers that the recommendation has not yet been fully addressed because the Party has not yet disaggregated the emissions under category 1.B.2.c.1 to categories 1.B.2.a.1, 1.B.2.a.2, 1.B.2.b.1 and 1.B.2.b.2 and has not yet provided a clarification of the estimation methods and country-specific EFs for each category in order to provide evidence of the accuracy and completeness of the time series of emission estimates for all subcategories.
E.18	1.B.2 Oil, natural gas and other emissions from energy production –gaseous and liquid fuels – CO_2 and CH_4 (E.21, 2020) (E.37, 2018) Accuracy	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 the country, 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	Addressing. Norway reported a comparison between the CH_4 and CO_2 emissions, calculated in accordance with the tier 3 methodology and the tier 1 methodology, respectively, in section 3.4.4.6 of the NIR (see ID# E.12 above). During the review, the Party explained that a new method for venting was implemented in the inventory in the NIR 2020 and the documentation in the NIR has since been improved. The Party also explained that disaggregated data input in the CRF is yet to be implemented. The ERT considers that the recommendation has not yet been fully addressed because the Party only provided a comparison of country-specific EFs and methods with IPCC default EFs for oil and gas fields as a whole (including fugitive and venting emissions) and has not yet presented information supporting the field-specific EFs by category for categories 1.B.2.a.1, 1.B.2.a.2, 1.B.2.b.1, 1.B.2.b.2 and 1.B.2.c.1.

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		completeness and accuracy of the national inventory.	
E.19	1.B.2 Oil, natural gas and other emissions from energy production – liquid and gaseous fuels – CO_2, CH_4 and N_2O (E.29, 2020) Transparency	Undertake the first step of achieving a higher resolution in the reporting of fugitive emissions from oil and natural gas (i.e. disaggregating fugitive and venting emissions between oil and natural gas) as soon as possible and report on the progress in the NIR.	Resolved. The Party reported in its NIR (section 3.4.4.2) a detailed methodology for calculating fugitive and venting emissions of CH_4 and NMVOCs. NIR tables 3.32–3.33 now distinguish between the venting emissions in 2020 (table 3.32) and the fugitive emissions in 2020 (table 3.33). However, this distinction has not yet been applied in the CRF tables, the level of detail of which has not changed since the previous annual submission, and no distinction between oil and natural gas has been made. During the review, the Party clarified that it plans to report disaggregated data in the CRF tables in the 2023 submission, which will require a change in the flow of data between the main emission model and CRF Reporter. The ERT considers this issue to be resolved, even though the disaggregated emissions are not yet included in the CRF tables and no distinction is made between oil and natural gas, because the Party undertook a first step by reporting the fugitive and venting emissions separately for 2020 in the NIR. Recommendations for the next steps (further disaggregation of the emissions) are included in ID#s E.15 and E.16 above.
E.20	1.B.2.a Oil – liquid fuels – CO_2 (E.24, 2020) Convention reporting adherence	Improve the QC checks to ensure that information for all recalculations is provided in the NIR, including those linked to the correction of errors, in line with paragraphs 43–45 of the UNFCCC Annex I inventory reporting guidelines.	Addressing. The Party reported in its NIR (section 10.2.1) the main recalculations performed for the energy sector. However, no description was included for the recalculations for categories 1.B.2.a.3 (2019, CH_4 and CO_2), 1.B.2.a.4 (1990–2019, CO_2) and 1.B.2.b.5 (1997–2019, CH_4). Of these recalculations, the recalculation for 1.B.2.b.5 produced a difference in emissions of more than 2 per cent (varying between –45 and +26 per cent over the period). During the review, the Party clarified that CH_4 emissions for category 1.B.2.b.5 were previously manually calculated, but are now calculated with a computer programme that uses data from the energy balance, and that therefore large parts of the time series have been updated. The ERT considers that the recommendation has not yet been fully addressed because recalculations resulting in large differences in emissions (e.g. for category 1.B.2.b.5 in the 2022 submission) have not been explained in the NIR.
E.21	1.C.1 Transport of CO_2 – gaseous fuels – CO_2 (E.30, 2020) Transparency	Correct the text describing the monitoring methods used for the CO_2 pipeline in the NIR and include in the text the relevant results regarding the detection of CO_2 leakage. If no CO_2 leakage is detected, revise the notation key used in CRF table 1.C in line with paragraph 37 of the UNFCCC Annex I inventory reporting guidelines.	Resolved. The Party reported in its NIR (p.3-138) a revised description of the methodology for estimating CO_2 emissions from pipeline transport. The sentence on 2D and 3D seismic surveys (which was included in the description of pipeline emissions in the previous annual submission) has been moved to the section on reservoir monitoring. The Party reported CO_2 emissions for category 1.C.1.a (pipelines) as "NE" in CRF table 1.C. The ERT noted that the 2006 IPCC Guidelines (vol. 2, chap. 5.4.1) include a default methodology for estimating CO_2 emissions from pipelines. The NIR (p.3-138) contains a justification for the emissions being below the threshold, including an estimate based on tier 1 EFs from the 2006 IPCC Guidelines (resulting in emissions of 0.2 kt CO_2 eq, or 0.0004 per cent of the national total, excluding LULUCF, in 2020) and a discussion of why these emissions, which are based on a default EF, are an overestimation.

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			During the review, the Party clarified that while CO_2 leakage from pipelines is monitored, the monitoring systems are not extremely sensitive and it is concluded that such emissions are below the level of detection. The notation key "NE" was used to indicate that any emissions that might occur would be below the level that would require a quantified estimate. The ERT agrees with the rationale for using the notation key "NE".
IPPU			
I.1	2. General (IPPU) (I.1, 2020) (I.21, 2018) Transparency	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 AD on fuel quantity combusted, and production quantities for the petrochemical production subcategories methanol, ethylene, and ethylene dichloride and vinyl chloride monomer.)	Resolved. The Party included in its NIR descriptions of and references and sources of information for specific methodologies, AD and EFs where tier 3 methods were used, in line with paragraph 41 of the UNFCCC Annex I inventory reporting guidelines, for the relevant categories. Information was provided in the NIR on AD on fuel quantity combusted and production quantities for methanol (section 4.3.6.3) and for the petrochemical production subcategories ethylene, ethylene dichloride and vinyl chloride monomer (section 4.3.7.3).
I.2	2. General (IPPU) – CO_2 (I.11, 2020) Comparability	Improve the comparability and transparency of the reporting by excluding indirect CO_2 emissions from sectoral (direct) CO_2 emissions in the IPPU sectoral CRF tables and reporting indirect CO_2 emissions from the IPPU sector in CRF table 6.	Addressing. The Party explained in its NIR (section 9.2) that indirect CO_2 emissions have been an integral part of the emission estimates for each source category at the most disaggregated level and that changes in the CRF tables for sectoral level reporting will be considered in future reporting. The Party provided in its NIR total indirect CO_2 emissions for the energy and IPPU sectors (table 9.2) and national totals with and without indirect CO_2 emissions (table 9.3). The ERT considers that the recommendation has not yet been fully addressed because the Party has continued reporting indirect CO_2 emissions for the IPPU sector in the sectoral CRF tables rather than in CRF table 6.
I.3	2.A.4 Other process uses of carbonates – CO_2 (I.12, 2020) Transparency	Report more transparently on the EF applied and the methodologies used to complete the time series of data for subcategory 2.A.4.d (other process uses of carbonates – other) for years for which no direct plant-specific data are available in order to ensure consistency across the time series.	Resolved. The Party provided in its NIR (section 4.2.7.2) the missing information on the methodology used for completing the time series of fly ash use and estimating emissions for the plant that neutralizes sulfuric acid waste. The Party also reported in its NIR (section 4.2.7.4) the EF applied, including for years for which no direct plant-specific data are available. The ERT considers that the estimation of CO_2 emissions from fly ash use in 1997–2009 and the estimation of amounts of fly ash used for 2017 and onward is an appropriate way of ensuring consistency across the time series.

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I.4	2.B.1 Ammonia production – CO_2 (I.13, 2020) Comparability	Report all emissions from ammonia production (category 2.B.1) under the IPPU sector in accordance with the 2006 IPCC Guidelines (vol. 3, chap. 1, box 1.1) and ensure that the related fuel consumption is excluded from the emissions reported under the energy sector to avoid double counting.	Resolved. Starting with the 2021 submission, the Party reported all emissions from ammonia production (category 2.B.1) under the IPPU sector. Emissions from fuel consumption (category 1.A.2.a (iron and steel)) in the energy sector were reduced accordingly. This approach is described in the NIR (section 4.3.1.2), where it is explained that Statistics Norway allocates emissions from ammonia production to the IPPU sector and ensures that emissions from this fuel use are not also reported under the energy sector.
I.5	2.B.5 Carbide production – CO_2 (I.14, 2020) Transparency	Report more transparently on the methodology applied to estimate CO_2 emissions from carbide production and provide an accurate explanation of the AD used to estimate indirect CO_2 from CH_4 and NMVOC emissions for this category.	Resolved. The Party added in its NIR (section 4.3.3.2) detailed information on the methodology applied to estimate CO_2 emissions from carbide production and explained that annual production of crude silicon carbide is used as AD to estimate CH_4 and NMVOC emissions and hence indirect CO_2 emissions for this category.
I.6	2.D Non-energy products from fuels and solvent use – CH_4 and N_2O (I.15, 2020) Comparability	Apply the correct notation keys for recovery of CH_4 and N_2O for lubricant use and solvent use (categories 2.D.1 and 2.D.3.a) in CRF table 2(I).A-Hs2.	Addressing. The Party reported in CRF table 2(I).A-Hs2 the recovery of CH_4 and N_2O for lubricant use (category 2.D.1) as "NA". However, the ERT noted that for solvent use (under category 2.D.3.a (other)), CH_4 and N_2O recovery was still reported as "IE", while CH_4 and N_2O emissions were reported as "NA". During the review, the Party clarified that CH_4 and N_2O recovery should have been reported as "NA" for this category and indicated that it will use this notation key in the next annual submission. The ERT considers that the recommendation has not yet been fully addressed because the Party has not used the correct notation key for solvent use under category 2.D.3.a.
I.7	2.D.1 Lubricant use – CO_2 (I.16, 2020) Transparency	Report clearly on the AD (description and corresponding units) for lubricants in CRF table 2(I).A-Hs2 and provide a clear explanation of the CO_2 EF and IEF in the NIR.	Resolved. The Party reported in CRF table 2(I).A-Hs2 the consumption of lubricants in kt (e.g. 48.82 kt for 2020), correcting the AD of oxidized lubricants previously reported. In the NIR (section 4.5.1.4), the Party provided an explanation of the CO_2 EF and explained how the sold amounts of lubricants are determined, which, in turn, determines the IEF. The change in the reported AD led to a reduction of the IEF from 2.95 to 0.93 t/t, which is now within the default range (0.24–0.96 t/t) provided in the 2006 IPCC Guidelines (vol. 3, chap. 5.2.2.2). The sold amounts of lubricants in kt are provided in NIR table 4.38, and are consistent with the consumption of lubricants reported in CRF table 2(I).A-Hs2.
I.8	2.D.3 Other (non-energy products from fuels and solvent use) – CO_2 (I.8, 2020) Transparency	Report consistently on recalculations performed between submissions in all relevant chapters of the NIR.	Resolved. The Party reported consistently in the relevant sections of the NIR on the recalculations for category 2.D.3, namely in sections 4.5.3.7 and 10.2.2.1 for the subcategory solvent use under category 2.D.3 (other).

ID#	*Issue/problem classification[a, b]*	*Recommendation from previous review report*	*ERT assessment and rationale*
I.9	2.E.1 Integrated circuit or semiconductor – SF_6 (I.17, 2020) Accuracy	Provide further justification for the assumption of constant values for the AD and EF in the NIR and, provided that funding is available and the project is prioritized, report on the use of up-to-date studies and assumptions to estimate SF_6 emissions for category 2.E.1.	Addressing. The Party continued reporting constant AD (0.09 and 0.10 t for 1995–1998 and 1999 onward respectively) and SF_6 emissions (0.045 and 0.05 t for 1995–1998 and 1999 onward respectively) in CRF table 2(II)B-Hs1. The Party reported in NIR table 10.14 that a project on estimating SF_6 emissions for category 2.E.1 has commenced. During the review, the Party clarified that the project will map the production of semiconductors in Norway and is expected to contribute to better data quality and documentation for category 2.E.1. The ERT, while noting that the reported emissions (0.05 t SF_6, or 1.14 kt CO_2 eq) are below the significance threshold and that any revisions to the estimates are expected to keep emissions for the category below the significance threshold, considers that the recommendation has not yet been fully addressed because the Party has not yet provided a justification for the use of constant values for the AD and EFs, and up-to-date studies for this category are not yet available.
I.10	2.F Product uses as substitutes for ozone-depleting substances – HFCs and PFCs (I.18, 2020) Transparency	Remove the references to the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* in the descriptions for categories 2.F.1 and 2.F.6 in the NIR in cases where the methodology and/or parameters applied are based on the 2006 IPCC Guidelines.	Resolved. The Party removed the references to the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* in the relevant sections of the NIR (4.7.1 and 4.7.2). In these sections, only the 2006 IPCC Guidelines are referenced, which are the guidelines used by the Party.
I.11	2.F.1 Refrigeration and air conditioning – HFCs and PFCs (I.6, 2020) (I.26, 2018) Transparency	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.	Resolved. The Party provided in the NIR (section 4.7.1.2) the equations used and the rationale for selecting the methods for estimating emissions from the production of new refrigeration and air-conditioning equipment and from equipment in use. In section 4.7.1.4, the Party provided the EFs and the rationale for selecting these EFs. Underlying assumptions informing the uncertainty of the data used were provided in section 4.7.1.4 of and in annex II to the NIR. In section 4.7.1.2, a link to additional information on the methods used (Bjønness, 2013) was provided.
I.12	2.F.1 Refrigeration and air conditioning – HFCs and PFCs (I.7, 2020) (I.27, 2018) Accuracy	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.	Addressing. The Party updated in its NIR (section 4.7.1.2) the information on the improvements made, specifically the updates of EFs for the main applications for category 2.F.1. In section 4.7.1.4, the Party explained that recovery rates are still under revision.
I.13	2.F.1 Refrigeration and air conditioning – HFCs	Include transparent information on recalculations in the NIR, including	Resolved. The Party reported in its NIR (section 4.7.1.7) on the recalculations conducted for category 2.F.1. It explained that there has been a correction in the reported amounts of destructed

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	(I.10, 2020) Transparency	the rationale for recalculations and information on any methodological or AD updates (e.g. the information provided during the review on the allocation of destructed gas).	HFCs and PFCs, leading to a reduction in emissions for 2004–2019. There were no methodological updates made in the 2022 submission compared with the 2021 submission.
I.14	2.F.1 Refrigeration and air conditioning – HFCs (I.19, 2020) Accuracy	Provide the recalculated time series for category 2.F.1 based on the updated F-gas model presented during the review.	Resolved. The Party recalculated the time series for category 2.F.1 in its 2021 submission to implement the revised F-gas model.
I.15	2.F.1 Refrigeration and air conditioning – HFCs (I.19, 2020) Accuracy	Report transparent and complete information on any new methodologies applied, including a comprehensive comparative analysis of the previous and new results of the applied models for estimating F-gas emissions and the underlying rationales for any differences.	Resolved. The Party provided comprehensive information on the methodologies applied for category 2.F.1 in section 4.7.1.2 of the NIR. During the review, the Party explained that the new methodologies were applied in 2021 for the first time and that section 10.2.2 of the 2021 NIR contains information on the differences between the old and new methods (the new EFs are provided in table 10.1 of the 2021 NIR), and an explanation of the underlying rationale. A comparative analysis of the old and new results can be found in section 10.2.2 of the 2021 NIR, supported by figures 10.1 and 10.2 of the 2021 NIR.
I.16	2.F.1 Refrigeration and air conditioning – HFCs (I.19, 2020) Accuracy	Investigate, analyse and report on any remaining considerable inter-annual changes in emission trends in order to increase the transparency of the reported emission trends.	Resolved. The Party reported in section 10.2.2 of the 2021 NIR how it analysed the considerable inter-annual changes in emission trends. As a consequence of this analysis, the Party applied new methods, after which the inter-annual changes were reduced, as shown in figure 10.1 of the 2021 NIR. A description of the new methods, including information on lifetimes, EFs and recovery efficiency, is provided in section 4.7.1.2 of the 2022 NIR.
I.17	2.F.1 Refrigeration and air conditioning – HFCs (I.19, 2020) Transparency	If the existing methods are still in use, report more transparently on the assumptions and methodology applied, including loss factors from amounts filled in new products, lifetime EFs and destruction rates, and provide a comprehensive justification for the considerable decrease in HFC emissions for category 2.F.1 between 2017 and 2018.	Resolved. The Party has changed the methodology used since its 2021 submission (see ID# I.14 above).
I.18	2.F.1 Refrigeration and air conditioning – HFCs (I.20, 2020) Transparency	Report more transparently on the inclusion of early decommissioned appliances contributing to HFC-143a emissions from “recovery” and on the use of notation keys in combination with the values reported for the inherently interrelated AD and	Addressing. For stationary air conditioning, the Party continued to report the amount of HFC-143a remaining in products at decommissioning and emissions from disposal and recovery as “NO” in CRF table 2(II)B-Hs2 for the entire time series. The Party explained in its NIR (section 4.7.1.3) that in some sectors, industries have started phasing out equipment earlier than expected, which can result in the amount of destructed gas being greater than the calculated amount remaining in products at decommissioning. The ERT noted that reporting emissions from disposal and recovery

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		emissions sources for stationary air conditioning.	of HFC-143a as "NO" for all years in CRF table 2(II).B-Hs2 indicates that no equipment has been phased out yet for this category and gas. During the review, the Party clarified that equipment was phased out before it reached its end of life. However, in the 2022 submission, a recalculation was made whereby the amount of destructed gas was reallocated to categories with emissions from end of life. The HFC-143a emissions from disposal and recovery are, therefore, included in the inventory but not in the correct category. For the 2023 submission, the Party indicated it will report categories and gases where phasing out occurs but no recovery is reported as "IE" instead of "NO". The ERT considers that the recommendation has not yet been fully addressed because the Party has not yet used the correct notation key to reflect the reporting on recovery from appliances that are decommissioned early.
I.19	2.G Other product manufacture and use – SF_6 (I.9, 2020) Convention reporting adherence	Report on recalculations performed in the relevant chapters of the NIR, in line with paragraphs 43–45 of the UNFCCC Annex I inventory reporting guidelines.	Resolved. The Party reported in sections 4.8.1.7 and 10.2.2.2 of its NIR on the recalculations for category 2.G. The Party described the rationale for the recalculations and the changes in AD, in line with paragraphs 43–45 of the UNFCCC Annex I inventory reporting guidelines.
Agriculture		No unresolved recommendations from the previous review report.	
LULUCF			
L.1	4. General (LULUCF) – CO_2, CH_4 and N_2O (L.1, 2020) (L.11, 2018) Completeness	Quantify the emissions for each excluded category to test its significance against the threshold values.	Resolved. The Party reported in its NIR (sections 1.7, p.1-28, and 6.1.5, p.6-17) on all LULUCF categories and pools reported as "NE" and assessed them against the criteria defined in paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines. The likely emissions of three sources were examined and reported in the NIR: (a) Controlled forest fires (non-CO_2 emissions): CH_4, 0.029 kt CO_2 eq; N_2O, 0.019 kt CO_2 eq (section 6.15.1.5.1 1, p.6-129); (b) Grassland wildfires (non-CO_2 emissions) mean for 2016–2020: CH_4, 1.6 kt CO_2 eq; N_2O, 1.1 kt CO_2 eq (section 6.15.1.5.1, p.6-130); (c) Land converted to peatland extraction (category 4.D.2) (CO_2, CH_4 and N_2O emissions): CO_2, 9.1 kt; CH_4, 0.4 kt CO_2 eq; N_2O, 0.1 kt CO_2 eq (section 6.7.3, p.6-99). Norway demonstrated that each source was below the significance threshold established in paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines (26.64–27.24 kt CO_2 eq for 2013–2020).
L.2	4. General (LULUCF) – CO_2, CH_4 and N_2O (L.2, 2020) (L.11, 2018)	Sum up all insignificant categories and apply the cumulative test referred to in paragraph 37(b) of the UNFCCC Annex I inventory reporting	Resolved. The Party reported in its NIR (sections 1.7, p.1-28, and 6.1.5, p.6-17) and assessed all criteria defined in paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines (see ID# L.1 above). Norway demonstrated that each source was below the individual threshold of 0.05 per cent of national total GHG emissions. Norway also demonstrated that the likely level of the

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	Convention reporting adherence	guidelines, and report the results in the NIR.	aggregated emissions reported as "NE", which amounted to a range of 11–15 kt CO_2 eq, was also below the total threshold of 0.1 per cent of the national total GHG emissions (range 24.64–27.24 kt CO_2 eq for 2013–2020).
L.3	4. General (LULUCF) – CO_2 and N_2O (L.3, 2020) (L.12, 2018) Accuracy	Replace the current method for estimating SOC changes in mineral soils associated with land-use conversion with a methodology consistent with the 2006 IPCC Guidelines.	Resolved. The Party commissioned a study to address this recommendation. The study (Bárcena et al., 2021) uses the tier 1 methodology in line with the 2006 IPCC Guidelines (vol. 4, chap. 2.3.3) for all land-use changes on mineral soils. It uses EFs from the 2019 Refinement to the 2006 IPCC Guidelines (vol. 4) where updated values are available (e.g. DOM from table 2.2 and SOC_{REF} from table 2.3) or where EFs are not available in the 2006 IPCC Guidelines (e.g. values for the polar zone for SOC_{REF} in table 2.3). These EFs have been stratified by climate zone, soil type and management practice, if applicable. On the basis of the updated EFs, recalculations have been applied for all land-use changes on mineral soils for the entire time series. During the review, the Party referred to the following methodological details provided in the NIR: (a) General issues (section 6.2.3); (b) Conversions from land to forest land (section 6.4.2) with EF stratified by land-use type for cool temperate moist climate (table 6.22); (c) Conversions from land to cropland (section 6.5.2) with EF stratified by land-use type for cool temperate moist climate (table 6.24); (d) Conversions from land to grassland (section 6.6.2) with EF stratified by land-use type for cool temperate dry and cool temperate moist climates (table 6.30); (e) Conversions from land to wetlands (section 6.7.2) with no CSC for the conversions; (f) Conversions from land to settlements (section 6.8.2) with EF stratified by land-use type for boreal dry, cool temperate dry and cool temperate moist climates (table 6.38).
L.4	4. General (LULUCF) – CO_2 (L.4, 2020) (L.13, 2018) Transparency	Provide in the NIR a definition of the litter pool that includes the minimum size of organic matter included in the pool.	Resolved. The Party provided in its NIR (section 6.2.3, p.6-28) a definition of the litter pool that includes the minimum size of organic matter and differs depending on land use: (a) For forest land remaining forest land, the changes in DOM are computed with the Yasso07 model, by which CSCs in the litter pool are estimated according to the origin, the chemical nature and the size of the carbon input to the model. The most recalcitrant material, originating from root decomposition, is allocated to the soil pool. In this way, there is a clear distinction between litter and SOC pools; (b) For land converted to or from forest land, the litter pool includes the stratified default carbon stocks presented in the 2019 Refinement to the 2006 IPCC Guidelines plus fine woody litter (dimension 1.0–7.5 cm) retrieved from external data sets because no country-specific data are available.
L.5	4. General (LULUCF) – CO_2, CH_4 and N_2O (L.6, 2020) (L.15, 2018)	Implement specific QC logical tests to avoid errors (in particular with regard to CRF table 4.1 (see ID# L.9 in	Resolved. The Party reported in its NIR (section 6.1.6, p.6-18) several new logical tests that have been developed and applied; in particular, the Party described the QC (12 points) logical tests and the four-eyes principle. The QC checklists are provided in the NIR (annex V, section 3.3.1). The

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	Convention reporting adherence	document FCCC/ARR/2018/NOR), land representation (see ID#s L.7–L.8 in document FCCC/ARR/2018/NOR), use of EFs (see ID# 14 in document FCCC/ARR/2018/NOR) and use of CSC factors (see ID#s L.18–L.21 in document FCCC/ARR/2018/NOR)), such as the checks detailed in ID# L.9 in document FCCC/ARR/2018/NOR, 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.	general checks are summarized in tables AV.2–AV.4, with table AV.4 providing specific checks for LULUCF. The ERT did not find any errors that could have been solved with logical tests, demonstrating the implementation of QC checks.
L.6	Land representation – CO_2, CH_4 and N_2O (L.7, 2020) (L.7, 2018) Accuracy	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.	Resolved. The Party described in its NIR (section 6.3.6, p.6-43) the correction of the estimates for the conversion areas of land for a cumulative 20-year conversion for 1971–1989. During the review, the Party clarified that national aggregated land use and land-use change backcasting was conducted back to 1969. The Party reported a correction to the area and estimates for 1990–2009 in the NIR.
L.7	Land representation – CO_2, CH_4 and N_2O (L.10, 2020) (L.8, 2018) Transparency	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.	Resolved. The Party provided in its NIR (sections 6.2.2, p.6-28, and 6.3.5, p.6-40) information on areas subject to multiple land-use changes before the end of the 20-year transition period. During the review, the Party explained that the plot-wise interpolation and extrapolation of area estimates used for the current submission allows for each land-use transition to be better tracked on a yearly basis for the whole time series than the panel-wise approach used for previous annual submissions.
L.8	Land representation – CO_2, CH_4 and N_2O (L.11, 2020) (L.9, 2018) Consistency	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.	Resolved. The Party described the improvements made related to the handling of multiple land-use changes within the 20-year period in its NIR (section 6.2.2.2, p.6-28). Improvements were made to the estimates of land area, which are based on linear interpolation of areas and carbon stocks between plot-wise observations that are then aggregated to the panel (a set of samples where the same elements are measured on two or more occasions). National values for land areas and carbon stocks are reported in the NIR (section 6.3.5, p.6-40). NIR figure 6.11 shows the areas of forest land remaining forest land in mineral soils from 1989 to 2012. The ERT noted that the Party has improved its calculations and reported corrected values for land-use areas. For example, the value reported in CRF table 4.1 for total forest land area (managed) at the beginning of 2020 is identical

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			to the value reported for the same category at the end of 2019. This is also true for all other categories for the beginning of a specific year and the end of the previous year.
L.9	Land representation – CO_2, CH_4 and N_2O (L.12, 2020) (L.10, 2018) Transparency	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.	Resolved. The Party added to the description in its NIR (section 6.2.1, p.6-21) of the classification of areal plots such that it now includes a decision tree for land-use classification (NIR figure 6.7) that shows how the hierarchy has been applied by Norway. Further, in the NIR (section 6.3, p.6-31), it is transparently explained that the Party considers the NFI plots as actual areal plots rather than dimensionless points, which reduces the uncertainty of area estimates slightly. The methodology for estimating uncertainties in land areas and living biomass is also described in the NIR (section 6.3.7, p.6-46). During the review, the Party clarified that if an area is used for grazing, it will be classified as intensive grassland even if it has more than 10 per cent crown cover and hence meets the forest definition. The Party explained that the statistical methodology and inference is generally the same for points and areal units. Because the scientific merit of the study underpinning this methodology is limited, its publication has not been prioritized.
L.10	4.A.1 Forest land remaining forest land – CO_2 and N_2O (L.14, 2020) (L.17, 2018) Accuracy	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.	Resolved. The Party reported in its NIR ((sections 6.3.2, p.6-35, and 6.4.1.1.3, p.6-56) that plot-specific climate data used as input data for the Yasso07 model have been calculated from SeNorge data using a dynamic backward-looking five-year moving average of annual values from 1957 to 2020. The entire time series since 1990 was recalculated between the 2020 and 2022 annual submissions. The ERT considers that the recommendation has been fully addressed because the Party has revised the use of the Yasso07 model and applied climate data reflecting the trends in temperature and precipitation observed during the reporting period.
L.11	4.A.1 Forest land remaining forest land – CO_2 and N_2O (L.15, 2020) (L.17, 2018) Convention reporting adherence	Verify the Yasso07 outputs using independent estimates. (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.)	Addressing. The Party reported in its NIR (section 6.4.1.2, p.6-50) information on the application of a tier 3 method for estimating CSC for the pools DOM and SOC using the model Yasso07. The ERT noted that when using a model for calculating estimates, verification of the results is mandatory, as per paragraph 41 of the UNFCCC Annex I inventory reporting guidelines. In addition, paragraphs 4(e) and 12 of those guidelines indicate that estimates should be accurate in the sense that they are systematically neither over nor under true emissions or removals and that country-specific AD and EFs should be used as long as they are considered more accurate than the IPCC defaults. The 2006 IPCC Guidelines (vol. 1, chap. 6.10.1) describe different possibilities for verification. A verification of the Yasso07 results could be performed by using independent estimates. In this regard, Norway explained in its NIR (sections 6.4.1.5, p.6-62, and 10.4, p.10-40) that it has established a national soil carbon monitoring programme under the NFI, with the first planned sampling to start in 2023. If independent estimates are not yet available, an alternative means of verification (see ID# L.12 below) could be applied. The ERT considers that the application of one kind of sound verification procedure would be sufficient to resolve both this issue and ID# L.12 (see below), as well as the related issue ID# L.23 (see table 5). During the review, the Party clarified that dedicated funding for the soil carbon monitoring programme was first provided in 2022 and that the programme will indeed produce independent

ID#	Issue/problem classification[a, b]	Recommendation from previous review report	ERT assessment and rationale
			data that can be used to verify the Yasso07 outputs on a national scale. Further, the Party explained that data from an earlier national soil survey conducted in 1990 cannot be used as a baseline for soil carbon owing to an inaccurate field methodology for carbon measurement being used at that time. Thus, sampling needs to be repeated to derive estimates for CSC. Owing to the magnitude of the task of sampling all over Norway, according to the Party, it will take at least 15–20 years until estimates for CSC in SOC that are representative at the national scale will be available for model verification. The ERT considers that the recommendation has not yet been fully addressed because the Party has not yet included in the NIR details on a sound procedure for verifying the outputs of the tier 3 method (Yasso07 model). The ERT welcomes the Party's plan to continue with the programme for measuring CSC in SOC, the results of which, in the long term, will be able to verify the model outputs or could even be used directly for the reporting. The ERT acknowledges that the soil carbon monitoring programme for obtaining area representative measurements needs time to be conducted before model verification can be carried out. The ERT appreciates the efforts made by the Party to verify the outputs of the tier 3 method (Yasso07 model) by applying alternative means, as has been partially done and reported in the NIR and information on which was provided to the ERT during the review (see ID# L.12 below).
L.12	4.A.1 Forest land remaining forest land – CO_2 and N_2O (L.16, 2020) (L.17, 2018) Convention reporting adherence	Pending the start of additional data collection, apply alternative means of verification, such as chrono-sequences stratified by climate, topography, soil and forest type and derived from available data (e.g. International Co-operative Programme on Assessment and Monitoring of Air Pollution Effects on Forests, Forest Level I) and data from other countries considered representative of conditions in Norway (e.g. Sweden).	Addressing. The Party reported in its NIR (section 6.4.1.2, p.6-50) information on the application of a tier 3 method for estimating CSC for the pools DOM and SOC using the model Yasso07. The ERT noted that the Party has not yet provided verification of the Yasso07 outputs using independent estimates (see ID# L.11 above). According to the 2006 IPCC Guidelines (vol. 1, chap. 6.10.1), verification can also be performed by alternative means. During the review, the Party provided the following information to be used as verification by alternative means: (a) A comparison of Yasso07 outputs with published measured and modelled CSC estimates for DOM and SOC of other countries and regions considered representative of conditions in Norway (Dalsgaard et al., 2017), and a comparison of Yasso07 outputs with reported CSC derived using current methodologies in Austria, Finland, Sweden and Switzerland. Both comparisons indicate that the changes reported for Norway in its annual submission are in the range reported (measured as well as modelled) for nearby countries. The south-eastern parts of the country (which are climatically similar to large parts of Sweden), representing approximately 40 per cent of the Norwegian forest area, showed changes similar to those measured in Sweden. The Party also provided references to peer-reviewed published scientific studies concluding that, with consideration of uncertainties in both modelled and measured data, the Yasso07 model is suitable for unbiased estimation of decomposition of deadwood and litter in Switzerland (Didion et al., 2014) and changes in SOC in Finland and Sweden (Ortiz et al. 2013; Rantakari et al., 2012). Rantakari et al. (2012) noted that "the Yasso07 model was able to predict both soil C stock and C accumulation within the error limits of the measured values"; Ortiz et al. (2013) "found that the

ID#	Issue/problem classification[a, b]	Recommendation from previous review report	ERT assessment and rationale
			stocks, changes, inter-annual variations and uncertainties were of the same magnitude among the different methods"; and Didion et al. (2014) "concluded that Yasso07 can provide accurate information on temporal changes in C stocks in litter and deadwood in Swiss forests in a transparent manner that is valid for, e.g., reporting purposes under the UNFCCC and the Kyoto Protocol"; (b) A comparison between simulations and measurements of CSC in SOC at two sites in the south-east of Norway. The Party acknowledged that two sites are not sufficient for model validation at the national scale, but considered that these data strengthen the findings of the comparison with other countries that the Yasso07 results are within the range to be expected. The ERT considers that the recommendation has not yet been fully addressed because the Party has not yet included in the NIR details on a sound procedure for verifying the outputs of the tier 3 method (Yasso07 model). The ERT appreciates the efforts made by the Party to provide details on the verification during the review. The ERT suggests that Norway include in its NIR the justification for use of the model, as provided during the review, and to further elaborate as to what extent the available studies and data support the use of Yasso07 for forest land in Norway. The ERT notes that special care should be taken when comparing national model estimates with model results from other countries; Norway should check if these countries properly verified their model results and if the countries are comparable. In this regard, Dalsgaard et al. (2017, p.86) notes that "generally, there is no specific reason to expect similar rates of changes for the three countries. There are differences in climate, growth and/or management, which may be reflected in differences for carbon stocks and changes as well. Nevertheless, the differences in the estimates between the countries are not pronounced". From the documents provided during the review, the ERT understands that Norway also sees the need to further improve the verification: "thus, further work is necessary to verify the Yasso07 on the nation scale, and this has high focus in Norway". The ERT notes that providing in the NIR alternative verification (i.e. alternative to verification against independent estimates) would address the issue. The ERT considers that the application of one kind of sound verification procedure would be sufficient to resolve both this issue and ID #L.11 (see above), and by consequence, the related issue ID# L.23 (see table 5).
L.13	4.A.2.3 Wetlands converted to forest land – CO_2 (L.28, 2020) Transparency	Include an explanation for the trend in inter-annual changes in the net CSCs in litter per area in the NIR.	Resolved. The Party reported in its NIR (section 6.4.2.1, p.6-64) a description of the methodology used for estimating CSC in DOM, including deadwood and litter. Norway improved its calculations for DOM through use of a spatially explicit tier 1 methodology; CSC in DOM is now estimated for all soils on all lands converted to or from forest land. As such, the IEF will change as a result of land stratification (i.e. in different climates and ecological regions) and not simply follow the change in the total area of the subcategory, which in former submissions has resulted in an artificial trend, an artefact produced by CRF Reporter for land-conversion categories conversion times of multiple years. The ERT considers that the recommendation has been fully addressed because the Party has included in the NIR an explanation for the trend in inter-annual changes in the net CSC in litter.

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L.14	4.B Cropland – CO_2 (L.17, 2020) (L.18, 2018) Accuracy	Develop an age-class distribution of 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.	Resolved. The Party reported in its NIR (section 6.5.1, p.6-68) on the methodology applied for calculating changes in carbon in living biomass of perennial crops, that is, fruit trees: the Party applied the gain–loss method, default parameters are taken from the 2019 Refinement to the 2006 IPCC Guidelines (vol. 4, table 5.3), the default harvest cycle is 20 years and the age-class distribution of fruit trees is taken into account. A detailed description of the development of the age-class distribution and the assumptions made is provided in the NIR (p.6-69). The entire time series of CSC in living biomass since 1990 has been recalculated, and data on the age-class distribution before 1989 have been included (to cover the CSC in living biomass 20 years before 1989 under the assumption that prior to 1990 the fruit tree area remains constant) and on the basis of the assumption that the age-class of 21-year-old trees are removed and replaced with the age-class of 1-year-old trees. The ERT considers that the recommendation has been fully addressed because the Party has developed an age-class distribution of land with perennial crops, has applied the appropriate IPCC default EFs and has recalculated the entire time series since 1990.
L.15	4.B.2 Land converted to cropland – CO_2 (L.19, 2020) (L.19, 2018) Accuracy	Use the IPCC default value (5 t C/ha) 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.	Resolved. The Party reported in its NIR (section 6.5.2, p.6-74) a justification for the application of the corrected value of 4.7 t C/ha for annual crop biomass gains for land converted to cropland, as provided in the 2019 Refinement to the 2006 IPCC Guidelines (vol. 4, chap. 5, table 5.9), with an herbaceous biomass factor of 0.47 t C/t dry matter. The ERT considers that the recommendation has been fully addressed because a justification of the application of the corrected value of 4.7 t C/ha for annual crop biomass gains for land converted to cropland has been included in the NIR.
L.16	4.B.2 Land converted to cropland – CO_2 (L.20, 2020) (L.19, 2018) Transparency	Transparently describe the approach used for biomass carbon stock gain in the conversion of different land-use categories to annual cropland in the NIR.	Resolved. The Party reported in its NIR (section 6.5.2, p.6-74) methodological details for the calculation of CSCs in living biomass. The Party now differentiates different types of conversion to cropland. The Party provided a description in the NIR for the following conversion types: (a) Conversions from forest land to cropland and wetlands to cropland are estimated using the tier 3 method used for forest land; (b) Conversions from grassland to cropland (changes in woody biomass are zero, as demonstrated by plot observations); (c) Other conversion to cropland refers to grassland converted to cropland and settlements converted to cropland.

ID#	Issue/problem classification[a, b]	Recommendation from previous review report	ERT assessment and rationale
L.17	4.C Grassland – CO_2 and N_2O (L.21, 2020) (L.22, 2018) Comparability	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.	Resolved. The Party included in its NIR a detailed description of "forested area in closed pastures" (section 6.6) and a box (p.6-79) clarifying why "forested area in closed pastures" is reported under "intensive grassland". During the review, the Party explained that the threshold values for land cover for forest might be sufficient for tree cover, but the dominant land-use activity is grazing and not wood harvesting. In the NIR, the Party explained that tree biomass sequestered in "forested area in closed pastures" is very small and amounts to approximately 299 kt C cumulated over 1990–2020. The Party also reported CSCs in mineral soils of "forested area in closed pastures". Further, in its second initial report (report to facilitate the calculation of the assigned amount for the second commitment period of the Kyoto Protocol), Norway provided definitions for activities under Article 3, paragraph 4, of the Kyoto Protocol. In the report (p.11), a definition of GM is provided that explicitly includes activities on "forested area in closed pastures", which is described as follows: "land with tree cover may be classified as grassland if grazing is considered more important than forestry even if the forest definition is met". During the review, the Party confirmed that the same definitions for the classification of land-use categories and thus for FM and GM were used for the first commitment period of the Kyoto Protocol. The ERT considers that the recommendation has been fully addressed because the Party has clarified the reason "forested area in closed pastures" is classified under GM by taking into account land-use aspects. This classification, defined in Norway's second initial report, has been transparently documented in the NIR and has been applied consistently over time – since the start of the first commitment period and in the second – with no reclassification.
L.18	4.C.2 Land converted to grassland – CO_2 (L.22, 2020) (L.21, 2018) Completeness	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.	Resolved. The Party recalculated the carbon stock gains from annual biomass for all relevant conversions of different land uses to grassland since its 2021 submission and reported in its NIR (section 6.6.2.1, p.6-91) CSCs in living biomass on land converted to grassland. During the review, the Party clarified that in its estimation of CSC, it differentiates between tree living biomass (forest land to grassland) and grass biomass gains (land to grassland). In the case of conversion from forest land to grassland, country-specific EFs derived from the NFI are used, while for the conversion from land to grassland, default values from the 2006 IPCC Guidelines (vol. 4, table 6.4), differentiated for boreal, cool temperate dry and cool temperate moist climates, are used.
L.19	4.E Settlements – CO_2 and N_2O (L.23, 2020) (L.23, 2018) Transparency	Noting 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, report the land-cover types included under	Resolved. The Party reported on its introduction of subdivisions under the category settlements and explained the reasoning behind them (NIR section 6.8, p.6-99). The subdivisions are infrastructure, paved, turfgrass with and without trees, and vegetated with and without trees (NIR table 6.34 and figure 6.17). The methods applied and the corresponding EFs for estimating CSCs are described by subdivision, differentiating between settlements remaining settlements (section 6.8.1) and land converted to settlements (section 6.8.2).

ID#	Issue/problem classification[a, b]	Recommendation from previous review report	ERT assessment and rationale
		settlements under one or more subdivisions to ensure a transparent and accurate assignment of the factors and methods used to estimate CSCs.	The ERT considers that the recommendation has been fully addressed because the Party has introduced several subdivisions under the category settlements and calculated CSC for each of them.
L.20	4.F Other land – CO_2 and N_2O (L.24, 2020) (L.24, 2018) Transparency	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.	Resolved. The Party included in its NIR (section 6.2.1) a description of which areas are considered as managed or unmanaged land and an explanation for this classification. In NIR table 6.8 (p.6-27), the management status for each land-use category is given. NIR table 6.7 shows that areas formerly reported under other land are now allocated to grassland (extensive) in one of three types: (1) wooded land with crown cover of 5–10 per cent, (2) coastal Calluna heath or (3) open areas with vegetation considered as unmanaged. The Party elaborated on this classification in its NIR (section 6.6, p.6-78) while NIR table 6.25 shows the characteristics of the different grassland types; the areas reallocated from other land to grassland now appear under the subcategory extensive grassland.
L.21	4.F Other land – CO_2 and N_2O (L.25, 2020) (L.24, 2018) Comparability	Noting 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, 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.	Resolved. The Party reported in its NIR that areas formerly reported under other land are now allocated to grassland (extensive) (NIR tables 6.7 (p.6-27) and 6.25 (6-78)). The grassland types are (1) wooded land with crown cover of 5–10 per cent, (2) coastal Calluna heath and (3) open areas with vegetation considered as unmanaged (see also ID# L.25 in table 5). During the review, the Party explained that by reclassifying areas with significant carbon stock that were formerly reported under other land and are now reported under grassland (extensive), which is unmanaged, conversions from managed to unmanaged land that need to be reported in CRF table 4.1 no longer occur. The ERT considers that the recommendation has been fully addressed because the Party has implemented a reclassification such that land is no longer transferred from a managed to an unmanaged land category.
L.22	4.F Other land – CO_2 and N_2O (L.26, 2020) (L.24, 2018) Transparency	Should the Party keep reporting the land-cover types other wooded land with crown cover of 5–10 per cent, coastal Calluna heath and open areas with vegetation considered as unmanaged under “other land”, report in the NIR information on the area covered by those land-cover types and ensure 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	Resolved. The Party reported in its NIR that it performed a reclassification such that areas with significant carbon stock formerly reported under other land are now reported under grassland (extensive), which is unmanaged (NIR tables 6.7 (p.6-27) and 6-25 (p.6-78)).

ID#	Issue/problem classification[a, b]	Recommendation from previous review report	ERT assessment and rationale
		unmanaged land with significant carbon stock.	
Waste			
W.1	5. General (waste) – CH_4 and N_2O (W.1, 2020) (W.13, 2018) Convention reporting adherence	Include in the 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, avoiding any possible misunderstanding regarding potential omission or double counting of emissions.	Resolved. The Party reported in its NIR (p.7-12) the measures it has taken to mitigate potential cross-sectoral issues and double counting between the waste and energy sectors. Emissions from the flaring of landfill gas and other biogas are now reported under the waste sector (NIR p.3-7) and emissions from the application of sewage sludge on urban lawns, roadside grass strips and parks are also now reported under the waste sector (NIR p.6-115). Norway has extended the description that appeared in the 2020 submission of its QA/QC procedures relating to potential cross-sectoral issues (NIR p.7-22). These procedures ensure that no double counting occurs between the waste and energy sectors.
W.2	5.A Solid waste disposal on land – CH_4 (W.7, 2020) Convention reporting adherence	Improve the QA/QC activities in order to ensure the accuracy of the reporting of recalculations and ensure that they are consistent between the NIR and CRF tables.	Resolved. The Party reported in its NIR (section 7.2.1.7) the recalculations for category 5.A.1 (managed waste disposal sites). The ERT did not identify any recalculation that was not described in the NIR or any inconsistency between the NIR and the CRF tables, which demonstrates that Norway has improved its QA/QC activities.
W.3	5.A.1 Managed waste disposal sites – CH_4 (W.2, 2020) (W.14, 2018) Transparency	Include the missing emissions attributed to the management of demolition and construction waste or demonstrate that these emissions are insignificant in accordance with paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines.	Addressing. The Party reported in its NIR (p.7-7) that all sources of waste – MSW and industrial, commercial, construction and demolition waste – are accounted for in the annual surveys used for preparing the inventory. Depositing biodegradable material in landfills has been prohibited by legislation since 2009 (or, for exceptions, 2012) and landfills that could receive biodegradable waste (waste containing degradable organic carbon) are required to collect and treat landfill gas (NIR p.7-2). The findings from a relevant project implemented by Norway in 2018–2019 confirm that the remaining mixed demolition waste, which may contain wood, is mainly burned and no significant amounts are landfilled (NIR page 7-7). During the review, the ERT made an extremely conservative emission estimation using the IPCC waste model and Eurostat data on demolition waste going to landfill, assuming 0.5 per cent wood (i.e. 0.2 per cent degradable organic carbon), which resulted in 0.2 kt CH_4 emissions (approximately 5 kt CO_2 eq) for 2020, well below the threshold of significance, and noting that the calculations of the ERT, by being conservative, intentionally overestimated the CH_4 emissions. Therefore, this issue was not included in the list of potential problems and further questions raised by the ERT. The ERT considers that the completeness issue has been resolved but an issue of transparency remains. The ERT also considers that, as indicated in the recommendation, adding information to the NIR that demonstrates that the likely level of emissions is below 0.05 per cent of the national total GHG emissions and does not exceed 500 kt CO_2 eq would resolve this recommendation.
W.4	5.B Biological treatment of solid waste – CH_4	Apply, in line with the 2006 IPCC Guidelines, the tier 2 method, using	Addressing. The Party continued to use a tier 1 methodology to estimate CH_4 and N_2O emissions for this category (NIR section 7.4.1.4). The Party identified CH_4 emissions from the biological

ID#	Issue/problem classification[a, b]	Recommendation from previous review report	ERT assessment and rationale
	and N_2O (W.3, 2020) (W.15, 2018) Accuracy	country-specific EFs, to estimate CH_4 and N_2O emissions from the biological treatment of solid waste.	treatment of solid waste (this category, 5.B) as key (NIR section 7.4.1.1). However, the ERT noted that the last paragraph in section 7.4.1.1 identifies, incorrectly, N_2O emissions also as key. NIR table 1.1, the heading of section 7.4 of the NIR and NIR table AI.1 all indicate that only CH_4 emissions have been identified as key. The ERT considers that the recommendation has not yet been fully addressed because the Party identified CH_4 emissions as key for this category but continued using a tier 1 method for estimating them, rather than a tier 2 or 3 method. For N_2O emissions, which are not identified as key, using a tier 1 methodology seems appropriate.
W.5	5.D Wastewater treatment and discharge – CH_4 (W.4, 2020) (W.7, 2018) (W.8, 2016) (W.8, 2015) Transparency	Present total organic product data in the NIR and in CRF table 5.D.	Not resolved. The Party reported in NIR table 7.11 that the total organic product treated in domestic wastewater for 2020 is 142,242 t DC and in NIR table 7.13 that the total organic product discharged into the environment from domestic wastewater is 39,664 t DC for that year. However, in CRF table 5.D, the total organic product of domestic wastewater is reported as 117.55 kt DC (i.e. 117,550 t DC) (calculated from population data using a BOD value of 60 g/person/day), which is inconsistent with the value reported in the NIR. It is not clear which value was used as the AD for calculating the emissions for this category. During the review, the Party clarified that the amount of total organic product reported in NIR table 7.11 is correct and the value in CRF table 5.D is incorrect. The ERT notes that CH_4 emissions are reported correctly in CRF table 5.D, even if the reported AD are incorrect.
W.6	5.D.2 Industrial wastewater – N_2O (W.5, 2020) (W.12, 2018) (W.11, 2016) (W.11, 2015) Transparency	Provide in the NIR information consistent with paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines to demonstrate the insignificance of N_2O emissions from industrial wastewater.	Resolved. The Party reported in its NIR (p.7-31) N_2O emissions from industrial wastewater for 1990–2020. The emissions were calculated using the IPCC default EF and expert judgment for other parameters. The Party also reported in its NIR that it included on-site emissions of N_2O, which vary between 4 and 12 t, in the 2022 submission.
W.7	5.D.2 Industrial wastewater – N_2O (W.6, 2020) (W.17, 2018) Transparency	Report N_2O emissions from the industrial wastewater treated in domestic wastewater treatment plants.	Addressing. The Party reported in its NIR (p.7-33) that it is not possible to fully distinguish between industrial and domestic wastewater emissions, as in Norway, industrial facilities, to a great extent, are coupled to the municipal sewer system. Wastewater streams from households and industrial facilities are mixed in the sewer system prior to treatment at centralized wastewater treatment plants. Industrial wastewater may be treated on site or released into the municipal sewer system. If it is released into the municipal sewer system, the emissions should be included in the domestic wastewater (category 5.D.1) emissions. Norway used a country-specific EF for estimating N_2O emissions from large wastewater treatment plants. The Norwegian wastewater treatment system is characterized by a few large, advanced aerobic wastewater treatment plants and many smaller wastewater treatment plants. The Party also reported (NIR p.7-25) that N_2O emissions from the discharge of domestic wastewater and wastewater from industrial facilities connected to large treatment plants (>50 population equivalent) were estimated on the basis of N content in wastewater effluent and that data for the amount of N released were taken from Statistics Norway's wastewater statistics. Based on this information, the ERT considers that direct and indirect N_2O emissions from industrial

ID#	Issue/problem classification[a, b]	Recommendation from previous review report	ERT assessment and rationale
			wastewater co-charged into domestic wastewater treatment plants are probably already included in the inventory. However, in NIR table 10.14 (p.10-47), in the row "5.D.2 Industrial wastewater – N_2O Completeness", the Party indicated that it has not addressed this issue yet. Furthermore, the ERT considers that it is not clear whether direct N_2O emissions from individual wastewater treatment plants that process only industrial wastewater are included in the inventory. However, the ERT notes that the 2006 IPCC Guidelines do not include a default EF to estimate these emissions. The ERT noted that, during the review of the 2020 submission, the Party estimated that the potentially missing emissions from industrial wastewater treated in domestic wastewater treatment plants amounted to about 0.8 kt CO_2 eq for 2017 (see document FCCC/ARR/2020/NOR, ID# W.6), which is well below the significance threshold (24.64–27.24 kt CO_2 eq for 2013–2020). This quantification was not included in the NIR of the 2022 submission. The ERT considers that the recommendation has not yet been fully addressed because N_2O emissions from the industrial wastewater treated in domestic wastewater treatment plants were not reported in the 2022 submission. However, the ERT considers that the issue is not of completeness but of transparency.
KP-LULUCF			
KL.1	General (KP-LULUCF) – CO_2, CH_4 and N_2O (KL.1, 2020) (KL.3, 2018) Consistency	Ensure the equivalence of areas between each pair of CRF tables NIR-2 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.	Resolved. See ID# L.8 above for the improvements made by the Party. For example, for deforestation, in CRF table NIR-2 for 2019, the total area at the end of 2019 is 172.45 kha, the same value for deforestation reported in CRF table NIR-2 for 2020 for the end of 2019. The ERT considers that the recommendation has been fully addressed because the Party has improved its calculations and reported corrected values for areas of the different land-use categories.
KL.2	General (KP-LULUCF) – CO_2, CH_4 and N_2O (KL.2, 2020) (KL.5, 2018) Transparency	Clarify the definition of the litter pool in line with changes implemented under the Convention.	Resolved. The Party provided in its NIR (section 6.2.3, p.6-28) a definition of the litter pool that includes the minimum size of organic matter and differs depending on land use: (a) For FM, the changes in DOM are computed with the Yasso07 model, by which CSCs in the litter pool are estimated according to the origin, the chemical nature and the size of the carbon input to the model. The most recalcitrant material, originating from root decomposition, is allocated to the soil pool. In this way, there is a clear distinction between litter and SOC pools; (b) For AR, the litter pool includes the stratified default carbon stocks presented in the 2019 Refinement to the 2006 IPCC Guidelines plus fine woody litter (dimension 1.0–7.5 cm) retrieved from external data sets because no country-specific data are available. The ERT considers that the recommendation has been fully addressed because the Party has provided in the NIR a definition of the litter pool that includes the minimum size of organic matter. See also ID# L.4 above.
KL.3	General (KP-LULUCF) – CO_2, CH_4 and N_2O (KL.3, 2020) (KL.6,	Replace the current method used to estimate SOC changes in mineral soils with a good practice	Resolved. The Party commissioned a study to address this recommendation and has replaced the method for estimating SOC changes in mineral soils associated with land-use conversion with a methodology consistent with the 2006 IPCC Guidelines. The study (Bárcena et al., 2021) uses the

ID#	Issue/problem classification[a, b]	Recommendation from previous review report	ERT assessment and rationale
	2018) Accuracy	methodology consistent with the 2006 IPCC Guidelines and the *2013 Revised Supplementary Methods and Good Practice Guidance Arising from the Kyoto Protocol*.	tier 1 methodology in line with the 2006 IPCC Guidelines for all land-use changes on mineral soils. It uses EFs from the 2019 Refinement to the 2006 IPCC Guidelines (vol. 4) where EFs are not available in the 2006 IPCC Guidelines. These EFs have been stratified by climate zone, soil type and management practice, if applicable. See also ID# L.3 above.
KL.4	General (KP-LULUCF) – CO_2, CH_4 and N_2O (KL.5, 2020) (KL.6, 2018) Accuracy	Revise the use of the Yasso07 model in line with changes implemented under the Convention.	Resolved. The Party has revised the use of the Yasso07 model and applied climate data reflecting the trends in temperature and precipitation observed during the reporting period. See also ID# L.10 above. It reported in its NIR (sections 6.3.2, p.6-35, and 6.4.1.1.3, p.6-56) that plot-specific climate data used as input data for the Yasso07 model have been calculated from SeNorge data using a dynamic backward-looking five-year moving average of annual values from 1957 to 2020.
KL.5	General (KP-LULUCF) – CO_2, CH_4 and N_2O (KL.6, 2020) (KL.6, 2018) Accuracy	Revise the methodology used for estimating CSC in perennial crops in line with changes implemented under the Convention.	Resolved. The ERT considers that the recommendation has been fully addressed because the Party has developed an age-class distribution of land with perennial crops and applied the appropriate IPCC default EFs. See also ID# L.14 above.
KL.6	General (KP-LULUCF) – CO_2, CH_4 and N_2O (KL.7, 2020) (KL.6, 2018) Accuracy	Ensure the consistent use of CSC factors for annual crop biomass in line with changes implemented under the Convention.	Resolved. The Party reported in its NIR information on the different EFs used to differentiate between land converted to cropland and cropland remaining cropland. For land converted to cropland (NIR sections 6.5.1 and 6.5.2.1.1) different values for the conversion of different grassland types to cropland are reported, that is, for forest land and wetlands converted to cropland, for grassland converted to cropland and for other conversions to cropland. For cropland remaining cropland (NIR sections 6.5.1 and 6.5.1.1) the Party reported that CSCs in living biomass are only considered for perennial woody crops. On the basis of the information provided, CSC factors for annual crop biomass for cropland remaining cropland were not recalculated; however, CSC factors for annual crop biomass for land converted to cropland for 1997 onward were recalculated. The ERT considers that the recommendation has been fully addressed because a justification of the application of the corrected value of 4.7 t C/ha for annual crop biomass gains for land converted to cropland has been included in the NIR (see ID#s L.15–L.16 above). Furthermore, developing a method for considering the age-class distribution of annual crops would not be useful (see ID#s L.14 and KL.5 above). The LULUCF category cropland corresponds to the KP-LULUCF activity CM.
KL.7	Deforestation – CO_2 (KL.8, 2020) (KL.9, 2018) Completeness	Report carbon stock gain for any conversion of forest land to grassland.	Resolved. The carbon stock gains from forest land conversion to grassland were revised upward in both the 2021 and the 2022 submission. The Party reported in its NIR (section 6.6.2.1, p.6-91) CSCs in living biomass on land converted to grassland. During the review, the Party clarified that in its estimation of CSC, it differentiates between tree living biomass (forest land to grassland) and grass biomass gains (land to grassland). In the case of conversion from forest land to grassland, country-specific EFs derived from the NFI are used, while for the conversion from land to grassland, default values from the 2006 IPCC Guidelines (vol. 4, table 6.4), differentiated for boreal, cool temperate dry and cool temperate moist climates, are used.

ID#	Issue/problem classification[a, b]	Recommendation from previous review report	ERT assessment and rationale
			The ERT considers that the recommendation has been fully addressed because the estimation of carbon stock gain for annual biomass for all relevant conversions to grassland has been applied for different grassland types. The LULUCF category grassland corresponds to the KP-LULUCF activity GM. See also ID# L.18 above.
KL.8	FM – CO_2, CH_4 and N_2O (KL.9, 2020) (KL.8, 2018) Comparability	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.	Resolved. See ID# L.17 above for the improvements that resolved the issue. The impact on accounting is discussed under ID# KL.9 below.
KL.9	FM – CO_2, CH_4 and N_2O (KL.10, 2020) (KL.8, 2018) Transparency	Provide information on the impact on accounted quantities of excluding grazed forest from FM in the NIR.	Resolved. The Party provided in its NIR a sound reason for classifying "forested area in closed pastures" under GM (see ID#17 and KL.9 above). As the Party accounts for GM, "forested area in closed pastures" is accounted for by a net-net approach relative to the base-year (1990) emissions or removals. During the review, the Party confirmed that the base-year (1990) emissions for GM include emissions and removals for "forested area in closed pastures". The Party provided estimates for the accounting under two scenarios of reclassifying "intensive grassland" (of which "forested area in closed pastures" is a subcategory): (1) assuming that 100 per cent of "intensive grassland" is accounted for under FM and (2) assuming that 31 per cent of "intensive grassland" is accounted for under FM. For both scenarios, Norway showed that the accounting quantity of FM does not change because the removals from FM are considerably above the FM cap, whereas the net emissions accounted for under GM are reduced from the reported emissions of 917.08 kt CO_2 eq (CRF accounting table) to 704.05 kt CO_2 under the first scenario and to 229.89 kg CO_2 eq under the second. In addition, the ERT compiled, from the information in the CRF tables, estimates for the impact on the accounting for "intensive grassland". Given that the total removals of "intensive grassland" over 2013–2020 amount to –65.22 kt CO_2 and that the removals of "intensive grassland" in 1990 (base year) amount to –79.81 kt CO_2 per year, the accountable amount of "intensive grassland" is thus net emissions of 522.64 kt CO_2 or 65.33 kt CO_2 per year. Because "intensive grassland" comprises net accountable emissions, Norway has neither overestimated net removals nor underestimated net emissions by classifying this subcategory under GM rather than under FM. Further, the ERT noted that accounting for these emissions under FM would not change the accounting quantity of FM because Norway has a reserve of removals substantially above the FM cap (CRF accounting table) that it cannot account for. The ERT considers that the recommendation has been fully addressed because the Party has neither overestimated its net removals nor underestimated its net emissions by classifying the subcategory "intensive grassland" under GM rather than under FM.

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

[b] The report on the review of the 2021 annual submission of Norway was not available at the time of this review. Therefore, the recommendations reflected in this table are taken from the 2020 annual review report. For the same reason, 2021, 2019 and 2017 are excluded from the list of review years in which issues could have been identified.

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

9. In accordance with paragraph 83 of the UNFCCC review guidelines, the ERT noted that the issues and/or problems included in table 4 have been identified in three or more successive reviews, including the review of the 2022 annual submission of Norway, and had not been addressed by the Party by the time of publication of this review report.

Table 4
Issues and/or problems identified in three or more successive reviews and not addressed by Norway

ID#	*Previous recommendation for issue*	*Number of successive reviews issue not addressed*[a]
General	No issues identified.	
Energy		
E.3	Improve the data-collection procedures for solid fuels (coal and coke oven coke).	5 (2014–2022)
E.4	Report on the time frame and progress of the revised energy balance system, highlighting the resulting reduction in statistical differences for solid fuels.	4 (2015/2016–2022)
E.7	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 conducting research to reduce the uncertainty of the allocation of fuels between national navigation and international shipping, and reporting on progress in the NIR.	3 (2018–2022)
E.10	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.	3 (2018–2022)
E.11	Investigate the underlying reason where large inter-annual fluctuations in the CO_2 IEFs are identified to ensure accurate reporting of emissions, and describe the reason in the NIR.	3 (2018–2022)
E.15	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.	4 (2015/2016–2022)
E.16	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.	3 (2018–2022)

ID#	*Previous recommendation for issue*	*Number of successive reviews issue not addressed*[a]
E.17	Advance the research and make improvements to the data reporting systems used to estimate emissions by subcategory, including fugitive emissions and emissions 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 subcategories, including fugitive emissions and venting and flaring. (In particular, the NIR should include a description of the methods used by operators for the facility-level reporting of emissions.)	3 (2018–2022)
E.18	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 the country, 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.	3 (2018–2022)
IPPU		
I.12	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.	3 (2018–2022)
Agriculture	No issues identified.	
LULUCF		
L.11	Verify the Yasso07 outputs using independent estimates. (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.)	3 (2018–2022)
L.12	Pending the start of additional data collection, apply alternative means of verification, such as chrono-sequences stratified by climate, topography, soil and forest type and derived from available data (e.g. International Co-operative Programme on Assessment and Monitoring of Air Pollution Effects on Forests, Forest Level I) and data from other countries considered representative of conditions in Norway (e.g. Sweden).	3 (2018–2022)
Waste		
W.3	Include the missing emissions attributed to the management of demolition and construction waste or demonstrate that these emissions are insignificant in accordance with paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines.	3 (2018–2022)
W.4	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.	3 (2018–2022)
W.5	Present total organic product data in the NIR and in CRF table 5.D.	4 (2015/2016–2022)
W.7	Report N_2O emissions from the industrial wastewater treated in domestic wastewater treatment plants.	3 (2018–2022)
KP-LULUCF	No issues identified.	

[a] The reports on the reviews of the 2017, 2019 and 2021 annual submissions of Norway have not yet been published. Therefore, 2017, 2019 and 201 were not included when counting the number of successive years for this table. In addition, as the reviews of the Party's 2015 and 2016 annual submissions were conducted together, they are not considered successive reviews and 2015/2016 is counted as one year.

V. Additional findings made during the individual review of the Party's 2022 annual submission

10. Table 5 presents findings made by the ERT during the individual review of the 2022 annual submission of Norway that are additional to those identified in table 3.

Table 5
Additional findings made during the individual review of the 2022 annual submission of Norway

ID#	*Finding classification*	*Description of finding with recommendation or encouragement*	*Is finding an issue/problem?*[a]
General			
G.11	Recalculations	The Party reported for a number of subcategories (e.g. in NIR sections 4.2.1.7, 4.2.2.7 and 4.3.7) that no, or only minor, recalculations were performed. The ERT noted that indicating that minor recalculations were performed without providing an explanation for them might not be in accordance with paragraph 44 of the UNFCCC Annex I inventory reporting guidelines, which states that recalculations shall be reported in the NIR with explanatory information and justification. The ERT notes that the guidelines do not establish a threshold for when to report on recalculations. During the review, the Party clarified that recalculations resulting in changes of more than 2 per cent were explained in the NIR. It also clarified that, for recalculations resulting in changes of less than 2 per cent, the inventory group evaluates whether the changes are significant enough to be documented in the NIR or whether they should be considered as small differences in accordance with paragraph 45 of the UNFCCC Annex I inventory reporting guidelines. The ERT recommends that the Party explain in the NIR how it determines whether recalculations are significant enough to be documented in the NIR or should be considered as small differences in accordance with paragraph 45 of the UNFCCC Annex I inventory reporting guidelines and thus not documented.	Yes. Convention reporting adherence
Energy			
E.22	1.A Fuel combustion – sectoral approach – other fossil fuels and biomass – CO_2, CH_4 and N_2O	The Party reported in its NIR (pp.3-146–3-147) that the AD for combustion emissions from waste reported under the sectoral approach include the non-fossil fraction of the waste. During the review, the Party clarified that both the AD of the biomass fraction and the related CH_4 and N_2O emissions are allocated to other fossil fuels and that CO_2 emissions from the biomass fraction are not calculated. In CRF tables 1.A(a)s1–1.A(a)s2, Norway reported fossil CO_2 emissions from waste and fossil and biogenic CH_4 and N_2O emissions from waste under other fossil fuels. The ERT noted that this is not in accordance with the 2006 IPCC Guidelines (vol. 2, chap. 2.3.3.3), which state that it is good practice to assess the content of waste and differentiate between the fraction containing plastics and other fossil carbon materials from the biogenic fraction and estimate the associated emissions accordingly.	Yes. Comparability

ID#	*Finding classification*	*Description of finding with recommendation or encouragement*	*Is finding an issue/problem?*[a]
		The ERT recommends that the Party (a) split the AD and CH_4 and N_2O emissions from the combustion of waste into a fossil component (reported under other fossil fuels) and a biogenic component (reported under biomass) in CRF tables 1.A(a)s1–1.A(a)s2; and (b) calculate and report CO_2 emissions from the biogenic fraction of waste as an information item under biomass in CRF tables 1.A(a)s1–1.A(a)s2.	
E.23	1.A.1.a Public electricity and heat production – liquid fuels – CO_2, CH_4 and N_2O	The Party reported in CRF table 1.A(a)s1 a CO_2 IEF for liquid fuels for subcategory 1.A.1.a.i (electricity generation) of 39.0 and 21.9 t/TJ for 2019 and 2020, respectively, while the CO_2 IEF for 2010–2018 is in the range of 51.1–61.6 t/TJ. During the review, the Party clarified that emissions and energy production are reported by individual companies, and that the emissions and energy production of the largest enterprise in the country are split between subcategories 1.A.1.a.i and 1.A.1.b (petroleum refining). The Party explained that an error occurred in splitting the energy AD between 1.A.1.a.i and 1.A.1.b for that enterprise in 2019 and 2020, but the emissions under 1.A.1.a.i. and 1.A.1.b are correct. The Party indicated that this error will be corrected in the next annual submission. The ERT recommends that the Party correct the AD for liquid fuels for categories 1.A.1.a.i (electricity generation) and 1.A.1.b (petroleum refining) reported in CRF table 1.A(a)s1 in 2019 and 2020 and check whether the AD correspond to the reported emissions.	Yes. Convention reporting adherence
E.24	1.A.2 Manufacturing industries and construction – gaseous fuels – CO_2, CH_4 and N_2O	The Party reported in CRF table 1.A(a)s2 AD for gaseous fuel consumption for subcategories 1.A.2.b (non-ferrous metals) and 1.A.2.f (non-metallic minerals) of 2.4 and 0.8 PJ respectively for 2020. These values deviate from the final energy consumption of natural gas in the energy statistics for non-ferrous metals and non-metallic minerals, which are 1.4 and 1.8 PJ respectively for the same year. During the review, the Party clarified that the inventory team reallocated AD and emissions between two companies in the same corporate group to better reflect where the emissions occur, which resulted in energy and emissions being reallocated from subcategory 1.A.2.f to subcategory 1.A.2.b. The ERT noted that the NIR (pp.3-13–23) includes a description of the allocation of AD (energy statistics) and emissions to several categories, but not 1.A.2.b and 1.A.2.f. The ERT encourages the Party to describe transparently in the NIR how gaseous fuel consumption in the national energy statistics has been allocated to the subcategories 1.A.2.b (non-ferrous metals) and 1.A.2.f (non-metallic minerals).	Not an issue/problem
E.25	1.A.2.c Chemicals – liquid fuels – CO_2	The Party reported in CRF table 1.A(a)s2 a CO_2 IEF for liquid fuels for subcategory 1.A.2.c in the range of 47.9–57.7 t/TJ for 2011–2019, while for 1990–2010 and for 2020, the CO_2 IEF was in the range of 62.5–73.8 t/TJ. During the review, the Party clarified that an error occurred in the energy data for liquid fuels for 2011–2019, namely, some of the AD corresponding to CO_2 emissions reported under subcategory 2.B.8.g other (petrochemical and carbon black production) were wrongly included under subcategory 1.A.2.c. The Party explained that emission and energy data inputted to the CRF tables are handled separately in the production cycle: the emission estimates are produced first, followed by the energy AD. Energy AD linked to emissions reported under the IPPU sector must be subtracted from the energy reported under the energy sector, and it is in this step that the error occurred. The error does not affect the emission estimates.	Yes. Convention reporting adherence

ID#	*Finding classification*	*Description of finding with recommendation or encouragement*	*Is finding an issue/problem?*[a]
		The ERT recommends that the Party correct the AD for liquid fuel consumption for subcategory 1.A.2.c and check that the corrected AD correspond to the reported CO_2 emissions.	
E.26	1.A.2.f Non-metallic minerals – solid fuels – CO_2, CH_4 and N_2O	The Party reported in CRF table 1.A(a)s2 AD for solid fuel consumption for subcategory 1.A.2.f (2.8 PJ for 2020) that deviate from the final energy consumption of coal and coal products in the energy statistics for non-metallic minerals (2.3 PJ). During the review, the Party clarified that the inventory added coal consumption under solid fuels in subcategory 1.A2.f, which is not included in the energy balance because the coal is a type of waste product not covered by the data sources for the energy balance. Experts from NEA advised that the coal should be included in the inventory; however, work in 2022 led to the conclusion by the Party that the coal should instead be reported as a waste product. The Party indicated that this change will be implemented for the next annual submission. The ERT noted that the NIR (pp.3-13–15) includes a description of the allocation of AD (energy statistics) and emissions to several categories, but not for 1.A.2.f. The ERT recommends that the Party reallocate the AD for waste to other fossil fuels (for fossil waste) or to biomass (for biogenic waste).	Yes. Comparability
E.27	1.A.3.b Road transportation – gasoline and diesel oil – CO_2	The Party reported in NIR table 3-4 (p.3-24) that constant country-specific CO_2 EFs were used for estimating CO_2 emissions from gasoline and diesel oil (71.30 t CO_2/TJ motor gasoline and 73.55 t CO_2/TJ auto diesel) across the time series. These EFs were obtained from a 1999 report from the Norwegian pollution control agency (see https://www.miljodirektoratet.no/globalassets/publikasjoner/klif2/publikasjoner/luft/1622/ta1622.pdf (in Norwegian), p.24). This report explains that the CO_2 EFs for motor gasoline and auto diesel were obtained from the Norwegian Petroleum Institute earlier and were not updated in the 1999 report. The ERT noted that it is not clear when and how these EFs were derived, and whether they are still valid. The ERT also noted that the EFs used by other Parties range from 69.3 to 76.9 t CO_2/TJ for gasoline and 72.2 to 76.2 t CO_2/TJ for diesel oil. If Norway's country-specific EFs are not valid for the most recent years, the Party may be underestimating or overestimating its emissions from road transportation. During the review, the Party clarified that it has been unable to find documentation on when and how the EFs (derived from carbon content data) from the Norwegian Petroleum Institute were derived. It contacted Drivkraft Norge (previously the Norwegian Petroleum Institute) about the year of measurement and to ask whether more recent measurements of carbon content are available or whether new measurements are planned but an answer was not received during the review. The ERT recommends that the Party determine when and how the country-specific CO_2 EFs for gasoline and diesel oil from the 1999 Norwegian pollution control agency report were derived and either justify that these CO_2 EFs are still valid for the most recent years or revise the EFs across the time series.	Yes. Accuracy
E.28	1.A.4.a Commercial/ institutional – gaseous fuels – CO_2, CH_4 and N_2O	The Party reported in its NIR (annex XII, p.AXII-20) that, when preparing the 2022 submission, it found that some natural gas AD and emissions for 2019 and 2020 were included in the energy balance incorrectly from this source and that this error will be corrected in the 2023 submission. During the review, the Party clarified that the values it reported for natural gas in the inventory were too high (18 million m^3 natural gas in 2019 and 9.3 million m^3 in 2020) when estimating emissions for subcategory 1.A.4.a.i (stationary combustion – commercial/institutional); as a result, the emissions for subcategory 1.A.4.a.i are	Yes. Accuracy

ID#	Finding classification	Description of finding with recommendation or encouragement	Is finding an issue/problem?[a]
		overestimated for 2019 and 2020. The correction, planned for the next annual submission, will eliminate the excess of natural gas, resulting in a decrease in emissions reported under 1.A.4.a.i as well as in the total emissions. The ERT recommends that the Party correct the AD and emissions from natural gas under subcategory 1.A.4.a.i (stationary combustion – commercial/institutional) for 2019 and 2020.	
E.29	1.A.4.b Residential – biomass – CO_2, CH_4 and N_2O	The Party reported in its NIR (p.3-74) that the AD for biomass under subcategory 1.A.4.b.i (stationary combustion – residential) are based on surveys from three time frames: 1990–2004 and 2012; 2005–2011; and 2013–2020. The ERT noted that AD for 2005–2011 are in the range of 21.7–24.8 PJ, while fuel consumption for 2013–2020 is in the range of 15.6–18.1 PJ. During the review, the Party clarified that the only difference in methodology between the surveys conducted in 2005–2011 and those conducted in 2013–2020 is the number of quarterly surveys the overall results are based on. Results for 2005–2011 were compiled from five surveys (one in each quarter plus an extra round of questions in the fourth quarter), while results for 2013–2020 were compiled from three surveys, one each in the first, second and fourth quarters. Household biomass consumption is minimal in Norway during the third quarter (summer) and therefore has little effect on overall results. The Party explained that the reduction in household biomass consumption during 2013–2020 can be attributed to a variety of factors, most notably increased use of more efficient wood burning ovens, increased electrification of household heating, and milder winters. The ERT recommends that the Party describe in the NIR how time-series consistency is ensured when using three different surveys to compile AD and explain the trend in AD for biomass throughout the time series for subcategory 1.A.4.b.i (stationary combustion – residential).	Yes. Transparency
E.30	1.A.4.b Residential – biomass – CH_4	The Party reported in NIR table 3-5 (p.3-26) a CH_4 EF for fuelwood of 300 kg CH_4/TJ. However, the CH_4 IEF for biomass for subcategory 1.A.4.b.i (stationary combustion – residential) reported in CRF table 1.A(a)s4 is different, decreasing from about 935 kg/TJ in 1990–1997 to 492 kg/TJ in 2020. During the review, the Party clarified that three CH_4 EFs for residential biomass consumption are used for estimating emissions for this category, according to wood burning method: wood burning stoves that use older technology (i.e. stoves produced before 1998) are assumed to emit 16.11 g/kg (959 kg/TJ), wood burning stoves that use newer technology (stoves produced after 1998) to emit 3.88 g/kg (228 kg/TJ) and open fireplaces to emit 5.3 g/kg (315 kg/TJ). Norway indicated that these EFs are based on a study by Seljeskog, Goile and Skreiberg (2017), and that this information will be included in section 3.2.10.3 or table 3.6 of the NIR of the next annual submission. Norway also clarified that the steady decline in the IEF value for CH_4 is the result of ovens using new technology being phased in. The ERT recommends that the Party include in section 3.2.10.3 and/or table 3.6 of the NIR a description of the CH_4 IEF for residential biomass burning for subcategory in 1.A.4.b.i (stationary combustion – residential) and explain the trend in the IEF across the time series.	Yes. Transparency
E.31	1.B.2 Oil, natural gas and other emissions from energy production – CO_2	The Party reported CO_2 emissions for subcategories 1.B.2.a (oil), 1.B.2.b (natural gas) and 1.B.2.c (venting) in CRF table 1.B.2. The ERT noted that the NIR (section 3.4) refers to indirect CO_2 emissions only, and that Norway did not report or explain in its NIR the calculation of direct CO_2 emissions.	Yes. Completeness

ID#	*Finding classification*	*Description of finding with recommendation or encouragement*	*Is finding an issue/problem?*[a]
		During the review, the Party clarified that direct emissions of CO_2 may be included with the emissions of CH_4 and NMVOCs reported by companies and that it is currently gathering information on this matter. Direct CO_2 emissions from the venting of captured CO_2 are calculated from the gas condensate field Sleipner Vest and the gas field Snøhvit. In both cases, CO_2 is injected into geological reservoirs for permanent storage. Venting of captured CO_2 occurs when the injection facilities are not operating. These emissions are reported under category 1.C (CO_2 transport and storage – CO_2) together with all other emissions from the carbon dioxide capture and storage operations. In response to a question from the ERT, the Party provided a spreadsheet containing the method for calculating the direct CO_2 emission component of fugitive and venting emissions from gas production, oil production and gas processing using IPCC default EFs (2006 IPCC Guidelines, vol. 2, chap. 4, table 4.2.4). These emissions, which are in the range of 10.7–33.7 kt CO_2 eq for 1990–2019 (30.4–33.7 kt CO_2 eq for 2013–2019), are slightly above the threshold of significance for a single category (0.05 per cent, or 24.64–27.24 kt CO_2 eq, for 2013–2020 in the 2022 submission). Norway also explained that the reported emissions of CH_4 from venting/fugitive emissions in oil and gas production (based on reported amounts from oil/gas operators) are considerably lower than the amounts estimated using IPCC default values and that it is assumed that the same will be true for direct CO_2 emissions. Calculating the emissions on the basis of the reported CH_4 emissions combined with the CH_4/CO_2 ratio from tier 1 EFs of the IPCC 2006 Guidelines would result in direct CO_2 emissions of 15.57 kt CO_2 in 2020. The ERT notes that direct CO_2 emissions are also not reported for the other categories in CRF table 1.B.2, and that calculating these emissions using tier 1 EFs of the 2006 IPCC Guidelines (vol. 2, chap. 4, table 4.2.4) results in emissions that are below the threshold of significance. The ERT recommends that the Party estimate the missing direct CO_2 emissions for subcategories 1.B.2.a (oil), 1.B.2.b (natural gas) and 1.B.2.c (venting) and report these emissions in CRF table 1.B.2.	
E.32	1.B.2 Oil, natural gas and other emissions from energy production – CH_4	The Party reported in its NIR (p.3-114) that the CH_4 emissions under subcategory 1.B.2.c.1.iii (venting – combined), which include emissions for subcategories 1.B.2.a.1 (oil – exploration), 1.B.2.a.2 (oil – production), 1.B.2.b.1 (natural gas – exploration), 1.B.2.b.2 (natural gas – production), 1.B.2.c.1.i (oil – venting) and 1.B.2.c.1.ii (gas – venting) for 1990–2016, were calculated on the basis of the average emissions per oil equivalent for 2017–2018. The ERT noted that the CH_4 IEF for 1.B.2.c.1.iii for 2017 and 2018 (911.5 and 879.5 kg/PJ respectively) differs from the CH_4 IEFs for 1990–2016 (which vary between 971.6 and 1,000 kg/PJ). During the review, the Party clarified that the emission figures for 2017 and 2018 were corrected for one of the main sources of emissions (the Sleipner Vest offshore gas condensate field). The correction was not captured by the inventory team, so the emissions for 1990–2016 were still calculated on the basis of the outdated emission figures reported for 2017 and 2018. The ERT notes that this issue relates to an overestimation of CH_4 emissions for 1990–2016. The ERT recommends that the Party recalculate the venting and fugitive CH_4 emissions for subcategory 1.B.2.c.1.iii (venting – combined) for 1990–2016 and explain the recalculations in the NIR.	Yes. Accuracy

ID#	*Finding classification*	*Description of finding with recommendation or encouragement*	*Is finding an issue/problem?*[a]
IPPU			
I.20	2.A.4 Other process uses of carbonates – CO_2	During the review, the Party explained that it did not follow the encouragement from the previous ERT (see document FCCC/ARR/2020/NOR, ID# I.12) to amend the description of the AD in CRF table 2(I).A-Hs1 for category 2.A.4.d (other process uses of carbonates – other) because it would need to reflect the use of clay as well as fly ash, and it considered that the resulting IEF, based on four different types of AD, may not be informative. Norway noted that the NIR (section 4.2.7) provides data on the use of all four types of AD.	Not an issue/problem
I.21	2.B.8 Petrochemical and carbon black production – CH_4	According to the NIR (section 4.3.6.2), CH_4 and NMVOC emissions for category 2.B.8.a (methanol production) are estimated using the results of measuring campaigns, which are conducted about every three years. However, the ERT noted that CH_4 emissions for this category reported in CRF table 2(I).A-Hs1 remain constant from 2013 to 2020 (0.55 kt CH_4). During the review, the Party explained that the single methanol producer in the country is revising its method for measuring and reporting fugitive emissions for 2016 onward, but the final validation of the results is still ongoing. The provisional CH_4 emissions for 2016 onward reported by the producer are 0.05–0.10 kt, significantly lower than the emissions reported for 2013–2015 (0.55 kt) using the previous measuring and reporting method. The CH_4 emissions reported in the inventory for 1990–2015 were calculated using the previous measuring and reporting method. For 2016 onward, the inventory compiler decided to report the same emissions as in 2013–2015 (0.55 kt) until the validation of the methanol producer estimates for those emissions is complete. The ERT noted that, considering the provisional data from the methanol producer, the CH_4 emissions reported in the inventory are probably overestimated for 2016 onward. The ERT recommends that the Party recalculate CH_4 emissions from methanol production (category 2.B.8.a) from 2013 onward and explain the recalculation in the NIR, and until that is done, explain in the NIR that the methods for measuring and reporting CH_4 emissions for methanol production under category 2.B.8 are under revision and the emissions reported for 2016 onward are assumed to be the same as for 2013–2015.	Yes. Accuracy
I.22	2.C.6 Zinc production – CO_2	According to the NIR (section 4.4.5.3), annual production levels of zinc were used for estimating CO_2 emissions from zinc production for 1990–2011. However, the ERT noted that AD for this category (2.C.6) are reported as "NE" in CRF table 2(I).A-Hs2 for all years. CO_2 emissions are, however, reported for each year in the time series (e.g. 5.19 kt CO_2 for 2020). During the review, the Party explained that it considers this emissions source to be very small, therefore, entering AD into CRF Reporter has not been prioritized for this category. The ERT noted that AD for zinc production are available, and they have been used for estimating CO_2 emissions in 1990–2011. The ERT recommends that the Party report the available AD for zinc production in CRF table 2(I).A-Hs2 for the entire time series rather than reporting them as "NE".	Yes. Transparency
I.23	2.D.3 Other (non-energy products from fuels and solvent use) – CO_2	The Party reported in its NIR (section 4.5.3.7) that AD for 2019 for solvent use, reported under category 2.D.3 (other), have been updated. CO_2 emissions for 2019 decreased by 21.7 per cent between the 2021 and 2022 submissions. The ERT noted that the AD in question stem from several data sources and no information was provided as to which data source was updated, the rationale for the update or the driver behind the significant inter-annual changes in CO_2 emissions in 2018–2020 after the update.	Yes. Convention reporting adherence

ID#	*Finding classification*	*Description of finding with recommendation or encouragement*	*Is finding an issue/problem?*[a]
		During the review, the Party clarified that the update was carried out because some reports containing AD for 2019 were not received by Statistics Norway in time to be included in the 2021 submission. AD from these reports were thus included in the 2022 submission. The ERT recommends that the Party include in the NIR a transparent description of any recalculations made for solvent use reported under category 2.D.3, including the rationale for the recalculations and information on any AD updates. The ERT also recommends that the Party provide an explanation for the significant inter-annual changes in CO_2 emissions from solvent use (112.03, 87.73 and 122.15 kt CO_2 eq for 2018, 2019 and 2020 respectively) reported under category 2.D.3 for 2018–2020.	
I.24	2.E Electronics industry – HFCs	According to the documentation box in CRF table 2(II)B-Hs2, emissions of an unspecified mix of HFCs for subcategories 2.E.1 (integrated circuit or semiconductor), 2.E.2 (TFT flat panel display), 2.E.3 (photovoltaics) and 2.E.4 (heat transfer fluid) are included in the emissions reported for category 2.F (product uses as substitutes for ozone-depleting substances). However, according to the NIR (section 4.6), HFC emissions do not occur under category 2.E (those emissions are reported as "NO" in CRF table 2(I)s2). During the review, the Party confirmed that HFC emissions do not occur under category 2.E and explained that the information in the documentation box of CRF table 2(II)B-Hs2 constitutes an error, which will be corrected in the next annual submission. The ERT recommends that the Party update the documentation box in CRF table 2(II)B-Hs2, namely, remove the text that states emissions of an unspecified mix of HFCs for subcategories 2.E.1, 2.E.2, 2.E.3 and 2.E.4 are included in the emissions reported for category 2.F.	Yes. Convention reporting adherence
I.25	2.F.1 Refrigeration and air conditioning – HFCs	According to CRF table 2(II)B-Hs2 and section 4.7.1.1 of the NIR, HFC emissions from industrial refrigeration (a subcategory under category 2.F.1) decreased by 95.5 per cent between 2019 and 2020. The Party explained in the NIR that this decline was mainly a consequence of restrictions from the EU F-gas regulation (which has been implemented in Norway). The ERT noted that other countries that have implemented the EU F-gas regulation have not reported such substantial emission decreases in recent years. During the review, the Party clarified that the reason for the recent decline in emissions is a drop in HFC imports in 2003 combined with an assumed lifetime of 17 years for industrial refrigeration equipment. The Party explained that the drop in imports in 2003 was a direct consequence of the introduction of a tax to stimulate a reduction in the use of HFCs. The ERT recommends that the Party explain in the NIR that the 95.5 per cent decrease in HFC emissions from industrial refrigeration (a subcategory under category 2.F.1) between 2019 and 2020 is due to a drop in HFC imports in 2003, which resulted from the introduction of a tax aimed at stimulating a reduction in the use of HFCs, combined with an assumed lifetime of 17 years for industrial refrigeration equipment.	Yes. Transparency
Agriculture			
A.1	3. General (agriculture) – N_2O	The Party reported the weight and typical animal mass for sheep, swine, deer, goats, horses, poultry, reindeer and fur-bearing animals as "NE" in CRF tables 3.As2 (additional information for enteric fermentation) and 3.B(b) (N_2O emissions from manure management). During the review, the Party clarified that the typical animal mass is reported as "NE" because this variable is not used in the method applied for estimating those emissions for these livestock	Yes. Comparability

ID#	*Finding classification*	*Description of finding with recommendation or encouragement*	*Is finding an issue/problem?*[a]
		types in the Norwegian inventory. The ERT noted that reporting the weight and typical animal mass could help to improve comparability across Parties, even if the parameter is not used in the estimations. The ERT recommends that the Party report the weight and typical animal mass for as many livestock types as possible (e.g. sheep, swine, deer, goats, horses, poultry, reindeer and fur-bearing animals) in CRF tables 3.As2 and 3.B(b), even when such parameters are not used in the estimation of emissions, or, alternatively, report the parameters as "NA" in CRF tables 3.As2 and 3.B(b) if it does not use them in the estimation of emissions from enteric fermentation and manure management and explain in the NIR the reason for using "NA".	
A.2	3.A Enteric fermentation – CH_4	The Party reported average GE (MJ/head/day) and average Y_m for swine, deer, goats, horses, poultry, reindeer and fur-bearing animals as "NE" in CRF table 3.As1. During the review, the Party clarified that these parameters are reported as "NE" because they are not used in the tier 1 method applied for estimating enteric CH_4 emissions for these livestock types in the Norwegian inventory. The Party indicated that the notation key can be changed to "NA" in the 2023 submission if the ERT recommends this as a more appropriate notation key. The ERT recommends that the Party report average GE and average Y_m for swine, deer, goats, horses, poultry, reindeer and fur-bearing animals or use "NA" in CRF table 3.As1 if it does not use these parameters in the estimation of emissions from enteric fermentation and explain in the NIR the reason for using "NA".	Yes. Comparability
A.3	3.A Enteric fermentation – CH_4	The Party reported many parameters for growing cattle, mature dairy cattle, other mature cattle, sheep and swine as "NE" in CRF table 3.As2. During the review, the Party clarified that these parameters are reported as "NE" because they are not used in the method applied for estimating enteric CH_4 emissions for these livestock types in the Norwegian inventory. The ERT encourages the Party to report the parameters for growing cattle, mature dairy cattle, other mature cattle, sheep and swine as "NA" in CRF table 3.As2 if it does not use a tier 2 methodology to estimate the emissions from enteric fermentation for those livestock types and to explain in the NIR the reason for using "NA".	Not an issue/problem
A.4	3.B Manure management – N_2O	The Party reported N_2O emissions from manure management in CRF table 3.B(b). The ERT noted that the total N excreted for the category "growing cattle" from all MMS for 2020 (23,517,221 kg N) is about 75,000 kg N/year higher than the total N excreted calculated from population size (526,905 animal years in 2020) multiplied by Nex rate per animal year (44.49 kg N/animal year), which equals 23,441,676 kg N. Differences also occur for other years, but in the opposite direction, that is, total N excreted from all MMS is lower than the total calculated from population size. For example, for 2019, the difference is –13,711 kg N/year; for 2018, –630 kg N/year; for 2017, –7,646 kg N/year; for 2016, –9,788 kg N/year; for 2015, –7,369 kg N/year; and for 2014, –6,111 kg N/year. Differences also occur for the categories "mature dairy cattle" and "sheep". The total N excreted for "mature dairy cattle" from all MMS for 2019 (26,523,651 kg N) is about 15,900 kg N/year lower than the total N excreted calculated from population size (199,417 head in 2019) multiplied by Nex rate per head (132.93 kg N/head), which equals 26,507,738 kg N. The total N excreted for the category "sheep" from all MMS for 2018 (13,514,864 kg N) is 53,714 kg N/year lower than the total N excreted calculated from population size (1,409,143 animal years in 2019) multiplied by Nex rate per head (9.63 kg N/head), which equals 13,568,578 kg N. The total N excreted from all MMS for "sheep" for 2019 is 2,239 kg N/year higher than the total N excreted calculated from population size. During the review, the Party clarified that the value of 44.49 kg/animal year reported as the Nex rate in CRF table 3.B(b) does not correspond to the value for total N excreted. The correct value is 44.69 kg N/head. The reason for	Yes. Convention reporting adherence

ID#	*Finding classification*	*Description of finding with recommendation or encouragement*	*Is finding an issue/problem?*[a]
		the difference is that these two values, Nex rate and total N excreted, are updated at different times and not fully in coordination. Population figures and total N excreted are automatically calculated by CRF Reporter but the Nex rate is manually updated. This lack of harmonization does not, however, affect the emissions of N_2O reported in CRF table 3.B(b). These emissions are correct because the Party has estimated them using a higher level of disaggregation of livestock categorization for growing cattle in the inventory than the disaggregation applied in the CRF table. The aggregated manually updated Nex rate for growing cattle is calculated separately only for use as additional information in CRF Reporter – it is not used in the inventory estimations. A harmonized table for Nex rate (kg/head/year) and total N excreted will be reported in the next annual submission. The ERT recommends that the Party report consistent values for total N excreted for growing cattle (from 2014 onward), mature dairy cattle (for 2019) and sheep (for 2018 and 2019) in CRF table 3.B(b) by ensuring that the values for total calculated from all MMS and total calculated from population size and Nex rate are the same. The ERT also recommends that the Party implement QA/QC checks for ensuring the consistency of these values for all years in the time series.	
A.5	3.B Manure management – CH_4	The Party reported in its NIR (p.5-31) that the MCFs for storage of solid manure (deep litter and solid manure) are based on default IPCC factors. The ERT noted that MCFs for storage of solid manure and dry lot presented in NIR table 5.14 and CRF table 3.b(a)s2 (e.g. mature dairy cattle, 8.1 per cent; mature non-dairy cattle, 10.3 per cent; young cattle/growing cattle, 10.0 per cent; sheep, 11.1 per cent; goats, 13.2 per cent; swine, 7.4 per cent) are higher than the default values in the 2006 IPCC Guidelines (vol. 4, table 10.17), which are 2.0 per cent for solid storage and 1.0 per cent for dry lot. During the review, the Party clarified that the reference given on page 5-31 of the NIR is not correct. The MCFs for storage of solid manure (deep litter and solid manure) consider the default IPCC factors and a methodology from the 2019 Refinement to the 2006 IPCC Guidelines. The relevant text in the NIR will be corrected in the 2023 submission. The Party indicated that detailed documentation of the Norwegian model used for estimating CH_4 emissions from manure management and a description of how the MCFs have been calculated can be found in the report *Greenhouse gas emissions from biogas production from manure in Norwegian agriculture* of the Norwegian Environment Agency published in 2020. The ERT recommends that the Party correct the reference given in the NIR (p.5-31) to the source of the values for MCFs of storage of solid manure and deep litter to indicate that they are based on default factors and a methodology from the 2019 Refinement to the 2006 IPCC Guidelines (vol.4, chap.10, table 10.17).	Yes. Convention reporting adherence
A.6	3.B Manure management – CH_4	The Party reported inconsistent MCFs for pasture range and paddock in NIR table 5.14 and CRF table 3.B(a)s2 (0.50 and 0.47 per cent respectively). In addition, the ERT noted that none of the values is in accordance with the 2006 IPCC Guidelines (vol. 4, chap.10, table 10.17), in which the MCF for pasture range and paddock for cold climate is 1 per cent. During the review, the Party clarified that it used the MCF from the 2019 Refinement to the 2006 IPCC Guidelines (vol. 4, chap.10, table 10.17), 0.47 per cent, and that the methodology was documented in the 2020 NIR (p.5-33 and sections 5.5.4 and 10.2.3). Emissions from grazing were estimated under separate MMS categories for all animal categories taking into account the conclusion from Cai et al. (2017) that indicates that there is no significant	Yes. Transparency

ID#	Finding classification	Description of finding with recommendation or encouragement	Is finding an issue/problem?[a]
		difference in emission values for different animal categories regardless of the method of representing CH_4 emissions or the climate zone. Thus, the Party applied a single set of MCF factors to all animal categories. The ERT recommends that the Party explain in the NIR that the source of the values for the MCF for pasture range and paddock is the 2019 Refinement to the 2006 IPCC Guidelines (vol. 4, chap.10, table 10.17), justify why those values are more appropriate to its national circumstances than the values in the 2006 IPCC Guidelines and report consistent values in NIR table 5.14 and CRF table 3.B(a)s2.	
A.7	3.F Field burning of agricultural residues – CH_4 and N_2O	The Party reported in NIR table 5.1 that emissions from the field burning of agricultural residues have decreased by 89 per cent since 1990. However, the NIR contains no explanation on this trend. The Party explained in its NIR (section 5.5.1.2) that the data for the category are provided by Statistics Norway and the Norwegian Crop Research Institute. During the review, the Party clarified that the amount of crop residues burned in Norway was investigated through surveys conducted in 2004 and 2012. The results of the 2012 survey necessitated the fraction burned for 2011 being reduced to 4 per cent. The reason for the reduction is that with the introduction of grants for changing tillage practices (under Norway's Regional Environment Programme), the burning of straw was prohibited or straw was only allowed to be burned in the spring. Many municipalities have also banned the burning of straw; in these cases, farmers must request and obtain an exception before they are allowed to burn crop residues. The ERT recommends that the Party explain in the NIR the AD used across the time series, including information on the surveys conducted in 2004 and 2012, and explain the trend in emissions for this category, for example by describing the introduction of grants for changing tillage practices and the prohibition of or restrictions on the burning of straw.	Yes. Transparency
A.8	3.F.1 Cereals – CH_4 and N_2O	For wheat, a subcategory under category 3.F.1 (cereals), the Party reported area burned, biomass available and combustion factor as "NE" in CRF table 3.F. However, total biomass burned and CH_4 and N_2O emissions were estimated and reported. During the review, the Party clarified that area burned, biomass available and combustion factor were reported as "NE" in the CRF table because these variables are not used in the method applied for calculating the total amount of biomass burned in the Norwegian inventory. Total biomass burned is estimated using statistics for crop production (in tonnes) and values for dry matter (fraction of crop residue and fraction burned in fields). The ERT recommends that the Party report the area burned, biomass available and combustion factor as "NA" in CRF table 3.F if it does not use these parameters in the estimation of emissions from the field burning of agricultural residues and explain in the NIR the reason for using "NA".	Yes. Transparency
LULUCF			
L.23	4.A.1 Forest land remaining forest land – CO_2 and N_2O	The Party reported in its NIR (section 6.4.1.2, p.6-50) information on the application of a tier 3 method for estimating CSC for the pools DOM and SOC in forest land remaining forest land using the model Yasso07. However, in the NIR, no verification of the Yasso07 outputs is provided (see also ID#s L.11–L.12 in table 3). During the review, the Party clarified that it has established a national soil carbon monitoring programme under the NFI that will produce independent data that can be used to verify the Yasso07 outputs on a national scale. The Party also provided the ERT with a document containing a comparison of its Yasso07 outputs with published	Yes. Accuracy

ID#	*Finding classification*	*Description of finding with recommendation or encouragement*	*Is finding an issue/problem?*[a]
		measured and modelled estimates for DOM and SOC of other countries and regions considered as representative of conditions in Norway, which is intended to be a verification of its Yasso07 outputs by alternative means. The ERT appreciates the efforts made by the Party on this issue but noted that Norway has not yet provided a sound verification of the Yasso07 outputs based on the national soil carbon monitoring programme or other verification methods in the NIR. From the information provided during the review, the ERT could not assess if the verification by alternative means is sufficient. As a result, the ERT has concerns about the accuracy of the estimates provided by Yasso07. The UNFCCC Annex I inventory reporting guidelines state that emission and removal estimates should be accurate in the sense that they are systematically neither over nor under true emissions or removals (para. 4(e)) and that a Party shall demonstrate that the applied parameters are more accurate than the default data provided in the 2006 IPCC Guidelines (para. 12). Further, in accordance with paragraph 41 of the same guidelines, verification information shall be provided for estimates of emissions and/or removals from using higher-tier (tier 3) methods and/or models. During the review, the Party provided arguments as to why a tier 1 approach is not appropriate for the pools SOC and DOM, namely, they depend on management practices (e.g. harvest levels, planting intensity, species conversion) and on climatic changes. In Norway, neither tree biomass in the forest, as subject to management, nor the climate are observed to be in equilibrium, hence, the Party concludes that it is highly unlikely that SOC and DOM would be in equilibrium and thus a tier 1 approach (the default method for pools in equilibrium) is not appropriate. Further, the Party explained that the model Yasso07 is able to capture CSC in SOC and DOM related to management practices. These dynamics cannot be captured by a tier 1 methodology, which would underestimate emissions in the initial years following harvest as well as underestimate uptake for mature stands. The ERT recommends that the Party estimate CSC for DOM and SOC under forest land remaining forest land using a more appropriate approach than the currently applied tier 3 approach with the model Yasso07, until verification of the Yasso07 model outputs based on the national soil carbon monitoring programme or other sound verification is made in accordance with the 2006 IPCC Guidelines (vol. 1, chap. 6.10). The ERT, noting that during the review the Party provided valid arguments (which are not included in the NIR) against applying a tier 1 approach (the default method for pools in equilibrium), considers that an alternative, more appropriate approach could therefore be the application of a tier 2 method. The ERT notes that, alternatively, the application of one kind of sound verification procedure (independent estimates or alternative means) would be sufficient to resolve this issue as well as ID#s L.11 and L.12 in table 3.	
Waste			
W.8	5.B Biological treatment of solid waste – CH_4	The Party reported in its NIR (p.7-17) that AD for 2020 were updated because the Norwegian waste accounts, with updated figures, were not released in time for the emissions inventory calculations. During the review, the Party clarified an error had occurred: on p.7-17 in the NIR, 2020 should read 2019. The ERT encourages the Party to enhance its QA/QC process to improve the quality of the NIR.	Not an issue/problem
W.9	5.B Biological treatment of solid waste – CH_4	The Party reported in NIR table 7.2 the amounts of different waste types deposited in municipal SWDS. A table note indicates that the AD for 2020 for several waste types (food, paper, wood, textiles and plastics) were reported as the same value as for the previous year (2019) because updated AD were not available at the time of compilation of the current submission but that the AD for another waste type, sewage sludge, for 2020 are valid. Using	Not an issue/problem

ID#	*Finding classification*	*Description of finding with recommendation or encouragement*	*Is finding an issue/problem?*[a]
		provisional data may lead to uncertainty in the calculations. The ERT noted that non-provisional AD for 2020 for wastewater were reported in NIR table 7.5. During the review, the Party clarified that for the waste sector inventory, AD are collected from different data sources and their availability differs. The amounts of composted waste and solid waste used for the biological treatment of waste are extracted from the Norwegian waste accounts. The waste accounts are published annually in December and are not available in time to be used for the emission estimations. AD from the previous year are hence used to estimate emissions for the latest year. It is unfortunately not possible for Norway to obtain AD for the amounts of composted waste and solid waste early enough to include these data in the estimation of emissions for the latest reported year. AD related to wastewater are collected from other sources – these AD are available early enough to be used for the emission estimations for the latest year. The ERT encourages the Party to make efforts to reform its data-collection system so as to be able to obtain the inventory year AD on the amounts of composted waste and solid waste used for the biological treatment of waste for emission calculations, thus improving the quality of its inventory.	
KP-LULUCF			
KL.10	General (KP-LULUCF) – all gases	The previous review (see document FCCC/ARR/2020/NOR, ID# KL.11) noted that according to Norwegian forest legislation, both forest land types (those under FM and those under AR) are subject to the same sustainable management practices, although the frequency and intensity of specific management activities likely differs between them. The previous ERT encouraged Norway to clarify which activities qualify as AR in terms of the conversion of other land and wetlands to forest land, noting that because of the definition of AR, those activities cannot be limited to tree planting and direct seeding. In response to the encouragement, the Party revised its description of human-induced activities in its 2022 submission (see NIR section 11.1.1). The ERT commends the Party for the efforts made and the improvements to the NIR achieved.	Not a problem
KL.11	FM	The Party reported figures for the FMRL and the technical correction in NIR table 11.13. However, the values were not included in the CRF accounting table of the initial submission (version 1, 8 April 2022). The ERT noted that this issue does not impact the accounting as the net removals are higher than the FM cap and, as a result, the accounting quantity for FM for Norway is determined by the FM cap. Norway submitted a revised submission on 16 September 2022 (version 2). The values for the FMRL and the technical correction are correctly reported in the CRF accounting table of the revised submission (–11,400.00 and –2,312.28 kt CO_2 eq respectively).	Not a problem
KL.12	FM	Norway reported the value for the FMRL technical correction as –2,312.28 kt CO_2 eq/year in CRF table 4(KP-I)B.1.1 and the CRF accounting table. However, the value for the technical correction reported in NIR table 11.13 is different: –3,852.42 kt CO_2 eq/year. During the review, the Party clarified that the value in the CRF tables is correct, and that the value in NIR table 11.13 was not updated since the previous annual submission. The ERT concluded that, although the incorrect reporting in the NIR is an issue, this issue has no impact on the accounting of KP-LULUCF activities and therefore does not influence the Party's ability to fulfil its commitments for the second commitment period of the Kyoto	Yes. Convention reporting adherence

ID#	*Finding classification*	*Description of finding with recommendation or encouragement*	*Is finding an issue/problem?*[a]
		Protocol. Therefore, this issue was not included in the list of potential problems and further questions raised by the ERT.	
KL.13	FM	The ERT noted that the NIR does not include information on the main factors generating the accounted quantity under FM. During the review, the Party provided a table with a times series of the emissions and removals split by pool for FM. This allowed for a comparison with the emissions and removals by pool of the FMRL technical correction (NIR table 11.13), showing the impact of the pools on the accounted quantity under FM. The Party also explained that: (a) CSCs in living biomass have the largest impact on the accounting quantity under FM. The combination of the Norwegian policy to rebuild the country after the Second World War and the demand for timber led to a large national effort to invest in forest tree planting in new areas and replanting after harvest on existing forest land. This effort in the decades following the Second World War led to a sharp increase in annual CSC until around 2009. The level remained higher than the 1990 level in 2013–2020; (b) Mineral soil, deadwood and litter are modelled with the Yasso07 model, with input data based on living biomass data obtained from the NFI. Carbon accumulation has increased in these pools but to a much lesser extent than in living biomass; (c) In 2009–2012, the wood processing industry in Norway faced several closures. As a result, harvested wood products, which had been producing removals, became a source of emissions, and in 2013–2015, net emissions from harvested wood products were still seen; (d) Drained organic soil emissions (estimated using the tier 1 methodology) have decreased slightly since 1990, mainly because the area under FM has continuously decreased owing to deforestation. The ERT considered the information provided during the review and concluded that, although the transparency issue in the NIR has not been resolved, this issue has no impact on the accounting of KP-LULUCF activities and therefore does not influence the Party's ability to fulfil its commitments for the second commitment period of the Kyoto Protocol. Therefore, this issue was not included in the list of potential problems and further questions raised by the ERT.	Yes. Transparency
KL.14	FM – CO_2 AR – CO_2	The Party reported in its NIR (section 6.4.1.2, p.6-50) information on the application of a tier 3 method for estimating CSC for the pools DOM and SOC using the model Yasso07. However, in the NIR, no verification of the Yasso07 outputs is provided (see also ID#s L.11–L.12 in table 3 and L.23 above). The ERT appreciates the efforts made by the Party on this issue but noted that Norway has not yet provided a complete, sound verification of the Yasso07 outputs in the NIR. As a result, the ERT has concerns about the accuracy of the estimates provided by Yasso07 used for FM and AR. During the review, the ERT asked Norway to provide estimates on the impact of using a tier 1 approach (i.e. CSC of DOM and SOC are zero because they are assumed to be in equilibrium) instead of a tier 3 approach for all pools calculated using Yasso07. In response, the Party provided detailed information on the impact of using a tier 1 approach for all pools calculated using the model. The information showed that (1) compared with using the tier 3 approach, applying a tier 1 approach for DOM and SOC has no impact on the accounting quantity of FM because the calculated removals of FM still exceed the FM cap and (2) applying the tier 1 approach for DOM and SOC has	Yes. Accuracy

ID#	*Finding classification*	*Description of finding with recommendation or encouragement*	*Is finding an issue/problem?*[a]
		a small impact on the accounting of AR: Yasso07 estimates net emissions for DOM and SOC of afforestation older than the conversion period of 20 years and thus removals are estimated at 314.89 kt CO_2 higher with the tier 1 approach than with the tier 3 approach. The ERT concludes that, although the Party has provided only partial verification of the tier 3 results (see ID#s L.11–L.12 in table 3) and there might be a potential accuracy issue (see ID# L.23 above), the analysis provided during the review showed that the Party has not underestimated accountable emissions or overestimated accountable removals by using the tier 3 approach for DOM and SOC under FM and AR. Applying a tier 1 approach for DOM and SOC under FM and AR would not influence the accounting quantity of FM and would lead to even higher accountable removals (–314.89 kt CO_2) under AR. Therefore, this issue was not included in the list of potential problems and further questions raised by the ERT.	

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

VI. Application of adjustments

11. The ERT did not identify the need to apply any adjustments for the 2022 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. Table I.5 presents the accounting quantities for KP-LULUCF reported by Norway and the final values agreed by the ERT. The final quantities of units to be issued and cancelled are presented in table I.6.

VIII. Questions of implementation

13. No questions of implementation were identified by the ERT during the individual review of the Party's 2022 annual submission.

Annex I

Overview of greenhouse gas emissions and removals and data and information on activities under Article 3, paragraphs 3–4, of the Kyoto Protocol, as submitted by Norway in its 2022 annual submission

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

Table I.1
Total greenhouse gas emissions and removals for Norway, base year–2020
(kt CO_2 eq)

	Total GHG emissions excluding indirect CO_2 emissions		*Total GHG emissions and removals including indirect CO_2 emissions*[a]		*Land-use change (Article 3.7 bis as contained in the Doha Amendment)*[b]	*KP-LULUCF (Article 3.3 of the Kyoto Protocol)*[c]	*KP-LULUCF (Article 3.4 of the Kyoto Protocol)*	
	Total including LULUCF	*Total excluding LULUCF*	*Total including LULUCF*	*Total excluding LULUCF*			*CM, GM, RV, WDR*	*FM*
FMRL								–11 400.00
Base year[d]	40 889.89	51 431.79	NA	NA	NA		1 461.20	
1990	40 889.89	51 431.79	NA	NA				
1995	36 187.88	51 631.42	NA	NA				
2000	36 281.48	54 922.38	NA	NA				
2010	31 222.87	54 938.67	NA	NA				
2011	28 976.22	53 990.82	NA	NA				
2012	32 050.38	53 412.71	NA	NA				
2013	31 794.10	53 671.56	NA	NA		1 638.70	1 544.87	–25 652.63
2014	35 943.02	54 040.58	NA	NA		1 656.73	1 545.31	–22 030.46
2015	41 387.37	54 488.25	NA	NA		2 128.32	1 556.49	–17 488.10
2016	40 749.35	53 585.78	NA	NA		1 782.34	1 551.21	–16 898.97
2017	38 977.60	52 840.35	NA	NA		1 817.42	1 538.04	–17 979.82
2018	38 269.63	52 871.07	NA	NA		1 996.74	1 535.32	–18 855.83
2019	34 650.02	51 086.03	NA	NA		1 958.77	1 536.65	–20 587.45
2020	28 940.24	49 272.55	NA	NA		1 463.20	1 520.82	–24 025.42

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

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

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

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

[d] "Base year" refers to the base year under the Kyoto Protocol, which is 1990 for CO_2, CH_4, N_2O, HFCs, PFCs and SF_6, and 2000 for NF_3. The base year for CM and GM under Article 3, para. 4, of the Kyoto Protocol is 1990. For activities under Article 3, para. 3, of the Kyoto Protocol and FM under Article 3, para. 4, only the inventory years of the commitment period must be reported.

Table I.2
Greenhouse gas emissions and removals by gas for Norway, excluding land use, land-use change and forestry, 1990–2020
(kt CO_2 eq)

	CO_2[a]	*CH_4*	*N_2O*	*HFCs*	*PFCs*	*Unspecified mix of HFCs and PFCs*	*SF_6*	*NF_3*
1990	35 096.63	6 235.95	4 105.84	0.04	3 894.80	NA, NO	2 098.54	NA, NO
1995	38 508.48	6 419.62	3 711.64	97.84	2 314.05	NA, NO	579.80	NA, NO
2000	42 148.81	6 176.00	3 818.56	369.28	1 518.45	NA, NO	891.28	NA, NO
2010	45 691.01	5 575.73	2 470.87	894.22	238.35	NA, NO	68.50	NA, NO
2011	44 791.39	5 454.16	2 463.24	965.80	262.60	NA, NO	53.62	NA, NO
2012	44 295.95	5 362.31	2 473.03	1 028.32	200.47	NA, NO	52.63	NA, NO
2013	44 586.63	5 281.02	2 449.33	1 118.11	181.03	NA, NO	55.44	NA, NO
2014	45 045.76	5 223.53	2 462.44	1 081.09	178.92	NA, NO	48.84	NA, NO
2015	45 590.31	5 218.90	2 501.71	963.35	146.39	NA, NO	67.59	NA, NO
2016	44 764.20	5 131.91	2 436.85	1 005.48	186.17	NA, NO	61.17	NA, NO
2017	44 242.84	4 991.18	2 389.92	1 029.18	130.96	NA, NO	56.28	NA, NO
2018	44 392.44	4 912.15	2 368.02	996.54	148.08	NA, NO	53.85	NA, NO
2019	42 784.54	4 734.88	2 389.60	933.97	175.07	NA, NO	67.98	NA, NO
2020	41 196.76	4 711.76	2 318.91	809.97	161.42	NA, NO	73.72	NA, NO
Percentage change 1990–2020	**17.4**	**–24.4**	**–43.5**	**1 845 045.3**	**–95.9**	**NA**	**–96.5**	**NA**

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

[a] Norway did not report indirect CO_2 emissions in CRF table 6.

Table I.3
Greenhouse gas emissions and removals by sector for Norway, 1990–2020
(kt CO_2 eq)

	Energy	*IPPU*	*Agriculture*	*LULUCF*	*Waste*	*Other*
1990	28 840.36	15 376.57	4 812.30	–10 541.90	2 402.56	–
1995	32 140.63	12 436.00	4 749.19	–15 443.54	2 305.60	–
2000	35 049.61	13 220.28	4 586.37	–18 640.90	2 066.13	–
2010	39 687.40	9 102.44	4 360.57	–23 715.80	1 788.27	–
2011	38 569.40	9 239.83	4 332.80	–25 014.59	1 848.79	–

	Energy	*IPPU*	*Agriculture*	*LULUCF*	*Waste*	*Other*
2012	38 138.03	9 169.56	4 352.23	–21 362.33	1 752.89	–
2013	38 252.66	9 302.04	4 402.74	–21 877.45	1 714.11	–
2014	38 529.64	9 311.46	4 473.25	–18 097.56	1 726.23	–
2015	38 991.21	9 317.41	4 537.83	–13 100.88	1 641.79	–
2016	38 129.77	9 263.06	4 587.46	–12 836.43	1 605.49	–
2017	37 502.87	9 245.55	4 563.77	–13 862.74	1 528.16	–
2018	37 519.82	9 296.03	4 541.64	–14 601.45	1 513.59	–
2019	35 927.08	9 258.97	4 518.01	–16 436.02	1 381.98	–
2020	34 187.76	9 224.44	4 509.62	–20 332.31	1 350.73	–
Percentage change 1990–2020	**18.5**	**–40.0**	**–6.3**	**92.9**	**–43.8**	**NA**

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

Table I.4

Greenhouse gas emissions and removals from activities under Article 3, paragraphs 3–4, of the Kyoto Protocol by activity, base year–2020, for Norway

(kt CO_2 eq)

	Article 3.7 bis as contained in the Doha Amendment[a]	*Activities under Article 3.3 of the Kyoto Protocol*		*FM and elected activities under Article 3.4 of the Kyoto Protocol*				
	Land-use change	*AR*	*Deforestation*	*FM*	*CM*	*GM*	*RV*	*WDR*
FMRL				–11 400.00				
Technical correction				–2 312.28				
Base year[b]	NA				1 766.09	–304.89	NA	NA
2013		–952.10	2 590.80	–25 652.63	1 744.45	–199.57	NA	NA
2014		–983.80	2 640.53	–22 030.46	1 742.42	–197.11	NA	NA
2015		–1 012.01	3 140.33	–17 488.10	1 747.06	–190.57	NA	NA
2016		–1 068.76	2 851.10	–16 898.97	1 740.97	–189.76	NA	NA
2017		–1 072.38	2 889.80	–17 979.82	1 728.13	–190.09	NA	NA
2018		–1 081.32	3 078.07	–18 855.83	1 716.35	–181.03	NA	NA
2019		–1 094.26	3 053.03	–20 587.45	1 720.20	–183.54	NA	NA
2020		–1 111.82	2 575.02	–24 025.42	1 711.22	–190.40	NA	NA
Percentage change base year–2019					**–3.1**	**–37.6**	**NA**	**NA**

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

[a] The value reported in this column relates to 1990.

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

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

Table I.5
Accounting quantities for activities under Article 3, paragraph 3, and forest management and any elected activities under Article 3, paragraph 4, of the Kyoto Protocol for Norway
(kt CO_2 eq)

GHG source/sink activity	*Net emissions/removals*										*Accounting parameters*	*Accounting quantities*[a]
	Base year[b]	*2013*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*	*2020*	*Total*[c]		
A.1. AR		–952.100	–983.801	–1 012.010	–1 068.760	–1 072.379	–1 081.324	–1 094.265	–1 111.824	–8 376.462		–8 376.462
Excluded emissions from natural disturbances[d]		NA	NA	NA	NA	NA	NA	NA	NA	NA		NA
Excluded subsequent removals from land subject to natural disturbances		NA	NA	NA	NA	NA	NA	NA	NA	NA		NA
A.2. Deforestation		2 590.797	2 640.527	3 140.334	2 851.099	2 889.795	3 078.068	3 053.031	2 575.024	22 818.676		22 818.676
B.1. FM										–163 518.680		–53 820.440
Net emissions/ removals		–25 652.628	–22 030.462	–17 488.104	–16 898.972	–17 979.818	–18 855.830	–20 587.448	–24 025.418	–163 518.680		
Excluded emissions from natural disturbances[d]		NA	NA	NA	NA	NA	NA	NA	NA	NA		NA
Excluded subsequent removals from land subject to natural disturbances		NA	NA	NA	NA	NA	NA	NA	NA	NA		NA
Any debits from newly		NA	NA	NA	NA	NA	NA	NA	NA	NA		NA

GHG source/sink activity	*Net emissions/removals*										*Accounting parameters*	*Accounting quantities*[a]
	Base year[b]	*2013*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*	*2020*	*Total*[c]		
established forest												
FMRL[e]											–11 400.000	
Technical corrections to FMRL											–2 312.280	
FM cap											14 538.096	–14 538.096
B.2. CM (if elected)	1 766.092	1 744.448	1 742.422	1 747.056	1 740.970	1 728.128	1 716.349	1 720.196	1 711.217	13 850.786		–277.950
B.3. GM (if elected)	–304.894	–199.573	–197.111	–190.568	–189.759	–190.092	–181.028	–183.545	–190.397	–1 522.074		917.083
B.4. RV (if elected)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA
B.5. WDR (if elected)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA

[a] The accounting quantity is the total quantity of units to be issued or cancelled for a particular activity.
[b] Net emissions and removals from CM, GM, RV and/or WDR, if elected, in the Party's base year as established in decision 9/CP.2.
[c] Cumulative net emissions and removals for all years of the commitment period reported in the annual submission under review.
[d] The Party indicated that it does not intend to exclude emissions from natural disturbances.
[e] As inscribed in the appendix to the annex to decision 2/CMP.7 in kt CO_2 eq per year.

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

Table I.6
Key data for Norway under Article 3, paragraphs 3–4, of the Kyoto Protocol from its 2022 annual submission

Parameter	*Data*
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
Elected activities under Article 3, paragraph 4, of the Kyoto Protocol	CM and GM
Election of application of provisions for natural disturbances	No
3.5% of total base-year GHG emissions, excluding LULUCF	1 817.262 kt CO_2 eq (14 538.096 kt CO_2 eq for the duration of the commitment period)
Cancellation of AAUs, CERs and ERUs and/or issuance of RMUs in the national registry for:	
1. AR	Issue 8 376 462 RMUs
2. Deforestation	Cancel 22 818 676 units
3. FM	Issue 14 538 096 RMUs
4. CM	Issue 277 950 RMUs
5. GM	Cancel 917 083 units

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

Annex II

Information to be included in the compilation and accounting database

Tables II.1–II.8 include the information to be included in the compilation and accounting database for Norway. Data shown are from the Party's annual submission, including the latest revised estimates submitted, adjustments (if applicable) and the final data to be included in the compilation and accounting database.

Table II.1
Information to be included in the compilation and accounting database for 2020, including on the commitment period reserve, for Norway
(t CO_2 eq)

	Original submission	*Revised submission*	*Adjustment*	*Final value*
CPR	**314 022 874**	–	–	**314 022 874**
Annex A emissions				
CO_2	41 196 761	–	–	41 196 761
CH_4	4 711 761	–	–	4 711 761
N_2O	2 318 914	–	–	2 318 914
HFCs	809 972	–	–	809 972
PFCs	161 424	–	–	161 424
Unspecified mix of HFCs and PFCs	NA, NO	–	–	NA, NO
SF_6	73 720	–	–	73 720
NF_3	NA, NO	–	–	NA, NO
Total Annex A sources[a]	**49 272 555**	**–**	**–**	**49 272 555**
Activities under Article 3, paragraph 3, of the Kyoto Protocol				
AR	–1 111 824	–	–	–1 111 824
Deforestation	2 575 024	–	–	2 575 024
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol				
FM	–24 025 418	–	–	–24 025 418
CM	1 711 217	–	–	1 711 217
CM for the base year	1 766 092	–	–	1 766 092
GM	–190 397	–	–	–190 397
GM for the base year	–304 894	–	–	–304 894

[a] The sum of the values for the individual gases and groups of gases may not match the total owing to rounding.

Table II.2
Information to be included in the compilation and accounting database for 2019 for Norway
(t CO_2 eq)

	Original submission	*Revised submission*	*Adjustment*	*Final value*
Annex A emissions				
CO_2	42 784 540	–	–	42 784 540
CH_4	4 734 882	–	–	4 734 882
N_2O	2 389 599	–	–	2 389 599
HFCs	933 966	–	–	933 966
PFCs	175 069	–	–	175 069
Unspecified mix of HFCs and PFCs	NA, NO	–	–	NA, NO
SF_6	67 979	–	–	67 979
NF_3	NA, NO	–	–	NA, NO

	Original submission	*Revised submission*	*Adjustment*	*Final value*
Total Annex A sources[a]	**51 086 035**	–	–	**51 086 035**
Activities under Article 3, paragraph 3, of the Kyoto Protocol				
AR	–1 094 265	–	–	–1 094 265
Deforestation	3 053 031	–	–	3 053 031
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol				
FM	–20 587 448	–	–	–20 587 448
CM	1 720 196	–	–	1 720 196
CM for the base year	1 766 092	–	–	1 766 092
GM	–183 545	–	–	–183 545
GM for the base year	–304 894	–	–	–304 894

[a] The sum of the values for the individual gases and groups of gases may not match the total owing to rounding.

Table II.3
Information to be included in the compilation and accounting database for 2018 for Norway
(t CO_2 eq)

	Original submission	*Revised submission*	*Adjustment*	*Final value*
Annex A emissions				
CO_2	44 392 442	–	–	44 392 442
CH_4	4 912 147	–	–	4 912 147
N_2O	2 368 016	–	–	2 368 016
HFCs	996 537	–	–	996 537
PFCs	148 080	–	–	148 080
Unspecified mix of HFCs and PFCs	NA, NO	–	–	NA, NO
SF_6	53 851	–	–	53 851
NF_3	NA, NO	–	–	NA, NO
Total Annex A sources[a]	**52 871 074**	–	–	**52 871 074**
Activities under Article 3, paragraph 3, of the Kyoto Protocol				
AR	–1 081 324	–	–	–1 081 324
Deforestation	3 078 068	–	–	3 078 068
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol				
FM	–18 855 830	–	–	–18 855 830
CM	1 716 349	–	–	1 716 349
CM for the base year	1 766 092	–	–	1 766 092
GM	–181 028	–	–	–181 028
GM for the base year	–304 894	–	–	–304 894

[a] The sum of the values for the individual gases and groups of gases may not match the total owing to rounding.

Table II.4
Information to be included in the compilation and accounting database for 2017 for Norway
(t CO_2 eq)

	Original submission	*Revised submission*	*Adjustment*	*Final value*
Annex A emissions				
CO_2	44 242 843	–	–	44 242 843
CH_4	4 991 176	–	–	4 991 176
N_2O	2 389 921	–	–	2 389 921
HFCs	1 029 175	–	–	1 029 175
PFCs	130 956	–	–	130 956
Unspecified mix of HFCs and PFCs	NA, NO	–	–	NA, NO
SF_6	56 277	–	–	56 277
NF_3	NA, NO	–	–	NA, NO

	Original submission	*Revised submission*	*Adjustment*	*Final value*
Total Annex A sources[a]	**52 840 349**	–	–	**52 840 349**
Activities under Article 3, paragraph 3, of the Kyoto Protocol				
AR	–1 072 379	–	–	–1 072 379
Deforestation	2 889 795	–	–	2 889 795
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol				
FM	–17 979 818	–	–	–17 979 818
CM	1 728 128	–	–	1 728 128
CM for the base year	1 766 092	–	–	1 766 092
GM	–190 092	–	–	–190 092
GM for the base year	–304 894	–	–	–304 894

[a] The sum of the values for the individual gases and groups of gases may not match the total owing to rounding.

Table II.5
Information to be included in the compilation and accounting database for 2016 for Norway
(t CO_2 eq)

	Original submission	*Revised submission*	*Adjustment*	*Final value*
Annex A emissions				
CO_2	44 764 196	–	–	44 764 196
CH_4	5 131 912	–	–	5 131 912
N_2O	2 436 851	–	–	2 436 851
HFCs	1 005 477	–	–	1 005 477
PFCs	186 171	–	–	186 171
Unspecified mix of HFCs and PFCs	NA, NO	–	–	NA, NO
SF_6	61 172	–	–	61 172
NF_3	NA, NO	–	–	NA, NO
Total Annex A sources[a]	**53 585 780**	–	–	**53 585 780**
Activities under Article 3, paragraph 3, of the Kyoto Protocol				
AR	–1 068 760	–	–	–1 068 760
Deforestation	2 851 099	–	–	2 851 099
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol				
FM	–16 898 972	–	–	–16 898 972
CM	1 740 970	–	–	1 740 970
CM for the base year	1 766 092	–	–	1 766 092
GM	–189 759	–	–	–189 759
GM for the base year	–304 894	–	–	–304 894

[a] The sum of the values for the individual gases and groups of gases may not match the total owing to rounding.

Table II.6
Information to be included in the compilation and accounting database for 2015 for Norway
(t CO_2 eq)

	Original submission	*Revised submission*	*Adjustment*	*Final value*
Annex A emissions				
CO_2	45 590 312	–	–	45 590 312
CH_4	5 218 902	–	–	5 218 902
N_2O	2 501 709	–	–	2 501 709
HFCs	963 348	–	–	963 348
PFCs	146 388	–	–	146 388
Unspecified mix of HFCs and PFCs	NA, NO	–	–	NA, NO
SF_6	67 590	–	–	67 590
NF_3	NA, NO	–	–	NA, NO

	Original submission	*Revised submission*	*Adjustment*	*Final value*
Total Annex A sources[a]	**54 488 250**	–	–	**54 488 250**
Activities under Article 3, paragraph 3, of the Kyoto Protocol				
AR	–1 012 010	–	–	–1 012 010
Deforestation	3 140 334	–	–	3 140 334
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol				
FM	–17 488 104	–	–	–17 488 104
CM	1 747 056	–	–	1 747 056
CM for the base year	1 766 092	–	–	1 766 092
GM	–190 568	–	–	–190 568
GM for the base year	–304 894	–	–	–304 894

[a] The sum of the values for the individual gases and groups of gases may not match the total owing to rounding.

Table II.7
Information to be included in the compilation and accounting database for 2014 for Norway
(t CO_2 eq)

	Original submission	*Revised submission*	*Adjustment*	*Final value*
Annex A emissions				
CO_2	45 045 760	–	–	45 045 760
CH_4	5 223 534	–	–	5 223 534
N_2O	2 462 437	–	–	2 462 437
HFCs	1 081 094	–	–	1 081 094
PFCs	178 919	–	–	178 919
Unspecified mix of HFCs and PFCs	NA, NO	–	–	NA, NO
SF_6	48 837	–	–	48 837
NF_3	NA, NO	–	–	NA, NO
Total Annex A sources[a]	**54 040 583**	–	–	**54 040 583**
Activities under Article 3, paragraph 3, of the Kyoto Protocol				
AR	–983 801	–	–	–983 801
Deforestation	2 640 527	–	–	2 640 527
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol				
FM	–22 030 462	–	–	–22 030 462
CM	1 742 422	–	–	1 742 422
CM for the base year	1 766 092	–	–	1 766 092
GM	–197 111	–	–	–197 111
GM for the base year	–304 894	–	–	–304 894

[a] The sum of the values for the individual gases and groups of gases may not match the total owing to rounding.

Table II.8
Information to be included in the compilation and accounting database for 2013 for Norway
(t CO_2 eq)

	Original submission	*Revised submission*	*Adjustment*	*Final value*
Annex A emissions				
CO_2	44 586 630	–	–	44 586 630
CH_4	5 281 019	–	–	5 281 019
N_2O	2 449 327	–	–	2 449 327
HFCs	1 118 111	–	–	1 118 111
PFCs	181 033	–	–	181 033
Unspecified mix of HFCs and PFCs	NA, NO	–	–	NA, NO
SF_6	55 437	–	–	55 437
NF_3	NA, NO	–	–	NA, NO

	Original submission	*Revised submission*	*Adjustment*	*Final value*
Total Annex A sources[a]	**53 671 558**	–	–	**53 671 558**
Activities under Article 3, paragraph 3, of the Kyoto Protocol				
AR	–952 100	–	–	–952 100
Deforestation	2 590 797	–	–	2 590 797
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol				
FM	–25 652 628	–	–	–25 652 628
CM	1 744 448	–	–	1 744 448
CM for the base year	1 766 092	–	–	1 766 092
GM	–199 573	–	–	–199 573
GM for the base year	–304 894	–	–	–304 894

[a] The sum of the values for the individual gases and groups of gases may not match the total owing to rounding.

Annex III

Additional information to support findings in table 2

Missing categories that may affect completeness

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

(a) 1.B.2.a (oil) (direct CO_2 emissions) (see ID# E.31 in table 5);

(b) 1.B.2.b (natural gas) (direct CO_2 emissions) (see ID# E.31 in table 5);

(c) 1.B.2.c (venting) (direct CO_2 emissions) (see ID# E.31 in table 5).

Annex IV

Reference documents

A. Reports of the Intergovernmental Panel on Climate Change

IPCC. 1997. *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*. JL Houghton, LG Meira Filho, B Lim, et al. (eds.). Paris: IPCC/Organisation for Economic Co-operation and Development/International Energy Agency. Available at https://www.ipcc-nggip.iges.or.jp/public/gl/invs1.html.

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 https://www.ipcc.ch/publication/2013-revised-supplementary-methods-and-good-practice-guidance-arising-from-the-kyoto-protocol/.

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

IPCC. 2019. *2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories.* E Calvo Buendia, K Tanabe, A Kranjc, et al. (eds.). Geneva: IPCC. Available at https://www.ipcc-nggip.iges.or.jp/public/2019rf/index.html.

B. UNFCCC documents

Annual review reports

Reports on the individual reviews of the 2014, 2015, 2016, 2018 and 2020 annual submissions of Norway, contained in documents FCCC/ARR/2014/NOR, FCCC/ARR/2015/NOR, FCCC/ARR/2016/NOR, FCCC/ARR/2018/NOR and FCCC/ARR/2020/NOR respectively.

Other

Aggregate information on greenhouse gas emissions by sources and removals by sinks for Parties included in Annex I to the Convention. Note by the secretariat. Available at https://unfccc.int/documents/510888.

Annual status report for Norway for 2022. Available at https://unfccc.int/sites/default/files/resource/asr2022_NOR.pdf.

Report on the review of the report to facilitate the calculation of the assigned amount for the second commitment period of the Kyoto Protocol of Norway. Available at https://unfccc.int/documents/9721.

Report to facilitate the calculation of the assigned amount for the second commitment period of the Kyoto Protocol of Norway. Available at https://unfccc.int/files/national_reports/initial_reports_under_the_kyoto_protocol/second_commitment_period_2013-2020/application/zip/nor-cp2-ir-15apr16.zip.

C. Other documents used during the review

Responses to questions during the review were received from Kathrine Loe Bjønness and Ingeborg Rønning (Norwegian Environment Agency), including additional material on the

methodology and assumptions used. The following references may not conform to UNFCCC editorial style as some have been reproduced as received:

Bárcena TG, Dalsgaard L, Strand LT, Mohr CW, Bjørkelo K, Eriksen R and Søgaard G (2021): A Tier 1 methodology for estimating changes in soil organic carbon after land use change on mineral soil. NIBIO report 7(49) 2021. Available at https://nibio.brage.unit.no/nibio-xmlui/handle/11250/2732255.

Cai Y, Chang SX and Cheng Y (2017): Greenhouse gas emissions from excreta patches of grazing animals and their mitigation strategies. *Earth-Science Reviews*, 171: 44-57.

Carbon Limits (2020): Greenhouse gas emissions from biogas production from manure in Norwegian agriculture. Miljødirektoratet (miljodirektoratet.no). Available at https://www.miljodirektoratet.no/publikasjoner/2020/desember-2020/greenhouse-gas-emissions-from-biogas-production-from-manure-in-norwegian-agriculture/.

Dalsgaard L, Kjønaas OJ and Lange H (2017). Forest soil carbon changes from measurements and models. Site-specific comparisons and implications for UNFCCC reporting. NIBIO report 3(114) 2017. Available at https://nibio.brage.unit.no/nibio-xmlui/handle/11250/2461354.

Didion M, Frey B, Rogiers N, Thürig E (2014). Validating tree litter decomposition in the Yasso07 carbon model. Ecological modelling 291: 58-68. Available at https://doi.org/10.1016/j.ecolmodel.2014.07.028 and https://www.sciencedirect.com/science/article/pii/S0304380014003652.

Ortiz CA, Liski J, Gärdenäs AI, Lehtonen A, Lundblad M., Stendahl J, Ågren GI, Karltun E (2013). Soil organic carbon stock changes in Swedish forest soils - A comparison of uncertainties and their sources through a national inventory and two simulation models. Ecological Modelling 251:221-231. Available at https://www.sciencedirect.com/science/article/abs/pii/S0304380012005972.

Rantakari M, Lehtonen A, Linkosalo T, Tuomi M, Tamminen P, Heikkinen J, Liski J, Mäkipää R, Ilvesniemi H, Sievänen R (2012). The Yasso07 soil carbon model - Testing against repeated soil carbon inventory. Forest Ecology and Management 286:137-147. Available at https://www.sciencedirect.com/science/article/abs/pii/S0378112712005257.

Seljeskog M, Goile F and Skreiberg Ø. 2017. Recommended revisions of Norwegian EFs for wood stoves. *Energy Procedia.* 105: pp.1022–1028.