United Nations

FCCC/ARR/2022/GBR

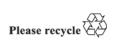Framework Convention on
Climate Change

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Report on the individual review of the annual submission of the United Kingdom of Great Britain and Northern Ireland 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 the United Kingdom of Great Britain and Northern Ireland, 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 19 to 24 September 2022 in Bonn.

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

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Contents

Abbreviations and acronyms

2006 IPCC Guidelines	*2006 IPCC Guidelines for National Greenhouse Gas Inventories*
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
CARBINE	forest carbon stock and carbon balance model
CER	certified emission reduction
CH_4	methane
CM	cropland management
CO_2	carbon dioxide
CO_2 eq	carbon dioxide equivalent
COD	chemical oxygen demand
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
EF	emission factor
ERT	expert review team
ERU	emission reduction unit
FM	forest management
FMRL	forest management reference level
GHG	greenhouse gas
GM	grazing land management
HFC	hydrofluorocarbon
HWP	harvested wood products
IE	included elsewhere
IEF	implied emission factor
IPCC	Intergovernmental Panel on Climate Change
IPPU	industrial processes and product use
KP-LULUCF	activities under Article 3, paragraphs 3–4, of the Kyoto Protocol
KP reporting adherence	adherence to the reporting guidelines under Article 7, paragraph 1, of the Kyoto Protocol
Kyoto Protocol Supplement	*2013 Revised Supplementary Methods and Good Practice Guidance Arising from the Kyoto Protocol*
LULUCF	land use, land-use change and forestry
MMS	manure management system(s)
MSW	municipal solid waste
N	nitrogen
N_2O	nitrous oxide
NA	not applicable
NE	not estimated
Nex	nitrogen excretion
NF_3	nitrogen trifluoride

NFI	national forest inventory
NIR	national inventory report
NO	not occurring
PFC	perfluorocarbon
QA/QC	quality assurance/quality control
RMU	removal unit
RV	revegetation
SCOTIA	soil carbon accounting model
SEF	standard electronic format
SF_6	sulfur hexafluoride
SIAR	standard independent assessment report
SOC	soil organic carbon
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*

I. Introduction

1.   This report covers the review of the 2022 annual submission of the United Kingdom of Great Britain and Northern Ireland, 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 19 to 24 September 2022 in Bonn and was coordinated by Lisa Hanle and Jamie Howland (secretariat). Table 1 provides information on the composition of the ERT that conducted the review for the United Kingdom.

Table 1
Composition of the expert review team that conducted the review for the United Kingdom of Great Britain and Northern Ireland

Area of expertise	Name	Party
Generalist	Carmen Teresa Meneses López	Bolivarian Republic of Venezuela
	Kristina Saarinen	Finland
Energy	Vincent Camobreco	United States
	Ricardo Fernandez	European Union
	Diana Guzman Barraza	Mexico
	Ioannis Sempos	Greece
IPPU	Koen Smekens	Belgium
	Katarina Yaramenka	Sweden
Agriculture	Daniel Bretscher	Switzerland
	Joel Gibbs	New Zealand
	Juan José Rincón Cristóbal	Spain
LULUCF and KP-LULUCF	Signe Kynding Borgen	Denmark
	Thelma Krug	Brazil
	Timothy Paul Liersch	Australia
	Nagmeldin Mahmoud	Sudan
Waste	Fatma Betül Demirok	Türkiye
	Stana Kopranović	Bosnia and Herzegovina
Lead reviewers	Fatma Betül Demirok	
	Ioannis Sempos	

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 the United Kingdom resolve identified findings, including issues[1] designated as problems.[2] Other findings, and, if applicable, the encouragements of the ERT to the United Kingdom to resolve related issues, are also included in this report.

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[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.

4.   A draft version of this report was communicated to the Government of the United Kingdom, which provided no comments.

5.   Annex I presents the annual GHG emissions of the United Kingdom, 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 the United Kingdom of Great Britain and Northern Ireland

Assessment			Issue/problem ID#(s) in table 3 or 5[a]
Dates of submission	Original submission: NIR, 14 April 2022; CRF tables (version 1), 14 April 2022; SEF tables, 14 April 2022		
	Revised submission: CRF tables (version 2), 11 May 2022		
	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	L.2
	(c) Development and selection of EFs?	No	
	(d) Collection and selection of AD?	Yes	E.2, E.4, A.7, L.5, W.2, W.5, W.7, KL.2
	(e) Reporting of recalculations?	No	
	(f) Reporting of a consistent time series?	Yes	I.7, A.3, L.3, L.24
	(g) Reporting of uncertainties, including methodologies?	Yes	G.3, A.2
	(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	A.1, L.8
	(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?	Yes	
Supplementary information under	Have any issues been identified related to the following aspects of the national system:		

Assessment			Issue/problem ID#(s) in table 3 or 5[a]
the Kyoto Protocol	(a) Overall organization of the national system, including the effectiveness and reliability of the institutional, procedural and legal arrangements?	No	
	(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?	No	G.2
Adjustments	Has the ERT applied any adjustments under Article 5, paragraph 2, of the Kyoto Protocol?	NA	
	Has the Party submitted a revised estimate to replace a previously applied adjustment?	NA	The United Kingdom 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	

Assessment			*Issue/problem ID#(s) in table 3 or 5[a]*
Questions of implementation	Did the ERT list any questions of implementation?	No	

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[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 1 March 2022,[3] and had not been resolved by the time of publication of the report on the review of the Party's 2021 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 the United Kingdom of Great Britain and Northern Ireland

ID#	Issue/problem classification[a, b]	Recommendation from previous review report	ERT assessment and rationale
General			
G.1	National registry (G.10, 2021) KP reporting adherence	Make information related to the national registry publicly available and provide the correct link in the next annual submission.	Resolved. The Party reported in its NIR (p.584) that publicly accessible information is available from the United Kingdom's registry via the Kyoto Protocol Public Reports page at https://view-emissions-trading-registry.service.gov.uk/kp-reports.
Energy			
E.1	1. General (energy sector) – CO_2, CH_4 and N_2O (E.1, 2021) (E.1, 2019) (E.1, 2017) (E.20, 2016) (E.20, 2015) Transparency	Clearly indicate the geographical coverage of the Digest of United Kingdom Energy Statistics and demonstrate how fuel consumption data at the subcategory level for each overseas territory and Crown dependency are obtained and incorporated into the national totals for that subcategory.	Not resolved. The Party continued to report in its NIR (annex A3.6, pp.971–977) the amount of fuel use in overseas territories and Crown dependencies by fuel type and the information was not disaggregated at the subcategory level. During the review, the Party clarified that AD on fuel consumption at the subcategory level were included for individual overseas territories and Crown dependencies where available. The ERT considers that the recommendation has not yet been addressed because the Party did not provide more information than that reported in the 2021 submission and has not yet demonstrated how fuel consumption data at the subcategory level for each overseas territory and Crown dependency are obtained and incorporated into the national totals for that subcategory. The ERT notes that this issue does not affect the overall accuracy of the emission estimates for the energy sector and is limited to the transparency of allocating and reporting information at the subcategory level.
E.2	1.A Fuel combustion – sectoral approach – biomass fuels – CO_2, CH_4 and N_2O (E.9, 2021) Comparability	Describe in the NIR how much biogas is blended with natural gas, consider ways of reporting AD on and related CO_2, CH_4 and N_2O emissions from biogas separately under biomass, ensuring that any changes do not affect the accuracy of the reporting on CH_4	Addressing. The Party clearly reported in its NIR (pp.146–147) that a small percentage of biogas is incorporated into the United Kingdom's natural gas grid and that the associated CO_2 emissions are split between gaseous fuels and biomass under the relevant subcategories in the CRF tables. However, all AD and non-CO_2 emissions are reported under gaseous fuels of the relevant subcategory. The method statements in the NIR reflect the current estimates in the CRF tables.

[3] FCCC/ARR/2021/GBR.

ID#	Issue/problem classification[a, b]	Recommendation from previous review report	ERT assessment and rationale
		and N$_2$O emissions, and update the NIR section on biomass (section 3.2.5) and the relevant method statements accordingly.	During the review, the Party clarified that it will consider how to appropriately represent blended fuels for future annual submissions.
			The ERT considers that the recommendation has not yet been fully addressed because the Party has not yet reported AD on and CH$_4$ and N$_2$O emissions from biogas separately under biomass in the relevant CRF tables or provided relevant documentation in the NIR and method statements.
E.3	1.A.1.a Public electricity and heat production – biomass fuels – CO$_2$, CH$_4$ and N$_2$O (E.10, 2021) Transparency	Enhance the transparency of allocation and reporting of recovered CH$_4$ originating from the waste sector that is used in the energy sector.	Resolved. The Party reported in its NIR (p.437) how waste management, waste disposal and waste utilization are considered and interact among the waste, energy and agriculture sectors, and where waste management, disposal and utilization are reported in the inventory. Specifically, the United Kingdom has introduced a new section to the NIR (pp.437–446, "Waste Related Activities Reported In Other Sectors"), which includes a discussion of how CH$_4$ recovery data related to biogas fuel use are treated in the inventory.
E.4	1.A.3.e.ii Other (other transportation) – liquid fuels – CO$_2$, CH$_4$ and N$_2$O (E.4, 2021) (E.25, 2019) Accuracy	Evaluate the relevance of the current equipment data used in the 2004 model for estimating off-road emissions, and on the basis of the results of the evaluation, either document in the NIR how the model still reflects current circumstances or make efforts to update the model and report on progress in the NIR.	Addressing. The Party continues to apply the same equipment data used in the 2004 model for estimating off-road emissions in the 2022 annual submission. The Party reported in its NIR planned improvements section of Method Statement 6 (p.178) that it is conducting "a detailed Government-supported machinery population and usage survey with industry stakeholders and evaluating the findings for their potential use in the inventory. This project is at an advanced stage and initial results are being shared with stakeholders to gain their feedback. Depending on the outcome of the review, a decision will then be made on a timetable and approach for implementing the agreed data into an updated version of the off-road machinery model".
			During the review, the Party clarified that the model for estimating off-road emissions has been extended to include agricultural machinery and it expects to integrate the results arising from this extension into the 2023 submission. The ERT notes that the United Kingdom undertakes fuel reconciliation procedures, which ensure that all gas oil is accounted for, so this issue does not lead to concerns about the accuracy of total fuel consumption.
			The ERT considers that the recommendation has not yet been addressed because the Party has not yet updated the model for estimating off-road emissions to reflect recent data for all types of off-road vehicles and machinery or documented that the current model sufficiently reflects current national circumstances. The Party did not report in the NIR its progress in updating the model to incorporate agricultural machinery.
E.5	1.B.2 Oil, natural gas and other emissions from energy production – all fuels – CO$_2$ and CH$_4$ (E.7, 2021) (E.18, 2019)	Describe in the NIR the coverage of the AD, methods and EFs for estimating emissions from well drilling, well testing and well completions in oil and natural gas exploration and clarify whether these emissions are reported under category 1.A	Resolved. The Party included in its NIR a new annex 3 section (p.789), which has a description of the AD, methods and EFs for estimating upstream oil and gas production emissions. The description covers the split between fuel combustion and fugitive emissions, including emissions from well drilling, well testing and well completions in oil and gas exploration. Method Statement 18 summarizes the data, methods and results from the recently completed United Kingdom Oil and Gas Inventory Improvement

ID#	Issue/problem classification[a, b]	Recommendation from previous review report	ERT assessment and rationale
(E.27, 2017) Accuracy		(fuel combustion activities) or 1.B (fugitive emissions from fuels).	project (Thistlethwaite et al., 2022). Further methodological details by category are provided in annex A3.1.6, including details of each source reported under category 1.B.2.a.1 (oil exploration) and category 1.B.2.b.1 (gas exploration).
E.6	1.B.2.b Natural gas – gaseous fuels – CO_2 and CH_4 (E.8, 2021) (E.21, 2019) (E.29, 2017) Completeness	Estimate and report CO_2 and CH_4 emissions from exploratory activities or, if they are considered insignificant, report them as "NE" and justify that the likely level of emissions is below the significance threshold established in paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines.	Resolved. A new minor source was added under category 1.B.2.a.1 (oil exploration) across the entire time series incorporating the method from the 2019 Refinement to the 2006 IPCC Guidelines (vol. 2, chap. 4, pp.49–51) to estimate emissions from onshore oil well exploration (NIR p.229). The Party also estimated fugitive CO_2 and CH_4 emissions from unconventional gas well drilling activities during the period in which they occurred (2010–2020). For 2020, 0.07 kt CH_4 emissions and 6.26 kt CO_2 emissions were estimated for this category.

IPPU

ID#	Issue/problem classification[a, b]	Recommendation from previous review report	ERT assessment and rationale
I.1	2. General (IPPU) – N_2O (I.1, 2021) (I.14, 2019) Transparency	On page 236 of the NIR, correct the information stating that N_2O emissions from nitric acid production and adipic acid production were reported together for 1990–1994 under category 2.B.3 (adipic acid production) to clarify that these emissions have been reported separately for the entire time series in CRF table 2(I)s1.	Not resolved. No changes have been made since the 2021 submission. The NIR (p.272) of the 2022 submission does not contain information stating that N_2O emissions from nitric acid production and adipic acid production were reported together for 1990–1994 under category 2.B.3 (adipic acid production). The text continues to explain only that emissions of nitrogen oxides from nitric acid production and adipic acid production are reported together under category 2.B.3 for 1990–1994.
			During the review, the Party clarified that N_2O emissions from nitric acid production and from adipic acid production at the considered facility are reported separately in CRF table 2(I).A-Hs1 for the entire time series, and that this information will be added to the NIR of the 2023 submission.
I.2	2. General (IPPU) – all gases (I.26, 2021) Transparency	Report recalculations or reallocations of emissions in accordance with paragraphs 43–45 of the UNFCCC Annex I inventory reporting guidelines.	Resolved. The ERT reviewed the explanations of the recalculations provided in the NIR of the 2022 submission and noted that the issues identified as not reported in compliance with the UNFCCC Annex I inventory reporting guidelines in the NIR of the 2021 submission (according to document FCCC/ARR/2021/GBR) have been fully addressed. This concerns documentation of recalculations in sections 4.5.5, 4.13.5, 4.34.5, 4.35.5, 4.36.5 and 4.42.5 of the NIR. The ERT noted that the Party documented significant recalculations in the "Source specific recalculation" sections of the NIR and used the wording "no significant recalculations" rather than "no recalculations" for minor recalculations. Furthermore, the Party summarized its explanations of non-minor recalculations in NIR tables 10.1–10.14.
			During the review, the Party expressed its intention to continue to review how recalculations are presented in the NIR.
I.3	2.A.4 Other process uses of carbonates – CO_2 (I.6, 2021) (I.17, 2019) Comparability	Report CO_2 emissions from stone wool production under subcategory 2.A.4.d (other) along with emissions from other sources currently reported under that category to avoid disclosing confidential data, or, if the	Resolved. The Party explained in NIR table 10.16 that an analysis of alternative approaches for reporting CO_2 emissions from stone wool production found that the number of facilities is too small to mask confidential data, if reported under category 2.A.4.d (other (other process uses of carbonates)), therefore, the Party continues to report these emissions under category 2.A.3 (glass production). Taking into

ID#	Issue/problem classification[a, b]	Recommendation from previous review report	ERT assessment and rationale
		number of facilities reporting under that category is insufficient to enable the confidential data from stone wool producers to be masked, report them at an aggregated level under one of the other categories under the mineral industry and use the appropriate notation key under subcategory 2.A.4.d, if needed, providing a relevant explanation in the NIR as to where emissions are reported.	consideration other options for following the recommendation and reporting emissions from stone wool production at an aggregated level under one of the other categories of the mineral industry (2.A.1 (cement production), 2.A.2 (lime production), 2.A.4.a (ceramics), 2.A.4.b (other uses of soda ash) or 2.A.4.c (non-metallurgical magnesium production)), the ERT agrees with the Party's judgment that reporting of emissions from stone wool production under category 2.A.3 is the most sensible option. The NIR (pp.254 and 515) clearly specifies that emissions from stone wool production are reported under category 2.A.3.
I.4	2.A.4 Other process uses of carbonates – CO_2 (I.8, 2021) (I.19, 2019) Transparency	Complete the ongoing study on the non-glass uses of soda ash in the country and estimate and report CO_2 emissions from sodium bicarbonate use under subcategory 2.A.4.d (other) as well as update the NIR to include the relevant AD, EF and methods used for estimating these emissions.	Addressing. The estimated CO_2 emissions from sodium bicarbonate use under subcategory 2.A.4.d (other (other process uses of carbonates)) and the AD used in the estimation are reported in CRF table 2(I)A-Hs1 under category 2.A.4.d (other (other process uses of carbonates)). The Party explained in its NIR (p.258) that emissions from soda ash use in applications other than glass production are included under category 2.A.4.b (other uses of soda ash) while emissions from the subsequent use of sodium bicarbonate are included under category 2.A.4.d. The NIR (p.264) clarifies that emissions from sodium bicarbonate use for flue gas desulfurization are reported under category 1.B.2.d (other (oil, natural gas and other emissions from energy production)). The EFs for soda ash use and for sodium bicarbonate use are reported in the NIR (p.263); however, the relevant AD are not.

During the review, the Party explained that the inclusion in the NIR of AD on soda ash use and on sodium bicarbonate use will be addressed for the 2023 submission.

The ERT considers that the recommendation has not yet been fully addressed because the Party has not yet included the AD for estimating CO_2 emissions from sodium bicarbonate in the NIR. |
| I.5 | 2.A.4 Other process uses of carbonates – CO_2 (I.9, 2021) (I.20, 2019) Completeness | Estimate CO_2 emissions from ceramic products other than bricks either by using the assumption that the clay consumption of these products is on average 11 per cent of the clay consumption of brick production, according to the available data for 2008–2012, or by applying a country-specific method (e.g. based on the AD for clay consumption for different applications as provided in the *United Kingdom Minerals Yearbook 2018*), and report these emissions under subcategory 2.A.4.a (ceramics). | Resolved. The Party reported CO_2 emissions from the use of clay for the production of ceramics other than bricks under category 2.A.4.a (ceramics) in CRF table 2(I).A-Hs1. The NIR (pp.257 and 260–261) provides details on the method applied to estimate the emissions and the EFs used. The resulting increase in CO_2 emissions for 2019 for category 2.A.4.a is 33.17 kt (9.8 per cent) compared with the level of emissions reported for 2019 for this category in the 2021 submission. |

ID#	Issue/problem classification[a, b]	Recommendation from previous review report	ERT assessment and rationale
I.6	2.A.4 Other process uses of carbonates – CO_2 (I.27, 2021) Transparency	Update the descriptions of the emissions from sodium bicarbonate use and their allocation in the inventory.	Resolved. The Party corrected the text about allocation of emissions from sodium bicarbonate use. In the NIR (pp.258 and 264) it explained that these emissions are included partly under category 2.A.4.d (other (other process uses of carbonates)) and partly under category 1.B.2.d (flue gas desulfurization (other)).
I.7	2.B Chemical industry – CO_2 (I.10, 2021) (I.21, 2019) Consistency	Use the standard splicing techniques in the 2006 IPCC Guidelines (vol. 1, chaps. 5.5.3.1–5.5.3.4) to fill the gaps of AD and CO_2 emissions for categories 2.B.6 (titanium dioxide production) for 1990–1998, 2.B.7 (soda ash production) for 1990–1998, 2.B.8.a (petrochemical and carbon black production (methanol)) for 1990–1997, 2.B.8.d (petrochemical and carbon black production (ethylene oxide)) for 1990–1995 and 2.B.8.f (petrochemical and carbon black production (carbon black)) for 1990–1998, revise the CO_2 emission estimates accordingly, and explain in the NIR which techniques were used to fill the gaps (e.g. the ERT considers that the surrogate data or overlap approach may be appropriate for developing a consistent time series). If it is not possible to apply the standard splicing techniques, follow the 2006 IPCC Guidelines (vol. 1, chaps. 5.3.3.5–5.3.3.6) and apply an alternative technique for splicing, providing an explanation in the NIR as to why the standard techniques are not valid, documenting the alternative technique applied and comparing the results with one of the standard techniques contained in the 2006 IPCC Guidelines.	Addressing. The Party continued to report constant emissions from the production of titanium dioxide (1992–1998), soda ash (1990–1998), methanol (1990–1997), ethylene oxide (1990–1995) and carbon black (1990–1998). The ERT noted that for titanium dioxide an update was made in the 2021 annual submission, resulting in consistent reporting of emissions only for 1992–1998. In the 2021 NIR table 10.4.1, the Party reported that it considered the issue resolved, noting that several potential splicing techniques were tested but deemed inappropriate – in particular, the interpolation and overlap technique. Regarding trend extrapolation, the Party noted that the trend in emissions for each category is thought to be non-linear, meaning that extrapolation should not be used. The surrogate data approach is deemed by the Party to be more appropriate. In an effort to apply the surrogate data approach, several potential surrogate data sets were tested (production, export, financial data, general financial and physical indices of chemical production), but according to the Party, these data sets have low correlation compared with the current approach (plant capacity as surrogate).

In the 2022 NIR table 10.4.1, and as confirmed during the review, the Party clarified that improvements in reporting AD and CO_2 emissions for this category are under way and expected to be implemented for the 2023 submission.

The ERT considers that the recommendation has not yet been fully addressed because the Party has not yet either applied one of the standard splicing techniques contained in the 2006 IPCC Guidelines or applied and justified the use of an alternative technique in accordance with the 2006 IPCC Guidelines. |
| I.8 | 2.B.1 Ammonia production – CH_4 and N_2O (I.11, 2021) (I.22, 2019) Accuracy | Either avoid the double counting between categories 2.B.1 and 2.B.10 other (chemical industry) or explain in the NIR that double counting of the emissions may occur between these categories. | Resolved. The Party clearly explained in its NIR (pp.265–267) the nature of the potential double counting between categories 2.B.1 (ammonia production) and 2.B.10 (other (other chemical production)), stating that CH_4 emissions from steam reforming processes are reported partly under category 2.B.1 and partly under category 2.B.10. N_2O emissions from natural gas combustion in ammonia production are estimated and reported under category 2.B.1. According to the NIR (p.281), the Party reports CH_4 emissions from general petrochemical processes under category 2.B.10; data on these emissions are obtained from the plant operator reports submitted to national regulators (NIR p.267). CH_4 emissions are reported together with process emissions from other |

ID#	Issue/problem classification[a, b]	Recommendation from previous review report	ERT assessment and rationale
			chemical plants; these operator-reported emissions may include estimates of CH_4 emissions from fuel combustion and hence there is a small risk of double counting in emissions reported between categories 2.B.1 and 2.B.10. The Party has decided that removing the CH_4 emissions from category 2.B.1 could lead to a possible omission in reporting CH_4 emissions, as it is not certain that operators would include CH_4 emissions from combustion in their reports to national regulators, so the approach used in the 2022 submission was deemed most conservative given the available information.
I.9	2.B.1 Ammonia production – CH_4 and N_2O (I.12, 2021) (I.22, 2019) Transparency	Provide in the NIR a description of the methodology used for estimating CH_4 and N_2O emissions from ammonia production reported under category 2.B.1 and provide the correct reference (i.e. to category 2.B.1 instead of 2.B.10) in CRF table 2(I).A-Hs1, where these emissions are reported.	Resolved. The Party provided in the NIR (p.267) a detailed description of the methodology used for estimating emissions of CH_4 and N_2O from ammonia production and correctly identified under which categories they are reported (2.B.1 and 2.B.10).
I.10	2.C.1 Iron and steel production – CO_2 (I.15, 2021) (I.25, 2019) Comparability	Reallocate CO_2 emissions from iron and steel production related to the use of blast furnace gas, coke oven coke, fluxing agents, fuel oil and coal from the energy sector to the IPPU sector in accordance with the 2006 IPCC Guidelines (vol. 3, chap. 4).	Resolved. The Party reported in NIR table 10.16 and in Method Statement 3 and Method Statement 4 that CO_2 emissions from blast furnace gas and coke oven gas used at integrated iron and steel plants and fuel used in blast furnaces (except for fuel oil and coal, which the Party has concluded are used for energy purposes) have been reallocated from category 1.A.2.a (iron and steel) of the energy sector to category 2.C.1.b (pig iron (iron and steel production)) of the IPPU sector. The ERT considers that this allocation is in accordance with the 2006 IPCC Guidelines (vol. 3, chap. 4) in terms of the transparency of reporting for iron and steel production. See also ID# I.14 in table 5.
I.11	2.F.1 Refrigeration and air conditioning – HFCs (I.28, 2021) Transparency	Include in the NIR the tier level of the methodology for estimating emissions for subcategory 2.F.1.	Resolved. The Party reported in its NIR (p.301) that a tier 2a approach is used for estimating emissions for this category.
I.12	2.G.2 SF_6 and PFCs from other product use – SF_6 and PFCs (I.25, 2021) (I.13, 2019) (I.24, 2017) Accuracy	Continue to include in the improvement plan the need for an update of the AD, based on actual consumption, for the estimation of SF_6 and PFC emissions from semiconductor manufacture and report any progress thereon in the NIR.	Resolved. The Party explained in its NIR (p.332) that it has recently revised a semiconductor model with the primary purpose of improving the AD needed for estimating SF_6 and PFC emissions from semiconductor manufacture. As a result of this revision, SF_6 and PFC emissions for category 2.G.2 have been recalculated for the entire time series. The methodology used to estimate emissions for the 2022 submission is described in the NIR (pp.327–331) and the assumptions made about the AD (sector growth rates) are explained (p.328). In particular, in the 2022 submission, it is assumed that semiconductor production is constant from 2001 onward (p.328), while in the previous version of the semiconductor model a 10 per cent growth rate after 2010 was assumed (p.332); this, together with updated assumptions on abatement rates, justifies the increasing differences in emissions from 2010 to 2019 between the 2021 and 2022 submissions. The assumptions in the current version of the model have been revised and updated on the basis of consultations with stakeholders in the semiconductor industry and other stakeholders such as trading bodies.

ID#	Issue/problem classification[a, b]	Recommendation from previous review report	ERT assessment and rationale
			During the review, the Party provided a very detailed explanation of the assumptions made in the updated model, as well as of the recalculations and on the trends in the SF_6 and PFC emissions. The ERT concludes that the assumptions made are reasonable, and that the recalculations are justified.
			The ERT acknowledges the improvements made to the model, the reporting on progress in the NIR and the Party's intention to continue with stakeholder consultations in order to make further improvements over time. The ERT concludes that with the existing update to the model, the recommendation is resolved.

Agriculture

ID#	Issue/problem classification[a, b]	Recommendation from previous review report	ERT assessment and rationale
A.1	3. General (agriculture) – CO_2, CH_4 and N_2O (A.1, 2021) (A.1, 2019) (A.6, 2017) Completeness	Estimate and report emissions for categories 3.F, 3.G and 3.H for overseas territories and Crown dependencies or, if they are considered insignificant, report them as "NE" and provide a detailed explanation in the NIR on the likely level of emissions for categories 3.F, 3.G and 3.H for overseas territories and Crown dependencies in accordance with paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines.	Addressing. The Party included in its NIR a new section (section 5.10, pp.378–380) on agriculture emissions in the overseas territories and Crown dependencies, which includes a short section that addresses reporting for categories 3.F (field burning of agricultural residues), 3.G (liming) and 3.H (urea application). However, the Party has not yet provided in the NIR the information outlined in the recommendation in a sufficiently transparent manner to allow the ERT to be sure of its completeness.
			During the review, the Party confirmed that the status of data availability for the overseas territories and Crown dependencies has not changed.
			The ERT concludes that the likely level of the total amount of emissions not estimated is below the threshold of significance for the United Kingdom (202.42 kt CO_2 eq for 2020) for the application of an adjustment in accordance with decision 22/CMP.1, annex, paragraph 80(b), in conjunction with decision 4/CMP.11, and therefore not included in the list of potential problems and further questions raised.
			The ERT considers that the issue could be resolved by providing, for example, in tabular format (1) the areas of the Isle of Man and the Falkland Islands (Malvinas), as well as the combined area of all other overseas territories and Crown dependencies, and (2) the total amount of emissions reported for these three areas. In addition, a list of all categories that are currently not estimated could be provided for each of these three areas with an indication of the magnitude of emissions involved.
A.2	3. General (agriculture) – CO_2, CH_4 and N_2O (A.2, 2021) (A.10, 2019) Convention reporting adherence	Update the uncertainty analysis for all categories, including enteric fermentation, for which significant data or methodological changes have occurred since the previous uncertainty analysis was conducted.	Addressing. The Party reported in its NIR (pp.351 and 369) that it made some updates to the uncertainty analysis but that, owing to time constraints, the uncertainty analysis was not updated to fully reflect the changes to uncertainty arising from the use of new methods and data for estimating emissions from agriculture in the 2022 annual submission. Accordingly, the Party stated in the NIR (pp.352 and 361) that uncertainties will be updated to fully reflect the changes to uncertainty arising from the use of new methods and data for estimating emissions from agriculture.
			During the review, the Party confirmed that the updates of the uncertainty estimates are on track for inclusion in the 2023 annual submission, except uncertainties for beef cattle, data for which are expected to be available by the end of the third quarter of 2022.

ID#	Issue/problem classification[a, b]	Recommendation from previous review report	ERT assessment and rationale
			The ERT considers that the recommendation has not yet been fully addressed because the Party has not yet fully updated its uncertainty analysis for all categories, including enteric fermentation, for which significant data or methodological changes have been made since the previous uncertainty analysis was conducted.
A.3	3. General (agriculture) – CH_4 and N_2O (A.3, 2021) (A.12, 2019) Accuracy	Improve the accuracy of emission estimates for enteric fermentation, manure management and agricultural soils reported for the Crown dependencies by applying a splicing technique (e.g. extrapolation) from the 2006 IPCC Guidelines (vol. 1, chap. 5) to estimate the IEFs for the Crown dependencies instead of maintaining a constant IEF in years for which updated United Kingdom IEFs are not available in sufficient time to apply them to the emission estimates for the Crown dependencies.	Not resolved. During the review, the Party clarified that the issue outlined in the recommendation continues to be an issue in the 2022 submission and that considerable efforts will need to be made to update the IEFs for the next annual submission. The Party included in its NIR a new section (section 5.10, pp.378–380) on agriculture emissions in the overseas territories and Crown dependencies, in which it mentions several planned improvements concerning the reporting of emissions for overseas territories and Crown dependencies. The ERT concludes that given the area and economic activities present in the overseas territories and Crown dependencies and the share of these activities already covered by the current reporting, any potential underestimation of emissions arising from the reporting is likely to be below the threshold of significance for the United Kingdom (202.42 kt CO_2 eq for 2020) for the application of an adjustment in accordance with decision 22/CMP.1, annex, paragraph 80(b), in conjunction with decision 4/CMP.11, and therefore not included in the list of potential problems and further questions raised.
A.4	3. General (agriculture) – CH_4 and N_2O (A.13, 2021) Convention reporting adherence	Implement general QC procedures in accordance with the QA/QC plan to avoid errors in future annual submissions such as the error found in the 2021 submission in the conversion of the uncertainty estimates for categories 3.B (manure management) and 3.D (agricultural soils) to percentages, where the value was divided by the range maximum rather than by the mean, causing these estimates to be underestimated.	Resolved. The Party reported in its NIR (p.533) that the model used to transpose uncertainty parameters from the agriculture sector uncertainty outputs to the United Kingdom approach 1 uncertainties model has been corrected. Furthermore, the Party stated in its NIR (p.724) that within-model documentation has been added to minimize the risk of such errors. The ERT confirms that the error found in the 2021 annual submission has been corrected, suggesting that general QC procedures have been implemented.
A.5	3. General (agriculture) – CH_4 and N_2O (A.15, 2021) Transparency	Clearly report the methodology used to estimate emissions for each of the overseas territories and Crown dependencies in the relevant section of the NIR and ensure that this information is consistent across the NIR, including clearly stating that there are no agriculture activities in Gibraltar.	Addressing. The Party included in its NIR a new section (section 5.10, pp.378–380) on agriculture emissions in the overseas territories and Crown dependencies, in which several planned improvements concerning the reporting of emissions for overseas territories and Crown dependencies are mentioned. However, the ERT still considers that AD and EFs are not reported transparently in their current state. Furthermore, the ERT could not find any new information in the NIR clearly stating that there are no agriculture activities in Gibraltar. During the review, the Party clarified that it continues to implement improvements in the agriculture sector for overseas territories and Crown dependencies. The ERT considers that the recommendation has not yet been fully addressed. The ERT also considers that the issue could be resolved by providing separate AD and EFs for

ID#	Issue/problem classification[a, b]	Recommendation from previous review report	ERT assessment and rationale
			each of the overseas territories and Crown dependencies, for example, in tabular format in the NIR and/or by integrating data on emissions for overseas territories and Crown dependencies into the CRF tables (see also ID# A.15 below).
A.6	3. General (agriculture) – CH_4 and N_2O (A.16, 2021) Transparency	Until a more transparent way of reporting emissions for overseas territories and Crown dependencies in the CRF tables is determined, enhance the transparency of reporting by correcting the CRF table references in the agriculture section of the NIR (the N_2O emissions from agricultural soils were said to be reported in CRF table 3.G (liming) but were actually reported in 3.G-I).	Resolved. The Party added in its NIR a new section (section 5.10, pp.378–380) on agriculture emissions in the overseas territories and Crown dependencies. Therein, the Party reported that in the CRF tables, all emission data for overseas territories and Crown dependencies are reported under category 3.J (other).
A.7	3.B Manure management – CH_4 and N_2O (A.4, 2021) (A.13, 2019) Accuracy	Estimate the animal distribution in composting and digester MMS to estimate CH_4 and N_2O emissions from manure management, using expert judgment to estimate the animal distribution in both MMS until such time that country-specific data are available for inclusion in the submission.	Addressing. The ERT noted that CH_4 and N_2O emissions from digesters have been reported by the Party since the 2021 submission. In the 2022 submission, quantities of manure being processed by anaerobic digestion, by livestock type and the relevant methane conversion factors have been included in the NIR (pp.354, 842 and 845). However, similar information for composting was not reported in the NIR or CRF table3.B(a)s2.
			During the review, the Party clarified that a review of composting AD is under way and that until the results are available, the respective emissions will continue to be reported as "NE".
			The ERT considers that the recommendation has not yet been fully addressed because the Party has not yet estimated CH_4 and N_2O emissions from composting separately. However, the ERT concludes that this issue does not lead to an underestimation in emissions large enough to exceed the threshold of significance for the United Kingdom (202.42 kt CO_2 eq for 2020) for the application of an adjustment in accordance with decision 22/CMP.1, annex, paragraph 80(b), in conjunction with decision 4/CMP.11, and therefore not included in the list of potential problems and further questions raised. Separate reporting of manure being composted would lead to lower overall emissions from manure management, especially CH_4 emissions, as methane conversion factors for composting are lower than for most other manure management systems, in particular with respect to solid storage and liquid systems. The actual difference in N_2O emissions would depend on the management system, but any underestimation would be small and the impact on overall emissions negligible and below the threshold.
A.8	3.B Manure management – CH_4 and N_2O (A.17, 2021) Transparency	Include the methane conversion factor for anaerobic digestion in NIR table 3.3.3 and include in the NIR details on and a reference for the methane conversion factor used for manure managed in digesters for cattle, pig	Resolved. The Party reported in its NIR (p.354) and in NIR table A3.3.3 that the methane conversion factors used for anaerobic digestion of livestock manure are based on the values used in the German inventory. The methane conversion factors for

ID#	Issue/problem classification[a, b]	Recommendation from previous review report	ERT assessment and rationale
		and poultry manure provided during the review.	anaerobic digestion for cattle, pig and poultry manure are reported in NIR table A3.3.3. The values are consistent with the values in CRF table 3.B(a)s2.
A.9	3.B Manure management – N_2O (A.18, 2021) Transparency	Include a summary in the NIR of the research and justification used to determine the different MMS used in the United Kingdom, together with the relevant references.	Resolved. The Party provided in its NIR (pp.356–357 and 864–865) a comprehensive summary of the research, including relevant references, and justification applied in determining the MMS used in the United Kingdom.
A.10	3.B Manure management – N_2O (A.18, 2021) Transparency	Clarify the data source, methodology used and references for the country-specific N_2O EFs in the NIR	Resolved. The Party reported in its NIR (pp.356–357) and in NIR tables A3.3.6(c–d) the data sources, methodologies and references used in developing the country-specific N_2O EFs for manure management. United Kingdom data relating to direct N_2O emissions from manure management were reviewed as part of a Department for Environment, Food and Rural Affairs project (AC0114) (Topp et al., in preparation). Country-specific EFs are derived from United Kingdom measurements, as described in documents available on request and summarized in *N_2O Emission Factors for Manure Management in UK Agriculture* (Misselbrook, 2017).
A.11	3.B.4 Other livestock – N_2O (A.6, 2021) (A.14, 2019) Transparency	Include in the NIR an explanation of the poultry manure management practice and the final destination of the manure.	Resolved. The Party reported in its NIR (p.357) an explanation of the poultry manure management practice and the final destination of the manure. Manure types going to incineration are assumed to be broiler and turkey litter and the reported quantities incinerated are converted to a proportion of the total manure for these poultry categories on the basis of estimated manure output per bird. Quantities incinerated are given in NIR table A3.3.6(a) and quantities exported from Northern Ireland to England and Scotland in NIR table A3.6.6(b). The quantities incinerated are deducted from the AD prior to the calculation of emissions from manure spreading on land.
A.12	3.D.a.2 Organic N fertilizers – N_2O (A.19, 2021) Transparency	Include in the NIR references for all assumptions made for managed manure N applied to grassland and cropland, whether it be a published reference, a reference or report under preparation, or simply expert judgment.	Resolved. The Party provided in its NIR (pp.364–365) references for the sources of data underpinning the assumptions applied in the United Kingdom inventory regarding managed manure N applied to grassland and cropland.
A.13	3.D.a.3 Urine and dung deposited by grazing animals – N_2O (A.20, 2021) Transparency	Include in future annual submissions a summary of how the country-specific N_2O EFs for sheep urine and dung were determined, including references.	Resolved. The Party reported in its NIR (p.367) a summary of how the country-specific N_2O EFs for sheep urine and dung were determined. According to the 2006 IPCC Guidelines (vol. 4, chap. 11, table 11.1), the N_2O EF for sheep excreta is 50 per cent of the value of the EF for cattle excreta. This EF is supported, for sheep urine, by mean EF values in the 2019 Refinement to the 2006 IPCC Guidelines (vol. 4, chapter 11, table 4A.1, wet climates), while the EF for sheep dung in the same table is less than 50 per cent of the value of the EF for cattle dung (0.04 per cent for sheep compared with 0.13 per cent for cattle). On the basis of this information, the United Kingdom derived N_2O EFs for sheep urine and dung by halving the country-specific values for cattle urine and dung.

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A.14	3.D.a.6 Cultivation of organic soils (i.e. histosols) – N$_2$O (A.7, 2021) (A.8, 2019) (A,8, 2017) Transparency	Provide in the NIR an explanation and further supporting evidence for the classification of organic soils in the Falkland Islands (Malvinas) as unmanaged and explain why the areas of organic soils in overseas territories and Crown dependencies are not included as a contributing source to N$_2$O emissions from the cultivation of organic soils.	Addressing. The Party reported in its NIR (p.379) that it understands managed organic soils are present only in the Falkland Islands (Malvinas) and the Isle of Man and absent from all other overseas territories and Crown dependencies. For the Isle of Man, N$_2$O emissions from managed organic soils were included for the first time in the 2022 submission. For the Falkland Islands (Malvinas), the Party reported in the NIR (p.379) that despite there being a very large area of grassland histosols, N$_2$O emissions from managed histosols are reported only for cropland areas.
			During the review, the Party clarified that the soil map for the Falkland Islands (Malvinas) has been updated (see https://data.saeri.org/saeri_webgis/lizmap/www/index.php/view/map/?repository=o5f07 2020&project=soil_mapping_webremote_wu) and was published in early 2022 as an output of the Darwin Plus project DPLUS083 funded by the United Kingdom Government (final report available at https://dplus.darwininitiative.org.uk/documents/DPLUS083/26056/DPLUS083%20FR% 20-%20edited.pdf). The map overlays show that the majority of soils in the Falkland Islands (Malvinas) are highly organic (greater than 35 per cent organic matter) even if they are not classified as full histosols. They are also relatively shallow, with the majority of peat being less than 40 cm in depth. The Party explained that the livestock-based agriculture sector relies on grazing of extensive rangelands; these are not drained, and they do not receive inputs of liming and fertilizer owing to the very high cost of importation of these products. Accordingly, the United Kingdom considers these soils as not being a source of N$_2$O emissions and that the tier 1 estimation of N$_2$O emissions from drained organic soils in the Falkland Islands (Malvinas) conducted by the Food and Agriculture Organization of the United Nations is oversimplified and cannot be applied to estimate emissions for this category.
			The ERT, while agreeing with the explanation provided by the Party during the review as to why the areas of organic soils in overseas territories and Crown dependencies are not included as a contributing source of N$_2$O emissions from the cultivation of organic soils, considers that the recommendation has not yet been fully addressed because the Party has not yet documented in the NIR references to the soil maps and accompanying information or alternative, relevant evidence for the classification of organic soils in the Falkland Islands (Malvinas) as unmanaged. The ERT also considers that the Party may want to consult the respective methodologies applied by Iceland because the climatic zone may be comparable with that of the Falkland Islands (Malvinas).
A.15	3.J Other (CO$_2$ emissions from liming, urea application and other carbon-containing fertilizers) – CO$_2$, CH$_4$ and N$_2$O	Report emissions from overseas territories and Crown dependencies in the respective categories (3.A (enteric fermentation), 3.B (manure management), 3.D (direct and indirect N$_2$O emissions from agricultural	Addressing. The Party included in its NIR a new section (section 5.10, pp.378–380) on agriculture emissions in the overseas territories and Crown dependencies, in which it mentions several planned improvements concerning the reporting of emissions for overseas territories and Crown dependencies.
			During the review, the Party clarified that it continues to discuss how changes might be made to make it more feasible to integrate data for overseas territories and Crown

ID#	Issue/problem classification[a, b]	Recommendation from previous review report	ERT assessment and rationale
	(A.8, 2021) (A.15, 2019) Comparability	soils), 3.G (liming) and 3.H (urea application)).	dependencies with data for the rest of the United Kingdom for agriculture reporting. The ERT noted that currently all data on emissions in overseas territories and Crown dependencies from livestock, soil and other sources are still provided in aggregate form under category 3.J (other) and in CRF table 3s2.
			The ERT considers that the recommendation has not yet been fully addressed. The ERT also considers that the United Kingdom may want to address all issues related to emissions in overseas territories and Crown dependencies in an integrated manner. The ERT further considers that while these emissions are still reported under category 3.J, providing a comment in the documentation box of CRF table 3.G-I (e.g. referring to the data in CRF table 3s2 and the respective information in the NIR) may increase transparency.

LULUCF

ID#	Issue/problem classification[a, b]	Recommendation from previous review report	ERT assessment and rationale
L.1	4. General (LULUCF) 4.B Cropland – CO_2 4.C Grassland – CO_2 (L.3, 2021) (L.3, 2019) (L.21, 2017) Comparability	Provide an explanation in the NIR for the discrepancies between areas of organic soils reported in CRF table 3.D and in CRF tables 4.B, 4.C and 4(II).	Resolved. The Party reported in its NIR (pp.368 and table 10.16) that the area of cultivated histosols, in hectares, is reported in CRF table 3.D as the sum of drained cropland in CRF table 4.B and intensive grassland. The area of grassland on organic soils reported in CRF table 4.C comprises both intensive and non-intensive/semi-natural grassland condition categories, hence the differences in areas of organic soils reported in CRF tables 4.B, 4.C and 4(II).
L.2	4. General (LULUCF) – CO_2 and N_2O (L.23, 2021) Accuracy	Calculate SOC change values for each soil type, under each land-use category and for each devolved administration and use those values to calculate SOC changes associated with land-use changes.	Addressing. The Party reported in its NIR (p.540) that implementation of the land-use tracking vector approach will enable the United Kingdom to move towards resolving this issue by analysing areas of stable land use. Use of this approach needs to be combined with an updated assessment of SOC estimates by land-use type to ensure that the most accurate and robust soil information is used in the inventory modelling.
			During the review, the Party confirmed that it reports soil carbon stock changes separately for mineral and organic soils and has calculated the soil carbon densities for each devolved administration and land use by revisiting the methodology used to calculate the original average changes (Bradley et al., 2005). This also disaggregates the grassland category between improved and rough (or semi-natural) grassland.
			The ERT considers that the recommendation has not yet been fully addressed because the Party has not yet analysed the areas of stable land use and combined these areas with the updated assessment of SOC estimates by land-use type to ensure that the most accurate and robust soil information is used in the inventory modelling.
L.3	4. General (LULUCF) – CO_2 and N_2O (L.24, 2021) Consistency	Implement methodological changes to avoid any artefact trends in SOC changes in mineral soils associated with land-use changes or identify how the accumulation of land that has undergone a land-use change but not yet reached a new equilibrium, rather than a change in the rate of land-use changes,	Not resolved. The Party reported in its NIR (p.541) that it plans to undertake an analysis of the land-use/soil carbon model in order to assess the contribution of historical changes (beyond the 20-year transition period) to total SOC changes in mineral soils. Work undertaken for the Department for Environment, Food and Rural Affairs in 2003 (project SP0533) determined that the impact of the conversion of permanent grassland

ID#	Issue/problem classification[a, b]	Recommendation from previous review report	ERT assessment and rationale
		contributes to the trend in total SOC changes in mineral soils.	and semi-natural vegetation after the Second World War could be seen in the decline in SOC in cropland soils but that this impact plateaued after 60 years.
			The ERT considers that the recommendation has not yet been addressed because the Party has not yet undertaken the analysis, and as appropriate, implemented the results to avoid artefact trends.
L.4	4.A Forest land – CO_2 (L.10, 2021) (L.12, 2019) (L.9, 2017) (L.15, 2016) (L.15, 2015) Convention reporting adherence	Include information in the NIR on the verification of all carbon stock changes estimated using tier 3 methods and/or models (CARBINE, C-Flow and BSORT models).	Addressing. The Party reported in its NIR (p.519) that the results from the second cycle of the NFI, when available, will be used as part of its efforts to verify carbon stock changes.
			During the review, the Party noted that work is in progress on using the CARBINE model to understand the dynamics of tree growth that determine the estimates of tree carbon stocks and that full documentation of the model's validation and recalibration exercise is planned for the future, at which time documentation on those verification activities can be included in the NIR. The Party provided a high-level verification of the model (Matthews et al., 2022). Further, the Party noted it will continue with its efforts to verify the changes in soil carbon estimated by the SCOTIA model and publish the results, along with identifying any potential additional data for verification (NIR p.543).
L.5	4.A Forest land – CO_2 (L.12, 2021) (L.14, 2019) (L.18, 2017) Accuracy	Estimate and report carbon stock changes in biomass from forests not used for timber production in accordance with the 2006 IPCC Guidelines (vol. 4, chap. 4) owing to biomass losses associated with harvesting and/or gathering (e.g. fuelwood) or provide transparent information justifying that such losses are not occurring.	Addressing. The Party reported in its NIR (p.522) that it carried out a comparison of carbon stocks estimated under the NFI with carbon stocks estimated by using the CARBINE model and found no evidence of bias in the modelling approach. However, the results from the second NFI cycle are required to verify that there is no bias in the estimated carbon stock changes. See also ID# KL.2 below.
			During the review, the Party indicated that it has not identified any evidence of bias in the emission estimates from currently available data sets; however, comparison with the NFI second cycle data is not possible because the relevant data are not yet available.
			The ERT considers that the recommendation cannot be fully addressed until data from the second NFI cycle are available to verify that there is no bias in the estimated carbon stock changes.
L.6	4.A Forest land – CO_2 and N_2O (L.25, 2021) Convention reporting adherence	Provide in the NIR verification information consistent with the 2006 IPCC Guidelines (vol. 1, chap. 6.10, p.6.19) on estimates of emissions and/or removals prepared using tier 3 models, in accordance with paragraph 41 of the UNFCCC Annex I inventory reporting guidelines, and continue the model soil carbon stocks and flux verification exercise and report the results in future NIRs.	Not resolved. The Party did not provide further information in the NIR on the verification of the SCOTIA model. The Party reported in its NIR (p.543) that it will continue with its efforts to verify the changes in soil carbon estimated by the SCOTIA model and publish the results, along with identifying any potential additional data for verification.
			During the review, the Party clarified that although some minor improvements have been made to the tier 3 soil model, no large-scale data sets have yet been identified that could be used to improve the parameterization. The Party has commissioned work to further investigate the available data sets, which will identify gaps in the data and provide recommendations regarding which additional data should be collected to address the requirements for verification of the model. The results of this work will be reviewed, and any resource implications considered for implementation. The Party noted that this

ID#	Issue/problem classification[a, b]	Recommendation from previous review report	ERT assessment and rationale
			commissioned work should lead to progress over the next three years on the verification of the SCOTIA model, which will be reported in the NIR.
L.7	4.C Grassland – CO_2 (L.16, 2021) (L.22, 2019) (L.25, 2017) Comparability	Allocate rural hedges to settlements or grassland, ensuring time-series consistency of the accounting of these areas to a single land-use category, and clearly indicate in the NIR where they are included.	Resolved. The Party reported in its NIR (pp.409 and 520) that the land-use change methodology has been revised to assimilate multiple sources of information on land use and land-use change, removing the inconsistency in the definition of hedgerows arising from the use of data on broad habitats from the UK Centre for Ecology & Hydrology Countryside Survey. The biomass carbon stock changes were calculated from a different (linear) Countryside Survey source (Haines-Young et al., 2000) and all carbon stock changes were reported under grassland.
L.8	4.D.1.1 Peat extraction remaining peat extraction – CO_2, CH_4 and N_2O (L.17, 2021) (L.25, 2019) (L.28, 2017) Completeness	Collect the necessary data to enable reporting of emissions/removals from peat extraction remaining peat extraction in overseas territories and Crown dependencies.	Addressing. The Party reported in the annex to the NIR (p.933) that peat organic soils occur in the Falkland Islands (Malvinas) and the Isle of Man but not in the other overseas territories and Crown dependencies and that emissions from the drainage and rewetting of organic soils on the Isle of Man were included for the first time in the 2022 submission for the time series 1990–2020. NIR table A3.4.29 shows that the area of peat extraction on peat organic soils on the Isle of Man was assessed as zero across the time series.
			During the review, the Party noted it had identified a new source of data on peat usage for the Falkland Islands (Malvinas), namely, a census undertaken in 2016, which includes an intermittent time series for peat use by households back to 1991. The cumulative area for peat extraction between 1990 and 2020 is estimated as 70.08 ha, resulting in emissions for 2020 of 0.825 kt CO_2 eq. It is not possible to derive estimates for years prior to the time series, but given the small population of the Falkland Islands (Malvinas) (approximately 2,000 people for much of the twentieth century), the amount of emissions is expected to be small. The United Kingdom also noted that it is funding long-term research projects into organic soil extent, condition and emissions in the Falkland Islands (Malvinas), and the findings from these projects will contribute to the inventory emission estimates in due course.
L.9	4.D Wetlands – CO_2, CH_4 and N_2O (L.18, 2021) (L.26, 2019) (L.28, 2017) Transparency	Provide in the NIR detailed information to describe that land conversion to peat extraction in overseas territories and Crown dependencies is not occurring.	Addressing. The Party reported areas of and emissions from organic soils for the Isle of Man in its NIR (p.933); however, corresponding information was not included for the Falkland Islands (Malvinas). Peat organic soils do not occur in the other overseas territories and Crown dependencies (see ID# L.8 above).
			The ERT considers that this recommendation has not yet been fully addressed because for the Falkland Islands (Malvinas), information was provided during the review (see ID# L.8 above) but has not yet been included in the NIR.
L.10	4(V) Biomass burning – CO_2, CH_4 and N_2O (L.21, 2021) (L.28, 2019) (L.30, 2017) Accuracy	Assess the areas of and emissions from wildfires on forest land remaining forest land, land converted to forest land, grassland remaining grassland and land converted to	Resolved. To address this issue, the United Kingdom assessed several sources of information on wildfires in the overseas territories and Crown dependencies, including published government data on fire occurrence, and contacted local experts in all overseas territories and Crown dependencies (NIR annex, p.934). This assessment found no occurrence of fires and zero burned areas for 2002–2019 for the Cayman Islands,

ID#	Issue/problem classification[a, b]	Recommendation from previous review report	ERT assessment and rationale
	grassland for all overseas territories and Crown dependencies.		Guernsey, the Isle of Man and Jersey. Bermuda fire statistics show no wildfire areas for either forest land or grassland. For the Falkland Islands (Malvinas), the Global Wildfire Information System recorded 11 fires between 2002 and 2019 on an estimated total area of 5,024 ha based on pixel size, although the total burned area is recorded as zero. Owing to the lack of publicly available data for wildfires in the overseas territories and Crown dependencies, a geographical proxy burning rate was used to estimate wildfire emissions.
L.11	4.G.3 Other (HWP) – CO_2 (L.22, 2021) (L.31, 2019) (L.13, 2017) (L.18, 2016) (L.18, 2015) Transparency	Include verifiable production data from the CARBINE model and the corresponding factors used to convert the production data to carbon, and report those data in CRF table 4.Gs2 to enable a more thorough verification of the HWP estimates.	Resolved. In the 2021 submission, the Party reported a truncated time series of production data from the CARBINE model in CRF table 4.Gs2 and values for converting production data to carbon were absent from the table. In the 2022 submission, the full time series is reported (1960–2020) and the values for converting production units to carbon are provided.
Waste			
W.1	5.A Solid waste disposal on land – CH_4 (W.1, 2021) (W.1, 2019) (W.1, 2017) (W.2, 2016) (W.2, 2015) (91, 2014) (98, 2013) Transparency	Implement the proposed improvements of the emission estimates for SWDS in overseas territories and Crown dependencies by providing further information on the methodologies used to estimate the emissions and by completing the CRF tables with specific parameters such as AD, methane correction factor and degradable organic carbon.	Resolved. The Party provided in its NIR the AD for total MSW disposal for Crown dependencies (NIR table A3.6.12) and overseas territories (NIR table A3.6.13). NIR table A3.5.5 lists all the relevant parameters used for estimating emissions for SWDS in addition to defaults provided in the IPCC landfill model. The United Kingdom indicated in the documentation box of CRF table 5.A that the AD reported are for mainland United Kingdom only, while the emissions reported include contributions from overseas territories and Crown dependencies.

During the review, the United Kingdom confirmed that in CRF table 5.A, AD and other non-emission data represent mainland United Kingdom only, while emissions include activities in mainland United Kingdom as well as in overseas territories and Crown dependencies. The Party explained that it considers this approach (in combination with the documentation box pointing readers to the section of the NIR where parameters for the overseas territories and Crown dependencies are documented) to be pragmatic. The Party noted that the alternative to presenting modified AD and other non-emission data in the CRF tables reflecting specific overseas territories and Crown dependencies that fall within the scope of each of the United Kingdom's three different CRF submissions (i.e. Convention, Kyoto Protocol and European Union) would lead to a disproportionate effort for little value. The ERT agrees that the reporting is sufficiently transparent, and that emissions are not affected by the choice of reporting approach.

The ERT considers that this recommendation has been fully addressed in accordance with paragraph 73 of the UNFCCC review guidelines. |
| W.2 | 5.A Solid waste disposal on land – CH_4 (W.3, 2021) (W.18, | Investigate the availability of alternative data sources for the composition of mixed waste and update the waste composition data used for estimating emissions from this category | Addressing. The composition of the waste used in the estimation of emissions for this category continues to be assumed by the Party as being constant over the entire time series. |

ID#	Issue/problem classification[a, b]	Recommendation from previous review report	ERT assessment and rationale
	2019) Accuracy	accordingly, or, if this is not possible for a given annual submission, provide a justification in the NIR that the waste composition data used are representative of current national circumstances.	During the review, the Party clarified that it has included an investigation of mixed waste composition in the United Kingdom Greenhouse Gas Improvement Programme. The Party reported this information on page 521 of the recalculations and improvements chapter (chap. 10) of its NIR but did not provide further information (i.e. in the source-specific planned improvements section under category 5.A). In response to a question raised by the ERT during the review, the United Kingdom provided more detailed information on the investigation. It explained that a project designed to address some items flagged in the Improvement Programme, including the composition of mixed waste sent to landfill (in addition to other features of interest to waste policymakers), is in the process of being tendered. Some information on the project can be found at https://bidstats.uk/tenders/2022/W14/772145333, including the Party's intent to develop a predictive model to update information on the composition of mixed municipal and non-municipal waste and the drivers of the trends in waste composition. The Party noted that this is a multi-year effort, so it does not expect to have any findings or new data available in time for inclusion in the 2023 submission; depending on how the work progresses, it might be a few years before changes are made to the GHG inventory as a result of this work.
			The ERT considers that the recommendation has not yet been fully addressed because the composition of mixed waste has not yet been updated.
W.3	5.D.1 Domestic wastewater – CH_4 (W.8, 2021) (W.9, 2019) (W.19, 2017) Comparability	Report CH_4 recovery consistently with the energy statistics.	Resolved. The Party revised the data on CH_4 recovery in CRF table 5.D and discussed in its NIR (pp.441–445) how data reported by companies compare with energy statistics on sewage gas utilization for 2013 onward. Prior to 2013, CH_4 recovered is extrapolated on the basis of United Kingdom energy statistics. The ERT concludes that the discussion in the NIR and reporting in CRF table 5.D is sufficient.
W.4	5.D.1 Domestic wastewater – N_2O (W.9, 2021) (W.12, 2019) (W.17, 2017) Accuracy	Exclude N removed with sludge in the calculation of the emission estimates for the waste sector, as suggested by equations 6.7 and 6.8 in the 2006 IPCC Guidelines, and report the AD in the relevant CRF table.	Resolved. The Party reviewed the calculations for N_2O emissions from domestic wastewater and updated them by applying an N-balance-based calculation reflecting the estimated N content of sewage sludge removed and used in agriculture, incinerated or landfilled (NIR table 10.16 and NIR p.476), in accordance with equations 6.7 and 6.8 in the 2006 IPCC Guidelines. The Party revised the AD in CRF table 5.D accordingly.
W.5	5.D.2 Industrial wastewater – CH_4 (W.11, 2021) (W.13, 2019) (W.10, 2017) (W.11, 2016) (W.11, 2015) Accuracy	Report on any progress in collecting the data needed to report AD and emissions from industrial wastewater separately from domestic wastewater.	Addressing. The Party applied a revised methodology developed in 2021 for estimating AD and emissions for industrial wastewater separately from those for domestic wastewater (p.477). The Party also reported industrial wastewater AD in the NIR (table A3.5.14).
			During the review, the Party clarified that information on how much wastewater from the chemical and the food and drinks industries are treated on site and how much wastewater is included in emissions from wastewater sent to sewers is still not available. The Party also clarified that the share of total BOD attributable to each industry sector that is disposed of in the municipal sewer system and treated by water companies was removed from estimates of COD generated by industrial activity. Therefore, only the

ID#	Issue/problem classification[a, b]	Recommendation from previous review report	ERT assessment and rationale
			COD treated through on-site treatment systems within the industry sector is considered under category 5.D.2 (industrial wastewater).
			The ERT considers that the recommendation has not yet been fully addressed because information is still not available on how much wastewater from the aforementioned industries are treated on-site and how much wastewater is included in emissions from wastewater sent to sewers. The ERT notes that the Party's current methods lead to a possible double counting of emissions between domestic and industrial wastewater. As this does not lead to an underestimate of GHG emissions, the ERT did not include it in the list of potential problems and further questions raised.
W.6	5.D.2 Industrial wastewater – CH_4 (W.12, 2021) (W.14, 2019) (W.20, 2017) Accuracy	Collect information on the proportions of aerobic and anaerobic treatment systems and revise the methane correction factor used accordingly.	Resolved. The Party deployed a revised methodology developed in 2021 for estimating CH_4 emissions from industrial wastewater that involves estimating the proportions of aerobic and anaerobic treatment systems and using a revised methane correction factor. As indicated in the NIR (p.478), default methane correction factors from the 2006 IPCC Guidelines are used for each type of treatment and discharge pathway or system, taking into account aerobic and anaerobic treatment (2006 IPCC Guidelines, vol. 5, chap. 6, table 6.8).
W.7	5.D.2 Industrial wastewater – CH_4 (W.16, 2021) Accuracy	Collect the necessary data to complete the estimates of CH_4 recovery from industrial wastewater.	Not resolved. The Party explained in the NIR (pp.477–478 and 546) and confirmed during the review that the available source data from the United Kingdom environmental regulatory reporting systems lack transparency with regard to CH_4 recovery from industrial wastewater. Although this activity likely takes place, owing to the lack of relevant, accurate measurements for the amount of CH_4 recovered, a default value of zero is used. This issue has not been progressed to date and will be considered for action alongside all other potential inventory improvements and acted upon subject to data and funding. The ERT notes that this issue does not lead to emissions being underestimated as the Party does not subtract recovered emissions from the CH_4 emissions reported.

KP-LULUCF

ID#	Issue/problem classification[a, b]	Recommendation from previous review report	ERT assessment and rationale
KL.1	General (KP-LULUCF) – CO_2, CH_4 and N_2O (KL.1, 2021) (KL.1, 2019) (KL.1, 2017) (KL.3, 2016) (KL.3, 2015) Transparency	Include specific information on how land under CM, GM and WDR is identified, especially related to the report developed as part of the ongoing project on areas of WDR.	Resolved. The Party reported in its NIR (pp.553–562 and 574) and confirmed during the review that the land-use tracking project is being implemented in two phases, and that the phase one results are available, allowing the Party to use, in the 1990–2020 inventory, spatially explicit data to track land-use change across the United Kingdom that are then simplified to non-spatial information for use in the LULUCF and KP-LULUCF models. During the review, the Party also clarified that implementation of phase two of the project will not change the land representation as the same underlying set of land-use vectors will be used.
KL.2	FM – CO_2 (KL.10, 2021) (KL.13, 2019) (KL.18, 2017) Accuracy	Estimate and report, in accordance with the 2006 IPCC Guidelines (vol. 4, chap. 4), carbon stock changes in biomass from forests not used for timber production owing to biomass losses associated with harvesting	Addressing. The Party reported in its NIR (p.522) that it carried out a comparison of carbon stocks estimated under the NFI with carbon stocks estimated by using the CARBINE model and found no evidence of bias in the modelling approach. However, the results from the second NFI cycle are required to verify that there is no bias in the estimated carbon stock changes.

ID#	Issue/problem classification[a, b]	Recommendation from previous review report	ERT assessment and rationale
		and/or gathering (e.g. fuelwood) or provide transparent information justifying that such losses are not occurring.	During the review, in assessing whether the omission of this possible source of emissions represents a potential problem, the ERT sought clarification from the Party on the application of the CARBINE model. The Party clarified that the model considers information published in the United Kingdom timber statistics, which in recent years have been improved to largely capture the informal harvest. While the accuracy of emission estimates could be improved using data from the latest NFI, the ERT considers that the degree of any error is likely to be insignificant. The ERT therefore concludes that this potential problem of a mandatory nature does not influence the Party's ability to fulfil its commitments for the second commitment period of the Kyoto Protocol and therefore this issue was not included in the list of potential problems and further questions raised. See ID# L.5 above for a related recommendation under the Convention.
KL.3	FM – CO_2 (KL.12, 2021) (KL.15, 2019) (KL.20, 2017) Accuracy	(a) Estimate the background level and margin using a consistent and initially complete time series containing emissions for 1990–2009, in accordance with decision 2/CMP.7, annex, paragraph 33, using, if appropriate, methodologies from the 2006 IPCC Guidelines (e.g. vol. 5);	(a) Resolved. The Party recalculated the background level and margin and reported in NIR table 11.7 a complete time series containing emissions from wildfires (the only natural disturbance considered) for 1990–2009, in Gg CO_2 eq, for mainland United Kingdom and the overseas territories and Crown dependencies, in accordance with decision 2/CMP.7, annex, paragraph 33, using methodologies from the 2006 IPCC Guidelines (e.g. vol. 1, chap. 5).
		(b) Report in the NIR detailed information on the background level of emissions associated with annual natural disturbances that have been included in the FMRL, on how the background levels and margins for AR and FM have been estimated, on how the Party avoids the expectation of net credits or net debits during the commitment period, and on how the FMRL technical correction addresses emissions from natural disturbances for which the provision (e.g. substitution of natural disturbances emissions in the FMRL by the background level estimated) is intended to be applied.	(b) Resolved. The default method in the Kyoto Protocol Supplement was used for estimating the background level of emissions and margins. The annual emissions from wildfires on FM and AR land reported in the United Kingdom's LULUCF sector GHG inventory were used for the calibration period, applying the same methodology for assigning the wildfire emissions. Avoidance of the expectation of net credits or net debits was achieved in the background level calculation by including only the emissions from natural disturbances explicitly included in the GHG inventory (namely, from wildfires) and, as noted by the ERT, the absence of an observable trend in the background time series. The United Kingdom calculated a technical correction to the FMRL for the current annual submission and one of the elements in the technical correction comprised the revised estimates of emissions from natural disturbances.
KL.4	FM – CO_2, CH_4 and N_2O (KL.16, 2021) KP reporting adherence	Correct the identified inconsistencies in the technical correction and all the information required by the Kyoto Protocol Supplement.	Resolved. The Party corrected the inconsistencies in the FMRL technical correction by including the estimates of emissions from FM land for overseas territories and Crown dependencies. The accounting quantity is reported and justified in the NIR (pp.577–580) in accordance with the requirements of the Kyoto Protocol Supplement.
KL.5	FM – CO_2 (KL.17, 2021) KP reporting adherence	Resolve the inconsistency resulting from the assumption that dead organic matter was instantaneously oxidized and recalculate the	Resolved. The Party recalculated the background level of emissions to ensure consistency with the estimates included in the GHG inventory, thus eliminating the inconsistency identified by the previous ERT (NIR pp.563 and 574). The technical correction was

ID#	Issue/problem classification[a, b]	Recommendation from previous review report	ERT assessment and rationale
		technical correction accordingly by using a recalculated and consistent background level of emissions.	recalculated on the basis of the latest inventory and assumptions about the level and type of management that would be consistent with policies in place in 2009. These assumptions were based on the method detailed in the United Kingdom National Forestry Accounting Plan, 2021 to 2025. Among the changes in data and assumptions since the FMRL was calculated are a correction to double counting in the calculation of deadwood and the inclusion of estimates of emissions from FM land in overseas territories and Crown dependencies. NIR table 11.10 contains the FMRL and technical correction for 2013–2020.
KL.6	FM – CO_2 (KL.18, 2021) Transparency	Clarify in the NIR how the automated algorithm is used to prepare timber production statistics for the CARBINE model used to produce the technical correction on the one hand, and FM estimates during the second commitment period on the other.	Resolved. The Party reported in its NIR (pp.577–580) that the assumptions for FM in the FMRL technical correction were revised to be consistent with the methodology described in the United Kingdom National Forestry Accounting Plan, 2021 to 2025. The resulting divergence between the technical correction and FM estimates is documented in the NIR and explained as part of the accounting quantity. The Party switched from using the CARBINE model to using the C-Flow/CARBINE models, which can represent a wider range of tree species and management practices, though the Party informed the ERT during the review that the methodologies of both models are consistent with each other. The FMRL for the United Kingdom was calculated using the same methodology for estimating forest carbon stock changes and GHG emissions as the methodology used for the Convention LULUCF inventory, the KP-LULUCF inventory and national projections of LULUCF emissions and removals, but with assumptions about the level and type of management that would be consistent with policies in place in 2009.
KL.7	FM – CO_2 (KL.18, 2021) Transparency	Provide an assessment of whether and to what extent differing application of the algorithm to adjust the assumed FM harvest to harmonize with timber production statistics results in a divergence between the technical correction and the FM estimates during the second commitment period.	Resolved. The Party reported in its NIR (pp.577–580) that the assumptions for FM in the FMRL technical correction were revised to follow the methodology described in the United Kingdom National Forestry Accounting Plan, 2021 to 2025. The resulting divergence between the technical correction and FM estimates is documented in the NIR and explained as part of the accounting quantity. For further details, see ID# KL.6 above.
KL.8	GM – CO_2 (KL.13, 2021) (KL.17, 2019) (KL.22, 2017) Consistency	Define the category of land under which hedges are to be accounted, ensure that corresponding GHG emissions and removals are estimated, and report consistently thereon for the entire time series.	Resolved. The Party stated in its NIR (p.906) that managed and unmanaged hedges are all reported under grassland and that biomass carbon stocks are estimated as the median of values relevant to the United Kingdom in the published literature, as determined from a literature review, supplemented by more recent data, for the entire time series. Full details of these values and data sources are included in the Party's Grassland Management Biomass calculation workbook. NIR table A3.4.14 contains the total biomass carbon stocks, the uncertainties and the root-to-shoot ratios for managed and unmanaged hedges applied in estimating emissions and removals for the 2022 submission.
KL.9	GM – CO_2, CH_4 and N_2O (KL.14, 2021) (KL.19,	Develop the necessary AD on controlled burning throughout the year and in land areas smaller than 1 ha and estimate and report the	Resolved. During the review of the 2021 submission, information regarding controlled burning on grassland was provided to the ERT, including a preliminary assessment supporting the view that emissions from controlled biomass burning are insignificant

ID#	Issue/problem classification[a, b]	Recommendation from previous review report	ERT assessment and rationale
	2019) (KL.24, 2017) Completeness	associated CO_2 and non-CO_2 emissions for the entire territory.	(approximately 163 kt CO_2 eq without accounting for post-fire vegetation regrowth). The previous ERT considered that including a summary of this information in the next annual submission would resolve the recommendation. The Party reported in the NIR (pp.916–917) of the current annual submission a summary of the information, as recommended.

[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 reports on the review of the 2018 and 2020 annual submissions of the United Kingdom were not available at the time of this review. Therefore, 2018 and 2020 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 the United Kingdom, 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 the United Kingdom of Great Britain and Northern Ireland

ID#	Previous recommendation for issue	Number of successive reviews issue not addressed[a]
General	No issues identified.	
Energy		
E.1	Clearly indicate the geographical coverage of Digest of United Kingdom Energy Statistics and demonstrate how fuel consumption data at the subcategory level for each overseas territory and Crown dependency are obtained and incorporated into the national totals for that subcategory.	5 (2015/2016–2022)
E.4	Evaluate the relevance of the current equipment data used in the 2004 model for estimating off-road emissions, and on the basis of the results of the evaluation, either document in the NIR how the model still reflects current circumstances or make efforts to update the model and report on progress in the NIR.	3 (2019–2022)
IPPU		
I.1	On page 236 of the NIR, correct the information stating that N_2O emissions from nitric acid production and adipic acid production were reported together for 1990–1994 under category 2.B.3 (adipic acid production) to clarify that these emissions have been reported separately for the entire time series in CRF table 2(I)s1.	3 (2019–2022)

ID#	Previous recommendation for issue	Number of successive reviews issue not addressed[a]
I.4	Complete the ongoing study on the non-glass uses of soda ash in the country and estimate and report CO_2 emissions from sodium bicarbonate use under subcategory 2.A.4.d (other) as well as update the NIR to include the relevant AD, EF and methods used for estimating these emissions.	3 (2019–2022)
I.7	Use the standard splicing techniques in the 2006 IPCC Guidelines (vol. 1, chaps. 5.5.3.1–5.5.3.4) to fill the gaps of AD and CO_2 emissions for categories 2.B.6 (titanium dioxide production) for 1990–1998, 2.B.7 (soda ash production) for 1990–1998, 2.B.8.a (petrochemical and carbon black production (methanol)) for 1990–1997, 2.B.8.d (petrochemical and carbon black production (ethylene oxide)) for 1990–1995 and 2.B.8.f (petrochemical and carbon black production (carbon black)) for 1990–1998, revise the CO_2 emission estimates accordingly, and explain in the NIR which techniques were used to fill the gaps (e.g. the ERT considers that the surrogate data or overlap approach may be appropriate for developing a consistent time series). If it is not possible to apply the standard splicing techniques, follow the 2006 IPCC Guidelines (vol. 1, chaps. 5.3.3.5–5.3.3.6) and apply an alternative technique for splicing, providing an explanation in the NIR as to why the standard techniques are not valid, documenting the alternative technique applied and comparing the results with one of the standard techniques contained in the 2006 IPCC Guidelines.	3 (2019–2022)
Agriculture		
A.3	Improve the accuracy of emission estimates for enteric fermentation, manure management and agricultural soils reported for the Crown dependencies by applying a splicing technique (e.g. extrapolation) from the 2006 IPCC Guidelines (vol. 1, chap. 5) to estimate the IEFs for the Crown dependencies instead of maintaining a constant IEF in years for which updated United Kingdom IEFs are not available in sufficient time to apply them to the emission estimates for the Crown dependencies	3 (2019–2022)
A.14	Provide in the NIR an explanation and further supporting evidence for the classification of organic soils in the Falkland Islands (Malvinas) as unmanaged and explain why the areas of organic soils in overseas territories and Crown dependencies are not included as a contributing source to N_2O emissions from the cultivation of organic soils.	4 (2017–2022)
A.15	Report emissions from overseas territories and Crown dependencies in the respective categories (3.A (enteric fermentation), 3.B (manure management), 3.D (direct and indirect N_2O emissions from agricultural soils), 3.G (liming) and 3.H (urea application)).	3 (2019–2022)
LULUCF		
L.4	Include information in the NIR on the verification of all carbon stock changes estimated using tier 3 methods and/or models (CARBINE, C-Flow and BSORT models).	5 (2015/2016–2022)
L.5	Estimate and report carbon stock changes in biomass from forests not used for timber production in accordance with the 2006 IPCC Guidelines (vol. 4, chap. 4) owing to biomass losses associated with harvesting and/or gathering (e.g. fuelwood) or provide transparent information justifying that such losses are not occurring.	4 (2017–2022)
L.8	Collect the necessary data to enable reporting of emissions/removals from peat extraction remaining peat extraction in overseas territories and Crown dependencies.	4 (2017–2022)

ID#	Previous recommendation for issue	*Number of successive reviews issue not addressed[a]*
L.9	Provide in the NIR detailed information to describe that land conversion to peat extraction in overseas territories and Crown dependencies is not occurring.	4 (2017–2022)
Waste		
W.2	Investigate the availability of alternative data sources for the composition of mixed waste and update the waste composition data used for estimating emissions from this category accordingly, or, if this is not possible for a given annual submission, provide a justification in the NIR that the waste composition data used are representative of current national circumstances.	3 (2019–2022)
W.5	Report on any progress in collecting the data needed to report AD and emissions from industrial wastewater separately from domestic wastewater.	5 (2015/2016–2022)
KP-LULUCF	No issues identified.	

[a] Reports on the reviews of the 2018 and 2020 annual submissions of the United Kingdom have not yet been published. Therefore, 2018 and 2020 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 the United Kingdom that are additional to those identified in table 3.

Table 5
Additional findings made during the individual review of the 2022 annual submission of the United Kingdom of Great Britain and Northern Ireland

ID#	Finding classification	Description of finding with recommendation or encouragement	*Is finding an issue/problem?[a]*
General			
G.2	CPR	The Party reported in its NIR (p.585) the CPR value of 90 per cent of the assigned amount as 2,470,443,559 t CO_2 eq. The ERT noted that according to the Party's report to facilitate the calculation of the assigned amount for the second commitment period of the Kyoto Protocol, and through its own calculation of the information documented in the NIR (p.585), this value should be 2,470,443,599 t CO_2 eq. The ERT also noted that in the NIR (p.585), the comparison of 90 per cent of the assigned amount was made with eight times the total GHG emissions of the inventory for 2018 contained in the 2020 submission instead of with eight times the total GHG emissions of the inventory for the 2020 contained in the 2022 submission, as required by decision 11/CMP.1, annex, paragraph 6.	Yes. KP reporting adherence
		During the review, the Party confirmed the CPR value to be an editorial error and that the correct value is 2,470,443,599. Regarding the comparison of the assigned amount, the Party clarified that it believes it should have used the total GHG emissions for 2019 contained in the 2021 submission. However, the ERT noted that as the 2022	

submission will be the latest available reviewed annual submission at the time of publication of the 2022 annual review report, the comparison should have been made with the total GHG emissions for 2020 contained in the 2022 submission, which is equal to $404,834,197 \times 8$, or $3,238,673,576$ t CO_2 eq. This value is higher than the value of the CPR as contained in the report to facilitate the calculation of the assigned amount for the second commitment period of the Kyoto Protocol.

The ERT concludes that the final CPR is $2,470,443,599$ t CO_2 eq. The ERT further concludes that this potential problem of a mandatory nature does not influence the Party's ability to fulfil its commitments for the second commitment period of the Kyoto Protocol and therefore this issue was not included in the list of potential problems and further questions raised.

| G.3 | Uncertainty analysis | In several cases, the Party reported in its NIR (annex 2) uncertainty for aggregated categories (e.g. 1.A (coal) (CO_2) and 2.B (chemical industry) (CO_2)) instead of for each subcategory. The Party reported in its NIR (p.525) that it will consider the encouragement from the previous ERT to transparently explain in the NIR its rationale for estimating uncertainties for aggregated categories during future updates of annex 2 to the NIR. | Yes. Transparency |

During the review, the Party clarified that according to the 2006 IPCC Guidelines (vol. 1, chap. 3), aggregation should be used as a means to make the uncertainty analysis more accurate by reducing unaccounted for correlations and dependencies. According to the Party, the biggest challenges with disaggregation are that (1) subcategories can have positive or negative correlations to one another that are either not accounted for in approach 1 or require additional work to adequately account for in approach 2 and (2) disaggregation without consideration of the correlations changes the results of the uncertainty analysis in ways which make the results less valid. The ERT agrees with the Party's views.

The ERT recommends that the Party explain in the NIR its rationale for aggregating category uncertainties to account for correlations and dependencies, rather than reporting uncertainty by subcategory.

Energy

| E.7 | Fuel combustion – reference approach – other fossil fuels – CO_2 | The Party reported in its NIR (p.141) fuels that are excluded from the United Kingdom's reference approach but are included in its sectoral approach, namely, waste oils, fossil-containing waste, scrap tyres and waste solvents. The Party also reported that the reference approach does not include emissions from these fuels because the reporting of the fuels is not complete in the United Kingdom energy statistics. The ERT noted that CRF table 1.A(c) shows a discrepancy in AD between the reference approach and the sectoral approach for other fossil fuels, specifically, for 2020, 69.85 PJ other fossil fuels are reported under the reference approach and 113.05 PJ are reported under the sectoral approach. | Yes. Transparency |

The ERT noted a lack of transparency regarding which other fossil fuels are included in the reference approach and the main reasons for the observed differences.

During the review, the Party clarified that the data on other fossil fuels used for the reference approach are data on MSW used as a fuel from the United Kingdom energy statistics and also that the MSW data in the energy statistics do not include all waste products accounted for under the sectoral approach. For example, while some scrap tyres are included in the United Kingdom energy statistics as part of the MSW data, the Party is aware that some scrap

ID#	Finding classification	Description of finding with recommendation or encouragement	Is finding an issue/problem?[a]
		tyres used as a fuel are not included in these statistics and, therefore, does not include these in the reference approach.	
		The ERT recommends that the Party clarify in the NIR which fuels are included in the other fossil fuels portion of fuels considered under the reference approach, including, for example, what percentage of total MSW is captured by the United Kingdom energy statistics.	
E.8	1.A.4.c.iii Fishing – residual fuel oil – CO_2	The Party reported in CRF table 1.A(a)s4 the AD and CO_2 emissions associated with residual fuel oil use in fishing, which resulted in a CO_2 IEF of 535.00 t/TJ. The ERT noted that the reported IEF is higher than that for all other reporting Parties (maximum of 77.95 t/TJ for 2020) and higher than the default IPCC EF (77.40 t/TJ) (vol. 2, chap. 2, table 2.5 of the 2006 IPCC Guidelines).	Yes. Comparability
		During the review, the Party clarified that the AD for this category are for mainland United Kingdom only while the emission data include the overseas territories and Crown dependencies. The use of these data resulted in an unrepresentative IEF, but the CO_2 EF used by the Party for residual fuel oil is 76.50 t/TJ, which is in line with the default IPCC EF and those of the other reporting Parties. The Party explained that the AD for the overseas territories and Crown dependencies for this source are in a different format to those for mainland United Kingdom and cannot be aggregated and included in the CRF tables without manual intervention. The Party noted that it is working towards recording AD for overseas territories and Crown dependencies in a format consistent with that of the mainland United Kingdom AD, therefore making it easier to identify and aggregate these data and transpose them into the CRF tables.	
		The ERT recommends that the Party continue to work to gather AD for residual fuel oil use in fishing (category 1.A.4.c.iii) for the United Kingdom's overseas territories and Crown dependencies in the appropriate format and report these AD in CRF table 1.A(a)s4 to allow comparability of the IEF with the other reporting Parties or describe in the NIR the differences in these AD from mainland United Kingdom AD and the reason for not including them in the CRF tables.	
E.9	1.B.1.b Solid fuel transformation – solid fuels – CO_2	The Party reported in CRF table 1.B.1 the AD and CO_2 IEFs associated with solid fuel transformation. The inter-annual change in the CO_2 IEF is significant for several years, for example, between 2015 (150.97 kg/t) and 2016 (217.23 kg/t), representing a 43.9 per cent increase, and between 2018 (214.75 kg/t) and 2019 (108.04 kg/t), representing a 49.7 per cent decrease. Methodological information on category 1.B.1.b was not provided in the NIR and the reasons for the inter-annual changes were not reported.	Yes. Transparency
		During the review, the Party clarified that category 1.B.1.b (solid fuel transformation) covers three distinct sources: coke oven related sources at steelworks, and the use of coal and petroleum coke in the production of solid smokeless fuel (i.e. two sources). The two solid smokeless fuel production sources dominate emissions for 2015–2019 and are mainly responsible for the inter-annual variation in the CO_2 IEF. The Party confirmed that emissions for these two sources tend to vary from year to year because their estimation is based on a simple carbon balance method and is affected by the ratio of coal to petroleum coke inputs and by the ratio of inputs to solid smokeless fuel outputs.	
		The ERT recommends that the Party include in Method Statement 4 of its NIR information on solid smokeless fuel production (currently only coke oven related sources at steelworks is covered) and reference the relevant background spreadsheet for each year of the inventory, which includes the AD and CO_2 EFs for the input and output streams of solid smokeless fuel production and explain any inter-annual differences in the CO_2 IEF for category 1.B.1.b (solid fuel transformation).	

ID#	Finding classification	Description of finding with recommendation or encouragement	Is finding an issue/problem?[a]
E.10	1.B.2.c Venting and flaring – flared gas – CO_2 and CH_4	The Party reported in annex 3 to its NIR (p.837) that the estimates of CH_4 emissions from gas flaring are among the most uncertain of all estimates of GHG emissions from the upstream oil and gas industry. The emissions are based on the CH_4 EF from the United Kingdom's Environmental and Emissions Monitoring System operator guidance and the accepted sector-wide methodology of the European Union Emissions Trading System to estimate CO_2 emissions, which is based on the sector-wide assumption that the oxidation of flared gases is 98 per cent. There is no routine monitoring and reporting of the performance of flares to industry regulators in the United Kingdom. The ERT noted that while this subcategory (1.B.2.c) is not a significant source of emissions (representing only 7.0 per cent of total CO_2 eq emissions for category 1.B.2 (oil, natural gas and other emissions from energy production)), it would be beneficial to examine if further information is available that would enhance accuracy beyond the current approach used.	Not an issue/problem
		During the review, the Party noted that trials on the monitoring of flaring emissions are under way and if these trials indicate the need for a change in the assumed oxidation factor, it will take that into consideration in future GHG inventory improvements.	
		The ERT encourages the Party to continue looking into the oxidation factor for flaring, including considering the methodologies for estimating CH_4 emissions from gas flaring used by other Parties with similar oil and gas operations, and to update its approach if and when new data to inform the oxidation factor, in line with the 2006 IPCC Guidelines, become available.	
IPPU			
I.13	2.B.1 Ammonia production – CO_2	The Party reported in its NIR (p.265) that some of the CO_2 recovered from ammonia production is sold by the production facilities to other industrial plants, without specifying whether the emissions associated with the CO_2 sold are included elsewhere in the inventory. The ERT noted that according to the 2006 IPCC Guidelines (vol. 3, chap. 3, equation 3.3 and figure 3.1), CO_2 recovered for downstream use in certain applications should be subtracted from emissions under category 2.B.1 (ammonia production) if reported elsewhere in the inventory.	Yes. Transparency
		During the review, the Party clarified the applications of the CO_2 sold, stating that it is used, for example, in the production of carbonated drinks, as a refrigerant, as a cover gas for the brewing industry, as a feedstock for other chemical industries, and at slaughterhouses. The Party confirmed that emissions from CO_2 used in these applications are included in the GHG inventory. The ERT did not identify any underestimation of CO_2 emissions resulting from the accounting for CO_2 sold.	
		The ERT recommends that the Party include in the NIR (section 4.6.1 or 4.6.2, for example, in tabular or list format) the applications of CO_2 that is recovered from ammonia production and sold to other industrial plants, clearly specifying for each application whether the associated emissions are reported under categories other than 2.B.1 (ammonia production), and if so, which categories.	
I.14	2.C.1 Iron and steel production – CO_2, CH_4 and N_2O	For the 2022 submission, in response to a recommendation (see ID# I.10 in table 3), the Party reallocated a large part of the emissions occurring at integrated iron and steel plants from category 1.A.2.a (manufacturing industries and construction (iron and steel)) to category 2.C.1.b (iron and steel production (pig iron)). Specifically, all blast furnace gas and coke oven gas used at integrated iron and steel plants and all fuel used in blast furnaces were reallocated. The ERT noted that the description of the methodology to estimate emissions from iron and steel production in the NIR (pp.282285) has not been updated accordingly; in particular, on page 283, the Party states	Yes. Transparency

ID#	Finding classification	Description of finding with recommendation or encouragement	Is finding an issue/problem?[a]
		that emissions from the use of blast furnace gas and coke oven gas are reported by the process in which they are used (i.e. under category 1.A.2.a) rather than under category 2.C.1. The ERT noted the lack of consistency between the actual allocation of emissions to categories 1.A.2.a and 2.C.1.b (as reported in CRF tables 1.A(a)s2 and 2(I).A-Hs2 respectively) and the text explaining that allocation in the NIR (pp.282–285).	
		During the review, the Party noted the error on NIR page 283 identified by the ERT, but clarified that this reallocation of emissions between categories 1.A.2.a and 2.C.1.b is documented (NIR Method Statement 3, Method Statement 4 and p.517).	
		The ERT recommends that the Party correct the text in the NIR (pp.282-–285 in the 2022 annual submission) regarding the allocation of emissions from the use of blast furnace gas and coke oven gas at integrated iron and steel plants to ensure that it reflects the allocation of these emissions between category 1.A.2.a (manufacturing industries and construction (iron and steel)) and category 2.C.1.b (iron and steel production (pig iron)).	
I.15	2.D.1 Lubricant use – CO_2	In CRF table 2(I).A-Hs2, the Party reported CO_2 emissions from lubricant use while it reported the AD for this category as "NO". The Party reported AD on lubricant use in CRF table 1.A(d) (11,933.93 TJ in 2020).	Yes. Comparability
		During the review, in response to a question raised by the ERT, the Party provided the ERT with the complete set of AD (amounts of lubricants used, in kt) covering the entire time series.	
		The ERT recommends that the Party report AD on lubricant use in CRF table 2(I).A-Hs2 in accordance with the UNFCCC Annex I inventory reporting guidelines.	
Agriculture			
A.16	3. General (agriculture) – CO_2, CH_4 and N_2O	During the 2019 review, the ERT observed that the Party did not include in the agriculture sector chapter of its NIR a description of trends and inter-annual variation or the main drivers of emissions by category in line with the UNFCCC Annex I inventory reporting guidelines (see ID# A.9 in table 6 of document FCCC/ARR/2021/GBR). In response to this observation the United Kingdom explained during the 2019 review that the occurrence of foot and mouth disease resulted in the culling of cattle in 2001, causing the population of cattle and associated emissions to decrease in 2001. The current ERT noted that the Party included in the 2021 and 2022 submissions brief information on trends, comparing emissions for 1990 with those for the latest year, in all sections of the agriculture sector. However, this information tends to indicate whether emissions have increased or decreased while providing no or little description of the variables driving the trends or of any inter-annual variation. During the 2022 review, the Party acknowledged that the descriptions of trends in emissions and underlying AD are still rather brief and mentioned that it will expand on these descriptions in the NIR of the next annual submission.	Not an issue/problem
		The ERT reiterates the encouragement in the previous review report (see ID# A.9 in table 6 of document FCCC/ARR/2021/GBR) that the United Kingdom enhance the transparency of the agriculture sector chapter of its NIR by including detailed descriptions of trends and inter-annual variation in emissions and the main drivers of the trends for each category, including events that influence emissions such as disease and weather.	
A.17	3. General (agriculture) – CO_2, CH_4 and N_2O	The ERT noted various encouragements in the previous review report concerning the transparency and the QA/QC of the description in the NIR of the model used for estimating emissions for the agriculture sector (see, e.g., ID#s A.10 and A.14 in table 6 of document FCCC/ARR/2021/GBR). The ERT also noted that new information has been provided in the NIR of the 2022 submission, mainly in response to recommendations from previous reviews.	Not an issue/problem

		However, the ERT still considers that the transparency of the NIR could be improved significantly, particularly by revising the text such that the argumentation flows logically. Additional data tables, material flow diagrams and figures might further increase transparency and facilitate the assessment of accuracy, consistency, completeness and transparency.	
		The ERT reiterates the encouragement in the previous review report (see ID# A.10 in table 6 of document FCCC/ARR/2021/GBR) that the United Kingdom continue to improve the transparency of its NIR and/or complete and include a reference to the stand-alone detailed description it is currently working on. The following should be included in future NIRs: (1) detailed information on the model used for estimating emissions for the agriculture sector, in line with footnote 11 in the UNFCCC Annex I inventory reporting guidelines, and (2) a diagram showing the procedures and data flows for the agriculture sector model.	
A.18	3.B Manure management – N_2O	The ERT conducted an N balance check for manure management from the point of Nex entering MMS to the point of land application on the basis of data available in CRF tables 3.B(a)s2, 3.B(b) and 3.D. The amount of N leaving manure storage estimated by the ERT was lower than the reported amount of N applied to soils for 1990–2013 and higher than the amount reported for 2014–2020.	Yes. Transparency
		During the review, the Party clarified that the values calculated by the ERT differ from the reported values owing to several factors not taken into account by the ERT: (1) consideration of emissions of N (dinitrogen/nitrogen gas) throughout manure management, (2) removal of poultry manure N going to incineration, (3) categorization of manure processed through anaerobic digestion as digestate when applied to land, with this manure therefore being included under category 3.D.2.c (other organic fertilizers applied to soils) (CRF table 3.D), and (4) inclusion of bedding N in the N amounts reported in CRF table 3.D but not in CRF table 3.B(b). Taking these factors into account, the ERT considers that the approach applied by the United Kingdom for calculating the N balance along the manure cascade is correct; however, it is not transparently described in the NIR. The Party also clarified that the structure of the CRF tables for reporting emissions from manure management do not align well with the more disaggregated nature of the United Kingdom's agriculture model and stated that it will therefore provide more detailed output in the NIR and the annex to the NIR, including a full N balance check from the point of Nex entering MMS to the point of land application.	
		The ERT recommends that the Party provide in the NIR information on all N flows from the point of Nex entering MMS to the point of land application in order to allow a transparent assessment of the N balance.	
A.19	3.B.4 Other livestock – N_2O	During the review, in response to the issue raised by the ERT under ID# A.20 below, the Party noted that incorrect values for poultry Nex were entered in CRF table 3.B(b) for 1991–2020 (the 1990 value was used throughout). The United Kingdom emphasized that this error has no impact on reported emissions for this category for those years. The ERT agreed that the reported emissions are not affected by the incorrect values for poultry Nex.	Yes. Convention reporting adherence
		The ERT recommends that the Party provide the correct values for poultry Nex in CRF table 3.B(b) for 1991–2020.	
A.20	3.D.a.1 Inorganic N fertilizers – N_2O	The ERT noted the inter-annual change in N input from the application of inorganic fertilizers between 2019 (1,057,980,605.27 kg N) and 2020 (951,280,989.34 kg N). The 2020 value is 10.1 per cent lower than the 2019 value, which is the largest inter-annual change observed for the time series. The ERT could not find any explanation of these inter-annual changes in the NIR.	Not an issue/problem

ID#	Finding classification	Description of finding with recommendation or encouragement	Is finding an issue/problem?[a]
		During the review, the Party clarified that N fertilizer use in the country declined markedly between 2019 and 2020, primarily owing to very wet weather in autumn 2019 preventing the sowing of winter cereal crops. Some of these winter cereal crops were subsequently replaced with spring cereal crops, which are associated with lower N application rates. This pattern can be observed in other years (e.g. 1992–1993, 2000–2001 and 2013–2014) and total N use generally increased again in the following years. The United Kingdom provided the ERT with additional information on the surveys and estimation procedures for the amount of mineral fertilizers applied.	
		The ERT encourages the Party to (1) include in the NIR a transparent description of the basis for its estimation of the amount of N from inorganic fertilizers applied to soils and of any cross-validation with data from fertilizer manufacturers and merchants and (2) improve the description in the NIR of trends and inter-annual variation in emissions from the application of inorganic fertilizers.	
LULUCF			
L.12	4.G HWP – CO_2	The ERT noted the following information relevant to HWP in SWDS: (1) in CRF table 4.Gs1, the information item for reporting HWP in SWDS was reported as "IE", with the comment "included with HWP consumed domestically"; (2) in CRF table 4.Gs1, the documentation box contains the note that "the amount of HWP in SWDS are not currently estimated"; and (3) in CRF table 5, the memo item for the annual change in the long-term carbon storage in HWP waste is reported as "NO". These three pieces of information are inconsistent with one another and present different potential issues depending on which of the entries is correct.	Yes. Transparency
		During the review, the Party clarified that the information in the documentation box to CRF table 4.Gs1 is correct and the amount of HWP in SWDS are not currently estimated, allowing the ERT to have confidence that neither an underestimation of CH_4 emissions for the waste sector nor a problem in KP-LULUCF reporting regarding the fulfilment of the requirements of decision 2/CMP.7, annex, paragraph 32, has occurred. The Party informed the ERT that it was unable to identify wood entering SWDS from domestic production as distinct from imports, consistent with the elected production approach, and therefore was unable to estimate the potential emissions from HWP in SWDS.	
		The ERT recommends that the Party (1) follow the guidance in the 2006 IPCC Guidelines (vol. 4, chap. 12, section 12.2.1), which advises using the methods of the waste sector (which are consistent with the consumption approach for HWP) to assess whether emissions from HWP in SWDS are likely to be significant (i.e. larger than any other key category), and include information consistent with this assessment in its reporting for the LULUCF sector; and (2) if the likely emissions from HWP in SWDS are found to be significant, develop a methodology consistent with the 2006 IPCC Guidelines that is appropriate to its national circumstances for estimating the emissions/removals of HWP in SWDS and include these emissions/removals in its reporting for the LULUCF sector.	
Waste		No findings for the waste sector additional to those included in table 3 were made by the ERT during the review.	
KP-LULUCF		No findings for KP-LULUCF additional to those included in table 3 were made by the ERT during the review.	

[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 the United Kingdom.

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 the United Kingdom 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 the United Kingdom of Great Britain and Northern Ireland in its 2022 annual submission

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

Table I.1
Total greenhouse gas emissions and removals for the United Kingdom of Great Britain and Northern Ireland, 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								8 268.00
Base year[d]	812 547.36	799 371.83	NA	NA	246.05		20 968.85	
1990	809 393.91	796 218.38	NA	NA				
1995	758 743.83	747 927.84	NA	NA				
2000	721 815.12	713 525.95	NA	NA				
2010	612 132.33	608 399.78	NA	NA				
2011	566 422.88	563 282.46	NA	NA				
2012	582 950.82	579 624.31	NA	NA				
2013	569 386.03	566 116.20	NA	NA		316.15	19 090.63	–18 868.92
2014	528 861.92	525 978.97	NA	NA		–44.41	19 010.96	–18 583.07
2015	511 502.29	508 314.70	NA	NA		230.38	18 748.51	–17 972.23
2016	486 560.50	483 271.73	NA	NA		–299.63	18 897.32	–17 593.69
2017	475 213.19	472 129.49	NA	NA		–803.74	18 839.41	–17 119.52
2018	467 073.67	463 323.29	NA	NA		–559.86	18 698.60	–16 380.05
2019	451 538.71	447 410.43	NA	NA		–440.86	18 545.51	–15 800.63
2020	408 602.98	404 834.20	NA	NA		–1 276.37	18 628.66	–15 495.98

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 and N_2O and 1995 for HFCs, PFCs, SF_6 and NF_3. The base year for CM, GM and WDR 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 the United Kingdom of Great Britain and Northern Ireland, 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	601 945.08	129 742.24	47 280.99	14 400.71	1 648.64	NO, NE	1 200.60	0.12
1995	566 158.96	123 723.32	37 642.04	18 568.47	589.45	NO, NE	1 245.33	0.27
2000	569 033.72	106 369.21	27 961.18	7 788.87	571.94	NO, NE	1 800.45	0.58
2010	511 904.58	62 421.24	21 186.14	11 952.37	280.02	NO, NE	655.06	0.36
2011	469 713.32	59 751.70	20 281.45	12 583.89	405.80	NO, NE	545.95	0.36
2012	487 476.78	58 136.34	20 034.37	13 222.09	233.57	NO, NE	520.79	0.36
2013	477 611.27	53 965.13	20 136.18	13 657.01	286.12	NO, NE	460.14	0.36
2014	438 807.08	51 997.42	20 683.65	13 835.25	233.58	NO	421.62	0.36
2015	422 460.79	50 989.01	20 342.52	13 850.16	269.32	NO	402.54	0.36
2016	399 430.13	49 223.06	20 039.66	13 866.99	279.52	NO	432.01	0.36
2017	387 367.14	49 622.24	20 524.73	13 776.96	400.70	NO	437.36	0.36
2018	379 729.76	49 098.29	20 365.71	13 449.42	144.56	NO	535.19	0.36
2019	364 753.31	48 800.62	20 359.40	12 811.53	210.72	NO	474.50	0.36
2020	326 263.20	46 727.64	19 290.46	11 985.80	159.79	NO	406.94	0.36
Percentage change 1990– 2020	**–45.8**	**–64.0**	**–59.2**	**–16.8**	**–90.3**	**NA**	**–66.1**	**207.3**

Note: Emissions and removals reported for the sector other (sector 6) are not included in this table.
^a The United Kingdom did not report indirect CO_2 emissions in CRF table 6.

Table I.3
Greenhouse gas emissions and removals by sector for the United Kingdom of Great Britain and Northern Ireland, 1990–2020
(kt CO_2 eq)

	Energy	IPPU	Agriculture	LULUCF	Waste	Other
1990	597 243.00	85 046.98	48 864.70	13 175.53	65 063.70	NO
1995	554 235.86	77 824.14	48 092.69	10 815.99	67 775.15	NO
2000	550 833.25	54 809.88	46 467.84	8 289.17	61 414.97	NO

	Energy	IPPU	Agriculture	LULUCF	Waste	Other
2010	496 229.46	41 605.49	41 873.68	3 732.55	28 691.15	NO
2011	455 394.94	39 426.22	41 840.60	3 140.42	26 620.69	NO
2012	471 960.41	41 121.69	41 387.29	3 326.51	25 154.92	NO
2013	456 890.18	45 729.20	41 205.72	3 269.83	22 291.10	NO
2014	417 389.59	45 696.95	42 729.05	2 882.96	20 163.38	NO
2015	402 864.28	43 678.00	42 258.98	3 187.59	19 513.44	NO
2016	383 970.66	38 467.98	42 014.86	3 288.77	18 818.23	NO
2017	371 830.66	38 529.91	42 522.87	3 083.70	19 246.05	NO
2018	365 467.43	36 665.16	41 995.30	3 750.38	19 195.40	NO
2019	349 829.88	36 243.58	42 260.86	4 128.28	19 076.11	NO
2020	311 644.09	34 669.54	40 700.46	3 768.78	17 820.11	NO
Percentage change 1990–2020	**−47.8**	**−59.2**	**−16.7**	**−71.4**	**−72.6**	**NA**

Note: The United Kingdom 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 the United Kingdom of Great Britain and Northern Ireland

(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				8 268.00				
Technical correction				9 333.00				
Base year[b]	246.05				16 693.63	3 988.78	NA	286.44
2013		−1 245.82	1 561.97	−18 868.92	15 948.35	2 916.70	NA	225.58
2014		−1 626.22	1 581.81	−18 583.07	15 920.39	2 865.19	NA	225.38
2015		−1 941.92	2 172.31	−17 972.23	15 836.57	2 687.24	NA	224.69
2016		−2 316.96	2 017.33	−17 593.69	15 889.88	2 784.06	NA	223.38
2017		−2 650.69	1 846.95	−17 119.52	15 952.62	2 663.77	NA	223.03
2018		−2 919.63	2 359.77	−16 380.05	15 890.87	2 597.01	NA	210.71
2019		−3 210.45	2 769.59	−15 800.63	15 896.22	2 438.93	NA	210.36
2020		−3 526.63	2 250.26	−15 495.98	15 949.41	2 474.67	NA	204.59
Percentage change base year–2020					**−4.5**	**−38.0**	**NA**	**−28.6**

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, GM and WDR 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 the United Kingdom of Great Britain and Northern Ireland

(kt CO$_2$ eq)

| GHG source/sink activity | Base year[b] | Net emissions/removals | | | | | | | | | Accounting parameters | Accounting quantity[a] |
		2013	2014	2015	2016	2017	2018	2019	2020	Total[c]		
A.1. AR		−1 245.817	−1 626.223	−1 941.925	−2 316.960	−2 650.691	−2 919.631	−3 210.452	−3 526.630	−19 438.329		−19 438.329
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		1 561.967	1 581.811	2 172.309	2 017.332	1 846.950	2 359.774	2 769.594	2 250.257	16 559.995		16 559.995
B.1. FM										−137 814.088		2 993.913
Net emissions/ removals		−18 868.916	−18 583.066	−17 972.231	−17 593.694	−17 119.524	−16 380.052	−15 800.627	−15 495.978	−137 814.088		
Excluded emissions from natural disturbances[e]		NO	NO	NO	NO	NO	NO	NO	NO	NO		NO
Excluded subsequent removals from land subject to natural disturbances		NO	NO	NO	NO	NO	NO	NO	NO	NO		NO

GHG source/sink activity	Base year[b]	Net emissions/removals								Total[c]	Accounting parameters	Accounting quantity[a]
		2013	2014	2015	2016	2017	2018	2019	2020			
Any debits from newly established forest		NO	NO	NO	NO	NO	NO	NO	NO	NO		NO
FMRL											−8 268.000	
Technical corrections to FMRL											−9 333.000	
FM cap											224 824.677	2 993.913
B.2. CM (if elected)	16 693.634	15 948.353	15 920.385	15 836.575	15 889.882	15 952.615	15 890.873	15 896.225	15 949.407	127 284.315		−6 264.754
B.3. GM (if elected)	3 988.776	2 916.697	2 865.189	2 687.244	2 784.060	2 663.766	2 597.010	2 438.931	2 474.666	21 427.563		−10 482.647
B.4. RV (if elected)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA
B.5. WDR (if elected)	286.436	225.579	225.383	224.687	223.377	223.026	210.714	210.357	204.591	1 747.715		−543.776

[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 CO2 eq per year.

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

Table I.6
Key data for the United Kingdom of Great Britain and Northern Ireland 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: commitment period accounting
Elected activities under Article 3, paragraph 4, of the Kyoto Protocol	CM, GM and WDR
Election of application of provisions for natural disturbances	Yes, for AR and FM[a]
3.5% of total base-year GHG emissions, excluding LULUCF	28 103.084 kt CO_2 eq (224 824.677 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 19 438 329 RMUs
2. Deforestation	Cancel 16 559 995 units
3. FM	Cancel 2 993 913 units
4. CM	Issue 6 264 754 RMUs
5. GM	Issue 10 482 647 RMUs
6. WDR	Issue 543 776 RMUs

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.

[a] The Party decided not to exclude emissions and subsequent removals from natural disturbances in its accounting for the 2022 annual submission.

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 the United Kingdom. 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 the United Kingdom of Great Britain and Northern Ireland
(t CO_2 eq)

	Original submission	*Revised submission*	*Adjustment*	*Final value*
CPR	**2 470 443 559**	**2 470 443 599**[a]		**2 470 443 599**
Annex A emissions				
CO_2	326 263 199			326 263 199
CH_4	46 727 642			46 727 642
N_2O	19 290 463			19 290 463
HFCs	11 985 795			11 985 795
PFCs	159 793			159 793
Unspecified mix of HFCs and PFCs	NO			NO
SF_6	406 944			406 944
NF_3	361			361
Total Annex A sources[b]	**404 834 197**			**404 834 197**
Activities under Article 3, paragraph 3, of the Kyoto Protocol				
AR	–3 526 630			–3 526 630
Deforestation	2 250 257			2 250 257
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol				
FM	–15 495 978			–15 495 978
CM	15 949 407			15 949 407
CM for the base year	16 693 634			16 693 634
GM	2 474 666			2 474 666
GM for the base year	3 988 776			3 988 776
WDR	204 591			204 591
WDR for the base year	286 436			286 436

[a] See ID# G.2 in table 5.
[b] 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 the United Kingdom of Great Britain and Northern Ireland
(t CO_2 eq)

	Original submission	*Revised submission*	*Adjustment*	*Final value*
Annex A emissions				
CO_2	364 753 306			364 753 306
CH_4	48 800 615			48 800 615
N_2O	20 359 403			20 359 403
HFCs	12 811 531			12 811 531
PFCs	210 718			210 718

	Original submission	Revised submission	Adjustment	Final value
Unspecified mix of HFCs and PFCs	NO			NO
SF$_6$	474 498			474 498
NF$_3$	361			361
Total Annex A sources[a]	**447 410 431**			**447 410 431**
Activities under Article 3, paragraph 3, of the Kyoto Protocol				
AR	–3 210 452			–3 210 452
Deforestation	2 769 594			2 769 594
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol				
FM	–15 800 627			–15 800 627
CM	15 896 225			15 896 225
CM for the base year	16 693 634			16 693 634
GM	2 438 931			2 438 931
GM for the base year	3 988 776			3 988 776
WDR	210 357			210 357
WDR for the base year	286 436			286 436

[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 the United Kingdom of Great Britain and Northern Ireland
(t CO$_2$ eq)

	Original submission	Revised submission	Adjustment	Final value
Annex A emissions				
CO$_2$	379 729 755			379 729 755
CH$_4$	49 098 294			49 098 294
N$_2$O	20 365 710			20 365 710
HFCs	13 449 419			13 449 419
PFCs	144 558			144 558
Unspecified mix of HFCs and PFCs	NO			NO
SF$_6$	535 190			535 190
NF$_3$	361			361
Total Annex A sources[a]	**463 323 287**			**463 323 287**
Activities under Article 3, paragraph 3, of the Kyoto Protocol				
AR	–2 919 631			–2 919 631
Deforestation	2 359 774			2 359 774
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol				
FM	–16 380 052			–16 380 052
CM	15 890 873			15 890 873
CM for the base year	16 693 634			16 693 634
GM	2 597 010			2 597 010
GM for the base year	3 988 776			3 988 776
WDR	210 714			210 714
WDR for the base year	286 436			286 436

[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 the United Kingdom of Great Britain and Northern Ireland

(t CO2 eq)

	Original submission	Revised submission	Adjustment	Final value
Annex A emissions				
CO2	387 367 141			387 367 141
CH4	49 622 236			49 622 236
N2O	20 524 731			20 524 731
HFCs	13 776 965			13 776 965
PFCs	400 705			400 705
Unspecified mix of HFCs and PFCs	NO			NO
SF6	437 355			437 355
NF3	361			361
Total Annex A sources[a]	**472 129 494**			**472 129 494**
Activities under Article 3, paragraph 3, of the Kyoto Protocol				
AR	–2 650 691			–2 650 691
Deforestation	1 846 950			1 846 950
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol				
FM	–17 119 524			–17 119 524
CM	15 952 615			15 952 615
CM for the base year	16 693 634			16 693 634
GM	2 663 766			2 663 766
GM for the base year	3 988 776			3 988 776
WDR	223 026			223 026
WDR for the base year	286 436			286 436

[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 the United Kingdom of Great Britain and Northern Ireland

(t CO2 eq)

	Original submission	Revised submission	Adjustment	Final value
Annex A emissions				
CO2	399 430 131			399 430 131
CH4	49 223 062			49 223 062
N2O	20 039 656			20 039 656
HFCs	13 866 985			13 866 985
PFCs	279 520			279 520
Unspecified mix of HFCs and PFCs	NO			NO
SF6	432 012			432 012
NF3	361			361
Total Annex A sources[a]	**483 271 728**			**483 271 728**
Activities under Article 3, paragraph 3, of the Kyoto Protocol				
AR	–2 316 960			–2 316 960
Deforestation	2 017 332			2 017 332
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol				
FM	–17 593 694			–17 593 694
CM	15 889 882			15 889 882
CM for the base year	16 693 634			16 693 634

	Original submission	Revised submission	Adjustment	Final value
GM	2 784 060			2 784 060
GM for the base year	3 988 776			3 988 776
WDR	223 377			223 377
WDR for the base year	286 436			286 436

[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 the United Kingdom of Great Britain and Northern Ireland
(t CO_2 eq)

	Original submission	Revised submission	Adjustment	Final value
Annex A emissions				
CO_2	422 460 794			422 460 794
CH_4	50 989 005			50 989 005
N_2O	20 342 517			20 342 517
HFCs	13 850 164			13 850 164
PFCs	269 316			269 316
Unspecified mix of HFCs and PFCs	NO			NO
SF_6	402 543			402 543
NF_3	361			361
Total Annex A sources[a]	**508 314 700**			**508 314 700**
Activities under Article 3, paragraph 3, of the Kyoto Protocol				
AR	–1 941 925			–1 941 925
Deforestation	2 172 309			2 172 309
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol				
FM	–17 972 231			–17 972 231
CM	15 836 575			15 836 575
CM for the base year	16 693 634			16 693 634
GM	2 687 244			2 687 244
GM for the base year	3 988 776			3 988 776
WDR	224 687			224 687
WDR for the base year	286 436			286 436

[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 the United Kingdom of Great Britain and Northern Ireland
(t CO_2 eq)

	Original submission	Revised submission	Adjustment	Final value
Annex A emissions				
CO_2	438 807 081			438 807 081
CH_4	51 997 423			51 997 423
N_2O	20 683 651			20 683 651
HFCs	13 835 248			13 835 248
PFCs	233 579			233 579
Unspecified mix of HFCs and PFCs	NO			NO
SF_6	421 623			421 623
NF_3	361			361
Total Annex A sources[a]	**525 978 966**			**525 978 966**
Activities under Article 3, paragraph 3, of the Kyoto Protocol				

	Original submission	Revised submission	Adjustment	Final value
AR	–1 626 223			–1 626 223
Deforestation	1 581 811			1 581 811
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol				
FM	–18 583 066			–18 583 066
CM	15 920 385			15 920 385
CM for the base year	16 693 634			16 693 634
GM	2 865 189			2 865 189
GM for the base year	3 988 776			3 988 776
WDR	225 383			225 383
WDR for the base year	286 436			286 436

[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 the United Kingdom of Great Britain and Northern Ireland
(t CO_2 eq)

	Original submission	Revised submission	Adjustment	Final value
Annex A emissions				
CO_2	477 611 268			477 611 268
CH_4	53 965 129			53 965 129
N_2O	20 136 178			20 136 178
HFCs	13 657 012			13 657 012
PFCs	286 118			286 118
Unspecified mix of HFCs and PFCs	NO, NE			NO, NE
SF_6	460 138			460 138
NF_3	361			361
Total Annex A sources[a]	**566 116 203**			**566 116 203**
Activities under Article 3, paragraph 3, of the Kyoto Protocol				
AR	–1 245 817			–1 245 817
Deforestation	1 561 967			1 561 967
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol				
FM	–18 868 916			–18 868 916
CM	15 948 353			15 948 353
CM for the base year	16 693 634			16 693 634
GM	2 916 697			2 916 697
GM for the base year	3 988 776			3 988 776
WDR	225 579			225 579
WDR for the base year	286 436			286 436

[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)   3.F field burning of agricultural residues (CH_4 and N_2O), 3.G liming (CO_2) and 3.H urea application (CO_2) (see ID# A.1 in table 3);

(b)   4.D.1.1 peat extraction remaining peat extraction (in the Falkland Islands (Malvinas)) (CO_2) (see ID# L.8 in table 3).

Annex IV

Reference documents

A. Reports of the Intergovernmental Panel on Climate Change

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

IPCC. 2014. *2013 Revised Supplementary Methods and Good Practice Guidance Arising from the Kyoto Protocol*. T Hiraishi, T Krug, K Tanabe, et al. (eds.). Hayama, Japan: Institute for Global Environmental Strategies. Available at 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 2013, 2014, 2015, 2016, 2017, 2019 and 2021 annual submissions of the United Kingdom of Great Britain and Northern Ireland, contained in documents FCCC/ARR/2013/GBR, FCCC/ARR/2014/GBR, FCCC/ARR/2015/GBR, FCCC/ARR/2016/GBR, FCCC/ARR/2017/GBR, FCCC/ARR/2019/GBR and FCCC/ARR/2021/GBR 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 the United Kingdom of Great Britain and Northern Ireland for 2022. Available at https://unfccc.int/sites/default/files/resource/asr2022_GBR.pdf.

C. Other documents used during the review

Responses to questions during the review were received from Onoriode Esegbue, Department for Business, Energy and Industrial Strategy of the United Kingdom of Great Britain and Northern Ireland, 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:

Chadwick, D. et al. (2016). Final Report - AC0116: Improvements to the national agricultural inventory - Nitrous oxide. The InveN$_2$Ory Project (2010-2016). Report to Defra, DARDNI, Scottish Government and Welsh Government. pp77. Available online at: http://sciencesearch.defra.gov.uk/Document.aspx?Document=14200_AC0116report_Final_Revised.pdf

DEFRA (2022). Inventory of Ammonia Emissions from UK Agriculture. 2020. DEFRA contract SCF0107. Available online at: Inventory of Ammonia Emission from (defra.gov.uk)

Haines-Young, R. H., et al. (2000). Accounting for nature: assessing habitats in the UK countryside. London, DETR Countryside Survey 2000. Available online at: N530719CR.pdf (nerc.ac.uk)

Matthews, Robert, et al. (2022). Quantifying the sustainable forestry carbon cycle. Summary Report. The Research Agency of the Forestry Commission. Available online at: https://cdn.forestresearch.gov.uk/2022/07/QFORC_Summary_Report_rv1e_final.pdf

Misselbrook (2017). "Nitrous oxide Emission Factors for Manure Management in UK Agriculture", Misselbrook 2017.

Nicholson, F.A. et al. (2013). An enhanced software tool to support better use of manure nutrients: MANNER-NPK. Soil Use and Management, December 2013, 29, 473–484. Available online at: An enhanced software tool to support better use of manure nutrients: MANNER-NPK - Nicholson - 2013 - Soil Use and Management - Wiley Online Library

Thistlethwaite et al (2022). "UK GHG Inventory Improvement: Upstream Oil and Gas".

Topp, K., et al. (in preparation) Development of nitrous oxide emission factors for manufactured fertiliser and managed manure nitrogen, for use in the United Kingdom agricultural greenhouse gas emissions inventory. Includes supplementary materials.