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## Report on the individual review of the inventory submission of Ireland submitted in 2023\*

### 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). This report presents the results of the individual review of the 2023 inventory submission of Ireland, conducted by an expert review team in accordance with 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”. The review took place from 11 to 16 September 2023 in Wexford, Ireland.

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\* In the symbol for this document, 2023 refers to the year in which the inventory was submitted, not to the year of publication.



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## Abbreviations and acronyms

2006 IPCC Guidelines	<i>2006 IPCC Guidelines for National Greenhouse Gas Inventories</i>
AD	activity data
CBM-CFS3	Carbon Budget Model of the Canadian Forest Sector
CH <sub>4</sub>	methane
CO <sub>2</sub>	carbon dioxide
CO <sub>2</sub> eq	carbon dioxide equivalent
Convention reporting adherence	adherence to the “Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual greenhouse gas inventories”
CPR	commitment period reserve
CRF	common reporting format
DAFM	Department of Agriculture, Food and the Marine of Ireland
EF	emission factor
EPA	Environmental Protection Agency of Ireland
ERT	expert review team
EU	European Union
EU ETS	European Union Emissions Trading System
F-gas	fluorinated gas
GHG	greenhouse gas
GWP-100	100-year global warming potential values
HFC	hydrofluorocarbon
IE	included elsewhere
IEF	implied emission factor
IPCC	Intergovernmental Panel on Climate Change
IPPU	industrial processes and product use
LULUCF	land use, land-use change and forestry
N	nitrogen
N <sub>2</sub> O	nitrous oxide
NA	not applicable
NE	not estimated
NF <sub>3</sub>	nitrogen trifluoride
NIR	national inventory report
NMVO	non-methane volatile organic compound
NO	not occurring
PFC	perfluorocarbon
QA/QC	quality assurance/quality control
SEAI	Sustainable Energy Authority of Ireland
SF <sub>6</sub>	sulfur hexafluoride
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”
Wetlands Supplement	<i>2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands</i>

## I. Introduction

1. This report covers the review of the 2023 inventory submission of Ireland, organized by the secretariat in accordance with the UNFCCC review guidelines, particularly 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 11 to 16 September 2023 in Wexford, Ireland, and was coordinated by Pedro Torres (secretariat). Table 1 provides information on the composition of the ERT that conducted the review for Ireland.

Table 1

**Composition of the expert review team that conducted the review for Ireland**

<i>Area of expertise</i>	<i>Name</i>	<i>Party</i>
Generalist	Marcelo Theoto Rocha	Brazil
Energy	Yuriko Hayabuchi	Japan
	Sunil Pathak	India
IPPU	Ole-Kenneth Nielsen	Denmark
Agriculture	Braulio Pikman	Brazil
LULUCF	Valentyna Slivinska	Ukraine
Waste	Maryna Bereznytska	Ukraine
Lead reviewers	Marcelo Theoto Rocha	
	Maryna Bereznytska	

2. The basis of the findings in this report is the assessment by the ERT of the Party’s 2023 inventory submission in accordance with the UNFCCC review guidelines.

3. The ERT has made recommendations that Ireland resolve identified findings and issues.<sup>1</sup> Other findings, and, if applicable, the encouragements of the ERT to Ireland to resolve related issues, are also included in this report.

4. A draft version of this report was communicated to the Government of Ireland, which provided comments that were considered and incorporated, as appropriate, into this final version of the report.

5. Annex I presents the annual GHG emissions of Ireland, including totals excluding and including LULUCF, indirect CO<sub>2</sub> emissions, and emissions by gas and by sector.

## II. Summary and general assessment of the Party’s 2023 inventory submission

6. Table 2 provides the assessment by the ERT of the Party’s 2023 inventory 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.

<sup>1</sup> Issues are defined in decision 13/CP.20, annex, para. 81.

Table 2  
**Summary of review results and general assessment of the 2023 inventory submission of Ireland**

<i>Assessment</i>		<i>Issue ID#(s) in table 3 or 5<sup>a</sup></i>		
Date of submission	Original submission: NIR, 17 April 2023; CRF tables (version 2), 14 April 2023			
Review format	In country			
Source of GWP-100	IPCC Fifth Assessment Report			
Application of the requirements of the UNFCCC Annex I inventory reporting guidelines and the Wetlands Supplement (if applicable)	Have any issues been identified in the following areas:			
	(a) Identification of key categories?			No
	(b) Selection and use of methodologies and assumptions?			Yes I.7, I.9, I.10, I.12, I.14, A.5, L.9
	(c) Development and selection of EFs?			Yes E.4, E.6, I.17, L.8
	(d) Collection and selection of AD?			Yes I.11, L.6
	(e) Reporting of recalculations?			No
	(f) Reporting of a consistent time series?			No
	(g) Reporting of uncertainties, including methodologies?	Yes G.3		
	(h) QA/QC?	No		
	(i) Missing categories, or completeness? <sup>b</sup>	Yes E.5, I.5, I.8, I.15, W.3, L.1, L.13		
	(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		
National inventory arrangements	Have any issues been identified with the effectiveness and reliability of the institutional, procedural and legal arrangements for estimating GHG emissions?	Yes L.11		
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		
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		

<sup>a</sup> Further information on the issues identified, as well as additional findings, may be found in tables 3 and 5.

<sup>b</sup> Missing categories for which methods are provided in the 2006 IPCC Guidelines may affect completeness and are listed in annex II.

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

7. Table 3 compiles the recommendations from previous review reports that were included in the most recent previous review report, published on 17 May 2023,<sup>2</sup> and had not been resolved by the time of publication of the report on the review of the Party's 2022 inventory submission. The ERT has specified whether it believes the Party had resolved, was addressing or had not resolved each issue 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 Ireland

<i>ID#</i>	<i>Issue classification<sup>a</sup></i>	<i>Recommendation from previous review report</i>	<i>ERT assessment and rationale</i>
General			
G.1	Archiving (G.7, 2022) Transparency	Improve documentation of the archiving process in the NIR, for example by compiling information on archiving in one dedicated chapter and adding information on storage of hard copies not yet included in the electronic archiving system.	Resolved. The Party reported in its NIR (p.11) that all data used in compiling the national GHG inventory submission are stored on a server at the Monaghan Regional Inspectorate of EPA, where key staff involved in compiling the national inventory are located. All background data for recent years are available in electronic format, with a transparent file structure. All data (emission estimates, AD, inventory submissions, references, information on QA/QC) on the server are backed up daily. During the review, the Party presented the file structure and electronic files for all the data.
G.2	CPR (G.1, 2022) (G.10, 2020) Adherence to the reporting guidelines under Article 7, paragraph 1, of the Kyoto Protocol	Present the calculation of the CPR and ensure that the comparison calculation is based on the most recent GHG inventory.	Resolved. During the review, the Party clarified that the CPR is not reported in the 2023 inventory submission as the reporting under the second commitment period of the Kyoto Protocol was completed with the 2022 submission. Following the guidance from the 2023 joint meeting of inventory lead reviewers, the ERT acknowledged that inventory submissions are now being made outside a commitment period of the Kyoto Protocol for the first time since 2006, and at the same time the review of the additional period for fulfilling commitments for the second commitment period is under way.
G.3	Uncertainty analysis (G.5, 2022) (G.12, 2020) Transparency	Report the underlying assumptions informing the uncertainty estimates in the NIR for category 1.B.2 and subcategories under categories 3.A, 3.B, 3.D, 3.G, 3.H and 5.B.1.	Not resolved. During the review, the Party provided to the ERT the underlying assumptions informing the uncertainty estimates and clarified that it will implement the recommendation in the next inventory submission.
Energy			
E.1	1.A Fuel combustion – sectoral approach – liquid	Provide in the NIR a description of the research project on AD for off-road vehicles and other	Addressing. The Party reported in its NIR (p.76) the redistribution of fuel within the energy sector between the 2022 and 2023 submissions. During the

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	fuels – CO <sub>2</sub> , CH <sub>4</sub> and N <sub>2</sub> O (E.1, 2022) (E.21, 2020) Transparency	machinery and how it will be implemented in order to improve emission estimates for off-road vehicles and other machinery reported under categories 1.A.2 and 1.A.4.	review, Ireland informed the ERT that the research project had been finalized but the coronavirus disease 2019 pandemic had a negative impact on its outcome as it affected the collection of AD. Therefore, the Party concluded that changing the methodology for estimating emissions from off-road vehicles and other machinery to take into account the results of the research project would not improve the accuracy of the inventory. The ERT considers that information on the outcome of the research project should be included in the NIR.
E.2	1.A.1.b Petroleum refining – gaseous fuels – CO <sub>2</sub> (E.4, 2022) (E.2, 2020) (E.3, 2018) (E.15, 2016) (E.15, 2015) Transparency	Provide an explanation of the low IEF for gaseous fuels and investigate the reason for the differences in the breakdown of fuels, especially for refinery gas and natural gas, used in refining between the EU ETS and SEAI data and report the results of the investigation in the NIR together with the proper allocation of fuels among fuel categories.	Resolved. The Party provided an explanation for the low IEF for gaseous fuels by stating in its NIR (p.72) that the total energy from fuel use reported under the EU ETS is harmonized with the total energy reported in the national energy balance for 2013–2021, and that the differences in breakdown between refinery and natural gas are due to the different reporting to SEAI for the energy balance and under the EU ETS. During the review, the Party explained that the total energy from use of both refinery and natural gas is identical in the EU ETS and SEAI reporting and that sometimes a mixture of natural and refinery gas is used for combustion, which results in differences for individual fuels between the EU ETS and SEAI reporting. As EU ETS reporting is based on energy use and SEAI includes both refinery and natural gas in the energy balance, some differences in the reporting are likely.
E.3	1.B.2 Oil, natural gas and other emissions from energy production – gaseous fuels – CH <sub>4</sub> (E.15, 2022) Completeness	Estimate emissions from exploration, or use the notation key “NE” for CH <sub>4</sub> emissions, explaining that they are below the significance threshold, rather than “NO”, given the evidence that the activity does occur.	Resolved. The Party reported CH <sub>4</sub> emissions from exploration in CRF table 1.B.2 as “NE”. In the NIR (p.413), it is stated that, during the previous review, the Party provided detailed information on the on- and offshore exploration wells drilled until 2019, demonstrating that there has been little historical activity for this category (no exploration occurred in 2020). It is also stated that only two onshore wells were drilled in Ireland during 1990–2019 and only seven offshore wells during 2009–2019. It is further stated that the previous ERT considered that any potential emissions from exploration would be below the significance threshold.
<b>IPPU</b>			
I.1	2.F.1 Refrigeration and air conditioning – HFCs (I.1, 2022) (I.5, 2020) Accuracy	Report recovered HFC emissions from mobile air conditioning.	Resolved. Ireland corrected the amount of gas remaining at decommissioning reported in CRF table 2(II)B-Hs2 so that the disposal loss factor reported in the CRF table matches the EF applied. Ireland explained the lack of recovery of F-gases from mobile air conditioning in the NIR (p.137).
I.2	2.F.1 Refrigeration and air conditioning – HFCs (I.6, 2022) Transparency	Improve the transparency of the reporting by providing more details in the NIR on assumptions, rates and EFs and their sources per substance (F-gas) used at the subcategory level for estimating HFC emissions across the time series.	Resolved. Ireland included such information in the NIR (annex 3.2, table 4.5).

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I.3	2.F.1 Refrigeration and air conditioning – HFCs (I.7, 2022) Transparency	Increase the transparency of the reporting by adding information on how the time series of stocks are determined, taking into account new additions and losses from operations and disposal at the subcategory level.	Resolved. Ireland provided information in the NIR (pp.136–137) on how emissions from refrigeration and air conditioning are estimated and provided data on assumptions, use of HFCs and EFs in the NIR (annex 3.2, table 4.5).
Agriculture			
A.1	3. General (agriculture) – CH <sub>4</sub> and N <sub>2</sub> O (A.1, 2022) (A.5, 2020) Accuracy	Estimate and report CH <sub>4</sub> and N <sub>2</sub> O emissions from anaerobic digesters or, if data are not available, report them as “IE” instead of “NO” and indicate in CRF table 9 where in the inventory the emissions have been included.	Resolved. The Party reported in its NIR (section 7.3.2) that agricultural slurries (manure) are not categorized as waste and therefore not diverted to anaerobic digestion. The emissions resulting from anaerobic digestion occur for commercial and household waste and are reported in the waste chapter of the NIR. Therefore, emissions from anaerobic digestion in agriculture are reported correctly in the CRF tables as “NO”. During the review, Ireland referred to the NIR (section 5.2.2.1.6) where anaerobic digestion is addressed and clarified that anaerobic digestion is in its infancy in Ireland and that the inventory agency is engaging with the industry to put in place the necessary data flows so that, as the industry becomes more widespread, information of feedstock will be made available.
A.2	3. General (agriculture) – CH <sub>4</sub> and N <sub>2</sub> O (A.2, 2022) (A.5, 2020) Transparency	Provide information on the biogas industry in Ireland (e.g. number of plants, capacity, gas production and, if available, treated amounts of manure and other biomass) in the NIR, including information on other organic fertilizers being applied to soils as part of the digestate.	Resolved. The Party reported in its NIR (section 7.3.2.1) all required information related to anaerobic digestion as a means of managing waste. AD for anaerobic digestion are provided by the EPA waste statistics team. During the review, the Party provided to the ERT the 2023 biomethane energy report, in which the potential for use of manure as feedstock for biomethane production is described. According to the report, no production of biomethane from manure is currently reported in the country.
A.3	3.A.1 Cattle – CH <sub>4</sub> (A.3, 2022) (A.1, 2020) (A.3, 2018) Transparency	Provide in the NIR input parameter tables for various cattle subcategories, including feed digestibility, live weight, weight gain and duration before slaughter, for the entire time series.	Resolved. The Party provided in its NIR additional information on feed digestibility and weight gain (annex 3.3.J) and live weight (annex 3.3.B) and referred in the NIR to information on duration before slaughter outlined in studies by O’Mara (2006) and O’Brien and Shalloo (2019).
A.4	3.D.a.6 Cultivation of organic soils (i.e. histosols) – N <sub>2</sub> O (A.7, 2022) Transparency	Provide more information in the NIR to justify the use of the nutrient-poor status of managed organic soils in the agriculture section of the NIR, and reconcile the inconsistency in the nutrient status of organic soils for grassland between the LULUCF and agriculture sections with the EFs and methods used to estimate emissions from grassland organic soils in the LULUCF section of the inventory (which assumes these soils are a mix of nutrient-poor and nutrient-rich condition).	Addressing. The Party reported in its NIR (p.170) that N <sub>2</sub> O emissions from organic soils were estimated following the tier 1 approach for nutrient-poor grassland provided in the Wetlands Supplement (table 2.5). According to a survey conducted by EPA, the dominant peatland in Ireland is ombrotrophic (nutrient poor), receiving water and nutrients solely from the atmosphere. During the review, the Party indicated that the more detailed analysis required to determine the fractions of nutrient-poor and nutrient-rich agricultural organic soils is ongoing. The ERT considers that the recommendation has not yet been fully addressed because the Party did not provide a detailed analysis of the agricultural organic soils, determining the fractions of nutrient-poor and



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			nutrient-rich organic soils and applying the corresponding EFs from the Wetlands Supplement.
A.5	3.G Liming – CO <sub>2</sub> (A.6, 2022) (A.4, 2020) (A.2, 2018) (A.3, 2016) (A.3, 2015) Accuracy	Collect country-specific data and apply a tier 2 method for this category, noting that the use of tier 1 is conservative.	Addressing. The Party reported in its NIR (p.187) that it has had discussions with researchers and funding agencies on improving the estimates of emissions for this category, and that a research project aimed at developing tier 2 emission estimates for liming has started. During the review, the Party argued that not all carbon contained in lime is emitted to the atmosphere and the research is expected to determine the fraction retained in soils. The ERT considers that the recommendation has not yet been fully addressed because the Party did not apply a tier 2 method for estimating emissions from liming.
A.6	3.G Liming – CO <sub>2</sub> (A.8, 2022) Transparency	Provide more information confirming that dolomite is not used in Ireland, either in the form of documented evidence from DAFM or other research.	Addressing. The Party reported in its NIR (section 5.7.2) that lime used in Ireland for agriculture must have a total neutralizing value of above 90 per cent (regulatory requirement) and that values above 95 per cent are usual. Nevertheless, dolomite use could result in a total neutralizing value of above 120 per cent, and a total neutralizing value of above 95 per cent is not sufficient to demonstrate that dolomite is not used. Further, the Party explained that calcium carbonate analyses are conducted to ensure that quarries meet the required specifications. The ERT considers that Ireland has not yet confirmed that lime is the only product used to reduce soil acidity in the country and that calcium carbonate analysis could be used to rule out the use of dolomite.
LULUCF			
L.1	4. General (LULUCF) – CO <sub>2</sub> (L.1, 2022) (L.9, 2020) Completeness	Conduct and report in the NIR an in-depth evaluation of the land-use conversion categories other than forest land where the reporting of the areas and the associated emissions and removals start in 1990 and have been accumulated since then, for example land converted to grassland, and revise the emission estimates by taking into account emissions and removals from conversion of land prior to 1990 accordingly.	Addressing. The Party reported in its NIR (p.221) and CRF tables 4.C, 4.E and 4.F the areas of forest land converted to grassland, settlements and other land in 1990 and the associated emissions and removals. The Party also reported in CRF table 4.E the areas of cropland, grassland and other land converted to settlements and the associated emissions. The Party further reported in its NIR (p.179) that a 20-year transition period was applied for all land uses other than forest land. However, no additional information was provided on land-use conversion categories for land other than forest land reported for 1990 and their associated emissions and removals considering conversion of land prior to 1990.  During the review, the Party clarified that there are little or no data available on land-use conversion other than forest land for before 1990 and, if they exist (e.g. from agricultural censuses), different approaches were used for data collection before and after 1990 (see NIR figure 6.28). The Party informed the ERT that the land-use matrix (see annex 3.4.D.1 to the NIR) shows the transition of land between categories and that estimates were made for 1989 for each of the land uses (cropland, grassland, wetlands, settlements and other land), which were used as the basis to derive the 1990 values.

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L.2	4. General (LULUCF) – CO <sub>2</sub> (L.2, 2022) (L.9, 2020) Transparency	Document the approach chosen by providing information on methodological decisions, including the decision regarding the conversion period, with respect to land-conversion categories, and the rationale for reporting land-conversion categories starting in 1990 and maintaining the reporting of these land areas within a specific land-conversion category as a cumulative total for all future years.	The ERT considers that the recommendation has not yet been fully addressed because the Party did not report the results of the in-depth evaluation.  Resolved. The Party reported in its NIR (p.179) that the 20-year transition period, as the default IPCC approach, was applied for all land uses other than forest land, and the 30-year transition period for forest land, to ensure compliance with EU regulation 2018/841, article 6, paragraph 2 (see also ID# L.10 in table 5).
L.3	4.A Forest land – CO <sub>2</sub> (L.3, 2022) (L.10, 2020) Transparency	Provide further information, ideally in section 6.3 of the NIR, on: (a) The modelling approach, including the rationale for not applying the conversion period when a tier 3 methodology is used; (b) The rationale for selecting 1990 to start reporting land converted to forest land and maintaining the reporting of these land areas within land converted to forest land as a cumulative total for all future years; (c) The rationale for not considering previous carbon stocks in simulations of forest land remaining forest land.	Resolved. The ERT considers that the recommendation has been implemented for (a), (b) and (c) because the Party reported in its NIR (p.197 and annex 3.4.B) detailed information on the functioning of CBM-CFS3 taking into account the application of the 30-year transition period and carbon stock transfers and carbon stock for land converted to forest land and forest land remaining forest land since 1960. During the review, the Party provided additional information about CBM-CFS3, including the application of a 30-year transition period in regard to the stabilization of the dead organic matter pool. In addition, the Party briefly explained how previous carbon stocks are considered in the initial calibration of the model (see also ID# L.2 above).
L.4	4.A Forest land – CO <sub>2</sub> (L.3, 2022) (L.10, 2020) Transparency	Provide further information, ideally in section 6.3 of the NIR, on the assumptions used for simulation of the dead organic matter pool and their rationale.	Addressing. The Party reported detailed information on the functioning of CBM-CFS3 (see ID#s L.2 and L.3 above). However, the Party did not provide in the NIR clarification of the assumptions used for simulation of the dead organic matter pool.
L.5	4.A Forest land – CO <sub>2</sub> (L.6, 2022) (L.12, 2020) Transparency	Improve the methodological description of and approach to reporting forest land areas in order to clearly describe the reporting approach for young stands that were afforested just prior to 1990 and demonstrate that the reporting of land areas in category 4.A (forest land) is complete in order to improve transparency.	Resolved. The Party reported in its NIR (p.186) that the 30-year transition period was applied for forest land, including the land converted to forest land prior to 1990 and since 1960.
L.6	4(II) Emissions/removals from drainage and rewetting and other management of	Report correct data on CH <sub>4</sub> emissions from drained organic soils in wetlands in CRF table 4(II).	Not resolved. The Party reported in CRF table 4(II) the CH <sub>4</sub> IEF per area of drained organic soils in wetlands as 119.64 kg CH <sub>4</sub> /ha for 2021. This continues to be the highest CH <sub>4</sub> IEF of all reporting Parties (0.16–119.64 kg CH <sub>4</sub> /ha). During the review, the Party clarified that this relates to a misallocation of

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	organic/mineral soils – CH <sub>4</sub> (L.11, 2022) Comparability		emissions and that it is discussing with stakeholders how to improve the reporting of rewetted and restored wetlands in future inventory submissions.
L.7	4(III) Direct N <sub>2</sub> O emissions from N mineralization/immobilization – N <sub>2</sub> O (L.12, 2022) Transparency	Ensure consistency in the reporting of N <sub>2</sub> O emissions from N mineralization/immobilization in both the NIR and the CRF tables and include an explanation for the use of notation keys in CRF table 9.	Addressing. The Party reported in its NIR (p.217) that N <sub>2</sub> O emissions due to mineralization of soil organic carbon due to land conversion to forest land are not significant and therefore reported as “NE”, and justified this reporting. Also, in CRF table 4(III) the Party reported N <sub>2</sub> O emissions from forest land remaining forest land and land converted to forest land as “NE”. However, the ERT noted that the Party did not explain the reporting of “NE” in CRF table 9. During the review, the Party clarified that N <sub>2</sub> O emissions were reported as “NE” in CRF table 4(III) and that use of notation keys was justified in the NIR (section 6.3.5.7).  The ERT considers that the recommendation has not yet been fully addressed because the Party did not explain the reporting of “NE” in CRF table 9.
L.8	4(V) Biomass burning – CO <sub>2</sub> (L.13, 2022) Accuracy	Provide transparent documentation of the country-specific data supporting the high IEF for biomass burning in wetlands.	Not resolved. The Party continued to report in CRF table 4(V) a CO <sub>2</sub> IEF of 352.66 (t/unit) for controlled burning on wetlands remaining wetlands for 2021. The ERT noted that no explanation for this was provided in the NIR (section 6.6.7). During the review, the Party clarified that the CO <sub>2</sub> IEF reported in CRF table 4(V) is based on country-specific data (Wilson et al, 2015) and within the range of default EFs for organic soil fires in boreal or temperate climate (table 2.7, chap. 2, of the Wetlands Supplement), and that detailed information will be provided in the next inventory submission.
Waste			
W.1	5.C.2 Open burning of waste – CO <sub>2</sub> , CH <sub>4</sub> and N <sub>2</sub> O (W.3, 2022) (W.7, 2020) Transparency	Report in the NIR the AD (e.g. the estimates of the amount of uncollected municipal solid waste) and assumptions used to estimate emissions from open burning of waste.	Resolved. The Party reported in the NIR (annexes 3.5 and 3.5.F) the AD (e.g. estimated amounts of uncollected municipal solid waste) and assumptions used for estimating emissions from open burning of waste.
W.2	5.D.1 Domestic wastewater – CH <sub>4</sub> and N <sub>2</sub> O (W.5, 2022) (W.5, 2020) (W.9, 2018) Transparency	Report wastewater flows including treated (aerobically and anaerobically) and untreated wastewater in the NIR.	Addressing. The Party did not report in the NIR the wastewater flows including treated (aerobically and anaerobically) and untreated wastewater in accordance with the 2006 IPCC Guidelines (vol. 5, chap. 6, figure 6.1, p.6.7). During the review, the Party provided the ERT with a wastewater flow diagram elaborated on the basis of an EPA report on urban wastewater treatment in Ireland. The ERT considers that the recommendation has not yet been fully addressed because the Party did not reflect this information in the NIR.

<i>ID#</i>	<i>Issue classification<sup>a</sup></i>	<i>Recommendation from previous review report</i>	<i>ERT assessment and rationale</i>
W.3	5.D.1 Domestic wastewater – CH <sub>4</sub> and N <sub>2</sub> O (W.6, 2022) (W.8, 2020) Transparency	Report CH <sub>4</sub> and N <sub>2</sub> O emissions from uncollected and untreated wastewater for the whole time series and provide an explanation in the NIR of the methods, AD and EFs used.	Addressing. The Party did not report CH <sub>4</sub> and N <sub>2</sub> O emissions from uncollected and untreated wastewater for the whole time series or explain in the NIR the methods, AD and EFs used. During the review, the Party provided the ERT with a wastewater flow diagram (see ID# W.2 above) and clarified that the share of uncollected and untreated wastewater is 1.1 per cent of the national generated wastewater and that the CH <sub>4</sub> and N <sub>2</sub> O emissions from uncollected and untreated wastewater amounted to approximately 1.55 kt CO <sub>2</sub> eq in 2021. The ERT noted that this results in the emissions being below the threshold of significance for 2021 in accordance with paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines. The ERT considers that the recommendation has not yet been fully addressed because the Party did not provide calculations for the whole time series or reflect the information provided during the review in the NIR.

<sup>a</sup> References in parentheses are to the paragraphs and the years of the previous review reports in which the issue 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.

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

8. In accordance with paragraph 83 of the UNFCCC review guidelines, the ERT noted that the issues included in table 4 have been identified in three or more successive reviews, including the review of the 2023 inventory submission of Ireland, and had not been addressed by the Party by the time of publication of this review report.

Table 4

##### Issues identified in three or more successive reviews and not addressed by Ireland

<i>ID#</i>	<i>Previous recommendation for issue</i>	<i>Number of successive reviews issue not addressed<sup>a</sup></i>
General		
G.3	Report the underlying assumptions informing the uncertainty estimates in the NIR for category 1.B.2 and subcategories under categories 3.A, 3.B, 3.D, 3.G, 3.H and 5.B.1.	3 (2020–2023)
Energy		
E.1	Provide in the NIR a description of the research project on AD for off-road vehicles and other machinery and how it will be implemented in order to improve emission estimates for off-road vehicles and other machinery reported under categories 1.A.2 and 1.A.4.	3 (2020–2023)
IPPU	No issues identified.	
Agriculture		

<i>ID#</i>	<i>Previous recommendation for issue</i>	<i>Number of successive reviews issue not addressed<sup>a</sup></i>
A.5	Collect country-specific data and apply a tier 2 method for this category, noting that the use of tier 1 is conservative.	5 (2015–2023)
<b>LULUCF</b>		
L.1	Conduct and report in the NIR an in-depth evaluation of the land-use conversion categories other than forest land where the reporting of the areas and the associated emissions and removals start in 1990 and have been accumulated since then, for example land converted to grassland, and revise the emission estimates by taking into account emissions and removals from conversion of land prior to 1990 accordingly.	3 (2020–2023)
L.4	Provide further information, ideally in section 6.3 of the NIR, on the assumptions used for simulation of the dead organic matter pool and their rationale.	3 (2020–2023)
<b>Waste</b>		
W.2	Report wastewater flows including treated (aerobically and anaerobically) and untreated wastewater in the NIR.	4 (2018–2023)
W.3	Report CH <sub>4</sub> and N <sub>2</sub> O emissions from uncollected and untreated wastewater for the whole time series and provide an explanation in the NIR of the methods, AD and EFs used.	3 (2020–2023)

<sup>a</sup> Reports on the reviews of the 2017, 2019 and 2021 inventory submissions of Ireland have not yet been published. Therefore, 2017, 2019 and 2021 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 inventory 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 2023 inventory submission

9. Table 5 presents findings made by the ERT during the individual review of the 2023 inventory submission of Ireland that are additional to those identified in table 3.

Table 5  
Additional findings made during the individual review of the 2023 inventory submission of Ireland

<i>ID#</i>	<i>Finding classification</i>	<i>Description of finding with recommendation or encouragement</i>	<i>Is finding an issue?<sup>a</sup></i>
<b>General</b>			
G.4	NIR	<p>The Party provided in the NIR (p.328) a list of the references mentioned in different chapters of the NIR. The ERT noted that the list is not complete as some references are missing (e.g. Duffy et al, 2020, and NFAP, 2019), which impairs the transparency of the information reported.</p> <p>During the review, the Party presented the missing references, which facilitated understanding of the methodologies applied.</p> <p>The ERT recommends that the Party revise the list of references to ensure that all references mentioned are listed and can be easily accessed.</p>	Yes. Transparency

<i>ID#</i>	<i>Finding classification</i>	<i>Description of finding with recommendation or encouragement</i>	<i>Is finding an issue?<sup>a</sup></i>
G.5	QA/QC and verification	<p>During the review, the Party informed the ERT of errors in the calculation estimates that could have been identified by the Party during the QA/QC checks (see, e.g., ID#s E.4 and L.9 below) and explained the reasons for the errors.</p> <p>The ERT recommends that the Party revise the QA/QC procedures in the light of the errors identified to include additional checks that could prevent this type of error in future inventory submissions.</p>	Yes. Convention reporting adherence
Energy			
E.4	1.A Fuel combustion – sectoral approach – liquid fuels – CO <sub>2</sub>	<p>The ERT noted that the same IEF was used for liquid fuels for the whole time series for a number of categories, such as road transportation.</p> <p>During the review, the Party informed the ERT that the country-specific EFs for liquid fuels were developed in 1990, that it was not planning to revise the country-specific CO<sub>2</sub> EFs for liquid fuels and that the EFs used are within the range used by other Parties included in Annex I to the Convention and EU member States. The Party intends to discuss updating the EFs with SEAI. The Party also informed the ERT that it may not be possible to update the country-specific EFs for the most significant liquid fuels and that the current individual liquid fuel EFs are in line with those recommended in the IPCC guidelines. The Party further informed that only 30 per cent of road transportation fuels are refined in Ireland’s single refinery and that the remainder of fuels used for road transportation are imported and most likely already contain blended biofuels (E10, B7, B12 or B20). Therefore, it may not be possible to derive the CO<sub>2</sub> EF for gasoline and diesel.</p> <p>The ERT recommends that Ireland evaluate country-specific EFs for the most significant liquid fuels, such as diesel and gasoline, with a view to confirming whether the current EFs are appropriate for the liquid fuels used in the country or updating its emission estimates, if necessary.</p>	Yes. Accuracy
E.5	1.A.3.b Road transportation – gaseous fuels – CO <sub>2</sub> , CH <sub>4</sub> and N <sub>2</sub> O	<p>The ERT noted from the NIR and CRF table 1.A(a)s3 that emissions from gaseous fuels under road transportation were reported as “NO”, but a quantity of natural gas used for road transportation was reported in the energy balance.</p> <p>During the review, the Party clarified that some natural gas was consumed in freight transport from 2014 onward and the cumulative quantity of CO<sub>2</sub> emissions from 2014 to 2021 equates to approximately 6.2 kt CO<sub>2</sub>.</p> <p>The ERT recommends that Ireland revise the historical data for 2014 onward to account for the consumption of natural gas in road transportation and report the corresponding emissions in the NIR and the CRF tables.</p>	Yes. Completeness
E.6	1.B.2.c Venting and flaring – CH <sub>4</sub> and N <sub>2</sub> O	<p>The ERT noted significant changes in the CH<sub>4</sub> and N<sub>2</sub>O IEFs for gas flaring (subcategory 1.B.2.c.2.ii) reported for 2020 in CRF table 1.B.2 between the 2022 and 2023 submissions. The IEFs changed from 1,000 kg CH<sub>4</sub>/unit to 0.001 kg CH<sub>4</sub>/unit, and from 100 kg N<sub>2</sub>O/unit to 0.0001 kg N<sub>2</sub>O/unit.</p> <p>During the review, the Party explained that CH<sub>4</sub> and N<sub>2</sub>O emissions were reported incorrectly, having been underestimated by a factor of one million in the 2023 submission. The Party also explained that the error was not identified during QC, as the change in CO<sub>2</sub> eq was only 0.1 per cent for subcategory 1.B.2.c.2.ii.</p> <p>The ERT recommends that Ireland correct its estimates of CH<sub>4</sub> and N<sub>2</sub>O emissions from gas flaring (subcategory 1.B.2.c.2.ii).</p>	Yes. Accuracy

IPPU

<i>ID#</i>	<i>Finding classification</i>	<i>Description of finding with recommendation or encouragement</i>	<i>Is finding an issue?<sup>a</sup></i>
I.4	2.A.4 Other process uses of carbonates – CO <sub>2</sub>	<p>Ireland reported emissions from non-metallurgical magnesia production as “NO” in CRF table2(I).A-Hs1, although magnesia production is occurring in Ireland at one plant.</p> <p>During the review, Ireland indicated that the magnesia is produced from seawater and slaked lime. Therefore, the Party included the emissions under lime production in CRF table 2.A.2. The ERT noted that the reporting by Ireland is consistent with the 2006 IPCC Guidelines considering the production process at the Irish plant.</p> <p>The ERT recommends that Ireland include information on the magnesia production process in the NIR, explaining why the emissions are included under lime production, and use the correct notation key for reporting in the relevant CRF table.</p>	Yes. Transparency
I.5	2.C.5 Lead production – CO <sub>2</sub>	<p>Ireland reported emissions from lead production as “NO” in CRF table2(I).A-Hs2. The ERT noted that the United States Geological Survey reports production of secondary lead in Ireland of around 17,000 t/year. The ERT also noted that one lead refinery is operating in Ireland.</p> <p>During the review, Ireland explained that it had not been aware of this activity and considered that the emissions could have been included in the energy sector. The ERT noted that the 2006 IPCC Guidelines provide an EF for production of secondary lead of 0.2 t CO<sub>2</sub>/t lead produced.</p> <p>The ERT recommends that Ireland estimate emissions from secondary lead production and report them under category 2.C.5 or reallocate the emission estimates if currently reported elsewhere in the inventory.</p>	Yes. Completeness
I.6	2.D.2 Paraffin wax use – CO <sub>2</sub>	<p>Ireland reported in its NIR (p.129) that data on consumption of wax are derived from the national energy balance. The ERT noted that annex 3.2.F to the NIR shows total wax consumption without disaggregating by use. The ERT also noted that no information was provided on the split of the total consumption between candles, with an oxidized during use factor of 1, and other uses of wax, with an oxidized during use factor of 0.2.</p> <p>During the review, the Party clarified that information on candles for the inventory came from the Central Statistics Office, and the national energy balance was used for information on other uses of wax as it had been confirmed that the data in the energy balance exclude candles.</p> <p>The ERT recommends that Ireland update the NIR to include the information that two different sources of AD are used and to present information in annex 3.2.F to the NIR separately for wax used for candles and wax used for other purposes.</p>	Yes. Transparency
I.7	2.F.1 Refrigeration and air conditioning – HFCs	<p>Ireland reported all emissions from refrigeration and air conditioning, apart from mobile air conditioning, under commercial refrigeration (2.F.1.a). Ireland described in the NIR (p.146) the reasons for this very aggregated approach.</p> <p>During the review, the ERT examined the current methodology together with Irish experts and noted that there are two methodologies being applied, as there is information available on heat pumps and stationary refrigeration units being imported to Ireland, while the end uses of bulk imports of HFCs are not known.</p> <p>The ERT recommends that Ireland report the AD for and emissions from heat pumps and stationary air conditioning separately under category 2.F.1.f in the CRF tables. The ERT also recommends that Ireland describe the methodology used for estimating these emissions in the NIR.</p>	Yes. Comparability

ID#	Finding classification	Description of finding with recommendation or encouragement	Is finding an issue? <sup>a</sup>
I.8	2.F.1 Refrigeration and air conditioning – HFCs	<p>As noted in ID# I.7 above, Ireland reported emissions from F-gases used in refrigeration and air conditioning at a highly aggregated level.</p> <p>During the review, in discussions with Irish experts, it became clear that the estimates do not include emissions from domestic refrigeration as it is considered that the appliances use hydrocarbons as refrigerants. The ERT noted that almost all Parties report emissions from domestic refrigeration and that it appears unlikely that household refrigeration appliances containing HFCs have not been sold in Ireland at any stage during the time series.</p> <p>The ERT recommends that Ireland investigate the use of domestic refrigeration appliances using HFCs throughout the time series and report emissions from domestic refrigeration under subcategory 2.F.1.b.</p>	Yes. Completeness
I.9	2.F.1 Refrigeration and air conditioning – HFCs	<p>Ireland reported the use of F-gases imported in bulk at a highly aggregated level.</p> <p>During the review, the ERT and Irish experts discussed the methodology used, which relies on an assumed split between the amount of gas used for refilling equipment and the amount of gas used for new installations and retrofitting existing installations (in recent years this split has been assumed to be 55 per cent for refill and 45 per cent for new fill). The amount of HFCs used for refill is assumed to represent the emissions in the year of refill, while the amount of HFCs used for first fill is the basis for the emission calculation for manufacturing, calculated using an EF of 1 per cent. The ERT noted that the estimated emissions from refrigeration and air conditioning are very dependent on the assumptions used for the calculation and that these assumptions appear to be highly uncertain.</p> <p>The ERT recommends that Ireland collect more detailed data from the importers and distributors of the gases or from other available data sources to reduce the uncertainty and enhance the transparency of its estimates of emissions from refrigeration and air conditioning.</p>	Yes. Accuracy
I.10	2.F.1 Refrigeration and air conditioning – HFCs	<p>Ireland reported in the NIR (pp.136–137) that for mobile air conditioning it uses a bottom-up approach to estimate emissions using information including vehicle lifetime, average charge of air-conditioning equipment and share of vehicles with air conditioning. However, the ERT noted that the specific values used were not presented in the NIR.</p> <p>During the review, Ireland provided the calculation file showing all the background information used. The spreadsheet made it easy for the ERT to understand the calculations. The ERT noted that the share of new vehicles equipped with air conditioning has been assumed constant at 90 per cent since 2010, but the ERT considers that this share is likely to be higher in the more recent years.</p> <p>The ERT recommends that Ireland update the assumption of the share of vehicles with air conditioning and revise its emission estimates for mobile air conditioning accordingly.</p>	Yes. Accuracy
I.11	2.F.3 Fire protection – HFCs	<p>In the NIR (pp.138–139) Ireland described the methodology used for estimating emissions from fire protection. However, the ERT noted that there is no information in the NIR on the derivation of the number of fire protection installations and the installed amount of HFCs.</p> <p>During the review, Ireland provided the ERT with the calculation spreadsheet. The ERT noted that the number of new installations has been assumed to be 495 since the introduction of HFCs as a fire protectant in Ireland in 1996, which seems unlikely. Additionally, the average volume of the room being protected and the flooding factor have also been kept constant since 1996. The ERT noted that the NIR states that one of the primary uses is in data centres and that there has been a significant increase in the number of data centres over the years. The ERT also</p>	Yes. Accuracy



ID#	Finding classification	Description of finding with recommendation or encouragement	Is finding an issue? <sup>a</sup>
		<p>noted that Ireland uses an EF during use of 1 per cent, while the 2006 IPCC Guidelines default value is 2 per cent. Further, Ireland assumes a recovery factor of HFCs of 91 per cent, which is based on a German paper (Schwartz et al., 2011), while the 2006 IPCC Guidelines provide a default assumption of no recovery. The 2006 IPCC Guidelines acknowledge that this could lead to overestimation of emissions and recommends collecting information on recovery that may occur due to legislation, industry practices or other measures. However, the ERT does not consider it good practice to rely on data on recovery from a different Party, where the legislation or industry practices might be very different.</p> <p>The ERT recommends that Ireland conduct a study on the use of HFCs for fire protection in Ireland to achieve more precise estimates across the time series. The ERT also recommends that Ireland change the applied EF during use to the IPCC default of 2 per cent or provide a justification for using a value of 1 per cent. The ERT further recommends that Ireland collect AD to justify the assumed recovery rate of 91 per cent or use the IPCC default assumption of no recovery.</p>	
I.12	2.F.4 Aerosols – HFCs	<p>Ireland reported in the NIR (p.140) that no specific information on aerosols is available for Ireland and the emission estimates are therefore based on a population proxy derived from the data reported by the United Kingdom of Great Britain and Northern Ireland. The ERT noted that, as stated in the NIR, the use of F-gases in aerosols is probably limited to specialty uses in Ireland and therefore it is uncertain whether a population proxy is the best approach for estimating the associated emissions.</p> <p>During the review, the Party confirmed that no specific data on types of aerosol were available for Ireland.</p> <p>The ERT recommends that Ireland investigate the types of aerosol using HFCs as propellant and assess whether the use of these types of aerosol in Ireland can be considered similar to their use in the United Kingdom.</p>	Yes. Accuracy
I.13	2.F.4 Aerosols – HFCs	<p>Ireland reported in the NIR (p.140) the methodology used to estimate emissions from metered dose inhalers, which includes use of data on population, prevalence of asthma and the share of patients using metered dose inhalers.</p> <p>During the review, Ireland provided information received from a company producing metered dose inhalers in Ireland. The ERT noted that the data provided by the producer show that the assumptions made by Ireland in estimating the emissions are valid, thereby verifying the emission estimates.</p> <p>The ERT recommends that Ireland mention this verification in the NIR (section 4.7.4.4), noting that exact estimates cannot be reported for confidentiality reasons.</p>	Yes. Transparency
I.14	2.G.2 SF <sub>6</sub> and PFCs from other product use – SF <sub>6</sub>	<p>Ireland reported in the NIR (pp.143–144) that there is no information available on SF<sub>6</sub> used in shoes in Ireland and therefore emissions are estimated using a population proxy derived from United Kingdom data. The ERT noted that use of SF<sub>6</sub> in shoes ended around 2003 and therefore it is unlikely that emissions from use of SF<sub>6</sub> in shoes are still occurring.</p> <p>During the review, Ireland acknowledged that the existing methodology does not reflect the current conditions in Ireland.</p> <p>The ERT recommends that Ireland revise the calculation of emissions from SF<sub>6</sub> used in shoes taking into account when such use ended and the expected lifetime of shoes.</p>	Yes. Accuracy

<i>ID#</i>	<i>Finding classification</i>	<i>Description of finding with recommendation or encouragement</i>	<i>Is finding an issue?<sup>a</sup></i>
I.15	2.G.2 SF <sub>6</sub> and PFCs from other product use – SF <sub>6</sub>	<p>Ireland reported in the NIR (pp.143–144) the different uses of SF<sub>6</sub> considered in the inventory, such as for soundproof windows, medical applications (eye surgery), tracer gas and adiabatic properties. Ireland did not mention use for other purposes, such as for particle accelerators.</p> <p>During the review, Ireland provided information on a recently commissioned project for obtaining more information on the uses of SF<sub>6</sub> in the country. The results of the project are expected to be available for use for the 2025 inventory submission.</p> <p>The ERT recommends that Ireland mention the aforementioned project in its next inventory submission and revise the relevant estimates taking into account the results of the project, as appropriate, for the 2025 inventory submission. The ERT also recommends that Ireland investigate the possibility of obtaining data on imports of SF<sub>6</sub> into Ireland in order to verify its current estimated use of SF<sub>6</sub>.</p>	Yes. Completeness
I.16	2.G.3 N <sub>2</sub> O from product uses – N <sub>2</sub> O	<p>Ireland reported in the NIR (p.145) that emissions from medical use of N<sub>2</sub>O (anaesthesia) are included in the inventory, but there is no information on how the emissions were calculated.</p> <p>During the review, Ireland explained that an EF of 0.03 kg/capita was used to estimate the emissions.</p> <p>The ERT recommends that Ireland include in the NIR information on the estimation of emissions from medical use of N<sub>2</sub>O.</p>	Yes. Transparency
I.17	2.H Other (IPPU) – CO <sub>2</sub>	<p>Ireland included emissions of indirect CO<sub>2</sub> in the CRF tables, including from the food and drink industry. The NIR (p.146) explains that Ireland uses the default factor for the carbon content of NMVOCs of 60 per cent. The ERT noted that, for some of the most significant emissions sources within this category, the relevant NMVOC is easily identified and therefore the accuracy of the emission estimates could easily be improved.</p> <p>During the review, Ireland explained that it was using the default factor from the 2006 IPCC Guidelines.</p> <p>The ERT recommends that Ireland investigate the possibility of applying the actual carbon content of the NMVOC where the specific NMVOC is known.</p>	Yes. Accuracy
Agriculture			
A.7	3.A.1 Cattle – CH <sub>4</sub> and N <sub>2</sub> O	<p>The Party reported in its NIR (p.157) that there is limited statistical information on the live-weight gain of the different types of cattle, but the weight of carcasses of all slaughtered cattle is recorded by DAFM. Using data for the average carcass weight of male and female cattle, appropriate live-weight gains are applied for the various life stages of each animal category, such that, when all categories are combined, those data are consistent with the national statistics for carcass weight. The ERT noted that parameters such as the live weight of animals during their lifetime, milk fodder unit and meat fodder unit are manually extracted from the model described in O'Mara (2006) and introduced as input to the spreadsheets to calculate enteric fermentation and manure emissions.</p> <p>During the review, the Party informed the ERT that a new procedure is being developed for using the actual live weight for the different cattle categories provided by stakeholders. The new data will mean that modelled input parameters based on average carcass weight will not be needed.</p> <p>The ERT commends Ireland for adopting this new procedure and encourages the Party to implement it for the next inventory submission.</p>	Not an issue

<i>ID#</i>	<i>Finding classification</i>	<i>Description of finding with recommendation or encouragement</i>	<i>Is finding an issue?<sup>a</sup></i>
A.8	3.A.1 Cattle – CH <sub>4</sub> and N <sub>2</sub> O	<p>The Party reported in its NIR (p.160) that EPA considered the results of a study (O’Brien and Shalloo, 2019) aimed at reviewing the tier 2 methodology used for estimating CH<sub>4</sub> emissions from enteric fermentation and manure management in cattle. For example, the study states that activity or input data for tier 2 livestock CH<sub>4</sub> emissions are not currently updated for several key input variables, for example animal turnout and housing dates, calving dates, dairy cow milk fat and protein production, meat production, cow live weight, farm feeding practices and farm facilities. It is not clear from the NIR which recommendations from the study were already implemented and which are pending.</p> <p>During the review, the Party informed the ERT that animal turnout and housing dates were updated on the basis of Buckley et al. (2023), which also provides an updated analysis of the type of housing systems employed. Cow live weight and meat production AD were taken from O’Brien and Shalloo (2019). Dairy cow milk fat and protein percentage values were sourced from the Central Statistics Office domestic milk production statistics. With respect to beef production, Ireland is in the process of improving the suckler cow and dairy cow models for determining the CH<sub>4</sub> emissions from enteric fermentation and manure management for future inventory submissions.</p> <p>The ERT recommends that Ireland indicate in the NIR which conclusions from the study (O’Brien and Shalloo, 2019) were already implemented (including any relevant references) and which ones are still to be incorporated into the inventory, providing more details in section 5.2.1.1.6.</p>	Yes. Transparency
LULUCF			
L.9	4.A Forest land – CO <sub>2</sub>	<p>The Party reported in its NIR (figure 6.13, p.214) the trend in total emissions and removals in kt CO<sub>2</sub> for land converted to forest land (including and excluding harvested wood products) in comparison with the harvesting rate in Mm<sup>3</sup> for 1991–2019 that consider the 30-year transition period introduced in the current NIR.</p> <p>During the review, the Party clarified that the trend in emissions from above-ground biomass does not correlate with the trend in harvest, where the increasing trend in harvest leads to increment in removals and vice versa. The Party informed the ERT of an error in the calculation of above-ground biomass gains and losses for land converted to forest land for the whole time series with the newly introduced 30-year transition period to forest land, but clarified that this error had no impact on the estimates for the below-ground, litter, deadwood and mineral soil organic carbon pools over 1990–2019, because it was a post model run output script error, and no impact on the total emission and removal trend for forest land. The Party also noted that there was an error in the transcribed organic soils data for forest remaining forest land for 2016–2021. During the review, the Party provided the ERT with the corrected data.</p> <p>The ERT recommends that Ireland correct the aforementioned calculation and report correct estimates for above-ground biomass in land converted to forest land for 1990–2019 and for organic soils for 2016–2021. The ERT also recommends that Ireland revise the QA/QC procedures in place regarding the emission and removal calculations for forest land by involving data providers, such as representatives of DAFM responsible for the national forest inventory, to review the outputs of the models used.</p>	Yes. Accuracy
L.10	4.A Forest land – CO <sub>2</sub> , CH <sub>4</sub> and N <sub>2</sub> O	<p>The Party reported in its NIR (section 6.2.1) that a 30-year transition period for forest land was used to ensure compliance with EU regulation 2018/841. Article 6, paragraph 2, of the regulation states that, where land is converted from cropland, grassland, wetlands, settlements or other land to forest land, an EU member State may change the categorization of such land from land converted to forest land to forest land remaining forest land, 30 years after the date of that conversion, if duly justified based on IPCC guidelines. The ERT noted that the Party did</p>	Yes. Transparency

ID#	Finding classification	Description of finding with recommendation or encouragement	Is finding an issue? <sup>a</sup>
L.11	4.A Forest land	<p>not report in its NIR the justification based on IPCC guidelines for implementing the 30-year transition period, as required by the EU regulation.</p> <p>During the review, the Party clarified that the justification for applying a 30-year transition period for forest land is documented in the national forest accounting plan submitted to the European Commission under EU regulation 2018/841.</p> <p>The ERT recommends that the Party report in the NIR the justification for applying a 30-year transition period for forest land.</p> <p>The ERT noted that the AD used to calculate carbon stock change in forest land, such as the AD used for the calculations prior to 2006, are not archived on the server at the Monaghan Regional Inspectorate of EPA, but are managed and stored on the hard drive of a DAFM consultant, which is not in line with paragraph 27(a) of decision 24/CP.19.</p> <p>During the review, the Party clarified that, under the existing memorandum of understanding between DAFM and EPA, DAFM is required to provide information to facilitate completion of the CRF tables and the NIR. This is done through an external consultant who is contracted by DAFM in an open tender procedure. The contractor is required to acquire all relevant AD from data providers, as set out in the memorandum of understanding, and process the data for use in models and calculations for forest land. The AD provided by the Forest Service of DAFM are archived on the DAFM server. The contractor also provides DAFM with the final input databases used for CBM-CFS3 simulations on completion of the CRF tables. The processed data, model input and output data and additional data are collated, archived and backed up by the contractor on the contractor's server and can be provided to EPA if required. Some of the key AD, such as land-use matrices and output data used for the CRF tables and the NIR, are provided to EPA on an annual basis for archiving.</p> <p>The ERT recommends that Ireland improve its archiving procedures by storing and archiving in the EPA archiving system the processed data and model input and output data used for the calculation of emissions and removals in order to ensure the completeness of the data archiving.</p>	Yes. Convention reporting adherence
L.12	4.A.1 Forest land remaining forest land – CO <sub>2</sub> , CH <sub>4</sub> and N <sub>2</sub> O	<p>The ERT noted that the NIR does not include information on how CBM-CFS3 considered dead organic matter and mineral soil carbon stock changes for land afforested prior to 1990 in simulations of forest land remaining forest land within the framework of the 30-year transition period.</p> <p>During the review, the Party presented the initial calibration of the model, including how carbon stock changes for areas afforested prior to 1990 in simulations of forest land remaining forest land were considered.</p> <p>The ERT recommends that the Party explain in its NIR the initial calibration of the model, including how carbon stock changes in dead organic matter and soils for areas afforested prior to 1990 in simulations of forest land remaining forest land were considered.</p>	Yes. Transparency
L.13	4.C.1 Grassland remaining grassland – CH <sub>4</sub>	<p>The Party reported in its NIR (section 6.5.2.5) that CH<sub>4</sub> emissions from organic soils were accounted for nutrient-poor organic soils in grassland using the EFs provided in the Wetlands Supplement. However, no CH<sub>4</sub> emissions from nutrient-rich organic soils were calculated or reported for grassland, and no justification for this was provided in the relevant chapter of the NIR. Yet, the Party reported CH<sub>4</sub> and N<sub>2</sub>O emissions from nutrient-rich organic soils in forest land in its NIR (section 6.3.4.6).</p>	Yes. Completeness

<i>ID#</i>	<i>Finding classification</i>	<i>Description of finding with recommendation or encouragement</i>	<i>Is finding an issue?<sup>a</sup></i>
		<p>During the review, the Party clarified that most organic soils are ombrotrophic (nutrient poor) in nature according to national research (Connolly and Holden, 2009). The Party indicated that discussions are ongoing with the research community in Ireland to refine emission estimates for grassland organic soils, which will allow for the refinement of the estimation approach for future inventory submissions.</p> <p>The ERT recommends that Ireland revise the estimates of CH<sub>4</sub> emissions taking into consideration nutrient-rich and nutrient-poor organic soils, or justify not providing estimates for CH<sub>4</sub> emissions from nutrient-rich organic soils.</p>	
Waste		No findings for the waste sector additional to those included in table 3 were made by the ERT during the review.	

<sup>a</sup> Recommendations made by the ERT during the review are related to issues as defined in para. 81 of the UNFCCC review guidelines.

## Annex I

## Overview of greenhouse gas emissions and removals as reported by Ireland in its 2023 inventory submission

Tables I.1–I.3 provide an overview of the total GHG emissions and removals as reported by Ireland.

Table I.1

### Total greenhouse gas emissions and removals for Ireland, 1990–2021

(kt CO<sub>2</sub> eq)

	<i>Total GHG emissions and removals excluding indirect CO<sub>2</sub> emissions</i>		<i>Total GHG emissions and removals including indirect CO<sub>2</sub> emissions<sup>a</sup></i>	
	<i>Total including LULUCF</i>	<i>Total excluding LULUCF</i>	<i>Total including LULUCF</i>	<i>Total excluding LULUCF</i>
1990	61 652.28	55 642.84	NA	NA
1995	66 782.83	60 080.66	NA	NA
2000	77 038.02	69 712.38	NA	NA
2010	70 087.95	63 032.16	NA	NA
2015	67 983.44	61 724.03	NA	NA
2020	66 098.75	59 056.30	NA	NA
2021	69 448.12	62 109.87	NA	NA

<sup>a</sup> The Party did not report indirect CO<sub>2</sub> emissions in CRF table 6.

Table I.2

### Greenhouse gas emissions and removals by gas for Ireland, excluding land use, land-use change and forestry, 1990–2021

(kt CO<sub>2</sub> eq)

	<i>CO<sub>2</sub><sup>a</sup></i>	<i>CH<sub>4</sub></i>	<i>N<sub>2</sub>O</i>	<i>HFCs</i>	<i>PFCs</i>	<i>Unspecified mix of HFCs and PFCs</i>	<i>SF<sub>6</sub></i>	<i>NF<sub>3</sub></i>
1990	32 944.42	16 138.04	6 524.85	0.50	0.11	NO	34.92	NO
1995	35 852.99	17 100.73	6 921.24	31.43	88.63	NO	81.54	4.09
2000	45 249.11	16 885.61	6 871.20	245.68	361.34	NO	53.41	46.03
2010	41 793.22	14 535.09	5 582.67	1 016.91	42.29	NO	34.15	27.83
2015	38 718.55	16 233.38	5 574.85	1 116.56	18.47	NO	45.87	16.36
2020	35 123.78	17 286.83	5 926.08	624.08	63.97	NO	18.95	12.62
2021	37 547.28	17 649.70	6 146.64	672.99	64.95	NO	16.23	12.07
<b>Percentage change 1990–2021</b>	<b>14.0</b>	<b>9.4</b>	<b>-5.8</b>	<b>135 583.0</b>	<b>59 658.6</b>	<b>NA</b>	<b>-53.5</b>	<b>NA</b>

<sup>a</sup> Ireland did not report indirect CO<sub>2</sub> emissions in CRF table 6.

Table I.3

### Greenhouse gas emissions and removals by sector for Ireland, 1990–2021

(kt CO<sub>2</sub> eq)

	<i>Energy</i>	<i>IPPU</i>	<i>Agriculture</i>	<i>LULUCF</i>	<i>Waste</i>	<i>Other</i>
1990	31 067.59	3 197.40	19 668.61	6 009.44	1 709.24	NO
1995	33 840.38	3 107.74	21 112.77	6 702.17	2 019.76	NO
2000	42 479.43	4 406.82	21 182.75	7 325.64	1 643.38	NO
2010	40 455.36	2 584.61	19 427.95	7 055.79	564.24	NO
2015	36 855.98	3 205.65	20 620.34	6 259.41	1 042.05	NO
2020	33 122.21	2 828.02	22 133.28	7 042.45	972.79	NO
2021	34 970.15	3 242.83	22 953.53	7 338.25	943.36	NO
<b>Percentage change 1990–2021</b>	<b>12.6</b>	<b>1.4</b>	<b>16.7</b>	<b>22.1</b>	<b>-44.8</b>	<b>NA</b>

Note: Ireland did not report indirect CO<sub>2</sub> emissions in CRF table 6.

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## Annex II

### 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:

- (a) 4 LULUCF (CO<sub>2</sub>) (see ID# L.1 in table 3);
- (b) 1.A fuel combustion – sectoral approach (CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O) (see ID# E.5 in table 5);
- (c) 2.C.5 lead production (CO<sub>2</sub>) (see ID# I.5 in table 5);
- (d) 2.F.1 refrigeration and air conditioning (HFCs) (see ID# I.8 in table 5);
- (e) 2.G.2 other product use (SF<sub>6</sub> and PFCs) (see ID# I.15 in table 5);
- (f) 4.C.1 grassland remaining grassland (CH<sub>4</sub>) (see ID# L.13 in table 5).

## Annex III

### 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 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/>.

#### B. UNFCCC documents

##### Annual review reports

Reports on the individual reviews of the 2015, 2016, 2018, 2020 and 2022 annual submissions of Ireland, contained in documents FCCC/ARR/2015/IRL, FCCC/ARR/2016/IRL, FCCC/ARR/2018/IRL, FCCC/ARR/2020/IRL and FCCC/ARR/2022/IRL 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 Ireland for 2023. Available at [https://unfccc.int/sites/default/files/resource/asr2023\\_IRL.pdf](https://unfccc.int/sites/default/files/resource/asr2023_IRL.pdf).

#### C. Other documents used during the review

Responses to questions during the review were received from Paul Duffy (EPA), 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:

Buckley, C., Moran, B., Donnellan, T., (2023). A report on bovine manure management, application and storage practices in Ireland, 2017 to 2021. Agriculture and Food Development Authority. ISBN: 978-1-84170-683-2. Available at <https://www.teagasc.ie/media/website/publications/2023/Manure-Management-Practices-Report-2022-Final-280223.pdf>.

Connolly J. and Holden N., (2009). Identification, Mapping, Assessment and Quantification of the Effects of Disturbance on the Peat Soil Carbon Stock in Ireland.

DAFM (2022). Industry survey on the crude protein content in compound animal feeds. Department of Agriculture, Food and the Marine.

Gas Networks Ireland (2023). Biomethane Energy Report. Available at <https://www.gasnetworks.ie/docs/business/renewable-gas/biomethane-energy-report.pdf>.

Hyde, B., Carton, O., Murphy, W., (2008). Farm Facilities Survey – Ireland 2003. Agriculture and Food Development Authority.

O'Brien, D. and Shalloo, L., (2019). A review of livestock methane emission factors. Environmental Protection Agency, Johnstown Castle, Wexford, Ireland. Available at [https://www.epa.ie/publications/research/climate-change/Research\\_Report\\_288.pdf](https://www.epa.ie/publications/research/climate-change/Research_Report_288.pdf).



O'Mara, F., (2006). Development of Emission Factors for the Irish Cattle Herd. Environmental Protection Agency, Johnstown Castle, Wexford, Ireland. Available at <https://www.epa.ie/publications/research/climate-change/climate-change-development-of-emission-factors-for-the-irish-cattle-herd.php>.

Schwarz, W., Gschrey, B., Leisewitz, A., Herold, A., Gores, S., Papst, I., Usinger, J., Oppelt, D., Croiset I., Pedersen, P. H., Colbourne, D., Kauffeld, M., Kaar, K., & Lindborg, A., (2011). Preparatory study for a review of Regulation (EC) No 842/2006 on certain fluorinated greenhouse gases. September 2011.

Wilson, D., Dixon, S. D., Artz, R. R. E., Smith, T. E. L., Evans, C. D., Owen, H. J. F., Archer, E., and Renou-Wilson, F., (2015). Derivation of greenhouse gas emission factors for peatlands managed for extraction in the Republic of Ireland and the United Kingdom, *Biogeosciences*, 12, 5291–5308, <https://doi.org/10.5194/bg-12-5291-2015>.

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