



COMPLIANCE COMMITTEE

CC/ERT/ARR/2021/3  
18 February 2021

## **Report of the individual review of the annual submission of Ireland submitted in 2020**

### **Note by the secretariat**

The report of the individual review of the annual submission of Ireland submitted in 2020 was published on 17 February 2021. For purposes of rule 10, paragraph 2, of the rules of procedure of the Compliance Committee (annex to decision 4/CMP.2, as amended by decisions 4/CMP.4 and 8/CMP.9), the report is considered received by the secretariat on the same date. This report, FCCC/ARR/2020/IRL, contained in the annex to this note, is being forwarded to the Compliance Committee in accordance with section VI, paragraph 3, of the annex to decision 27/CMP.1.



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## **Report on the individual review of the annual submission of Ireland submitted in 2020\***

### **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 2020 annual submission of 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 12 to 17 October 2020 remotely.

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\* In the symbol for this document, 2020 refers to the year in which the inventory was submitted, not to the year of publication.



## Contents

	<i>Page</i>
Abbreviations and acronyms .....	3
I. Introduction .....	5
II. Summary and general assessment of the Party's 2020 annual submission .....	6
III. Status of implementation of recommendations included in the previous review report.....	8
IV. Issues and problems identified in three or more successive reviews and not addressed by the Party	22
V. Additional findings made during the individual review of the Party's 2020 annual submission .....	23
VI. Application of adjustments.....	33
VII. Accounting quantities for activities under Article 3, paragraph 3, and, if any, activities under Article 3, paragraph 4, of the Kyoto Protocol .....	33
VIII. Questions of implementation .....	33
 Annexes	
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 Ireland in its 2020 annual submission .....	34
II. Information to be included in the compilation and accounting database .....	38
III. Additional information to support findings in table 2 .....	42
IV. Reference documents .....	43

## Abbreviations and acronyms

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”
CARBWARE	Irish carbon reporting system
CBM	carbon budget model
CER	certified emission reduction
CH <sub>4</sub>	methane
CM	cropland management
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”
COPERT	software tool for calculating road transport emissions
CO <sub>2</sub>	carbon dioxide
CO <sub>2</sub> eq	carbon dioxide equivalent
CPR	commitment period reserve
CRF	common reporting format
CSC	carbon stock change
EEA	European Environment Agency
EF	emission factor
EMEP	Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe
EPA	Environmental Protection Agency of Ireland
ERT	expert review team
ERU	emission reduction unit
EU ETS	European Union Emissions Trading System
EUROCONTROL	European Organisation for the Safety of Air Navigation
FM	forest management
FMRL	forest management reference level
F <sub>ON</sub>	annual amount of animal manure and sewage sludge applied to soils
Frac <sub>GASM2</sub>	fraction of nitrogen in sewage sludge applied to soils that volatilizes as ammonia and nitrogen oxides
GHG	greenhouse gas
GM	grazing land management
HFC	hydrofluorocarbon
HWP	harvested wood products
IE	included elsewhere
IEA	International Energy Agency
IEF	implied emission factor
IPCC	Intergovernmental Panel on Climate Change
IO	instantaneous oxidation
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

LULUCF	land use, land-use change and forestry
N	nitrogen
NA	not applicable
NE	not estimated
NF <sub>3</sub>	nitrogen trifluoride
NIR	national inventory report
NO	not occurring
N <sub>2</sub> O	nitrous oxide
N <sub>2</sub> O <sub>(ATD)</sub> -N	annual amount of N <sub>2</sub> O-N produced from atmospheric deposition of nitrogen volatilized from managed soils
N <sub>2</sub> O <sub>(L)</sub> -N	annual amount of N <sub>2</sub> O-N produced from leaching and run-off of nitrogen additions to managed soils in regions where leaching and run-off occur
N <sub>2</sub> O-N <sub>Ninputs</sub>	annual direct N <sub>2</sub> O-N emissions from nitrogen inputs to managed soils
N <sub>2</sub> O-N <sub>PRP</sub>	annual direct N <sub>2</sub> O-N emissions from urine and dung inputs to grazed soils
PFC	perfluorocarbon
QA/QC	quality assurance/quality control
RMU	removal unit
RV	revegetation
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”
WDR	wetland drainage and rewetting
Wetlands Supplement	<i>2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands</i>
2006 IPCC Guidelines	<i>2006 IPCC Guidelines for National Greenhouse Gas Inventories</i>

## I. Introduction

1. This report covers the review of the 2020 annual submission of 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 12 to 17 October 2020 remotely<sup>1</sup> and was coordinated by Pedro Torres, Luca Birigazzi, Javier Hanna Figueroa and Claudia do Valle (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	Mausami Desai	United States
	Glen Thistlethwaite	United Kingdom
Energy	Brooke Elizabeth Perkins	Australia
	Regine Röthlisberger	Switzerland
	Aynur Tokel	Turkey
IPPU	Jacek Skoskiewicz	Poland
	Erhan Ünal	Turkey
Agriculture	Kingsley Kwako Amoako	Ghana
	Ole-Kenneth Nielsen	Denmark
LULUCF and KP-LULUCF	Rehab Ahmed Hassan	Sudan
	Inge GC Jonckheere	Belgium
	Nele Inge Gabrielle Rogiers	Switzerland
Waste	Phindile Mangwana	South Africa
	Sirinthornthep Towprayoon	Thailand
Lead reviewers	Glen Thistlethwaite	
	Sirinthornthep Towprayoon	

2. The basis of the findings in this report is the assessment by the ERT of the Party’s 2020 annual submission in accordance with the UNFCCC review guidelines and the Article 8 review guidelines.

3. The ERT has made recommendations that Ireland resolve identified findings, including issues<sup>2</sup> designated as problems.<sup>3</sup> Other findings, and, if applicable, the encouragements of the ERT to Ireland to resolve related issues, are also included.

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, and

<sup>1</sup> Owing to the circumstances related to the coronavirus disease 2019, the review had to be conducted remotely.

<sup>2</sup> Issues are defined in decision 13/CP.20, annex, para. 81.

<sup>3</sup> Problems are defined in decision 22/CMP.1, annex, paras. 68–69, as revised by decision 4/CMP.11.

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 2020 annual submission

7. Table 2 provides the assessment by the ERT of the Party's 2020 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 2020 annual submission of Ireland

Assessment		Issue/problem ID#(s) in table 3 or 5 <sup>a</sup>	
Date of submission	Original submission: NIR, 15 April 2020; CRF tables (version 3), 15 April 2020; standard electronic format tables, 15 April 2020		
Review format	Centralized review conducted remotely		
Application of the requirements of the UNFCCC	Have any issues been identified in the following areas:		
Annex I inventory reporting guidelines and the Wetlands Supplement (if applicable)	(a) Identification of key categories?	No	
	(b) Selection and use of methodologies and assumptions?	Yes	A.2, A.4, L.10, L.11
	(c) Development and selection of EFs?	No	
	(d) Collection and selection of AD?	Yes	A.5, A.6
	(e) Reporting of recalculations?	Yes	G.11, E.22, E.23, E.24, E.25, L.15
	(f) Reporting of a consistent time series?	No	
	(g) Reporting of uncertainties, including methodologies?	Yes	G.12
	(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? <sup>b</sup>	Yes	E.14, E.16, L.13, L.9, L.14, W.1
	(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 the Kyoto Protocol	Have any issues been identified related to the following aspects of the national system:		
	(a) Overall organization of the national system, including the effectiveness and reliability of the institutional, procedural and legal arrangements?	No	
	(b) Performance of the national system functions?	No	
	Have any issues been identified related to the national registry:		

<i>Assessment</i>			<i>Issue/problem ID#(s) in table 3 or 5<sup>a</sup></i>
	(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 standard independent assessment report?	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.10
Adjustments	Has the ERT applied any adjustments under Article 5, paragraph 2, of the Kyoto Protocol?	No	
	Has the Party submitted a revised estimate to replace a previously applied adjustment?	No	Ireland 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?	Yes	Please refer to annex III for a list of the questions and issues to be considered during the in-country review
Questions of implementation	Did the ERT list any questions of implementation?	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 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 6 August 2019,<sup>4</sup> and had not been resolved by the time of publication of the review report of the Party's 2018 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. The ERT noted that the individual review of Ireland's 2019 annual submission did not take place in 2019 owing to insufficient funding for the review process.

Table 3

#### Status of implementation of recommendations included in the previous review report for Ireland

ID#	Issue/problem classification <sup>a, b</sup>	Recommendation made in previous review report	ERT assessment and rationale
General			
G.1	Article 3, paragraph 14, of the Kyoto Protocol (G.11, 2018) KP reporting adherence	Report in the NIR any change in the information provided under Article 3, paragraph 14, of the Kyoto Protocol in accordance with decision 15/CMP.1 in conjunction with decision 3/CMP.11.	Resolved. The Party reported that there are no changes to the information since the previous submission relating to Article 3, paragraph 14, of the Kyoto Protocol in its NIR (p.364).
G.2	Key category analysis (G.5, 2018) (G.7, 2016) (G.7, 2015) (table 4 and para. 77, 2014) Transparency	Include a paragraph explaining the assessment of key categories for KP-LULUCF activities in chapter 11 of the NIR.	Resolved. The Party reported in its NIR (chap. 11, pp.322–323) the assessment of key categories for KP-LULUCF activities.
G.3	Key category analysis (G.7, 2018) Convention reporting adherence	Provide a summary table for the key category analysis for the latest reporting year (by level and trend) in accordance with the UNFCCC Annex I inventory reporting guidelines.	Resolved. The Party reported a summary table for the key category analysis in its NIR (annex 1, section 1.G) in addition to CRF table 7.
G.4	KP-LULUCF supplementary information (G.6, 2018) (G.9, 2016) (G.9, 2015) Transparency	Include the value of the FM cap in the NIR and in the CRF accounting table, together with information on its calculation.	Addressing. The Party reported the FM cap in the CRF accounting table but not in the NIR. During the review, the Party clarified that it will endeavour to include details of the FM cap and information on its calculation in its next NIR.  The ERT considers that the recommendation has not yet been addressed because the Party has not yet reported information on the FM cap or its calculation in the NIR.

<sup>4</sup> FCCC/ARR/2018/IRL. The ERT notes that the report on the individual inventory review of Ireland's 2019 annual submission has not been published yet. As a result, the latest previously published annual review report reflects the findings of the review of the Party's 2018 annual submission.

<i>ID#</i>	<i>Issue/problem classification<sup>a, b</sup></i>	<i>Recommendation made in previous review report</i>	<i>ERT assessment and rationale</i>
G.5	NIR (G.3, 2018) (G.4, 2016) (G.4, 2015) (table 3, 2014) Transparency	Improve the descriptions in the NIR of the use of EU ETS data in the energy sector and the assumptions and methodologies used for estimating emissions.	<p>Resolved. The Party improved its reporting regarding identified transparency issues (see ID#s E.7 and W.2 below). During the review, Ireland highlighted the improved descriptions, including assumptions and methodologies used for estimating emissions in the NIR of its use of EU ETS data (i.e. in the energy chapter (sections 3.1.2, 3.1.3, 3.2.4 and 3.2.5) and the IPPU chapter (section 4.2)).</p> <p>The ERT considers that the Party has addressed the recommendation and instances where transparency regarding the use of EU ETS data can be improved are covered under the findings on the energy sector (see ID# E.2 below).</p>
G.6	Notation keys (G.2, 2018) (G.2, 2016) (G.2, 2015) (table 3, 2014) Comparability	Improve the use of notation keys.	<p>Resolved. Ireland has improved the consistency of its use of notation keys between the NIR and the CRF tables (see ID#s E.7 and E.13 below).</p> <p>The ERT considers that there is no general issue regarding the Party's use of notation keys and that sector-specific issues with notation keys, if any, can be addressed under the relevant recommendations or encouragements.</p>
G.7	Notation keys (G.10, 2018) Transparency	Reconcile and cross-check the information reported in section 1.8 and table 1.14 with information reported elsewhere in the NIR and the CRF tables and apply the notation keys "NO", "NA" and "NE", where relevant, instead of providing partial reporting. Explain why the reporting on CH <sub>4</sub> and N <sub>2</sub> O emissions for the categories referred to was incomplete.	<p>Addressing. During the review, the Party clarified that NIR table 1.14, on summary of completeness, has not been reconciled and cross-checked for the current submission and as a result, some information is incorrect, such as the reporting on completeness under category 2.A for gases that are not applicable. The ERT noted that the Party has improved completeness, for example by reporting N<sub>2</sub>O from natural gas flaring (category 1.B.2) in the NIR (chap. 3, section 3.3.2.2), but has not updated NIR table 1.14 for summarizing completeness.</p> <p>The ERT considers that the recommendation has not yet been fully addressed because the some of the previously identified inconsistencies remain.</p>
G.8	Uncertainty analysis (G.8, 2018) Convention reporting adherence	Enhance QA/QC procedures and ensure that the tables containing the results of the uncertainty analysis represent the entire inventory.	Resolved. The Party has enhanced its QC procedures and corrected the headings of NIR tables 1.12 and 1.13 (pp.33–40) and NIR tables 2.A and 2.B in annex 2 to make it clear that the tables contain the results of an uncertainty analysis representing the entire inventory; that is, including all emission and removal categories as required by paragraphs 15 and 25(c) of the UNFCCC Annex I inventory reporting guidelines.

<i>ID#</i>	<i>Issue/problem classification<sup>a, b</sup></i>	<i>Recommendation made in previous review report</i>	<i>ERT assessment and rationale</i>
G.9	Uncertainty analysis (G.9, 2018) Convention reporting adherence	In addition to reporting the uncertainty assessment for the latest inventory year and the trend uncertainty between 1990 and the latest inventory year, include the results of the base-year uncertainty analysis in the NIR.	Resolved. The Party reported the results of the base-year uncertainty analysis with and without LULUCF in its NIR (tables 1.12 and 1.13 and annex 2).
Energy			
E.1	1.A.1.a Public electricity and heat production – biomass – CH <sub>4</sub> and N <sub>2</sub> O (E.12, 2018) Transparency	Include in the next NIR information on the applied EFs and energy consumption values for the individual biomass fuels.	Resolved. The Party reported in its NIR (p.73) additional information on the EFs and energy consumption values for individual biomass fuels.
E.2	1.A.1.b Petroleum refining – gaseous fuels – CO <sub>2</sub> (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; and transparently describe in the NIR the AD and method used for the estimation of CO <sub>2</sub> emissions.	Addressing. The Party reported in its NIR (p.75) that, since AD are derived from the energy balance and CO <sub>2</sub> emission data are derived from EU ETS data, the resulting CO <sub>2</sub> IEF fluctuates significantly. The Party also reported that the issue regarding national energy balance fuel proportions in comparison with EU ETS data is still to be resolved. During the review, the Party clarified that historical emissions that have been reported since 2005 under category 1.A.1.b are based on country-specific and plant-specific data, which are in turn independently verified (EU ETS data). The Party acknowledged that the historical IEF trends within category 1.A.1.b may not be in line with the emissions. This is a result of applying the values in TJ calculated using a different collection method used by the national energy statistics provider in order to balance the fuel data as a whole for the entire energy sector. This means that there were two different collection systems for similar data, whereby verified EU ETS data take precedence in the reporting of emissions. Ireland explained that it is very difficult for various reasons to retrospectively align AD from the two collection systems for historical years, given the relatively small amount of energy (0.9 per cent of energy sector AD in 2018). The Party discussed this issue recently with the national energy statistics provider and is better placed to trace and align the AD attributed to category 1.A.1.b for future reporting as a result of requesting specific breakdown data from both sources. The Party has now retrospectively aligned the data for 2013 onward and this will be reflected in the next submission.  The ERT considers that the recommendation has not yet been fully addressed because the Party has not yet provided an explanation of the low CO <sub>2</sub> IEF for gaseous fuels or the results of the investigation on the differences in the breakdown of fuels between SEAI and the

ID#	Issue/problem classification <sup>a, b</sup>	Recommendation made in previous review report	ERT assessment and rationale
			EU ETS and the allocation of fuels among fuel categories. The ERT notes the Party's intention to provide an update in its next submission.
E.3	1.A.3.a Domestic aviation – liquid fuels – CO <sub>2</sub> (E.4, 2018) (E.16, 2016) (E.16, 2015) Transparency	Provide information in the NIR on which category includes CH <sub>4</sub> and N <sub>2</sub> O emissions from aviation gasoline.	Resolved. The Party explained in its NIR (pp.80–81) that the EUROCONTROL advanced emission model does not split CH <sub>4</sub> and N <sub>2</sub> O emissions between jet kerosene and gasoline, and that its use of aviation gasoline is minimal. Therefore, Ireland reported aviation gasoline as “IE” and included the emissions under jet kerosene.
E.4	1.A.3.a Domestic aviation – liquid fuels – CO <sub>2</sub> , CH <sub>4</sub> and N <sub>2</sub> O (E.13, 2018) Transparency	Include in the NIR information on the Irish Aviation Authority data and the approach used to implement the tier 3a methodology from the <i>EMEP/EEA air pollutant emission inventory guidebook 2016</i> .	Resolved. The Party updated its approach from a tier 3a to a tier 3b methodology and described the new approach in its NIR (pp.80–84).
E.5	1.A.3.a Domestic aviation – liquid fuels – CO <sub>2</sub> , CH <sub>4</sub> and N <sub>2</sub> O (E.14, 2018) Accuracy	Revise the definition of domestic flights and include all flights according to the definition of domestic aviation in the 2006 IPCC Guidelines; discuss with the Irish Aviation Authority whether there are any domestic flights (as defined by the 2006 IPCC Guidelines) that are not included in the provided data, and, if there are, provide estimates or collect additional data on fuel consumption and emissions for those flights (especially training flights).	Resolved. The Party reported in its NIR (pp.80–84) an update to its approach from a tier 3a to a tier 3b methodology. During the review, the Party clarified that the method was updated to capture the additional flights and emissions that were missed using the tier 3a methodology.
E.6	1.A.3.b Road transportation – biomass – CH <sub>4</sub> and N <sub>2</sub> O (E.15, 2018) Transparency	Include in the NIR information on the COPERT calibration procedure for adjusting the average annual mileage based on the statistical fuel consumption and describe the estimation approach applied for biofuels.	Addressing. The Party reported in its NIR (p.92) that the option to balance the mileage on the basis of statistical fuel consumption in the COPERT 5 model was selected. The Party also reported that the emissions from biodiesel and bioethanol are calculated in COPERT 5 by vehicle type, which assumes each vehicle consumes the same split of biofuel and fossil fuel. During the review, Ireland clarified that COPERT does not disaggregate the emissions for biofuels (i.e. biodiesel and bioethanol) from the fossil portion. Appropriate blends are specified within the model for the relevant vehicle categories and the emissions are calculated as a whole (i.e. fossil plus biofuel per fleet category). In order to balance the statistical and the calculated energy consumption, the software matches the fossil/bioenergy consumption ratio defined in the statistical values by modifying the blend type and blend share and in turn the average mileages are updated. Ireland also clarified that, in terms of calibration, it follows the formal step-by-step process that is built within the software and that cross-checks are carried out to ensure mileage is adjusted by comparing the input data with

ID#	Issue/problem classification <sup>a, b</sup>	Recommendation made in previous review report	ERT assessment and rationale
			<p>the updated modified data. The Party further clarified that it will include this information in the next submission.</p> <p>The ERT considers that the recommendation has not yet been fully addressed because the Party has not transparently described in its NIR the calibration procedure used.</p>
E.7	1.A.3.e Other transportation – liquid fuels – CO <sub>2</sub> (E.5, 2018) (E.6, 2016) (E.6, 2015) (30, 2014) Comparability	Review the notation key used to report liquid fuels and, as appropriate, change the notation key from “NO” to “IE”, and provide a transparent description of the basis for dividing fuel consumption between road and non-road traffic.	Resolved. The Party described its use of notation keys for this source category in its NIR (pp.96–97). It indicated that it reported emissions from liquid fuels as “NO” as there are no known emissions related to off-road vehicles for other transportation.
E.8	1.A.3.e.i Pipeline transport – gaseous fuels – CH <sub>4</sub> and N <sub>2</sub> O (E.16, 2018) Accuracy	Update the currently applied EFs to the default EFs from the 2006 IPCC Guidelines (vol. 2, chap. 2, table 2.2), which are 1.0 and 0.1 kg/TJ for CH <sub>4</sub> and N <sub>2</sub> O, respectively, and provide the relevant reference in the NIR.	Resolved. The Party used default EFs from the 2006 IPCC Guidelines and referred to their use in the NIR (pp.96–97).
E.9	1.A.5 Other (not specified elsewhere) – all fuels – CO <sub>2</sub> , CH <sub>4</sub> and N <sub>2</sub> O (E.6, 2018) (E.17, 2016) (E.17, 2015) Transparency	Include the information on the allocation of emissions and the AD and resulting emissions for subcategories 1.A.5.a (stationary) and 1.A.5.b (mobile) provided during the review (i.e. fuel associated with military vehicles is included in category 1.A.3 (transport) and fuel associated with military bases is included in category 1.A.4.a (commercial/institutional)).	<p>Addressing. The Party reported in its NIR (p.99) that other emissions (category 1.A.5) are included in categories 1.A.4.a and 1.A.3 as Ireland’s national statistics and the EUROCONTROL advanced emission model do not provide a split for these minor sources. The Party reported in CRF table 9 that emissions for category 1.A.5.b are included in transport (category 1.A.3). However, no information was reported in CRF table 9 on the reporting of “IE” for category 1.A.5.a. During the review, the Party clarified that CRF table 9 was not complete for category 1.A.5.a owing to importing issues with CRF Reporter and indicated that the issue will be resolved in its next submission.</p> <p>The ERT considers that the recommendation has not yet been fully addressed because the Party has not yet included in CRF table 9 all information on where emissions for category 1.A.5.a are included.</p>
E.10	1.B.1.a Coal mining and handling – solid fuels – CH <sub>4</sub> (E.17, 2018) Transparency	Describe in the NIR the national circumstances surrounding abandoned coal mines (e.g. no history of explosions and the depth of the coal seam) to justify the choice of EF.	Resolved. The Party expanded the description in its NIR (p.101) on the national circumstances surrounding abandoned coal mines, including information about mine depths and the history of the few explosions and outbursts.
E.11	1.B.2 Oil, natural gas and other emissions from energy production – gaseous fuels – CO <sub>2</sub>	Provide an explanation of where fugitive emissions of CH <sub>4</sub> and CO <sub>2</sub> from natural gas exploration and transmission are reported both in the CRF tables and in the NIR, and provide a detailed	Addressing. The Party reported in its NIR (pp.103–104) an expanded description of how fugitive emissions of CH <sub>4</sub> and CO <sub>2</sub> from natural gas transmission are calculated. It explained that they were reported together with emissions from natural gas distribution

<i>ID#</i>	<i>Issue/problem classification<sup>a, b</sup></i>	<i>Recommendation made in previous review report</i>	<i>ERT assessment and rationale</i>
	and CH <sub>4</sub> (E.7, 2018) (E.7, 2016) (E.7, 2015) (31, 2014) Transparency	description in the NIR of how the emissions from each activity are estimated.	owing to the source data being reported together for these two sources. Regarding emissions from natural gas exploration, the Party reported CO <sub>2</sub> emissions as “NO” and CH <sub>4</sub> emissions as “IE”, indicating in CRF table 1.B.2 that CH <sub>4</sub> emissions were reported under production (category 1.B.2.b.2). During the review, the Party clarified that CO <sub>2</sub> emissions from natural gas exploration are not estimated but they may not occur because the heavy drilling muds used during exploratory drilling may prevent hydrocarbons from escaping the well. The Party informed the ERT that it will include a description in the NIR regarding emissions from natural gas exploration in its next submission.  The ERT considers that the recommendation is not yet fully resolved because a justification for reporting CO <sub>2</sub> emissions as “NO” and a description of how the CH <sub>4</sub> emissions from natural gas exploration are estimated is not included in the NIR.
E.12	1.B.2 Oil, natural gas and other emissions from energy production – gaseous fuels – CO <sub>2</sub> and CH <sub>4</sub> (E.8, 2018) (E.8, 2016) (E.8, 2015) (32, 2014) Transparency	Explain where fugitive CO <sub>2</sub> emissions from natural gas and fugitive CH <sub>4</sub> emissions from venting and flaring are allocated in the CRF tables.	Resolved. The Party expanded section 3.3.2.2 of the NIR (pp.102–106) and stated that fugitive CO <sub>2</sub> emissions from natural gas are included under category 1.B.2.b.5 (distribution) and CH <sub>4</sub> emissions from venting and flaring are reported under category 1.B.2.c (venting and flaring) in CRF table 1.B.2. The Party improved its reporting by providing numerical values for CH <sub>4</sub> emissions from venting and flaring in CRF table 1.B.2 instead of a notation key.
E.13	1.B.2 Oil, natural gas and other emissions from energy production – gaseous fuels – CO <sub>2</sub> and CH <sub>4</sub> (E.10, 2018) (E.9, 2016) (E9, 2015) (32, 2014) Convention reporting adherence	Use the notation keys consistently between the NIR and the CRF tables for CO <sub>2</sub> emissions from natural gas and CH <sub>4</sub> emissions from venting and flaring (“NO” in NIR table 3.1 and “IE” in CRF table 1.B.2).	Resolved. The Party reported notation keys consistently between its NIR (pp.102–106) and CRF table 1.B.2.
E.14	1.B.2.b Natural gas – gaseous fuels – CO <sub>2</sub> (E.9, 2018) (E.18, 2016) (E.18, 2015) Completeness	Report CO <sub>2</sub> emissions from natural gas exploration and processing.	Not resolved. The Party reported CO <sub>2</sub> emissions from natural gas exploration as “NO” and CO <sub>2</sub> emissions from gas processing as “IE” in CRF table 1.B.2. It explained in its NIR (pp.102–103) that CO <sub>2</sub> emissions from processing were conservatively assumed to be CH <sub>4</sub> and therefore CO <sub>2</sub> emissions were included with CH <sub>4</sub> emissions from natural gas processing. The ERT noted that CH <sub>4</sub> emissions from natural gas processing were also reported as “IE”.

ID#	Issue/problem classification <sup>a, b</sup>	Recommendation made in previous review report	ERT assessment and rationale
E.15	1.B.2.b Natural gas – gaseous fuels – CO <sub>2</sub> and CH <sub>4</sub> (E.18, 2018) Transparency	Include in the NIR the information provided during the review on the Kinsale storage facility (e.g. type of facility and methodology for assessing the emissions from it), clarifying that the emissions from underground storage of natural gas are included under production of natural gas.	<p>During the review, the Party clarified that CO<sub>2</sub> emissions from natural gas exploration are not estimated but they may not occur because the heavy drilling muds used during exploratory drilling may prevent hydrocarbons from escaping the well. Regarding CO<sub>2</sub> emissions from natural gas processing, the Party provided an analyses of the gas stream composition after processing at the entry points into the gas network; however, it was unable to provide data on the gas composition prior to processing. As CO<sub>2</sub> is often removed during processing, these analyses were unable to provide the CO<sub>2</sub> composition of the unprocessed natural gas streams. During the review, Ireland indicated that CO<sub>2</sub> emissions for categories 1.B.2.b.2 and 1.B.2.b.3 should be reported as “NE” and informed the ERT that it will report emissions from these sources as “NE” in its next submission.</p> <p>The ERT considers that the recommendation has not yet been addressed because the Party has not yet adequately or transparently reported CO<sub>2</sub> emissions from natural gas exploration and processing. If CO<sub>2</sub> emissions from exploration are reported as “NO” the Party should provide a justification to confirm that emissions have not been underestimated. If CO<sub>2</sub> emissions from processing are reported as “NE” the Party should demonstrate in its NIR that the sources are below the significance threshold and are eligible to be reported as “NE”.</p> <p>Resolved. The Party included information in its NIR (pp.103–104) about the Kinsale storage facility and where emissions are reported. According to the information provided in the NIR, emissions from underground storage are covered under venting of natural gas. The Party explained that emission estimates for this facility, including data from the offshore venting of gas, are reported to the Department of Communications, Climate Action and Environment under the Convention for the Protection of the Marine Environment of the North-East Atlantic.</p>
E.16	1.B.2.b Natural gas – gaseous fuels – CO <sub>2</sub> and CH <sub>4</sub> (E.19, 2018) Completeness	Estimate CO <sub>2</sub> and CH <sub>4</sub> emissions from natural gas production and CH <sub>4</sub> emissions from natural gas processing applying the default EFs and methodologies from the 2006 IPCC Guidelines (vol. 2, chap. 4, table 4.2.4); if any category is determined to be below the significance threshold, as defined in paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines, report “NE” for the category and provide appropriate documentation in the NIR.	Addressing. The Party reported CH <sub>4</sub> emissions for natural gas production and processing together under the production subcategory (1.B.2.b.2). The Party also reported CO <sub>2</sub> emissions from natural gas production (1.B.2.b.2) and processing (1.B.2.b.3) as “IE” and stated in the NIR (pp.102–103) that emissions from natural gas production and processing are conservatively assumed to be CH <sub>4</sub> (i.e. CO <sub>2</sub> emissions are reported as CH <sub>4</sub> emissions under category 1.B.2.b.2). The Party further reported in the NIR (pp.103) that the default EFs were not applied for estimating natural gas

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			<p>production and processing emissions; however, the Party used plant-specific EFs derived from the average emissions from monitored data measured in 2017 and 2018. Ireland indicated that the default EFs were not appropriate and would lead to significant overestimation if used.</p> <p>The ERT considers that the recommendation has not yet been fully addressed because the Party has not sufficiently documented CO<sub>2</sub> emissions from natural gas production. The ERT also considers that assuming CO<sub>2</sub> emissions are covered by overestimating CH<sub>4</sub> emissions is not good practice. If CO<sub>2</sub> emissions are not estimated they should be reported as “NE” and a justification should be provided in the NIR to demonstrate that the source is below the significance threshold as defined in paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines.</p>
E.17	1.B.2.b Natural gas – gaseous fuels – CO <sub>2</sub> and CH <sub>4</sub> (E.20, 2018) Transparency	Update the description in the NIR of the method, AD and EFs used to estimate fugitive CO <sub>2</sub> and CH <sub>4</sub> emissions from natural gas transmission (the estimates were revised in response to the list of potential problems and further questions from the ERT).	<p>Addressing. The Party expanded the description in its NIR (pp.103–104) of the methods, AD and EFs used for estimating CO<sub>2</sub> and CH<sub>4</sub> emissions from natural gas transmission. During the review, the Party clarified that Gas Networks Ireland performs a monthly analysis of the separate gas streams and provides EPA with these gas analysis reports annually for each gas stream. The reports give the composition of the gas, calorific values, density and all information required for Ireland to calculate EFs for each gas stream. The amount of gas transmitted and distributed annually for each gas stream is taken from the energy balance so that weighted averages can be calculated.</p> <p>The ERT considers that the recommendation has not yet been fully addressed because the Party has not yet included sufficient detail on the methods, AD and EFs used for calculating CO<sub>2</sub> and CH<sub>4</sub> emissions from natural gas transmission in its NIR. The Party should include the information provided during the review in its next submission.</p>
E.18	1.B.2.b Natural gas – gaseous fuels – CO <sub>2</sub> and CH <sub>4</sub> (E.21, 2018) Transparency	Update the description in the NIR of the method, AD and EFs used to estimate fugitive CO <sub>2</sub> and CH <sub>4</sub> emissions from natural gas distribution (the estimates were revised in response to the list of potential problems and further questions from the ERT).	<p>Addressing. The Party expanded the description in its NIR (p.104) of the methods, AD and EFs used for estimating CO<sub>2</sub> and CH<sub>4</sub> emissions from natural gas distribution. During the review, the Party clarified the source of the EFs. Gas Networks Ireland performs a monthly analysis of the separate gas streams and provides EPA with these gas analysis reports annually for each gas stream. The reports give the composition of the gas, calorific values, density and all information required for Ireland to calculate EFs for each gas stream. The amount of gas transmitted and</p>



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			distributed annually for each gas stream is taken from the energy balance so that weighted averages can be calculated.  The ERT considers that the recommendation has not yet been fully addressed because the Party has not yet included in its NIR the sources of the EFs (provided during the review) used for estimating emissions from natural gas distribution for 2010–2018.
E.19	1.B.2.c Venting and flaring – gaseous fuels – CH <sub>4</sub> and N <sub>2</sub> O (E.22, 2018) Completeness	Either report CH <sub>4</sub> and N <sub>2</sub> O emissions from flaring in the Kinsale gas field using available AD and the EFs provided in the 2006 IPCC Guidelines (vol. 2, chap. 2, table 2.2) (namely 1.0 and 0.1 kg/TJ for CH <sub>4</sub> and N <sub>2</sub> O, respectively), or, if emissions are determined to be insignificant in accordance with paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines, report them as “NE” and include appropriate justification in the NIR.	Resolved. The Party reported CH <sub>4</sub> and N <sub>2</sub> O emissions from flaring in CRF table 1.B.2 under category 1.B.2.c (venting and flaring) and updated the methodology reported in its NIR (pp.104–105).
IPPU			
I.1	2.F.2 Foam blowing agents – HFCs (I.4, 2018) Transparency	Provide in the NIR descriptions for the whole lifetime of fluorinated gas emissions.	Resolved. The Party reported in its NIR (section 4.7.2.1, p.136) information on the manufacture, use and disposal of foam blowing agents, confirming that emissions from those sources do not occur.
I.2	2.G.1 Electrical equipment – SF <sub>6</sub> (I.3, 2018) (I.5, 2016) (I.5, 2015) Transparency	Describe in the NIR the result of efforts to review the approach used by the Electricity Supply Board to estimate the quantity of SF <sub>6</sub> used for maintenance with a view to clarifying its appropriateness as a tier 1 or higher-tier method.	Resolved. The Party reported in its NIR (section 4.8.1.2, p.140) information on the results of the review of the approach taken by the Electricity Supply Board to estimate the quantity of SF <sub>6</sub> used.
I.3	2.G.3 N <sub>2</sub> O from product uses – N <sub>2</sub> O (I.5, 2018) Transparency	Include a clearer justification of why category 2.G.3.b is excluded from the inventory in accordance with paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines; include information either in section 4.8.3.1 or a cross-cutting chapter of the NIR to clarify that N <sub>2</sub> O emissions from propellant use for pressure and aerosol products is the only category considered insignificant in Ireland.	Resolved. The Party reported in its NIR (section 4.8.3.2, p.143) information showing, using basic assumptions, why emissions from N <sub>2</sub> O used as a propellant reported under category 2.G.3.b (other) are below the significance threshold.
I.4	2.G.4 Other (other product manufacture and use) – CO <sub>2</sub> (I.6, 2018) Transparency	As emissions reported in CRF table 2(I).A-Hs2 are automatically included in Ireland’s national totals by CRF Reporter, include a cell comment regarding subcategory 2.G.4 to clearly indicate that the emissions are indirect CO <sub>2</sub> emissions.	Resolved. The Party reported CO <sub>2</sub> emissions from tobacco use under category 2.G.4 (other) in CRF table 2(I).A-Hs2 and included a comment in the documentation box indicating that these are indirect CO <sub>2</sub> emissions.
Agriculture			

<i>ID#</i>	<i>Issue/problem classification<sup>a, b</sup></i>	<i>Recommendation made in previous review report</i>	<i>ERT assessment and rationale</i>
A.1	3.A.1 Cattle – CH <sub>4</sub> (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.	<p>Not resolved. The Party did not include in its NIR the information requested in the previous recommendation. The Party reported in its NIR (section 5.2, p.152) that two large research projects have greatly contributed to improving the estimation of emissions from enteric fermentation and manure management in Ireland: O'Mara (2006) and Hyde et al. (2008). During the review, the Party clarified that the methodological approach to deriving emission estimates for cattle is based on the report by O'Mara (2006). The Party further clarified that, as part of improvement plans, detailed in section 5.2.1.1.6 of the NIR, updated assumptions and key AD will be included in future submissions.</p> <p>The ERT considers that the Party has not yet addressed the recommendation as the NIR input parameter tables for various cattle subcategories were not provided in the NIR.</p>
A.2	3.A.2 Sheep – CH <sub>4</sub> (A.4, 2018) Accuracy	Collect country-specific data for applying the IPCC tier 2 method for this category, and update the description of the methodology, AD and EFs in the NIR; if this is not possible, include an update on the progress of developing tier 2 EFs for enteric fermentation for sheep in the NIR.	<p>Addressing. The Party reported in its NIR (section 5.2.1.2.6, p.159) that the inventory agency is in the process of investigating the applicability of developing tier 2 estimates for CH<sub>4</sub> emissions from enteric fermentation for sheep. This investigation is being done in tandem with the review of tier 2 estimates for cattle as discussed in section 5.2.1.1.6 of the NIR (see ID# A.1 above). Outputs are being reviewed with a view to including relevant information in the national inventory, as appropriate. During the review, the Party stated that some outstanding country-specific data are being collated and appropriate references from national studies are being gathered. The inventory agency will review these materials once the work is complete and endeavour to include tier 2 estimates for sheep in future submissions.</p>
A.3	3.D.b Indirect N <sub>2</sub> O emissions from managed soils – N <sub>2</sub> O (A.5, 2018) Accuracy	Revise the description of F <sub>ON</sub> in the equations for N <sub>2</sub> O <sub>(L)</sub> -N, N <sub>2</sub> O-N <sub>inputs</sub> , N <sub>2</sub> O-N <sub>PRP</sub> or the equation for N <sub>2</sub> O <sub>(ATD)</sub> -N in the NIR (section 5.5.2.2) to avoid the potential double counting of sewage sludge N, and correct the typographical error in relation to the reference for Frac <sub>GASM2</sub> in NIR table 5.7.	<p>Resolved. The Party has updated the methodological description in section 5.5.1.2 of the NIR (p.116). The reference for Frac<sub>GASM2</sub> has also been corrected in NIR table 5.7 (p.171).</p>
A.4	3.G Liming – CO <sub>2</sub> (A.2, 2018) (A.3, 2016) (A.3, 2015) Accuracy	Collect country-specific data and apply a tier 2 method for this category for future submissions, noting that the use of tier 1 is conservative.	<p>Addressing. The Party reported in its NIR (section 5.8.2, p.172) that the inventory agency has undertaken some initial discussions with agricultural and environmental researchers and funding agencies with a view to exploring the development of more refined estimates for this category. During the review, the Party stated that only five Parties included in Annex I to the Convention report emissions from lime application to soils using a tier 2 or a country-specific methodology. The Party also stated that in 2018 emissions</p>

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			<p>from lime application to soils accounted for only 0.75 per cent of national total emissions (excluding LULUCF). The inventory agency has raised the issue with agricultural research funding bodies in Ireland and to date the development of refined estimates has not been prioritized for research.</p> <p>The ERT considers that the recommendation has not yet been fully addressed because the Party continues to apply a tier 1 method for estimating CO<sub>2</sub> emissions for this key category.</p>
LULUCF			
L.1	4. General (LULUCF) – CO <sub>2</sub> (L.1, 2018) (L.4, 2016) (L.4, 2015) (57, 2014) Transparency	Report removals for the mineral soils pool, report the pool as “NE” instead of “NO” or report the CSC as “NA” if the CSC in the pool is assumed to be zero because the losses are balanced out by the gains.	Resolved. The Party estimated CSC in mineral soils for forest land remaining forest land, land converted to forest land and forest land converted to grassland and other land as recommended by the ERT.
L.2	4. General (LULUCF) (L.7, 2018) Convention reporting adherence	Correct the total forest land area reported in NIR table 6.3.	Resolved. The Party corrected the total forest land area reported in NIR table 6.3.
L.3	4. General (LULUCF) (L.8, 2018) Transparency	Ensure the consistency of the land areas reported between NIR table 6.3, CRF tables 4.A–4.F and CRF table 4.1.	Resolved. The forest land area reported in NIR table 6.3 is consistent with that reported in CRF tables 4.A–4.F and CRF table 4.1.
L.4	4.A Forest land – CO <sub>2</sub> (L.2, 2018) (L.3, 2016) (L.3, 2015) (56, 2014) Transparency	Correct the typographical error regarding the value of the country-specific EF for organic forest soils.	Resolved. The EF for soil organic carbon was corrected to 0.59 t carbon/ha/year in section 6.3.4.3 of the NIR (p.200).
L.5	4.A.1 Forest land remaining forest land – CO <sub>2</sub> (L.9, 2018) Transparency	Explain the trends in emissions from the dead organic matter pool and provide the reviewed decay coefficients for litter and deadwood, when available, in the NIR.	Resolved. During the review, the Party clarified that it is now using a new model framework (CBM), which shows a different covariance between biomass and dead organic matter trends compared with the CARBWARE model reviewed by the previous ERT. While the Party has not explained the emission trends in the dead organic matter pool, given the change in modelling for this category, the ERT considers that this issue is no longer relevant. Identified issues specific to CBM are raised in ID#s L.10 and L.11 in table 5.
L.6	4.E.1 Settlements remaining settlements – CO <sub>2</sub> (L.5, 2018) (L.8, 2016)	Report CSC in soils for settlements remaining settlements as “NA” instead of “NO” and include an explanation for the use of the notation key in the NIR.	Addressing. The Party reported the CSC in soils as “NA” in CRF table 4.E, as recommended by the previous ERT. However, the use of this notation key was not clearly explained in the NIR (section 6.7.2.2, p.270).

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	(L.8, 2015) (62, 2014) Transparency		The ERT considers that the recommendation has not yet been fully addressed because an explanation for the use of the notation key “NA” was not included in the NIR.
L.7	4(V) Biomass burning – CO <sub>2</sub> , CH <sub>4</sub> and N <sub>2</sub> O (L.6, 2018) (L.11, 2016) (L.11, 2015) Transparency	Explain in the NIR and the documentation box of the relevant CRF table that CO <sub>2</sub> , CH <sub>4</sub> and N <sub>2</sub> O emissions from wildfires on land converted to cropland reported as “IE” are included under cropland remaining cropland.	Resolved. During the review, the Party clarified that there are no conversions of land to cropland, as reported in CRF table 4.B, and therefore there is no biomass burning on land converted to cropland. The previously reported “IE” in CRF table 4(V) has been corrected and changed to “NO”.
Waste			
W.1	5.B.2 Anaerobic digestion at biogas facilities – CH <sub>4</sub> (W.6, 2018) Accuracy	Report CH <sub>4</sub> emissions from unintentional leakage and other unexpected events at anaerobic digestion facilities outside of the wastewater treatment area digesting other forms of waste (including agricultural waste) and explain the estimations in the NIR.	Not resolved. Ireland reported in the NIR (p.290) that it has not yet sourced the necessary AD to estimate CH <sub>4</sub> emissions from unintentional leakage and other unexpected events at anaerobic digestion facilities outside of the wastewater treatment area and is as yet unable to subtract the required amount of agricultural slurries that are digested in these plants. CH <sub>4</sub> emissions from such facilities due to unintentional leakages during process disturbances or other unexpected events will be reported under the waste sector when suitable AD have been sourced for Ireland. During the review, the Party stated that until data become available this category is being reported as “NO”.  The ERT concluded that the recommendation has not yet been addressed and that the use of the notation key “NO” until data become available may not be appropriate as emissions do seem to occur.
W.2	5.D Wastewater treatment and discharge – CH <sub>4</sub> and N <sub>2</sub> O (W.5, 2018) (W.7, 2016) (W.7, 2015) (72, 2014) Completeness	Describe the source and derivation of the AD and the industrial sectors contributing to the biochemical oxygen demand load.	Resolved. The Party reported that information on individual industry sectors is not readily available. It reported in its NIR (pp.294–298) that the centralized wastewater treatment plants also treat commercial and industrial wastewater and that emissions from industrial wastewater (category 5.D.2) are included under domestic wastewater (category 5.D.1). Ireland further reported in its NIR (p.298) that on-site wastewater treatment provisions at industrial facilities, where they exist, are aerobic systems and no CH <sub>4</sub> emissions from these sites occur. During the review, Ireland confirmed the approach to estimating emissions from industrial wastewater treatment. The ERT noted that, according to the 2006 IPCC Guidelines (vol. 5, chap. 6, equation 6.3), emissions from industrial wastewater treatment may be estimated together with emissions from domestic wastewater treatment.

ID#	Issue/problem classification <sup>a, b</sup>	Recommendation made in previous review report	ERT assessment and rationale
			<p>The ERT also considers that the Party's reporting of emissions from industrial wastewater treatment is sufficient and in line with the 2006 IPCC Guidelines.</p>
W.3	5.D.1 Domestic wastewater – CH <sub>4</sub> (W.7, 2018) Transparency	Provide a reference to justify the use of a methane correction factor of 0.083 or apply the default value from the 2006 IPCC Guidelines.	<p>Not resolved. The Party did not provide a reference to justify the use of a methane correction factor of 0.083. During the review the Party provided a link to Ireland's national meteorological service (<a href="https://www.met.ie/climate/available-data/monthly-data">https://www.met.ie/climate/available-data/monthly-data</a>).</p> <p>The ERT considers that the recommendation has not yet been fully addressed because, while the new reference confirms that the soil temperature exceeds 15 °C for two months of the year and justifies the methane correction factor used by the Party, the reference was not provided in the NIR.</p>
W.4	5.D.1 Domestic wastewater – CH <sub>4</sub> (W.8, 2018) Transparency	Amend the text in the NIR to reflect the number of wastewater treatment plants with biogas recovery in the country.	<p>Resolved. The Party updated section 7.6.1.2 of its NIR. It reported that there are 16 urban wastewater treatment plants with biogas recovery for heat only or combined heat and power; and of these 16 plants, 12 were operational for part or all of 2018.</p>
W.5	5.D.1 Domestic wastewater – CH <sub>4</sub> and N <sub>2</sub> O (W.9, 2018) Transparency	Report wastewater flows including treated (aerobically and anaerobically) and untreated wastewater in the NIR.	<p>Not resolved. The Party reported in its NIR (p.294) that on the basis of the available data on wastewater treatment in Ireland the inventory agency considers that all wastewater is accounted for in its approach, with two thirds of the population of Ireland being served by centralized sewage treatment plants and one third of the population using septic tanks. During the review, the Party provided further information on the types of wastewater treatment plants in the country (urban wastewater treatment plants and domestic wastewater treatment systems (septic tank systems)), including a reference to a publication (EPA, 2019). The ERT noted the statement on page 3 of the publication that sewage from the equivalent of 77,000 people in 36 towns and villages is released into the environment every day without treatment. The ERT also noted that this information on untreated wastewater has not been included in the NIR and that the emissions from untreated wastewater were not included in the inventory (see ID# W.8 in table 5).</p> <p>The ERT considers that the recommendation has not yet been fully addressed because the Party did not report wastewater flows including treated (aerobically and anaerobically) and untreated wastewater in the NIR. The ERT considers that such reporting could, for example, be provided as a diagram showing the wastewater flows.</p>

<i>ID#</i>	<i>Issue/problem classification<sup>a, b</sup></i>	<i>Recommendation made in previous review report</i>	<i>ERT assessment and rationale</i>
<b>KP-LULUCF</b>			
KL.1	General (KP-LULUCF) (KL.7, 2018) Transparency	Complete the documentation box of CRF table 4(KP-I)B.1.1 to provide information on how HWP are included under the FMRL.	Resolved. The Party provided information on how HWP are included in the FMRL in the documentation box of CRF table 4(KP-I)B.1.1. The Party also gave a cross reference in its NIR (section 11.5).
KL.2	Deforestation – CO <sub>2</sub> (KL.3, 2018) (KL.6, 2016) (KL.6, 2015) Transparency	Report the appropriate notation key with explanation or estimated values in CRF table 4(KP-I)A.2.	Resolved. The Party reported the net CSC for HWP in CRF table 4(KP-I)A.2 as “NO” and “IO”. The footnote to CRF table 4(KP-I)A.2 provides the definition of the notation key “IO”.  The ERT considers the reporting to be transparent, and hence the issue is resolved.
KL.3	CM – CO <sub>2</sub> (KL.8, 2018) Transparency	Provide the numerical values for cropland area under CM in the relevant section of the NIR and verify the consistency of that information between CRF table NIR-2 and the NIR.	Addressing. During the review, the Party clarified that detailed data on cropland area have been provided in annex 3.4.D to the NIR (p.427) and that the data reported in the CRF tables and the NIR are consistent with each other. However, the ERT noted that the area under CM in CRF table NIR-2 is equal to that in CRF table 4(KP-I)B.2 (781.67 kha in 2018) but is not consistent with the area under CM reported in table 3.5 of annex 3.4.C to the NIR (780.40 kha in 2018) (p.431).  The ERT considers that this recommendation has not yet been fully addressed because there are still some inconsistencies between the CRF tables and the NIR.
KL.4	GM – CO <sub>2</sub> (KL.9, 2018) Transparency	Provide the numerical values for grassland area and verify the consistency of the information between the CRF tables and the NIR.	Resolved. The Party provided consistent numerical values for GM in CRF tables NIR-2 and 4(KP-I)B.3 (4,161.90 kha in 2018). The GM area reported in table 3.6 of annex 3.4.D to the NIR was also consistent with that reported in the CRF tables.
KL.5	HWP – CO <sub>2</sub> (KL.10, 2018) Convention reporting adherence	Ensure that correct values and units are reported for harvesting activities (columns D and E) under Article 3, paragraphs 3–4, of the Kyoto Protocol in CRF table 4(KP-1)C.	Not resolved. The Party populated the column assigned for the units in which harvest is reported with numerical values (instead of units), while the column in which the numerical values should have been reported was left blank. During the review, the Party clarified that the error is related to a CRF Reporter bug; the XML files have the harvest volume and units reported in the correct rows, but the data were not correctly imported into CRF Reporter.  The ERT considers that the recommendation has not yet been fully addressed because the Party populated column “E”, assigned for the units with numerical values (instead of units) for Article 3, paragraph 3–4, activities, while column “D”, in which the numerical values should have been reported, was left blank in CRF table 4(KP-1)C.

<sup>a</sup> 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.

<sup>b</sup> The report on the review of the 2019 annual submission of Ireland was not available at the time of this review. Therefore, the recommendations reflected in this table are taken from the 2018 annual review report. For the same reason, 2019 and 2017 are excluded from the list of review years in which issues could have been identified.

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

9. In accordance with paragraph 83 of the UNFCCC review guidelines, the ERT noted that the issues and/or problems included in table 4 have been identified in three or more successive reviews, including the review of the 2020 annual submission of Ireland, and had not been addressed by the Party at 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 Ireland

<i>ID#</i>	<i>Previous recommendation for the issue</i>	<i>Number of successive reviews issue not addressed<sup>a</sup></i>
<b>General</b>		
G.4	Include the value of the FM cap in the NIR and in the CRF accounting table, together with information on its calculation.	3 (2015/2016–2020)
<b>Energy</b>		
E.2	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. Transparently describe in the NIR the AD and method used for the estimation of CO <sub>2</sub> emissions.	3 (2015/2016–2020)
E.9	Include the information on the allocation of emissions and the AD and resulting emissions for subcategories 1.A.5.a (stationary) and 1.A.5.b (mobile) provided during the review (i.e. fuel associated with military vehicles is included in category 1.A.3 (transport) and fuel associated with military bases is included in category 1.A.4.a (commercial/institutional)).	3 (2015/2016–2020)
E.14	Report CO <sub>2</sub> emissions from natural gas exploration and processing.	3 (2015/2016–2020)
IPPU	No issues identified.	
<b>Agriculture</b>		
A.4	Collect country-specific data and apply a tier 2 method for this category for future submissions, noting that the use of tier 1 is conservative.	3 (2015/2016–2020)
<b>LULUCF</b>		
L.6	Report CSC in soils for settlements remaining settlements as “NA” instead of “NO” and include an explanation for the use of the notation key in the NIR.	4 (2014–2020)

<i>ID#</i>	<i>Previous recommendation for the issue</i>	<i>Number of successive reviews issue not addressed<sup>a</sup></i>
Waste	No issues identified.	
KP-LULUCF	No issues identified.	

<sup>a</sup> Reports on the reviews of the 2017 and 2019 annual submissions of Ireland have not yet been published. Therefore, 2017 and 2019 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 2020 annual submission

10. Table 5 presents findings made by the ERT during the individual review of the 2020 annual submission of Ireland that are additional to those identified in table 3.

Table 5  
Additional findings made during the individual review of the 2020 annual submission of Ireland

<i>ID#</i>	<i>Finding classification</i>	<i>Description of the finding with recommendation or encouragement</i>	<i>Is finding an issue/problem?<sup>a</sup></i>
General			
G.10	CPR	<p>The Party reported the calculation of the CPR in its NIR (pp.355–366) by referencing a link to document FCCC/IRR/2016/IRL. It did not present the actual calculation of the CPR using the most recent inventory in the NIR (i.e. 2018 GHG emissions excluding LULUCF in the current submission), which is not in accordance with decision 15/CMP.1, annex, paragraph 18, in conjunction with decision 3/CMP.11. During the review, Ireland provided the ERT with the updated calculation using the current submission to confirm the information that should be included. The ERT acknowledges that updating the calculation will not change the CPR.</p> <p>The ERT recommends that the Party, in future annual submissions, present the calculation of the CPR and ensure that the comparison calculation uses the most recent GHG inventory.</p>	Yes. KP reporting adherence
G.11	Recalculations	<p>The Party has improved its inventory and implemented recalculations for the energy and IPPU sectors. However, the NIR did not include sufficient explanations, justifications and reasons for the recalculations (see ID#s E.22, E.23, E.24, E.25 and L.15 below). This is not in accordance with the UNFCCC Annex I inventory reporting guidelines, paragraphs 43–45 and 50(h), because recalculations are to be reported in the NIR for all applicable years with explanatory information and justifications.</p> <p>The ERT recommends that the Party provide in the NIR explanatory information and justifications for the recalculations in accordance with the UNFCCC Annex I inventory reporting guidelines, paragraphs 43–45 and 50(h).</p>	Yes. Transparency
G.12	Uncertainty analysis	<p>The Party reported uncertainty estimates for all source and sink categories, including methods, base year, latest year and trend uncertainty, using approach 1 from the 2006 IPCC Guidelines (vol. 1, chap. 3) in its NIR (pp.24–26 and annex 2). For some categories, Ireland did not transparently report on underlying assumptions. For others, it provided a table in the NIR noting underlying assumptions, including source and reference information (e.g. for</p>	Yes. Transparency



ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue/problem? <sup>a</sup>
Energy		<p>forest land remaining forest land (p.207) and deforested land (p.223)), but provided no information on underlying assumptions for category 1.B.2 or subcategories under categories 3.A, 3.B, 3.D, 3.G, 3.H and 5.B.1. This is not in accordance with the UNFCCC Annex I inventory reporting guidelines, paragraph 42. During the review, the Party clarified that it does not have plans to further update the approach to explaining the uncertainty analysis in the NIR but will try to report more information to improve transparency.</p> <p>The ERT recommends that the Party 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.</p>	
E.20	Comparison with international data – liquid fuels	<p>There are discrepancies between the data reported by Ireland to IEA and the inventory data in CRF table 1.D for international marine bunkers. The data reported in the inventory for residual fuel oil are systematically greater by 3–4 per cent for 1990–2012, 5 per cent for 2013–2014 and 3 per cent for 2015 onward. For gas/diesel oil, the data are within 2 per cent for all years except 2002 (–4 per cent). These differences were not discussed in the NIR and could not be addressed during the review owing to an ongoing investigation by Ireland into these differences. During the review, the Party clarified that SEAI is investigating differences between data reported to IEA and data used in the inventory and will be revising international data for all years to better align marine bunker values in the energy balance. The Party also indicated that it did not intend to discuss these checks and revisions to reference approach data in the next submission but will be including revised data for the reference approach.</p> <p>The ERT noted that the inventory agency does not currently have access to the submissions made to IEA and has been unable to undertake comparisons. It also noted that the inventory agency has been working with SEAI, which compiles the data for submission to IEA, to confirm quantities of fuel. SEAI has advised that it will revise the data for submission to IEA to match the inventory values. The ERT encourages the Party to provide an update on the efforts to align IEA and inventory data, and to include in the NIR any explanations for significant differences between the data reported to IEA and data reported in the CRF tables.</p>	Not an issue/problem
E.21	1.A Fuel combustion – sectoral approach – liquid fuels – CO <sub>2</sub> , CH <sub>4</sub> and N <sub>2</sub> O	<p>Ireland reported emissions from liquid fuel use in off-road vehicles and other machinery in categories 1.A.2.g.vii, 1.A.4.a.ii and 1.A.4.b.ii as “IE”. For category 1.A.4.c.ii, emissions are reported for diesel oil while emissions of all other liquid fuels are reported as “NO”. Moreover, for emissions reported as “IE” the Party did not provide information on where these emissions were included in CRF table 9 or in the NIR. During the review, the Party explained that a research project is under way looking at AD for the purpose of improving the reporting of emissions for subcategories concerning off-road vehicles and other machinery (1.A.2.g.vii, 1.A.4.a.ii, 1.A.4.b.ii and 1.A.4.c.ii) and splitting emissions across these subcategories.</p> <p>The ERT could not identify a description of these planned improvements in the NIR. On page 99 it is stated that there were no planned improvements for category 1.A.4, and the planned improvements for category 1.A.2 discussed in the NIR (p.79) did not appear to reference this research project. The ERT recommends that Ireland 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. If emissions from off-road vehicles and other machinery are reported as “IE”, the ERT also recommends that Ireland provide information in CRF table 9 on where these emissions are included in the inventory.</p>	Yes. Transparency

<i>ID#</i>	<i>Finding classification</i>	<i>Description of the finding with recommendation or encouragement</i>	<i>Is finding an issue/problem?<sup>a</sup></i>
E.22	1.A.1.a Public electricity and heat production – other fossil fuels and biomass – CO <sub>2</sub> , CH <sub>4</sub> and N <sub>2</sub> O	<p>The Party described in the NIR (p.74) how estimates for public electricity and heat production were recalculated due to available revised data for waste-to-energy plants. During the review, the Party clarified that the revisions were the result of SEAI revising the net calorific value for municipal solid waste at one plant for the time series. It added that EPA has changed the way it estimates CO<sub>2</sub> emissions; it now uses data from the European Pollutant Release and Transfer Register for both waste-to-energy plants. The ERT could not identify this information on the methodology in the NIR. During the review, the Party stated that it will include information on the updated methodology in the NIR of its next submission.</p> <p>The ERT recommends that Ireland expand the description of the methodology for estimating emissions from public electricity and heat production to include the AD related to the use of waste for electricity and heat production and EFs used.</p>	Yes. Transparency
E.23	1.A.1.b Petroleum refining – gaseous fuels – CH <sub>4</sub> and N <sub>2</sub> O	<p>The Party reported no changes to estimates for this category in its NIR (p.75); however, the ERT noted an unexplained recalculation that resulted in a decrease of 377.57 TJ (–6.18 per cent) in estimated gaseous fuel consumption for 2017 between the 2020 and the 2019 submissions. There were similar decreases in the estimated CH<sub>4</sub>, N<sub>2</sub>O and non-methane volatile organic compound emissions for this source, but CO<sub>2</sub> emissions did not change as the estimates are based on plant-specific EU ETS data. The ERT noted that the Party did not transparently describe the recalculations that occurred and did not demonstrate that the recalculations were applied consistently and carried out to improve accuracy and/or completeness. During the review, the Party confirmed that the CO<sub>2</sub> emission estimates are based on verified EU ETS data for 2005–2018, and that these data have not been revised. Conversely, SEAI provides an energy balance that EPA uses to calculate non-CO<sub>2</sub> emissions, and recalculations have occurred in this time series.</p> <p>The ERT recommends that Ireland document in its NIR the recalculations carried out for this category, including cause and impact, and demonstrate that they are applied consistently and accurately.</p>	Yes. Transparency
E.24	1.A.2 Manufacturing industries and construction – liquid, gaseous, biomass and other fossil fuels – CO <sub>2</sub> , CH <sub>4</sub> and N <sub>2</sub> O	<p>The Party reported in its NIR (p.79) that emissions from gaseous fuels were recalculated for 2009, 2013 and 2015, and emissions from fuel oil, biomass and other non-renewable waste were recalculated for 2017. The Party described the effects of these recalculations; however, it did not provide the reasons for the recalculations. During the review, the Party clarified that the recalculations of emissions from gaseous fuels were the result of corrected AD within this category, which can vary slightly in retrospect as a result of receiving delayed survey data, corrected values from the operators and other new sources of data that were unavailable at the time of the previous submission. Recalculations of emissions from fuel oil, biomass and other non-renewable waste were caused by delayed delivery of data regarding the national energy statistics. The data for 2017 in the previous submission that were estimated by expert judgment and interpolation were replaced by these delayed data.</p> <p>The ERT recommends that Ireland transparently document recalculations in its NIR, including the specific reasons for the recalculations, and demonstrate that they have been applied consistently and accurately. The ERT also recommends that any plans for future recalculations, including those to replace data derived from expert judgment and/or interpolation where other data are not available, be included in the next submission.</p>	Yes. Transparency
E.25	1.A.3.a Domestic aviation – liquid	<p>The Party carried out various minor recalculations to jet kerosene reported under category 1.A.3.a (domestic aviation) in CRF table 1.A(a)s3. In its NIR (p.84), Ireland described the impact on the time series 1990–2004 of incorporating minor revisions to average fuel burn landing and take-off rates for some Irish airports.</p>	Yes. Transparency

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue/problem? <sup>a</sup>
	fuels – CO <sub>2</sub> , CH <sub>4</sub> and N <sub>2</sub> O	<p>During the review, the Party explained that the revisions to the average fuel burn landing and take-off rates at Cork and Shannon airports were previously based on an average of EUROCONTROL data for 2005–2010, whereas the landing and take-off rates at all other regional airports were based on an average of data for 2004–2010. Revisions to the time series were the result of updating the average to 2004–2010 to correct the inconsistency. The ERT considers that the causes of the recalculations were not described transparently in the NIR. Additionally, the method of using the average of EUROCONTROL data for 2004–2010 was not described in the NIR.</p> <p>The ERT recommends that Ireland transparently document recalculations in its NIR, including the specific cause or causes of the recalculation. The ERT also recommends that Ireland transparently document in the NIR the methods and assumptions used in the model to calculate emissions for category 1.A.3.a.</p>	
E.26	1.B.2.b Natural gas – gaseous fuels – CO <sub>2</sub> and CH <sub>4</sub>	<p>The Party reported in its NIR (pp.103–104) that emissions from natural gas transmission (category 1.B.2.b.4) and distribution (category 1.B.2.b.5) are reported together under category 1.B.2.b.5 because the AD and EFs for both sources are reported together by Gas Networks Ireland. The Party also reported in the NIR that emissions from storage are reported directly by Vermilion Energy, which operates the only applicable storage facility in Ireland, and are also included under category 1.B.2.b.5. During the review, the Party clarified that Gas Networks Ireland provided a percentage breakdown of fugitive emissions across the high-pressure transmission network and the distribution network for 2014–2019, which indicated that there is a ratio of approximately 21:79 for transmission and distribution across the available years. Ireland also indicated that it will endeavour to include this information in its next inventory submission and report transmission and distribution emissions separately.</p> <p>The ERT recommends that Ireland use the Gas Networks Ireland data to report emissions from natural gas transmission (category 1.B.2.b.4) and distribution (category 1.B.2.b.5) separately by applying the Gas Networks Ireland splits consistently and as accurately as possible across the whole time series, document all input data and assumptions applied, and transparently describe the method used in the NIR. To ensure comparability, the ERT further recommends that the data from Vermilion Energy's underground storage facility be reported with the emissions from natural gas transmission under category 1.B.2.b.4, and that these data be removed from the combined natural gas transmission and distribution estimates prior to splitting the two sources using the pipeline ratios.</p>	Yes. Comparability
IPPU			
I.5	2.F.1 Refrigeration and air conditioning – HFCs	<p>The Party reported in CRF table 2(II)B-Hs2 disposal emissions of HFC-134a from mobile air conditioning assuming that 12.83 per cent of the initial charge is emitted during the decommissioning process. However, the ERT noted that recovery amounts were not reported in CRF table 2(II)B-Hs2. During the review, the Party indicated that the inventory agency is currently reviewing the estimation methodology for mobile air conditioning with the assumption that 50 per cent of the initial charge will be recovered. Ireland also stated that the inventory agency is attempting to find actual recovery rates for mobile air conditioning in the country from end-of-life vehicles.</p> <p>The ERT recommends that the Party report recovered HFC emissions from mobile air conditioning.</p>	Yes. Accuracy

<i>ID#</i>	<i>Finding classification</i>	<i>Description of the finding with recommendation or encouragement</i>	<i>Is finding an issue/problem?<sup>a</sup></i>
<b>Agriculture</b>			
A.5	3. General (agriculture) – CH <sub>4</sub> and N <sub>2</sub> O	<p>The agriculture chapter of the NIR makes no mention of the use of anaerobic digesters in Ireland and this was reported as “NO” in CRF tables 3.B(a)s2 and 3.B(b). However, in the waste chapter of the NIR (section 7.4.2, p.290), it is mentioned that the digestion of animal manure (agricultural slurry) does occur. The NIR (p.165) includes a generic statement on planned improvements indicating that the inventory agency is in the process of investigating the availability of new data for manure management practices in Ireland and will provide the relevant information when the data become available. During the review, the Party stated that all animal manure under category 3.B was fully accounted for and no manure was reported as “NE”. The inventory agency continues to investigate the use of anaerobic digestion in Ireland, which is still in its infancy, with only a small number of plants (fewer than 10) in operation. The Party also stated that there is a lack of precise estimates of the effective capacity and actual throughput of these plants in terms of quantity and type of feedstock and digestate produced that may be spread on land, as there is no system in place at the national level to accurately track the data owing to the relatively small scale of this industry in Ireland. The inventory agency continues to engage with other research and national agencies to fill data gaps and create robust systems to track the use of anaerobic digester systems to manage animal manure in Ireland. The Party will include the relevant information in the NIR when it becomes available. Reporting emissions for this category as “NO” is not in accordance with the UNFCCC Annex I inventory reporting guidelines because such emissions do seem to occur.</p> <p>The ERT noted that the impact on emissions from the current allocation of manure to different management systems will not lead to an underestimation of emissions from manure management. The digestate produced from biogas plants will contain biomass sources other than animal manure and therefore will constitute an additional nitrogen input to the fields. The ERT considers that the potential underestimation falls far below the threshold of significance given the few and small biogas plants currently in operation in Ireland. However, this could change if using digesters as a manure management system gains in popularity.</p> <p>The ERT recommends that Ireland 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. The ERT also recommends that Ireland 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 its next NIR, including information on other organic fertilizers being applied to soils as part of the digestate.</p>	Yes. Accuracy
A.6	3.D.a.6 Cultivation of organic soils (i.e. histosols) – N <sub>2</sub> O	<p>All cultivated histosols in Ireland are categorized as nutrient-poor (NIR, p.168). However, in the LULUCF chapter of the NIR (p.203) drained forest soils are referred to as both nutrient-rich and nutrient-poor. It is also stated that deforested grassland is assumed to be nutrient-rich. During the review, the Party clarified that it used a tier 1 method to estimate CSC in grassland soils, as discussed in the NIR (section 6.5.2.4). However, for forest soils a tier 3 method was used on the basis of country-specific soils data available from the national forest inventory, as discussed in the NIR (section 6.3.6). Such plot-level information does not exist for grassland to allow for a detailed analysis. The ERT noted that Ireland used the EFs from the Wetlands Supplement for “grassland, drained, nutrient-poor”. Default tier 1 EFs are available for both nutrient-rich and nutrient-poor organic soils in the Wetlands Supplement (table 2.5); moreover, a recent scientific paper (Paul et al., 2018) considers that both soil types occur in Ireland.</p>	Yes. Accuracy

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue/problem? <sup>a</sup>
LULUCF			
L.8	4. General (LULUCF)	<p>The ERT recommends that Ireland justify in the NIR the characterization of all organic grassland soils as nutrient-poor and collect country-specific data on histosols in order to improve the accuracy of the estimated emissions from organic soils by using an appropriate characterization of grassland soils as nutrient-rich and nutrient-poor.</p> <p>The ERT noted throughout the NIR and CRF tables a number of minor reporting errors, omissions or inconsistencies. For example, NIR table 6.6 data were misaligned for all lines of data for 2009 onward, being two years out (data presented for 2009 were in fact 2007 data), NIR table 1.5 did not include information on category 4.B (cropland), which was omitted by mistake, and key underlying AD on land-use change matrices for forest land use and FM were not included in annex 3.4.D to the NIR (whereas this information was provided for non-forest land use). During the review, the Party provided clarifications and indicated that any errors noted will be rectified in the next submission.</p>	Not an issue/problem
L.9	4. General (LULUCF) – CO <sub>2</sub>	<p>The ERT encourages Ireland to correct errors, omissions and inconsistencies between the NIR and the CRF tables.</p> <p>Ireland started to report its conversions from non-forest land to forest land (category 4.A.2) in 1990 and has accumulated the area since then (NIR, p.188). Therefore, the ERT concluded that emissions and removals from conversions of land to forest land before 1990 were not taken into account (see ID# L.13 below) and that it is unclear whether spatial coverage was ensured (see ID# L.12 below). The ERT noted that conversions to other land-use categories, such as land converted to grassland, were accounted using a similar approach. During the review, the Party clarified that for grassland conversions the land area has been aggregated since 1990 as indicated in CRF table 4.C and NIR table 6.17, and that the method is based on the principles of Article 3, paragraphs 3–4, of the Kyoto Protocol, as discussed in the NIR (chap. 11), and not on reporting under the Convention. The ERT concluded that emissions and removals from conversion of land to grassland before 1990 were not taken into account in the inventory reporting, leading to a completeness issue for land converted to grassland. Furthermore, from the description in the NIR, it is not clear where areas converted to grassland prior to 1990 were reported and whether the spatial coverage of grassland (categories 4.C.1 and 4.C.2) was ensured, leading to a transparency issue.</p> <p>The ERT recommends that Ireland conduct 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 its emission estimates by taking into account emissions and removals from conversion of land prior to 1990 accordingly. The ERT also recommends that Ireland report on its findings regarding the above-mentioned analysis in the NIR. It further recommends that the Party document the approach chosen by providing information on its methodological decisions, including its 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.</p>	Yes. Completeness
L.10	4.A Forest land – CO <sub>2</sub>	<p>The Party deployed CBM to generate estimates of emissions and removals from land converted to forest land, as described in its NIR (section 6.3, p.182). The modelling approach and method used by Ireland is not common practice for Parties reporting under the Convention, for example in not defining a transition period and reporting land areas for land converted to forest land accumulating only from 1990 onward (see also ID# L.13 below).</p>	Yes. Transparency

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue/problem? <sup>a</sup>
L.11	4.A Forest land – CO <sub>2</sub>	<p>The ERT notes that the transparency of the modelling and the rationale to explain the approach used by Ireland is of critical importance to enable the ERT to assess the quality of the methodology. The ERT acknowledges that the Party has provided substantive details in the NIR (pp.182 and 194) and in annex 3.4.B to the NIR, including all parameters and disturbance matrices and information on how the volume growth and biomass models were parameterized. However, given the novel modelling approach, the ERT considers that the description in the NIR (section 6.3) does not include sufficient detail on the modelling approach and method selection to transparently describe the calculation methodology applied by the Party, or to justify that the modelling approach delivers complete and accurate reporting of emissions and removals according to Ireland's national circumstances.</p> <p>During the review, the Party provided the ERT with detailed and critical methodological clarifications which will greatly assist future ERTs to assess the quality of the novel modelling methodology in detail, including:</p> <ul style="list-style-type: none"> <li>(a) The decision regarding the conversion period, which is not applied in the Party's modelling approach;</li> <li>(b) The rationale for reporting land converted to forest land starting in 1990 and maintaining the reporting of these land areas within land converted to forest land as a cumulative total for all future years;</li> <li>(c) The approach to modelling biomass in young forest stands for recently afforested areas;</li> <li>(d) Documentation and explanation or justification of the modelling approach, including that CBM does not consider previous carbon stocks in land use when forest land remaining forest land simulations are run; and that the dead organic matter pool is equilibrated to represent the initial dead organic matter pools before simulations are run; and a more detailed description of the implications of these methodological and model set-up decisions in terms of the completeness and accuracy of the model outputs.</li> </ul> <p>The ERT therefore recommends that Ireland provide further information, ideally in section 6.3 of the NIR, on:</p> <ul style="list-style-type: none"> <li>(a) Its modelling approach, including the rationale for not applying the conversion period when a tier 3 methodology is used;</li> <li>(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;</li> <li>(c) The rationale for not considering previous carbon stocks in simulations of forest land remaining forest land;</li> <li>(d) The assumptions used for simulation of the dead organic matter pool and their rationale.</li> </ul> <p>The ERT also recommends that Ireland justify the appropriateness of the modelling approach used in relation to its national circumstances, discuss the completeness and accuracy of the modelling approach, in accordance with the UNFCCC Annex I inventory reporting guidelines, paragraph 50(a), and discuss whether this approach is compatible with the 2006 IPCC Guidelines and is well documented and scientifically based.</p>	Yes. Convention reporting adherence
		<p>The Party deployed CBM to derive estimates of emissions and removals for the LULUCF sector, as described in the NIR (section 6.3.3, p.194). The ERT noted that CBM was used for the first time for the Party's 2019 submission and this is the first review of the Party's LULUCF inventory since starting to use the model. Many of the key elements of transparent reporting of a tier 3 model are evident in the current NIR. However, the ERT noted that some aspects are not yet in place; for example (1) detailed uncertainty analysis for CBM was not provided (as noted in the NIR (p.182)); (2) comparison of the CBM outputs with measured data (e.g. from the national forest inventory), with in situ data or other models in the 2020 submission (information on comparisons with other</p>	

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue/problem? <sup>a</sup>
		<p>models, such as CARBWARE, which was used for reporting up to 2017, was not included in the current submission, but rather noted in the 2019 NIR, while the evidence specific to the CARBWARE model validation is in the 2018 NIR); and (3) further evidence of the CBM output validation and sensitivity analysis. During the review, the Party provided detailed responses summarizing key elements to justify the selection and calibration of the model using national parameters and its appropriateness for modelling the LULUCF emissions and removals according to national circumstances. Furthermore, the Party clarified that research is ongoing to evaluate the model's performance against real-time eddy covariance data, in order to test the net ecosystem exchange model and verify that specific pool outputs such as biomass are being validated, where possible, using CSC values obtained from the national forest inventory. The Party indicated that this information will be presented in its next annual submission.</p> <p>The ERT recommends that the Party report on the research to validate CBM, conduct a model-specific uncertainty analysis and present the findings, including comparisons of CBM outputs against other models and/or against in situ measurements, in order to adhere to the UNFCCC Annex I inventory reporting guidelines, paragraph 50(a), regarding requirements for reporting using country-specific tier 3 models.</p>	
L.12	4.A Forest land – CO <sub>2</sub>	<p>Regarding the reporting of emissions and removals for category 4.A.2, the NIR does not clearly describe the reporting of the forest land area for stands that were converted to forest land shortly prior to 1990. For example, it is unclear where and whether the land areas for young stands converted to forest land in 1989 (most probably covered by sapling size trees) were reported across categories 4.A.1 (forest land remaining forest land) and/or 4.A.2 (land converted to forest land). As a result of this lack of transparency, the ERT was unable to evaluate completeness and accuracy in relation to the spatial coverage and reporting of forest land areas. During the review, in response to questions of the ERT regarding potentially incomplete spatial coverage of areas under category 4.A.1, the Party indicated that these areas were reported under category 4.A.2, leading to complete spatial coverage of land areas for category 4.A (forest land). The Party noted that the use of a transition period different from default approaches led to this reporting approach and indicated that this was an issue of transparency rather than completeness.</p> <p>The ERT recommends that Ireland 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. This will enable future ERTs to evaluate the accuracy and completeness of the country-specific method.</p>	Yes. Transparency
L.13	4.A.2 Land converted to forest land – CO <sub>2</sub>	<p>The Party documented in its NIR (p.209) the modelling approach for CSC in land converted to forest land. Ireland started to report its conversions from non-forest land to forest land (category 4.A.2) in 1990 and has aggregated the area since then (NIR, p.188). The cumulative areas since 1990 are documented in NIR table 6.13 (p.211). Ireland applied the same method for calculating CSC for all pools for category 4.A.2 in CRF table 4.A, and for afforestation in CRF table 4(KP-I)A.1.</p> <p>The ERT noted that for reporting under the Convention, reporting of conversions in general, thus also those to forest land (category 4.A.2), should start from 1990. However, conversions before 1990 should also be taken into account in order to report a full geographical coverage of sources and sinks in 1990 (according to the UNFCCC Annex I inventory reporting guidelines, paragraph 4(d)). More specifically, the category land converted to forest</p>	Yes. Completeness

<i>ID#</i>	<i>Finding classification</i>	<i>Description of the finding with recommendation or encouragement</i>	<i>Is finding an issue/problem?<sup>a</sup></i>
		<p>land for 1990 should, in addition to afforestation in 1990, cover all land afforested since 1990 minus the transition period plus one. If the land converted to forest land category for 1990 includes only the area of afforestation in 1990 then the emission and removal estimates will be biased for 1990 to 1990 plus the transition period minus one because the estimates exclude the emissions and removals from the areas afforested before 1990. Thus, the ERT considers that the reported emissions and removals under land converted to forest land have been underestimated as a result of the omission of emissions and removals from land to forest land conversions before 1990.</p> <p>During the review, the Party clarified that CBM estimates CSC in soils as a function of the mean soil value for a soil stratum of the previous land use and that CSC in soils from land-use conversions is taken into account. The ERT agrees that the CSC in soils before 1990 is taken into account for those areas reported under category 4.A.2 starting in 1990, but not for those areas converted to forest land shortly before 1990, since they have not been reported under category 4.A.1 (forest land remaining forest land) or under category 4.A.2 (land converted to forest land), and thus not taken into account. During the review, the Party provided additional information indicating that it assessed emissions from mineral soils in conversions to forest land for 1970–1989 as not significant. The Party indicated that this was its justification for not estimating these emissions, but noted that this was not documented in the NIR.</p> <p>The ERT recommends that Ireland provide in the NIR a justification for the exclusion of the emissions and removals from the areas of land converted to forest land prior to 1990, which are currently not reported. If the Party cannot demonstrate that emissions and removals from these areas are insignificant, consistently with the UNFCCC Annex I inventory reporting guidelines, paragraph 37(b), the ERT recommends that Ireland review and update its modelling and reporting under the Convention to reflect the conversions to forest land prior to 1990 in order to report complete tracking of the national area per land-use category (complete geographical coverage); and ensure accurate modelling of emissions and removals from all land converted to forest land (also that converted prior to 1990) and forest land remaining forest land, thereby improving the completeness of the inventory.</p>	
L.14	4.D.1 Wetlands remaining wetlands – CO <sub>2</sub>	<p>The Party reported in its NIR (section 6.6.9, p.268) recalculations of emissions and removals from wetlands associated with revised data on market shares for the main companies involved in peat harvesting for the horticultural peat market. During the review, the Party provided the ERT with the model used to estimate emissions from on-site and off-site CO<sub>2</sub> emissions from peat extraction, in order to clarify the reasons for the recalculations. The ERT noted that the model did not correctly aggregate the calculated CSC in soils for off-site CO<sub>2</sub> emissions, omitting the component of emissions calculated to reflect the peat extraction activity from a subset of operators in Ireland, leading to an underestimation of emissions across the time series. For 2018, for example, the missing emissions are estimated to be about 817 kt CO<sub>2</sub> eq.</p> <p>The ERT recommends that Ireland report complete estimates of CSC in soils for off-site CO<sub>2</sub> emissions from peat extraction for wetlands.</p>	Yes. Completeness
L.15	4.D.1 Wetlands remaining wetlands – CO <sub>2</sub>	<p>The Party reported in its NIR (section 6.6.9, p.268) recalculations of emissions and removals from wetlands (category 4.D.1) associated with revised data on market shares for the main companies involved in peat harvesting for the horticultural peat market. The recalculation under this category was the most significant single recalculation in the 2020 national inventory, increasing estimated emissions in the base year and reducing estimated emissions in 2017, and altering the 1990–2017 reported trend by around –800 kt CO<sub>2</sub>. The ERT noted that the explanation for the recalculation was limited to two sentences in the NIR referring to revised data on market shares for companies</p>	Yes. Transparency



ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue/problem? <sup>a</sup>
		<p>involved in peat harvesting, and a revision to the area of peat burned in 2017. During the review, the ERT reviewed the model used by Ireland to estimate emissions and removals from wetlands and identified an error in the calculations; this finding illustrated that the documentation of the recalculation in the NIR was incorrect. The ERT notes that the correction of the error (to address the completeness issue under ID# L.14 above) will lead to a further recalculation of the emissions from wetlands for the next submission.</p> <p>The ERT recommends that Ireland provide in the NIR a full and transparent description of the recalculations, for example any changes to the AD, EFs and methods used to estimate emissions from wetlands.</p>	
Waste			
W.6	5.B.1 Composting – CH <sub>4</sub> and N <sub>2</sub> O	<p>The Party reported in NIR table 7.6 (p.289) the use of a CH<sub>4</sub> EF of 4 g CH<sub>4</sub>/kg and an N<sub>2</sub>O EF of 0.24 kg N<sub>2</sub>O/kg from the 2006 IPCC Guidelines (vol. 5, table 4.1). In addition, these EFs are used for calculating emissions on a wet weight basis. However, in CRF table 5.B the AD are expressed as dry matter and thus the table indicates that the AD used by Ireland to estimate emissions from composting are 149.72 kt dry matter in 2018. During the review, Ireland explained that it reported the AD on a wet weight basis in CRF table 5.B. It stated that it will change the reporting of AD to a dry weight basis. The Party also explained that the EFs for dry waste are estimated from those for wet waste assuming a moisture content of 60 per cent wet waste. The ERT considers that the CH<sub>4</sub> and N<sub>2</sub>O emissions have been correctly estimated.</p> <p>The ERT recommends that Ireland change the reporting of AD and the CH<sub>4</sub> and N<sub>2</sub>O EFs to a dry weight basis in CRF table 5.B for the whole time series.</p>	Yes. Transparency
W.7	5.C.2 Open burning of waste – CO <sub>2</sub> , CH <sub>4</sub> and N <sub>2</sub> O	<p>According to the NIR (p.293), statistics on open burning of waste are not available in Ireland and estimates reported in CRF table 5.C are based on AD for uncollected household waste. However, no documentation or references were provided in the NIR. During the review, Ireland explained that data on uncollected household waste are sourced from the EPA national waste statistics publications and provided a link to the source (<a href="https://www.epa.ie/nationalwastestatistics/household/">https://www.epa.ie/nationalwastestatistics/household/</a>).</p> <p>The ERT recommends that Ireland 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.</p>	Yes. Transparency
W.8	5.D.1 Domestic wastewater – CH <sub>4</sub> and N <sub>2</sub> O	<p>The Party reported in its NIR (section 7.6.1.2, p.294) that two thirds of the population of Ireland is served by centralized sewage treatment plants and the remaining one third of the population uses septic tanks to treat wastewater, mainly for individual houses in non-urban areas. During the review, Ireland explained that the types of wastewater treatment plants in Ireland are urban wastewater treatment plants and domestic wastewater treatment systems (septic tank systems) and provided a reference to an EPA report (see ID# W.5 in table 3). It stated that it will provide further information on untreated wastewater on the basis of available information in the above-mentioned EPA report in its next submission. Ireland acknowledged that the emissions from untreated wastewater were not included in the inventory and estimated that the missing emissions account for about 2.52 kt CO<sub>2</sub> eq in 2018. The ERT acknowledges that this is below the level of significance for including this issue in the list of potential problems and further questions raised by the ERT in accordance with decision 22/CMP.1 in conjunction with decision 4/CMP.11, annex, paragraph 80(b) (30.47 kt CO<sub>2</sub> eq, i.e. 0.05 per cent of total national emissions without LULUCF in 2018).</p>	Yes. Completeness

<i>ID#</i>	<i>Finding classification</i>	<i>Description of the finding with recommendation or encouragement</i>	<i>Is finding an issue/problem?<sup>a</sup></i>
		The ERT recommends that Ireland 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.	
KP-LULUCF		No findings for KP-LULUCF 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 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 2020 annual submission of Ireland.

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

12. Ireland elected commitment period accounting and therefore the issuance and cancellation of units for KP-LULUCF is not applicable to the 2020 review.

## **VIII. Questions of implementation**

13. No questions of implementation were identified by the ERT during the individual review of the Party's 2020 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 Ireland in its 2020 annual submission

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

Table I.1

## Total greenhouse gas emissions for Ireland, base year<sup>a</sup>–2018

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

	Total GHG emissions excluding indirect CO <sub>2</sub> emissions		Total GHG emissions including indirect CO <sub>2</sub> emissions <sup>b</sup>		Land-use change (Article 3.7 bis as contained in the Doha Amendment) <sup>c</sup>	KP-LULUCF (Article 3.3 of the Kyoto Protocol) <sup>d</sup>	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								–142.07
Base year	60 580.74	55 660.09	NA	NA	8.2299		6 932.73	
1990	60 388.94	55 468.30	NA	NA				
1995	64 410.80	59 164.25	NA	NA				
2000	73 778.95	68 314.28	NA	NA				
2010	66 810.06	61 277.54	NA	NA				
2011	61 812.85	57 156.86	NA	NA				
2012	61 807.76	57 752.70	NA	NA				
2013	62 060.97	57 589.73	NA	NA		–2 521.84	6 422.23	–1 452.75
2014	61 272.03	57 325.32	NA	NA		–4 028.89	6 360.17	–782.56
2015	63 936.55	59 415.93	NA	NA		–2 885.41	6 363.97	–1 137.40
2016	64 874.36	61 491.44	NA	NA		–3 753.97	6 307.98	–1 346.96
2017	66 343.05	61 004.88	NA	NA		–3 349.75	6 542.47	–984.07
2018	65 232.23	60 934.54	NA	NA		–3 330.15	6 440.15	–815.21

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

<sup>a</sup> “Base year” refers to the base year under the Kyoto Protocol, which is 1990 for CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O and 1995 for HFCs, PFCs, SF<sub>6</sub> and NF<sub>3</sub>. The base year for CM and GM under Article 3, para. 4, of the Kyoto Protocol is 1990. For activities under Article 3, para. 3, of the Kyoto Protocol and FM under Article 3, para. 4, only the inventory years of the commitment period must be reported.

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

<sup>c</sup> 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 report to facilitate the calculation of the assigned amount for the second commitment period of the Kyoto Protocol of the Party.

<sup>d</sup> Activities under Article 3, para. 3, of the Kyoto Protocol, namely AR and deforestation.

Table I.2

**Greenhouse gas emissions by gas for Ireland, excluding land use, land-use change and forestry, 1990–2018**(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	32 944.33	14 760.69	7 728.69	0.59	0.12	NO	33.88	NO
1995	35 852.67	15 000.47	8 084.72	45.29	97.61	NO	79.11	4.37
2000	45 249.00	14 338.19	7 958.07	270.34	397.76	NO	51.76	49.17
2010	41 747.93	12 070.12	6 345.59	1 034.23	46.58	NO	33.09	NO
2011	38 052.22	12 037.56	5 938.67	1 067.04	15.88	NO	45.49	NO
2012	38 209.59	12 336.89	6 097.94	1 060.53	9.56	NO	37.41	0.78
2013	37 235.30	12 672.87	6 536.82	1 091.97	8.32	NO	43.55	0.90
2014	36 785.33	12 966.85	6 356.32	1 174.90	3.56	NO	37.41	0.96
2015	38 545.33	13 290.14	6 354.99	1 159.51	20.50	NO	44.49	0.96
2016	40 029.84	13 678.84	6 465.80	1 239.35	37.36	NO	39.29	0.96
2017	38 910.19	13 991.91	6 748.96	1 266.14	47.20	NO	39.21	1.26
2018	38 803.39	13 984.98	6 953.70	1 100.36	49.86	NO	40.92	1.32
<b>Percentage change 1990–2018</b>	<b>17.8</b>	<b>–5.3</b>	<b>–10.0</b>	<b>185 772.4</b>	<b>41 528.9</b>	<b>NA</b>	<b>20.8</b>	<b>NA</b>

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

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

Table I.3

**Greenhouse gas emissions by sector for Ireland, 1990–2018**(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	31 022.10	3 309.16	19 584.98	4 920.64	1 552.05	NO
1995	33 824.93	3 217.34	20 292.81	5 246.54	1 829.18	NO
2000	42 485.77	4 558.52	19 777.21	5 464.68	1 492.77	NO
2010	40 427.94	2 577.80	17 765.62	5 532.52	506.19	NO
2011	36 925.88	2 462.21	17 176.34	4 655.99	592.43	NO
2012	36 998.84	2 668.53	17 568.04	4 055.06	517.29	NO
2013	35 816.79	2 623.17	18 477.16	4 471.24	672.62	NO
2014	35 114.72	3 037.16	18 318.42	3 946.71	855.01	NO
2015	36 665.91	3 232.72	18 581.00	4 520.63	936.30	NO
2016	37 998.08	3 467.07	19 084.68	3 382.92	941.61	NO

	<i>Energy</i>	<i>IPPU</i>	<i>Agriculture</i>	<i>LULUCF</i>	<i>Waste</i>	<i>Other</i>
2017	36 840.01	3 623.78	19 621.92	5 338.17	919.16	NO
2018	36 582.87	3 508.50	19 953.07	4 297.69	890.10	NO
<b>Percentage change 1990–2018</b>	<b>17.9</b>	<b>6.0</b>	<b>1.9</b>	<b>–12.7</b>	<b>–42.6</b>	<b>NA</b>

*Note:* Ireland did not report indirect CO<sub>2</sub> 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<sup>a</sup>–2018, for Ireland**  
(kt CO<sub>2</sub> eq)

	<i>Article 3.7 bis as contained in the Doha Amendment<sup>b</sup></i>	<i>Activities under Article 3.3 of the Kyoto Protocol</i>		<i>FM and elected activities under Article 3.4 of the Kyoto Protocol</i>				
	<i>Land-use change</i>	<i>AR</i>	<i>Deforestation</i>	<i>FM</i>	<i>CM</i>	<i>GM</i>	<i>RV</i>	<i>WDR</i>
FMRL				–142.07				
Technical correction				–933.52				
Base year	8.2299				33.37	6 899.36	NA	NA
2013		–3 586.89	1 065.06	–1 452.75	–20.47	6 442.70	NA	NA
2014		–4 289.90	261.00	–782.56	–72.36	6 432.53	NA	NA
2015		–4 231.51	1 346.10	–1 137.40	–73.77	6 437.75	NA	NA
2016		–4 115.94	361.97	–1 346.96	–108.85	6 416.83	NA	NA
2017		–3 632.76	283.02	–984.07	–59.58	6 602.05	NA	NA
2018		–3 606.02	275.87	–815.21	–156.37	6 596.52	NA	NA
<b>Percentage change base year–2018</b>					<b>–568.6</b>	<b>–4.4</b>	<b>NA</b>	<b>NA</b>

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

<sup>a</sup> The base year for CM and GM under Article 3, para. 4, of the Kyoto Protocol is 1990. For activities under Article 3, para. 3, of the Kyoto Protocol, and FM under Article 3, para. 4, only the inventory years of the commitment period must be reported.

<sup>b</sup> The value reported in this column relates to 1990.

2. Table I.5 provides an overview of key relevant data from Ireland's reporting under Article 3, paragraphs 3–4, of the Kyoto Protocol.

Table I.5

**Key relevant data for Ireland under Article 3, paragraphs 3–4, of the Kyoto Protocol from its 2020 annual submission**

<i>Parameter</i>	<i>Data values</i>
Periodicity of accounting	(a) AR: commitment period accounting (b) Deforestation: commitment period accounting (c) FM: commitment period accounting (d) CM: commitment period accounting (e) GM: commitment period accounting (f) RV: not elected (g) WDR: not elected
Elected activities under Article 3, paragraph 4, of the Kyoto Protocol	CM and GM
Election of application of provisions for natural disturbances	Yes, for AR and FM
3.5% of total base-year GHG emissions, excluding LULUCF	1 974.616 kt CO <sub>2</sub> eq (15 796.928 kt CO <sub>2</sub> 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	NA
2. Deforestation	NA
3. FM	NA
4. CM	NA
5. GM	NA

## Annex II

### Information to be included in the compilation and accounting database

Tables II.1–II.6 include the information to be included in the compilation and accounting database for Ireland. 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 2018, including on the commitment period reserve, for Ireland**  
(t CO<sub>2</sub> eq)

	<i>Original submission</i>	<i>Revised estimate</i>	<i>Adjustment</i>	<i>Final</i>
<b>CPR</b>	<b>309 167 903</b>	–	–	<b>309 167 903</b>
<b>Annex A emissions</b>				
CO <sub>2</sub>	38 803 394	–	–	38 803 394
CH <sub>4</sub>	13 984 983	–	–	13 984 983
N <sub>2</sub> O	6 953 701	–	–	6 953 701
HFCs	1 100 364	–	–	1 100 364
PFCs	49 859	–	–	49 859
Unspecified mix of HFCs and PFCs	NO	–	–	NO
SF <sub>6</sub>	40 918	–	–	40 918
NF <sub>3</sub>	1 321	–	–	1 321
<b>Total Annex A sources</b>	<b>60 934 541</b>	–	–	<b>60 934 541</b>
<b>Activities under Article 3, paragraph 3, of the Kyoto Protocol</b>				
AR	–3 606 018	–	–	–3 606 018
Deforestation	275 870	–	–	275 870
<b>FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol</b>				
FM	–815 212	–	–	–815 212
CM	–156 368	–	–	–156 368
CM for the base year	33 372	–	–	33 372
GM	6 596 522	–	–	6 596 522
GM for the base year	6 899 357	–	–	6 899 357

Table II.2

**Information to be included in the compilation and accounting database for 2017 for Ireland**  
(t CO<sub>2</sub> eq)

	<i>Original estimate</i>	<i>Revised estimate</i>	<i>Adjustment</i>	<i>Final value</i>
<b>Annex A emissions</b>				
CO <sub>2</sub>	38 910 193	–	–	38 910 193
CH <sub>4</sub>	13 991 910	–	–	13 991 910
N <sub>2</sub> O	6 748 962	–	–	6 748 962
HFCs	1 266 142	–	–	1 266 142
PFCs	47 195	–	–	47 195
Unspecified mix of HFCs and PFCs	NO	–	–	NO
SF <sub>6</sub>	39 213	–	–	39 213
NF <sub>3</sub>	1 261	–	–	1 261
<b>Total Annex A sources</b>	<b>61 004 876</b>	–	–	<b>61 004 876</b>
<b>Activities under Article 3, paragraph 3, of the Kyoto Protocol</b>				

	<i>Original estimate</i>	<i>Revised estimate</i>	<i>Adjustment</i>	<i>Final value</i>
AR	-3 632 763	–	–	-3 632 763
Deforestation	283 016	–	–	283 016
<b>FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol</b>				
FM	-984 069	–	–	-984 069
CM	-59 580	–	–	-59 580
CM for the base year	33 372	–	–	33 372
GM	6 602 052	–	–	6 602 052
GM for the base year	6 899 357	–	–	6 899 357

Table II.3

**Information to be included in the compilation and accounting database for 2016 for Ireland**(t CO<sub>2</sub> eq)

	<i>Original submission</i>	<i>Revised estimate</i>	<i>Adjustment</i>	<i>Final</i>
<b>Annex A emissions</b>				
CO <sub>2</sub>	40 029 837	–	–	40 029 837
CH <sub>4</sub>	13 678 844	–	–	13 678 844
N <sub>2</sub> O	6 465 799	–	–	6 465 799
HFCs	1 239 348	–	–	1 239 348
PFCs	37 357	–	–	37 357
Unspecified mix of HFCs and PFCs	NO	–	–	NO
SF <sub>6</sub>	39 294	–	–	39 294
NF <sub>3</sub>	961	–	–	961
<b>Total Annex A sources</b>	<b>61 491 440</b>	–	–	<b>61 491 440</b>
<b>Activities under Article 3, paragraph 3, of the Kyoto Protocol</b>				
AR	-4 115 936	–	–	-4 115 936
Deforestation	361 966	–	–	361 966
<b>FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol</b>				
FM	-1 346 956	–	–	-1 346 956
CM	-108 846	–	–	-108 846
CM for the base year	33 372	–	–	33 372
GM	6 416 831	–	–	6 416 831
GM for the base year	6 899 357	–	–	6 899 357

Table II.4

**Information to be included in the compilation and accounting database for 2015 for Ireland**(t CO<sub>2</sub> eq)

	<i>Original submission</i>	<i>Revised estimate</i>	<i>Adjustment</i>	<i>Final</i>
<b>Annex A emissions</b>				
CO <sub>2</sub>	38 545 330	–	–	38 545 330
CH <sub>4</sub>	13 290 144	–	–	13 290 144
N <sub>2</sub> O	6 354 994	–	–	6 354 994
HFCs	1 159 512	–	–	1 159 512
PFCs	20 497	–	–	20 497
Unspecified mix of HFCs and PFCs	NO	–	–	NO
SF <sub>6</sub>	44 487	–	–	44 487
NF <sub>3</sub>	961	–	–	961
<b>Total Annex A sources</b>	<b>59 415 925</b>	–	–	<b>59 415 925</b>
<b>Activities under Article 3, paragraph 3, of the Kyoto Protocol</b>				
AR	-4 231 505	–	–	-4 231 505
Deforestation	1 346 099	–	–	1 346 099



	<i>Original submission</i>	<i>Revised estimate</i>	<i>Adjustment</i>	<i>Final</i>
<b>FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol</b>				
FM	-1 137 398	—	—	-1 137 398
CM	-73 773	—	—	-73 773
CM for the base year	33 372	—	—	33 372
GM	6 437 745	—	—	6 437 745
GM for the base year	6 899 357	—	—	6 899 357

Table II.5

**Information to be included in the compilation and accounting database for 2014 for Ireland**(t CO<sub>2</sub> eq)

	<i>Original submission</i>	<i>Revised estimate</i>	<i>Adjustment</i>	<i>Final</i>
<b>Annex A emissions</b>				
CO <sub>2</sub>	36 785 327	—	—	36 785 327
CH <sub>4</sub>	12 966 845	—	—	12 966 845
N <sub>2</sub> O	6 356 316	—	—	6 356 316
HFCs	1 174 901	—	—	1 174 901
PFCs	3 563	—	—	3 563
Unspecified mix of HFCs and PFCs	NO	—	—	NO
SF <sub>6</sub>	37 406	—	—	37 406
NF <sub>3</sub>	961	—	—	961
<b>Total Annex A sources</b>	<b>57 325 318</b>	—	—	<b>57 325 318</b>
<b>Activities under Article 3, paragraph 3, of the Kyoto Protocol</b>				
AR	-4 289 896	—	—	-4 289 896
Deforestation	261 003	—	—	261 003
<b>FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol</b>				
FM	-782 557	—	—	-782 557
CM	-72 362	—	—	-72 362
CM for the base year	33 372	—	—	33 372
GM	6 432 534	—	—	6 432 534
GM for the base year	6 899 357	—	—	6 899 357

Table II.6

**Information to be included in the compilation and accounting database for 2013 for Ireland**(t CO<sub>2</sub> eq)

	<i>Original submission</i>	<i>Revised estimate</i>	<i>Adjustment</i>	<i>Final</i>
<b>Annex A emissions</b>				
CO <sub>2</sub>	37 235 303	—	—	37 235 303
CH <sub>4</sub>	12 672 866	—	—	12 672 866
N <sub>2</sub> O	6 536 820	—	—	6 536 820
HFCs	1 091 969	—	—	1 091 969
PFCs	8 324	—	—	8 324
Unspecified mix of HFCs and PFCs	NO	—	—	NO
SF <sub>6</sub>	43 551	—	—	43 551
NF <sub>3</sub>	901	—	—	901
<b>Total Annex A sources</b>	<b>57 589 735</b>	—	—	<b>57 589 735</b>
<b>Activities under Article 3, paragraph 3, of the Kyoto Protocol</b>				
AR	-3 586 893	—	—	-3 586 893
Deforestation	1 065 056	—	—	1 065 056
<b>FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol</b>				
FM	-1 452 753	—	—	-1 452 753

	<i>Original submission</i>	<i>Revised estimate</i>	<i>Adjustment</i>	<i>Final</i>
CM	–20 470	–	–	–20 470
CM for the base year	33 372	–	–	33 372
GM	6 442 696	–	–	6 442 696
GM for the base year	6 899 357	–	–	6 899 357

## Annex III

### Additional information to support findings in table 2

#### A. Missing categories that may affect completeness

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

- (a) 1.B.2.b natural gas – gaseous fuels (CO<sub>2</sub>) (see ID# E.14 in table 3);
- (b) 1.B.2.b natural gas – gaseous fuels (CO<sub>2</sub> and CH<sub>4</sub>) (see ID# E.16 in table 3);
- (c) 4.C.2 land converted to grassland (CO<sub>2</sub>) (see ID# L.9 in table 5);
- (d) 4.A.2 land converted to forest land (CO<sub>2</sub>) (see ID# L.13 in table 5);
- (e) 4.D.1 wetlands remaining wetlands (CO<sub>2</sub>) (see ID# L.14 in table 5);
- (f) 5.D.1 domestic wastewater (CH<sub>4</sub> and N<sub>2</sub>O) (see ID# W.8 in table 5).

#### B. Recommendation for an in-country review: list of issues

2. The ERT recommends that the next review for Ireland be conducted as an in-country review. As noted in table 5 (ID#s L.10, L.11 and L.13), the ERT has concluded that Ireland has not sufficiently explained the application of country-specific methods for estimating emissions and removals from LULUCF while also ensuring completeness and compatibility with the 2006 IPCC Guidelines in accordance with the UNFCCC Annex I inventory reporting guidelines. The ERT notes that Ireland faced challenges in reporting on verification when using a tier 3 approach. The ERT notes that, as far as was practicable, there was constructive dialogue and progress during this remote centralized review. However, it was acknowledged during the review by both the Party and the ERT that an in-country review is the most appropriate forum to enable a more rigorous review of the novel modelling approach that Ireland has implemented, and to enable a future ERT to work with the Party to formulate pragmatic solutions to facilitate continual improvement on documentation/transparency, verification and validation of the approach.

3. In accordance with decision 13/CP.20, annex, paragraph 64, the ERT has set out below a list of issues additional to those identified in tables 3 and 5 that should be addressed during the in-country review:

- 4. Key areas that the next ERT conducting the in-country review should consider are:
  - (a) Approach to land representation;
  - (b) National methods for estimating emissions and removals from forest land and land converted to forest land;
  - (c) National methods for estimating emissions and removals from land conversion to land-use categories other than forest land;
  - (d) How verification is conducted when a tier 3 methodology is applied;
  - (e) Use of notation keys and reporting on completeness in accordance with decision 24/CP.19, paragraphs 37 and 50(f).

## 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/>.

#### B. UNFCCC documents

##### Annual review reports

Reports on the individual reviews of the 2014, 2015, 2016 and 2018 annual submissions of Ireland, contained in documents FCCC/ARR/2014/IRL, FCCC/ARR/2015/IRL, FCCC/ARR/2016/IRL and FCCC/ARR/2018/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/sites/default/files/resource/AGI%202020\\_final.pdf](https://unfccc.int/sites/default/files/resource/AGI%202020_final.pdf).

Annual status report for Ireland for 2020. Available at [https://unfccc.int/sites/default/files/resource/asr2020\\_IRL.pdf](https://unfccc.int/sites/default/files/resource/asr2020_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 have been reproduced as received:

Paul, C. Fealy, R., Fenton, O., Lanigan, G. O'Sullivan, L. & Schulte, R.P.O.: Assessing the role of artificially drained agricultural land for climate change mitigation in Ireland. *Environmental Science & Policy* Volume 80, February 2018, Pages 95-104. Available at <https://doi.org/10.1016/j.envsci.2017.11.004>.

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/pubs/reports/research/climate/ertdireport46.html>.

Hyde, B., Carton, O.T. and Murphy, W.E. (2008). Farm Facilities Survey – Ireland 2003. Report prepared for the Department of Agriculture by Teagasc, Johnstown Castle, Co. Wexford. P1-150.

EEA. 2016. *EMEP/EEA air pollutant emission inventory guidebook 2016*. Luxembourg: Publications Office of the European Union. Available at <https://www.eea.europa.eu/publications/emep-eea-guidebook-2016>.

EPA. 2019. *Urban Wastewater Treatment in 2018*. Environmental Protection Agency of Ireland, November 2019. Available at [https://www.epa.ie/pubs/reports/water/wastewater/Urban%20Waste%20Water%20Treatment%20in%202018\\_Web.pdf](https://www.epa.ie/pubs/reports/water/wastewater/Urban%20Waste%20Water%20Treatment%20in%202018_Web.pdf).

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