United Nations

FCCC/ARR/2018/IRL

Framework Convention on Climate Change

Distr.: General
6 August 2019

English only

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

Note by the expert review team

Summary

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

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

GE.19-13221(E)

1913221

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Abbreviations and acronyms

2006 IPCC Guidelines	*2006 IPCC Guidelines for National Greenhouse Gas Inventories*
AD	activity data
Annex A sources	source categories 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"
CH_4	methane
CM	cropland management
CO_2	carbon dioxide
CO_2 eq	carbon dioxide equivalent
CP	commitment period
CPR	commitment period reserve
CRF	common reporting format
CSC	carbon stock change
EEA	European Environment Agency
EF	emission factor
EMEP	European Monitoring and Evaluation Programme
ERT	expert review team
EU ETS	European Union Emissions Trading System
FM	forest management
FMRL	forest management reference level
F_{ON}	annual amount of managed animal manure, compost, sewage sludge and other organic nitrogen applied to soils
$Frac_{GASM}$	fraction of applied organic nitrogen fertilizer and of urine and dung nitrogen deposited by grazing animals that volatilizes as ammonia and nitrogen oxides
GHG	greenhouse gas
GM	grazing land management
HFC	hydrofluorocarbon
IAA	Irish Aviation Authority
IE	included elsewhere
IEF	implied emission factor
IO	instantaneous oxidation
IPCC	Intergovernmental Panel on Climate Change
IPPU	industrial processes and product use
KP-LULUCF activities	activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol
LULUCF	land use, land-use change and forestry
N	nitrogen
N_2O	nitrous oxide
$N_2O_{(ATD)}$-N	nitrous oxide and nitrogen emissions from atmospheric deposition
$N_2O(L)$-N	annual amount of nitrogen produced from leaching and run-off of nitrogen additions to managed soils in regions where leaching and run-off occur
N_2O-$N_{Ninputs}$	annual amount of urine and dung nitrogen deposited on pasture, range and paddock by grazing animals
N_2O-N_{prp}	annual amount of managed animal manure, compost, sewage sludge and other organic nitrogen additions applied to soils
NA	not applicable
NE	not estimated

NF_3	nitrogen trifluoride
NH_3	ammonia
NIR	national inventory report
NO	not occurring
QA/QC	quality assurance/quality control
RV	revegetation
SEF	standard electronic format
SF_6	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

I. Introduction[1]

1. This report covers the review of the 2018 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" (decision 13/CP.20). The review took place from 17 to 22 September 2018 in Bonn and was coordinated by Mr. Tomoyuki Aizawa and Mr. Simon Wear (secretariat). Table 1 provides information on the composition of the ERT that conducted the review of Ireland.

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

Area of expertise	*Name*	*Party*
Generalist	Mr. Mikhail Gytarskiy	Russian Federation
	Ms. Agnieszka Patoka-Janowska	Poland
Energy	Mr. Alexey Cherednichenko	Kazakhstan
	Mr. Pedro Faria	United Kingdom of Great Britain and Northern Ireland
	Mr. Peter Seizov	Bulgaria
IPPU	Ms. Elsa Hatanaka	Japan
	Ms. Qing Tong	China
Agriculture	Ms. Hongmin Dong	China
	Mr. Chang Liang	Canada
LULUCF	Ms. Oksana Butrym	Ukraine
	Mr. Markus Didion	Switzerland
	Mr. Igor Onopchuk	Ukraine
Waste	Mr. Philip Acquah	Ghana
	Mr. Pavel Gavrilita	Republic of Moldova
	Mr. Julius Madzore	Zimbabwe
Lead reviewers	Mr. Acquah	
	Mr. Gytarskiy	

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

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

3. The ERT has made recommendations that Ireland resolve the findings related to issues,[2] including issues designated as problems.[3] Other findings, and, if applicable, the encouragements of the ERT to Ireland to resolve them, 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 shows annual GHG emissions for Ireland, including totals excluding and including the LULUCF sector, indirect CO_2 emissions and emissions by gas and by sector. Annex I also contains background data related to emissions and removals from KP-LULUCF activities, if elected, by gas, sector and activity for Ireland.

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

II. Summary and general assessment of the 2018 annual submission

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

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

Assessment			*Issue or problem ID#(s) in table 3 and/or 5[a]*
Dates of submission	Original submission: 12 April 2018 (NIR), 13 April 2018, Version 2 (CRF tables), 13 April 2018 (SEF-CP1-2017 and SEF-CP2-2017) Revised submission: 6 November 2018, Version 3 (CRF tables) Unless otherwise specified, the values from the latest submission are used in this report		
Review format	Centralized		
Application of the requirements of the UNFCCC Annex I inventory reporting guidelines and the *2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands* (if applicable)	1. Have any issues been identified in the following areas:		
	(a) Identification of key categories	No	
	(b) Selection and use of methodologies and assumptions	Yes	A.2, A.4
	(c) Development and selection of EFs	Yes	E.16, E.21, W.7
	(d) Collection and selection of AD	Yes	G.10, E.14
	(e) Reporting of recalculations	No	
	(f) Reporting of a consistent time series	No	
	(g) Reporting of uncertainties, including methodologies	Yes	G.8, G.9

[2] Issues are defined in decision 13/CP.20, annex, paragraph 81.
[3] Problems are defined in decision 22/CMP.1, annex, paragraphs 68 and 69, as revised by decision 4/CMP.11.

Assessment			*Issue or problem ID#(s) in table 3 and/or 5[a]*
	(h) QA/QC	QA/QC procedures were assessed in the context of the national system (see para. 2 in this table)	
	(i) Missing categories/completeness[b]	Yes	E.9, E.19, E.22, W.6
	(j) Application of corrections to the inventory	No	
Significance threshold	For categories reported as insignificant, has the Party provided sufficient information showing that the likely level of emissions meets the criteria in paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines?	No	I.6
Description of trends	Did the ERT conclude that the description in the NIR of the trends for the different gases and sectors is reasonable?	No	L.9
Supplementary information under the Kyoto Protocol	2. Have any issues been identified related to the national system:		
	(a) The overall organization of the national system, including the effectiveness and reliability of the institutional, procedural and legal arrangements	No	
	(b) Performance of the national system functions	No	
	3. Have any issues been identified related to the national registry:		
	(a) Overall functioning of the national registry	No	
	(b) Performance of the functions of the national registry and the technical standards for data exchange	No	
	4. Have any issues been identified related to reporting of information on emission reduction units, certified emission reductions, assigned amount units and removal units and on discrepancies reported in accordance with decision 15/CMP.1, annex, chapter I.E, in conjunction with decision 3/CMP.11, taking into consideration any findings or recommendations contained in the standard independent assessment report?	No	
	5. Have any issues been identified in matters related to Article 3, paragraph 14, of the Kyoto Protocol, specifically problems related to the transparency, completeness or timeliness of reporting on the Party's activities related to the priority actions listed in decision 15/CMP.1, annex, paragraph 24, in conjunction with decision 3/CMP.11, including any changes since the previous annual submission?	Yes	G.11
	6. Have any issues been identified related to the reporting of LULUCF activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, as follows:		
	(a) Reporting requirements in decision 2/CMP.8, annex II, paragraphs 1–5	No	
	(b) Demonstration of methodological consistency between the reference level and reporting on	No	

Assessment			*Issue or problem ID#(s) in table 3 and/or 5[a]*
	FM in accordance with decision 2/CMP.7, annex, paragraph 14		
	(c) Reporting requirements of decision 6/CMP.9	No	
	(d) Country-specific information to support provisions for natural disturbances, in accordance with decision 2/CMP.7, annex, paragraphs 33 and 34	No	
CPR	Was the CPR reported in accordance with the annex to decision 18/CP.7, the annex to decision 11/CMP.1 and decision 1/CMP.8, paragraph 18?	Yes	
Adjustments	Has the ERT applied an adjustment under Article 5, paragraph 2, of the Kyoto Protocol?	No	
	Did the Party submit a revised estimate to replace a previously applied adjustment?	NA	The Party does not have a previously applied adjustment
Response from the Party during the review	Has the Party provided the ERT with responses to the questions raised, including the data and information necessary for the assessment of conformity with the UNFCCC Annex I inventory reporting guidelines and any further guidance adopted by the Conference of the Parties?	Yes	
Recommendation for an exceptional in-country review	On the basis of the issues identified, does the ERT recommend that the next review be conducted as an in-country review?	No	
Questions of implementation	Did the ERT list any questions of implementation?	No	

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

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

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

8. Table 3 compiles all the recommendations made in previous review reports that were included in the previous review report, published on 20 July 2017.[4] For each issue and/or problem, the ERT specified whether it believes the issue and/or problem has been resolved by the conclusion of the review of the 2018 annual submission and provided the rationale for its determination, which takes into consideration the publication date of the previous review report and national circumstances.

[4] FCCC/ARR/2016/IRL. The ERT notes that the individual inventory review of Ireland's 2017 annual submission did not take place in 2017. As a result, the latest published annual review report reflects the findings of the review of the Party's 2016 annual submission.

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

ID#	*Issue and/or problem classification*[a, b]	*Recommendation made in previous review report*	*ERT assessment and rationale*
General			
G.1	QA/QC and verification (G.1, 2016) (G.1, 2015) (table 3, 2014) Adherence to the UNFCCC Annex I inventory reporting guidelines	Resolve the inconsistencies in the information reported in different parts of the NIR and between the NIR and the CRF tables.	Resolved. The ERT did not identify any relevant inconsistencies. During the review the Party confirmed that it has made efforts to minimize any inconsistencies between the reporting in the NIR and the CRF tables. (The original recommendation related also to inconsistencies in the use of notation keys; see ID# G.2 below.)
G.2	Notation keys (G.2, 2016) (G.2, 2015) (table 3, 2014) Comparability	Improve the use of notation keys.	Addressing. The two matters related to the use of notation keys identified in the 2014 annual review report (see ID#s E.5 and E.10 below) have not been resolved. The ERT acknowledged that Ireland has improved the use of notation keys in the following categories of the energy sector: 1.A.2.g.vii, 1.A.4.a.ii, 1.A.4.b.ii, 1.A.5 and 1.B.2. The Party indicated that it still faces challenges in using the notation keys and intends to continue to make improvements in subsequent inventory submissions.
G.3	NIR (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.	Addressing. The use of EU ETS data and the assumptions and methodologies used for estimating GHG emissions for the energy sector are described in sections 3.2.4.1.2–3.2.4.1.4 and 3.2.4.2.2 of the NIR. However, the ERT noted that several transparency-related issues identified in the 2014 annual review report have not yet been resolved (see ID#s E.5, E.7, L.3 and W.5 below).
G.4	NIR (G.6 and L.2, 2016) (G.6 and L.2, 2015) (4 and 55, 2014) (67, 2013) Transparency	Include information on the key drivers of emission and removal trends for cropland, grassland, wetlands, settlements and other land in the NIR.	Resolved. Information on the key drivers of emission and removal trends for specific categories of the LULUCF sector has been provided in section 2.3.4 of the NIR.
G.5	Key category analysis (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.	Addressing. Explanation of the assessment of key categories for KP-LULUCF activities was provided in section 1.6.2 of the NIR. The ERT noted that chapter 11 (p.343) of the NIR includes a table with key category specifications and a description of the identification criteria used. The ERT also noted that Ireland intends to provide an explanation of the key category assessment for KP-LULUCF activities in chapter 11 of its next submission.
G.6	KP-LULUCF supplementary information (G.9, 2016) (G.9,	Include the value of the forest management cap in the NIR and in the CRF accounting table, together with information on its calculation.	Addressing. The ERT noted that Ireland included the value of the forest management cap in the CRF information table on accounting for KP-LULUCF activities. The

ID#	Issue and/or problem classification[a, b]	Recommendation made in previous review report	ERT assessment and rationale
	2015) Transparency		ERT also noted that, in its response to the initial findings by the secretariat (the assessment report), Ireland indicated its intention to include the value of the forest management cap and information on its calculation in its next NIR.
Energy			
E.1	Fuel combustion – reference approach – all fuels – CO_2 (E.13, 2016) (E.13, 2015) Transparency	Ensure consistent reporting between CRF tables 1.A(b), 1.A(c) and 1.A(d).	Resolved. Previous inconsistencies between CRF tables 1.A(b), 1.A(c) and 1.A(d) have been resolved. The Party has reported correct values for apparent energy consumption in CRF table 1.A(c).
E.2	1.A.1.a Public electricity and heat production – other fossil fuels – CO_2, CH_4 and N_2O (E.14, 2016) (E.14, 2015) Completeness	Provide information on EU ETS coverage of other fuels in the NIR, as well as information on how the completeness of the estimates for the sector is ensured.	Resolved. Ireland has included the required information on EU ETS coverage in NIR section 3.2.4.1.2 and information on the category-specific procedures for ensuring completeness of the estimates in section 3.2.4.1.4. The ERT did not identify any completeness issue in relation to this category.
E.3	1.A.1.b Petroleum refining – gaseous fuels – CO_2 (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 Sustainable Energy Authority of Ireland 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_2 emissions.	Addressing. In its NIR (section 3.2.4.2.2) Ireland has addressed the issue of the varying IEFs for liquid and gaseous fuels, originating from differences in fuel aggregation between the national energy balance and EU ETS reports. Some quantities of refinery gas are reported as gaseous fuels in the energy balance, while emissions from refinery gas are correctly reported under liquid fuels. The AD and method used to estimate CO_2 emissions have been clarified in the NIR (e.g. comparing national energy balance and EU ETS reports) (p.78); however, the Party has not provided the proper allocation of fuels among fuel categories in its NIR as reported in EU ETS reports.
E.4	1.A.3.a Domestic aviation – liquid fuels – CO_2 (E.16, 2016) (E.16, 2015) Transparency	Provide information on which category includes CH_4 and N_2O emissions from aviation gasoline in the NIR.	Not resolved. Ireland has reported "IE" for CH_4 and N_2O emissions from aviation gasoline, but neither CRF table 1.A(a)s3 nor NIR section 3.2.6.1.2 provides an explanation of the aggregation of CH_4 and N_2O emissions from aviation gasoline under jet kerosene. The ERT believes that future ERTs should consider this issue further to ensure that there is no underestimation of emissions for this category.
E.5	1.A.3.e Other transportation – liquid fuels – CO_2 (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	Not resolved. Ireland has reported the correct notation key "IE" for off-road vehicles and equipment in subcategories 1.A.2.g.vii, 1.A.4.a.ii, 1.A.4.b.ii and 1.A.5.b, and estimates for subcategory 1.A.4.c.ii. However, the original recommendation to change the notation key

ID#	*Issue and/or problem classification*[a, b]	*Recommendation made in previous review report*	*ERT assessment and rationale*
		consumption between road and non-road traffic.	to "IE" for subcategory 1.A.3.e.ii was not implemented and there is no explanation for this in the NIR.
E.6	1.A.5 Other (fuel combustion activities) – all fuels – CO_2, CH_4 and N_2O (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).	Not resolved. Although information on the allocation of military consumption is included in the documentation box of CRF table1.A(a)s4, no information on this category has been provided in the NIR.
E.7	1.B.2 Oil, natural gas and other emissions from energy production – gaseous fuels – CO_2 and CH_4 (E.7, 2016) (E.7, 2015) (31, 2014) Completeness	Provide an explanation of where fugitive emissions of CH_4 and CO_2 from natural gas exploration and transmission are reported both in the CRF tables and in the NIR, and provide a detailed description in the NIR of how the emissions from each activity are estimated.	Addressing. Ireland has reported CO_2 emissions from natural gas exploration as "NO" and CH_4 emissions as "IE". Emissions from exploration and production are monitored and reported together by the Marine Institute of Ireland. The Party has reported CO_2 and CH_4 emissions from transmission separately (0.004 kt CO_2 and 0.31 kt CH_4 for 2016). Ireland provided some information on the allocation of fugitive emissions from natural gas production and distribution in CRF table 1.B.2, NIR section 3.3.2.2 (p.105) and NIR table 5.1a. However, the methodology used for estimating these emissions are not described in detail in the NIR. See also ID# E.21 in table 5.
E.8	1.B.2 Oil, natural gas and other emissions from energy production – gaseous fuels – CO_2 and CH_4 (E.8, 2016) (E.8, 2015) (32, 2014) Transparency	Explain where fugitive CO_2 emissions from natural gas and fugitive CH_4 emissions from venting and flaring are allocated in the CRF tables.	Addressing. NIR table 3.1 reports use of a tier 2 method for estimating fugitive CO_2 and CH_4 emissions for category 1.B.2.b (natural gas) and "NA" for category 1.B.2.c (venting and flaring). The reporting in NIR table 3.1 is not consistent with the information reported in CRF table 1.B.2. NIR table 3.1 reported "NO" whereas CRF tables 1.B.2 (1.B.2.b natural gas and 1.B.2.c venting and flaring) reported "IE". Ireland provided some information on the allocation of fugitive emissions from venting and flaring in CRF table 1.B.2, NIR section 3.3.2.2 and NIR table 5.1a. See also ID#s E.19 and E.20 in table 5.
E.9	1.B.2.b Natural gas – gaseous fuels – CO_2 (E.18, 2016) (E.18, 2015) Completeness	Report CO_2 emissions from natural gas exploration and processing.	Not resolved. Ireland has included estimates for fugitive CO_2 emissions from natural gas distribution, but there are no estimates reported for fugitive CO_2 emissions from natural gas exploration or processing, which are reported as "NO" in CRF table 1.B.2. See also ID# E.19 in table 5.
E.10	1.B.2 Oil, natural gas and other emissions from energy production – gaseous	Use the notation keys consistently between the NIR and the CRF tables for CO_2 emissions from natural gas and CH_4 emissions from venting and	Not resolved. NIR table 3.1 reports use of a tier 2 method for estimating fugitive CO_2 and CH_4 emissions for category 1.B.2.b (natural gas) and "NA" for category 1.B.2.c

ID#	*Issue and/or problem classification*[a, b]	*Recommendation made in previous review report*	*ERT assessment and rationale*
	fuels – CO_2 and CH_4 (E.9, 2016) (E9, 2015) (32, 2014) Adherence to the UNFCCC Annex I inventory reporting guidelines	flaring ("NO" in NIR table 3.1 and "IE" in CRF table 1.B.2).	(venting and flaring). The reporting in NIR table 3.1 is not consistent with the information reported in CRF table 1.B.2. NIR table 3.1 reported "NO" whereas CRF tables 1.B.2 (1.B.2.b natural gas and 1.B.2.c venting and flaring) reported "IE".
E.11	1.B.2.c Venting and flaring – gaseous fuels – CH_4 (E.11, 2016) (E.11, 2015) (34, 2014) Transparency	Include information on the mobile drilling unit in the Kinsale gas field for 2001 in the NIR.	Resolved. NIR section 3.3.2.2 provides relevant information on natural gas flaring in 2001.
IPPU			
I.1	2.F.2 Foam blowing agents – HFCs and SF_6 (I.2, 2016) (I.2, 2015) (40, 2014) Completeness	Provide additional information on how potential sources (e.g. imported products) are considered in the emission estimates for this category to ensure a complete and accurate inventory.	Resolved. Emissions from foam blowing agents were previously estimated using global data provided by the Alternative Fluorocarbons Environmental Acceptability Study and weighted by the gross domestic product of all Organisation for Economic Co-operation and Development member countries. This method did not consider any country-specific information on the industry. Since then, two major production companies have been consulted to understand the various manufacturing processes and market in Ireland, which confirmed that the company that produces foams does not use fluorinated gases, and that imports of products containing such gases are negligible, if occurring at all. From background information provided to the ERT during the review, including the names of the two producers consulted and their understanding of the Irish market, the ERT agrees with Ireland's assessment of the status of foam blowing emissions in the country. See also ID# I.4 in table 5.
I.2	2.F.2 Foam blowing agents – HFCs and SF_6 (I.4, 2016) (I.4, 2015) Completeness	Report the emissions from foam blowing agents from stocks and disposal of imported closed-cell foams using national data or expert judgment. If this is not possible, report the appropriate notation key and provide justification for its use (e.g. level of significance) in the NIR.	Resolved. Emissions from foam blowing agents were previously estimated using global data provided by the Alternative Fluorocarbons Environmental Acceptability Study and weighted by the gross domestic product of all Organisation for Economic Co-operation and Development member countries. This method did not consider any country-specific information on the industry. Since then, two major production companies have been consulted to understand the various manufacturing processes and market in Ireland, which confirmed that the company that produces foams does not use fluorinated gases, and that imports of products containing such gases are negligible, if occurring at all. From background information provided to

ID#	*Issue and/or problem classification*[a, b]	*Recommendation made in previous review report*	*ERT assessment and rationale*
			the ERT during the review, including the names of the two producers consulted and their understanding of the Irish market, the ERT agrees with Ireland's assessment of the status of foam blowing emissions in the country.
I.3	2.G.1 Electrical equipment – SF_6 (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_6 used for maintenance with a view to clarifying its appropriateness as a tier 1 or higher-tier method.	Not resolved. No additional information was provided in the NIR. During the review, following re-evaluation, Ireland acknowledged that the approach taken is more in line with the 2006 IPCC Guidelines tier 3 utility-level pure-mass balance approach and stated that it will provide an appropriate methodological description in future NIRs. The current ERT encourages Ireland to update the methodological description for this subcategory and to include in its NIR the re-evaluated tier information as well as reference to the 2006 IPCC Guidelines instead of the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*.
Agriculture			
A.1	3.B Manure management – CH_4 and N_2O (A.1, 2016) (A.1, 2015) (50, 2014) (63, 2013) (66, 2012) Accuracy	Develop dynamic N excretion rates for non-dairy cattle and use the data in the inventory when available.	Resolved. The country-specific N excretion rates were estimated using the tier 2 approach from the 2006 IPCC Guidelines (volume 4, chapter 10, section 10.5.2) and a detailed explanation and equations have been provided in the NIR (section 5.3.1.2 and annex 3.3.E).
A.2	3.G Liming – CO_2 (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.	Not resolved. The tier 1 approach from the 2006 IPCC Guidelines was applied. Ireland stated in its NIR (section 5.8.6) that there are no planned improvements for this category. In response to a question raised by the ERT during the review, Ireland explained that the inventory agency has highlighted this issue with the funding body for agricultural research in Ireland. The Party noted that it will continue to engage with the funding body and include appropriate text in its next annual submission.
LULUCF			
L.1	4. General (LULUCF) – CO_2 (L.4, 2016) (L.4, 2015) (57, 2014) Transparency	Report removals for the 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.	Addressing. The notation keys for the mineral soils pool for cropland and grassland converted to forest land were corrected and the Party has reported CSC in mineral soils for forest land converted to other land in line with the recommendation made in the 2014 annual review report. However, CSC in mineral soils for wetlands, settlements and other land converted to forest land and forest land

ID#	Issue and/or problem classification[a, b]	Recommendation made in previous review report	ERT assessment and rationale
			converted to grassland have been reported as "NO". For the mineral soils pool for forest land remaining forest land in CRF table 4.A, the notation key "NO" was reported in error: Ireland applied a tier 1 approach under the assumption that the CSC in mineral soils is zero, so the correct notation key is "NA".
L.2	4.A Forest land – CO_2 (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.	Not resolved. The typographical error has not been corrected in the NIR (section 6.3.3.1.2).
L.3	4.A Forest land – CO_2 (L.5, 2016) (L.5, 2015) (58, 2014) Transparency	Delete the sentence "emissions from soils due to biomass burning resulting from forest wildfires are assumed to be negligible and do not occur (NO)" from the NIR, to avoid confusion.	Resolved. The sentence was deleted (see section 6.3.4.4 of the NIR).
L.4	4.A.2 Land converted to forest land – CO_2 (L.9, 2016) (L.9, 2015) Transparency	Report the notation key "NA" for grassland converted to forest land and "NE" for cropland converted to forest land, and demonstrate in the NIR that emissions from cropland converted to forest land are insignificant, when the land tracking methodology is available from the CForRep research project of the Irish Department of Agriculture, Food and the Marine.	Resolved. Ireland has used appropriate notation keys ("NA" for CSC in mineral soils for grassland converted to forest land and "NE" for mineral soils for cropland converted to forest land). It demonstrated that there was no change in carbon stock in the mineral soils pool of areas converted to forest land (see section 6.3.3.1.2, p.198–199, of the NIR) and described additional national research completed at the end of 2017 on this subject (see section 6.11, p.294, of the NIR).
L.5	4.E.1 Settlements remaining settlements – CO_2 (L.8, 2016) (L.8, 2015) (62, 2014) Transparency	Report CSC in soils in settlements remaining settlements as "NA" instead of "NO" and include an explanation for the use of the notation key in the NIR.	Not resolved. CSC in soils has been reported as "NO" in CRF table 4.E and the rationale for the reporting was not provided in the NIR (section 6.7.2.1). Ireland recognizes that this may be a significant carbon sink, especially under the policy of actively encouraging urban tree planting along new roads and in new housing developments, but no relevant data are available.
L.6	4(V) Biomass burning – CO_2, CH_4 and N_2O (L.11 and L.12, 2016) (L.11 and L.12, 2015) Transparency	Explain in the NIR and the documentation box of the relevant CRF table that CO_2, CH_4 and N_2O emissions from wildfires on land converted to cropland reported as "IE" are included under cropland remaining cropland.	Not resolved. Ireland has reported emissions from wildfires on land converted to cropland as "IE", noting in the documentation box that the emissions are reported under cropland remaining cropland. However, emissions from wildfires on cropland remaining cropland are reported as "NO". Emissions from wildfires on land converted to cropland are reported as "IE" instead of "NO", which would be consistent with the information provided in CRF table 4.B, which indicates "NO" for the area converted to cropland.

ID#	Issue and/or problem classification[a, b]	Recommendation made in previous review report	ERT assessment and rationale
			Information has not been provided in the relevant section of the NIR (section 6.3.4.4)
Waste			
W.1	5.A Solid waste disposal on land – CH_4 (W.4, 2016) (W.4, 2015) (70, 2014) (88, 2013) Transparency	Discuss the first-order decay model parameters (time lag, oxidation and fraction of CH_4 in landfill gas) in the next NIR, including the values used and justification for their use.	Resolved. Information was included in the NIR (section 7.2.1.2).
W.2	5.A Solid waste disposal on land – CH_4 (W.8, 2016) (W.8, 2015) Transparency	Provide complete information in the NIR on how the annual methane correction factor values are derived.	Resolved. Information was provided in the NIR (annex 3.5, table 3.5.B).
W.3	5.A Solid waste disposal on land – CH_4 (W.9, 2016) (W.9, 2018) Transparency	Justify the assumed paper content of waste in the period before 1980.	Resolved. Ireland has included a reference to this assumption in the NIR (section 7.2.1.2) and the ERT did not identify any issues related to the assumption.
W.4	5.A.1 Managed waste disposal sites (W.10, 2016) (W.10, 2015) Accuracy	Provide in the NIR supporting data and information on the high values of the fraction of degradable organic carbon that can decompose (0.75) for the two major landfills in Ireland.	Resolved. The Party has revised its approach to modelling CH_4 emissions from solid waste disposal sites. Previously, a fraction of 0.75 was applied for the two major landfills, while a value of 0.6 was used for all other landfills. As of 2017, the default value of 0.5 for the fraction of degradable organic carbon that can decompose was applied for landfills and described in the NIR (section 7.2.1.2). The ERT agrees with the Party's application of the fraction of degradable organic carbon.
W.5	5.D Wastewater treatment and discharge – N_2O (W.7, 2016) (W.7, 2015) (72, 2014) Transparency	Describe the source and derivation of the AD and the industrial sectors contributing to the biochemical oxygen demand load.	Not resolved. Ireland indicated that information was included in the NIR (section 7.5.1.2). However, the Party has not provided information on the AD and chemical oxygen demand loadings from individual industries.
KP-LULUCF			
KL.1	AR – CO_2 (KL.4, 2016) (KL.4, 2015) Accuracy	Include correct values for the background level and margin of natural disturbance in table 4(KP-I)A.1.1 and in the NIR.	Resolved. Corrected values for the background level (23.95 kt CO_2 eq) and margin (46.67 kt CO_2 eq) of natural disturbance were included in table 11.12 of the NIR and CRF table 4(KP-1)A1.1.
KL.2	AR – CO_2 (KL.5, 2016) (KL.5, 2015) Transparency	Clarify the classification of forest (natural forest) in the country.	Resolved. The NIR (section 11.1.3, p.344) includes a definition of semi-natural forest, noting that there are no unmanaged natural forests in Ireland.

ID#	*Issue and/or problem classification*[a, b]	*Recommendation made in previous review report*	*ERT assessment and rationale*
KL.3	Deforestation – CO_2 (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.	Addressing. The Party has changed the notation key used from "IE" to "NO, IO" for the total net CSC for harvested wood products but left the relevant cell blank in CRF table 4(KP-I)A.2. No explanation is provided in the documentation box. The notation key "IO" should only be reported in CRF table NIR 1 as an information item and should not be reported in the other CRF tables.
KL.4	GM (KL.7, 2016) (KL.7, 2015) Transparency	Include detailed information on the land identification system for GM in the NIR and revise the land-transition matrix to include all grassland under managed grassland.	Resolved. The definition of grassland in the 2018 NIR (section 6.5) differs from that in the 2016 annual submission with the wording "grasslands not currently in use" instead of "semi-natural and natural grasslands". The Party has reported all grassland as managed grassland in CRF table 4.1 and in the NIR provided values for "Total for activity B.3" (which is the same as the value for GM in table NIR-2) further divided into "GM under grass in reporting year" and "GM under non Art 3.3 or 3.4 activities" in CRF table 4(KP-I)B.3. Ireland has detailed the sources of information in the NIR (chapter 6.5.1, p.261).
KL.5	FM (KL.8, 2016) (KL.8, 2015) Accuracy	Use the corrected FMRL (–0.142 Mt CO_2 eq/year) in the NIR and the CRF tables.	Resolved. The corrected FMRL was used in the NIR and the CRF tables.
KL.6	FM (KL.9, 2016) (KL.9, 2015) Consistency	Maintain consistency regarding the technical correction of the FMRL between the NIR and the CRF tables.	Resolved. The NIR (section 11.5) includes the same FMRL as indicated in CRF table 4(KP-I)B.1.1.

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

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

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

9. In accordance with paragraph 83 of the UNFCCC review guidelines, the ERT noted that the issues included in table 4 have been identified in three successive reviews, including

the review of the 2018 annual submission of Ireland, and have not been addressed by the Party.

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

ID#	*Previous recommendation for the issue identified*	*Number of successive reviews issue not addressed*[a]
General		
G.2	Improve the use of notation keys	3 (2014–2018)
G.3	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	3 (2014–2018)
G.5	Include a paragraph explaining the assessment of key categories for KP-LULUCF activities in chapter 11 of the NIR	3 (2014–2018)
Energy		
E.5	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	3 (2014–2018)
E.7	Provide an explanation of where fugitive emissions of CH_4 and CO_2 from natural gas exploration and transmission are reported both in the CRF tables and in the NIR, and provide in the NIR a detailed description of how the emissions from each activity are estimated	3 (2014–2018)
E.8	Explain where fugitive CO_2 emissions from natural gas and fugitive CH_4 emissions from venting and flaring are allocated in the CRF tables	3 (2014–2018)
E.10	Use the notation keys consistently between the NIR and the CRF tables for CO_2 emissions from natural gas and CH_4 emissions from venting and flaring ("NO" in NIR table 3.1 and "IE" in CRF table 1.B.2)	3 (2014–2018)
E.11	Include information on the mobile drilling unit in the Kinsale gas field for 2001 in the NIR	3 (2014–2018)
IPPU		
	No issues identified	
Agriculture		
	No issues identified	
LULUCF		
L.1	Report removals for the 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	3 (2014–2018)
L.2	Correct the typographical error regarding the value of the country-specific EF for organic forest soils	3 (2014–2018)
L.3	Report removals for the 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	3 (2014–2018)
L. 5	Report the CSC in soils in settlements remaining settlements as "NA" instead of as "NO" and include an explanation for the use of the notation key in the NIR	3 (2014–2018)

ID#	*Previous recommendation for the issue identified*	*Number of successive reviews issue not addressed*[a]
Waste		
W.5	Describe the source and derivation of the AD and the industrial sectors contributing to the biochemical oxygen demand load	3 (2014–2018)
KP-LULUCF		
	No issues identified	

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

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

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

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

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?[a] If yes, classify by type*
General			
G.7	Key category analysis	Ireland conducted an approach 1 and 2 key category analysis and reported the results in the NIR. In accordance with paragraph 50(d) of the UNFCCC Annex I inventory reporting guidelines, the description of national key categories is to include a summary table for the latest reporting year (by level and trend) following the structure of table 4.4 of the 2006 IPCC Guidelines, but such a summary table was not provided in the NIR. During the review, Ireland explained that the overview of the results of the key category analysis for the latest reporting year by level and trend was provided in CRF table 7, and so the summary table was not included to avoid duplication of information in the NIR. The ERT recommends that Ireland 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.	Adherence to the UNFCCC Annex I inventory reporting guidelines
G.8	Uncertainty analysis	Ireland performed a quantitative uncertainty analysis on a gas-by-gas basis following approach 1 of the 2006 IPCC Guidelines. The headings of tables 1.12 and 1.13 of the NIR and of tables 2.A and 2.B of annex 2 to the NIR suggest that the uncertainty assessment was performed only for the key categories of the inventory. However, in accordance with paragraphs 15 and 25(c) of the UNFCCC Annex I inventory reporting guidelines, the uncertainty assessment is to be performed for the whole inventory (all source and sink categories). During the review, Ireland confirmed that the uncertainty assessment was performed for the entire inventory. However, the category identification columns in tables 1.12 and 1.13 of the NIR and in tables 2.A and 2.B of annex 2 to the NIR had incorrect headings, which will be revised for the next inventory submission. The ERT recommends that Ireland enhance its QA/QC procedures and ensure that the tables containing the results of the uncertainty analysis represent the entire inventory.	Adherence to the UNFCCC Annex I inventory reporting guidelines
G.9	Uncertainty analysis	Ireland performed a quantitative uncertainty analysis on a gas-by-gas basis following approach 1 of the 2006 IPCC Guidelines. The uncertainty analyses reported in tables 1.12 and 1.13 of the NIR and in tables 2.A and 2.B of annex 2 to the NIR were performed for the latest inventory year (2016) and the trend between the base year (1990) and the latest inventory year. The uncertainty of the base-year estimates was not reported in the NIR. However, in accordance with paragraph 15 of the UNFCCC Annex I inventory reporting guidelines, the quantitative uncertainty assessment is to be performed for at least the base year and the latest inventory year and for the trend between the two years. During the review, Ireland clarified that the level of uncertainty for the base year was not reported. The Party provided the base-year uncertainty analysis to the ERT during the review and the ERT considered the information to be adequate.	Adherence to the UNFCCC Annex I inventory reporting guidelines

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?[a] If yes, classify by type*
		The ERT recommends that Ireland, 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.	
G.10	AD	The ERT noted that according to the NIR (table 1.14, p.45) not all emissions and removals were estimated for the 2018 inventory submission of Ireland for the following categories: CO_2 for 2.B (chemical industry), 2.D (non-energy products from fuels and solvent use), 4.E (settlements) and 4.A (forest land); and N_2O for 1.B.2 (oil and natural gas), 2.B (chemical industry), 2.G (other product manufacture and use) and 4.A (forest land).	Transparency
		During the review, Ireland clarified that chemical industry ceased operation in the country in 2003. The Party explained that CO_2 emissions occur from only a few sources under the category non-energy products from fuels and solvent use, which are listed in section 4.1.1 of the NIR. According to the NIR (sections 6.3.3.1, 6.3.5.2 and 11.3) emissions were not estimated for the subcategory grassland converted to forest land for mineral soils because of the lack of significant change in soil organic carbon due to afforestation and the absence of AD on mineral soil CSC for cropland converted to forest land. Furthermore, Ireland stated that it uses a tier 1 approach for estimating emissions from settlements, which assumes no change in biomass and soil carbon stocks.	
		The ERT recommends that Ireland 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. The ERT also recommends that Ireland explain why the reporting on CH_4 and N_2O emissions for the categories referred to above was incomplete.	
G.11	Article 3, paragraph 14, of the Kyoto Protocol	Ireland did not provide information on changes in its reporting on the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol. However, in response to questions raised by the ERT during the review, the Party reported that there have been no changes in its reporting on the minimization of adverse impacts since the previous annual submission. Ireland informed the ERT that it will provide information on changes in its reporting in the next inventory submission.	Adherence to the reporting guidelines under Article 7, paragraph 1, of the Kyoto Protocol
		The ERT recommends that Ireland 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.	
Energy			
E.12	1.A.1.a Public electricity and heat production – biomass – CH_4 and N_2O	According to the NIR, significant amounts of biomass (primary solid biofuels, renewable waste, landfill gas) are combusted in public electricity and heat production plants in Ireland. Unlike the emissions from fossil fuels in this category, which are reported according to verified EU ETS reports, the emissions from biomass are estimated applying default IPCC EFs. The ERT noted that, because energy consumption and emission estimates for various biofuels are aggregated under one category, it could not determine which EFs were applied and this information is not available in the NIR.	Yes. Transparency

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and/or a problem?[a] If yes, classify by type
		During the review, the Party provided the currently applied EFs for the wood and wood waste, landfill gas and biomass fractions of municipal waste, as well as the quantities of each fuel used. The ERT confirmed that there is no under- or overestimation of emissions because the correct EFs have been applied for each type of biomass fuel, sourced from the 2006 IPCC Guidelines (volume 2, chapter 2, table 2.2 for landfill gas and municipal waste and table 2.6 for wood and wood waste boilers). To improve transparency, the ERT recommends that the Party include in its next NIR information on the applied EFs and energy consumption values for the individual biomass fuels.	
E.13	1.A.3.a Domestic aviation – liquid fuels – CO_2, CH_4 and N_2O	According to the NIR (section 3.2.6.1.2, p.84), fuel consumption in and emissions from domestic aviation are estimated based on origin and destination flight data provided by IAA. During the review, the ERT requested more information on the type of data provided by IAA and the applied methodology. The Party explained that IAA flight data are provided, including the International Civil Aviation Organization code and aircraft type, which it uses to match the data with the corresponding fuel consumption rates and EFs in the *EMEP/EEA air pollutant emission inventory guidebook 2016*, and these are then applied for each flight, implementing a tier 3a approach from the guidebook. The ERT confirmed that this approach is in line with the 2006 IPCC Guidelines. In addition, the Party explained that, because the Sustainable Energy Authority of Ireland does not separately estimate domestic jet kerosene consumption, the split between domestic and international jet kerosene sales in the national energy balance is performed with the support of the inventory agency. The ERT commends the Party for this interinstitutional cooperation. However, the ERT noted that there are some discrepancies between the reported fuel consumption for jet kerosene in the CRF tables (102 TJ) and the national energy balance (2.8 kt oil equivalent, 117 TJ). The ERT recommends that the Party include in its NIR information on the IAA data and the approach used to implement the tier 3a methodology from the *EMEP/EEA air pollutant emission inventory guidebook 2016*. The ERT encourages the Party to ensure that the split between international and domestic jet kerosene consumption is reported in the same manner in the CRF tables as in the national energy balance.	Yes. Transparency
E.14	1.A.3.a Domestic aviation – liquid fuels – CO_2, CH_4 and N_2O	According to the NIR (section 3.2.6.1.4), the QA/QC procedure of comparing the national data with the international data provided by EUROCONTROL, the European Organisation for the Safety of Air Navigation, revealed that there are some discrepancies in the national data owing to the omission of some training flights from Cork airport. The ERT commends the Party for making the comparison and for transparently reporting the findings. The ERT discussed with the Party the type of flights that are considered under domestic aviation. The ERT noted that, according to the 2006 IPCC Guidelines (volume 2, chapter 3, section 3.6.1.2), the category should include all civil commercial use of airplanes, including scheduled and charter traffic for passengers and freight, air taxiing and general aviation (e.g. agricultural airplanes, private jets and helicopters) with departure and landing locations within the country. The ERT considers that the definition of domestic aviation currently adopted by the Party excludes some types of flight, such as training and unplanned flights, as well as some of the military aviation flights, which the documentation box of CRF table 1.A(a)s4 currently reports as being included in category 1.A.3. The Party explained that this is because the data provided by IAA are likely to be missing some domestic aviation flights.	Yes. Accuracy

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?[a] If yes, classify by type*
		The ERT recommends that the Party revise its definition of domestic flights and include all flights according to the definition of domestic aviation in the 2006 IPCC Guidelines. The ERT also recommends that the Party discuss with IAA 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).	
E.15	1.A.3.b Road transportation – biomass – CH_4 and N_2O	The NIR (section 3.2.6.2 and annex 3.1.B) provides details on the applied methodology, AD and EFs used for estimating emissions from road transport. The ERT commends the Party for the outstanding transparency and detail on the application of the COPERT model in its NIR. During the review, the ERT requested more detail on the described calibration procedure within the COPERT model, and, more specifically, questioned whether the option to automatically adjust the average annual mileage based on the statistical fuel consumption was enabled. The Party confirmed that the estimated CH_4 and N_2O emissions were automatically adjusted and provided evidence from the calibration procedure. In addition, the Party explained that emissions from blended biodiesel and bioethanol fuel consumption are also estimated, currently using the COPERT model. The ERT confirmed that there are no potential underestimates of CH_4 and N_2O emissions from either fossil fuels or biofuels. The ERT recommends that the Party 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.	Yes. Transparency
E.16	1.A.3.e.i Pipeline transport – gaseous fuels – CH_4 and N_2O	According to the NIR (section 3.2.6.3.2) the Party applied default EFs for CH_4 and N_2O to estimate the combustion emissions from natural gas used in compressor stations. According to CRF table 1.A(a)s3, the currently applied EFs are 5 and 2 kg/TJ for CH_4 and N_2O, respectively. The ERT noted that the currently applied EFs do not correspond to the default values from the 2006 IPCC Guidelines, leading to an overestimation of the emissions. During the review, the Party explained that, in 2010, the previously applied EFs for natural gas were revised, but the EFs for subcategory 1.A.3.e pipeline transport were not updated. The ERT recommends that the Party update the currently applied EFs to the default EFs from the 2006 IPCC Guidelines (volume 2, chapter 2, table 2.2), which are 1.0 and 0.1 kg/TJ for CH_4 and N_2O, respectively, for its next submission, and provide the relevant reference in its NIR.	Yes. Accuracy
E.17	1.B.1.a Coal mining and handling – solid fuels – CH_4	The NIR (section 3.3.2.2) provides information on the applied methodology and EFs used to calculate fugitive emissions from abandoned underground coal mines. During the review, the ERT requested the Party to justify its choice of a low default fraction of gassy mines from the 2006 IPCC Guidelines (volume 2, chapter 4, table 4.1.5). Ireland explained that it does not have a history of CH_4 explosions or leakage and mines are relatively shallow, with the main coal seam reported to be at depths of between 60 and 200 m from the surface. The low range of the default fraction of gassy mines is representative of the Irish conditions and the ERT accepted the justification. The ERT recommends that the Party 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.	Yes. Transparency

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?[a] If yes, classify by type*
E.18	1.B.2.b Natural gas – gaseous fuels – CO_2 and CH_4	Ireland reported CO_2 and CH_4 emissions from transmission and storage of natural gas as "IE". The NIR does not provide any information on fugitive emissions from underground storage of natural gas. As there is an underground storage facility at the Southwest Kinsale reservoir, the ERT requested more information on emissions from the facility. During the review, the Party provided additional information stating that, as the Kinsale gas field is offshore, emission estimates are prepared by the Marine Institute of Ireland and reported under the Oslo and Paris Convention for the Protection of the Marine Environment of the North-East Atlantic. The reporting covers all fugitive losses associated with offshore production of natural gas, including the two platforms at Kinsale and the undersea well at Corrib. The Party also provided additional information on the Kinsale facility (see https://www.kinsale-energy.ie/files/pdf/DecommissioningPlan_KinsaleHeadNo.1_Issue1_120618.pdf), which is currently being decommissioned. The ERT considers that the default estimation methodology and EFs for underground storage of natural gas might not be applicable to this storage facility and that any emissions from the facility should be accounted in the reports under the above-mentioned Convention, covering the offshore production of natural gas. The ERT recommends that Ireland include the information provided during the review on the Kinsale storage facility in its next NIR (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.	Yes. Transparency
E.19	1.B.2.b Natural gas – gaseous fuels – CO_2 and CH_4	Fugitive CO_2 emissions from production and processing of natural gas have been reported as "NO" in CRF category 1.B.2.b.2 (production) and 1.B.2.b.3 (processing). The Party provided CH_4 emission estimates only for natural gas production in 2016 (0.34 kt CH_4); processing is reported as "IE". During the review, the Party explained that all production and processing activities take place offshore, and fugitive losses are reported to the inventory agency under a memorandum of understanding with the Marine Institute of Ireland. According to the NIR (section 3.3.2.2), there are two companies involved in natural gas production and processing and they have reported emissions for several years in the time series, which the Party used to estimate the emissions for the non-reported years. During the review, the Party explained that estimates are available for 1998–2017 from the Marine Institute. CH_4 emissions were estimated for 1990–1997 based on the production of natural gas at Kinsale and an average CH_4 EF of 0.006 t CH_4/t oil equivalent gas produced, with the EF being an average based on the emissions reported for 1998–2004. The Party also provided a recent report from Kinsale detailing the methodology used to calculate the emissions from production and processing. The report clarifies that emissions were conservatively assumed to be 100 per cent CH_4, even though they might contain small amounts of CO_2 and other gases. This assumption explains why the Party reported CH_4 emissions from natural gas production and processing and reported CO_2 emissions as "NO". After reviewing the report from Kinsale, the ERT determined that the reported emissions should not be regarded as fugitive emissions from production and processing of natural gas, but as CH_4 emissions from venting (subcategory 1.B.2.c.ii), and considers that the emissions for subcategories 1.B.2.b.2 and 1.B.2.b.3 have not been estimated. The ERT believes that future ERTs should consider this issue further to ensure that there is no underestimation of emissions for this category.	Yes. Completeness

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?[a] If yes, classify by type*
		Noting that the recommendation to report CO_2 from natural gas processing is already covered in ID# E.9 in table 3, the ERT recommends that the Party estimate CO_2 and CH_4 emissions from natural gas production and CH_4 emissions from natural gas processing applying the default EFs and methodologies from the 2006 IPCC Guidelines (volume 2, chapter 4, table 4.2.4). If the Party determines that any category is below the significance threshold, as defined in paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines, the ERT recommends that the Party report "NE" for the category and provide appropriate documentation in the NIR.	
E.20	1.B.2.b Natural gas – gaseous fuels – CO_2 and CH_4	Ireland reported CO_2 and CH_4 emissions from transmission and storage of natural gas as "IE". Fugitive emissions of CO_2 and CH_4 from transmission of natural gas were estimated together with fugitive emissions from distribution, applying a methodology described in the NIR (section 3.3.2.2) (see also ID# E.21 below). During the review, Ireland confirmed that, in its view, the assessment covered all fugitive emissions from transmission and distribution of natural gas, but explained to the ERT that the Irish national gas transmission and distribution company Ervia maintains that losses from high-pressure transmission pipelines are so small that they cannot be measured. According to Ireland, the relatively new network infrastructure built after the 1970s has been expanded and modernized in recent years owing to the opening of the Corrib field and the associated refinery in late 2015. The ERT did not agree with the assumption that emissions from transmission networks were negligible, because the 2006 IPCC Guidelines provide methodologies and EFs for the assessment of both transmission and distribution emissions separately. The ERT considered that CH_4 and CO_2 fugitive emissions from transmission of natural gas had been underestimated and included this issue in the list of potential problems and further questions raised by the ERT. The ERT recommended that the Party provide a separate estimate of the emissions from transmission of natural gas, preferably by applying a country-specific methodology based on measured data, or, if that were not possible, by applying the default EFs for gas transmission from the 2006 IPCC Guidelines (volume 2, chapter 4, table 4.2.4). In response, the Party submitted revised estimates for the entire time series using the lower-range default EFs from the 2006 IPCC Guidelines, considering the relatively new national infrastructure; namely, for CH_4 from gas transmission: 6.6×10–5 Gg/106 m^3 marketable gas and for CO_2 from gas transmission: 8.8×10–7 Gg/106 m^3 marketable gas. The ERT determined that the Party's response resolved the issue of the underestimation of the CO_2 and CH_4 emissions. The recalculation to address the issue resulted in estimates of 3.4 kt CO_2 eq emissions for category 1.B.2.b.4 (transmission) for 1990 and 7.8 kt CO_2 eq emissions for 2016. The ERT recommends that the Party update the description in the NIR of the method, AD and EFs used to estimate fugitive CO_2 and CH_4 emissions from natural gas transmission.	Yes. Transparency
E.21	1.B.2.b Natural gas – gaseous fuels – CO_2 and CH_4	Ireland estimated fugitive emissions of CH_4 and CO_2 from distribution of natural gas applying a methodology described in the NIR (section 3.3.2.2) and reported as "IE" CO_2 and CH_4 emissions from transmission and storage, noting that the emissions are included under distribution (see also ID# E.20 above). In 1995 Ervia assessed the system losses as the difference between the system input and metered sales, and projected that, owing to the expected completion of the long-term programme to replace cast iron mains with polyethylene pipe in all urban	Yes. Transparency

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and/or a problem?[a] If yes, classify by type
		areas served by natural gas, the expected system losses in 2020 will be negligible (unquantifiable). Based on that projection, Ireland applied linear interpolation to calculate estimated losses for all years in the time series if losses from the entire system in 2020 were zero. During the review, Ireland was not able to provide the original communication on this issue to the ERT as it took place in 1998 between the Irish Department of the Environment and a former employee of the inventory agency. The ERT did not agree with the assumption that emissions from distribution systems could become negligible and noted that the 2006 IPCC Guidelines provide methodologies and EFs for the assessment of distribution emissions and that the Party should provide documentation to support the assumption of negligible emissions from polyethylene pipe. The ERT considered that the applied methodology was not in line with the 2006 IPCC Guidelines because the approach used by the Party was based on an outdated projection and unjustified assumption, and could not be supported by recent evidence, and therefore included this issue in the list of potential problems and further questions raised by the ERT. The ERT recommended that the Party estimate emissions from distribution of natural gas, preferably by applying a country-specific methodology based on measured data. If the Party was not able to implement a country-specific methodology, the ERT recommended that the Party calculate the emissions using the default EFs for gas distribution from the 2006 IPCC Guidelines (volume 2, chapter 4, table 4.2.4); namely, for CH_4 from gas distribution: 1.1×10–3 Gg/106 m^3 utility sales and for CO_2 from gas distribution: 5.1×10–5 Gg/106 m^3 utility sales. In response, Ireland indicated it did not have sufficient time to acquire country-specific data from Ervia, and therefore estimated emissions for category 1.B.2.B.5 (distribution) by applying default CO_2 and CH_4 EFs from the 2006 IPCC Guidelines, as recommended by the ERT. The ERT determined that the Party's response resolved the issue of the underestimation of the CO_2 and CH_4 emissions. The recalculation to address this and the issue identified in ID# E.20 above resulted in an 86 per cent reduction in the estimate of total CO_2 eq emissions for category 1.B.2.b.5 (distribution) for 1990 and a 372 per cent increase in the estimate of CO_2 eq emissions for 2016. The ERT recommends that the Party update the description in the NIR of the method, AD and EFs used to estimate fugitive CO_2 and CH_4 emissions from natural gas distribution. The ERT encourages the Party to continue to work with Ervia to develop a country-specific method and EFs for this category.	
E.22	1.B.2.c Venting and flaring – gaseous fuels – CH_4 and N_2O	According to the NIR (section 3.3.2.2) GHG emissions from flaring of natural gas occurred in 1999 and 2001 related to drilling in the Kinsale gas field and from 2015 onward related to the operation of a new gas terminal for processing. The ERT noted that the Party provided estimates for CO_2 emissions from flaring but did not provide any estimates for CH_4 and N_2O emissions, which have been reported as "NO". In addition, the methodology for assessing CO_2 emissions was not described transparently in the NIR. According to the 2006 IPCC Guidelines (volume 2, chapter 4, table 4.2.4) there are default EFs for CH_4 and N_2O from flaring because this is a combustion process and the emissions are expected to occur together with CO_2 emissions. The Party explained that it does not consider the EFs provided in the 2006 IPCC Guidelines to be appropriate to Ireland's only natural gas refinery, which commenced production in 2015. The Party also clarified that the plant reports the actual volume of natural gas and energy amount of gas flared annually under the EU ETS, which formed the basis for the reporting of CO_2 for	Yes. Completeness

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?[a] If yes, classify by type*
		2015 and 2016. The ERT considers the current approach to estimating CO_2 emissions to follow the 2006 IPCC Guidelines, but the current approach for CH_4 and N_2O emissions does not, leading to a potential underestimation of those emissions. However, because the quantities of natural gas flared could be small, the potential underestimation would be below the significance threshold. The ERT believes that future ERTs should consider this issue further to ensure that there is no underestimation of CH_4 and N_2O emissions for this category. The ERT recommends that Ireland either report CH_4 and N_2O emissions from flaring in the Kinsale gas field using available AD and the EFs provided in the 2006 IPCC Guidelines (volume 2, chapter 2, table 2.2) (namely 1.0 and 0.1 kg/TJ for CH_4 and N_2O, 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.	
IPPU			
I.4	2.F.2 Foam blowing agents – HFCs	The NIR (section 4.7.2.1) addresses manufacturing only and does not fully cover Ireland's assessment of the whole lifetime of emissions of fluorinated gases (from manufacturing, use and disposal) for this subcategory. The ERT recommends that Ireland provide in its next NIR descriptions for the whole lifetime of fluorinated gas emissions.	Yes. Transparency
I.5	2.G.3 N_2O from product uses – N_2O	The NIR (section 4.8.3.1) states that Ireland does not estimate N_2O emissions from propellant use for pressure and aerosol products and reports the category as "NE" as the emissions are considered insignificant. According to the NIR (p.142), the amount of N_2O from products per capita would have to be 21.7 g to be above the threshold of significance for Ireland (30.77 kt CO_2 eq in 2016). In response to a question during the review, the Party explained that, with the amount of N_2O per aerosol can being approximately 8 g, it is not likely that 3 cans per capita per year will be used, and that Ireland is not a major user of such products and its Central Statistics Office does not have any relevant data. The ERT notes that the explanation provided in the NIR to demonstrate the level of significance of this category is basically a conversion of the insignificance threshold to the Irish context. During the review, the Party confirmed that this is the only subcategory in the Irish inventory for which "NE" has been used to indicate that the emissions were considered insignificant. The ERT recommends that in the NIR the Party include a clearer justification of why this subcategory is excluded from the inventory in accordance with paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines. The ERT also recommends that Ireland include information either in section 4.8.3.1 or a cross-cutting chapter of the NIR to clarify that N_2O emissions from propellant use for pressure and aerosol products is the only category considered insignificant in Ireland.	Yes. Transparency
I.6	2.G.4 Other (other product	The ERT noted that the emissions reported under the new category 2.G.4 (tobacco) are indirect CO_2 emissions. This was found by subtracting the emissions reported for the subcategory in CRF table 2(I).A-Hs2 (clearly indicated in	Yes. Transparency

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and/or a problem?[a] If yes, classify by type
	manufacture and use) – CO_2	the cell comments to be indirect CO_2) from the total indirect CO_2 emissions reported in chapter 9 of the NIR. During the review, Ireland acknowledged that the emissions reported for category 2.G.4 are indirect CO_2 emissions. As emissions reported in CRF table 2(I).A-Hs2 are automatically included in Ireland's national totals by the CRF Reporter software, the ERT recommends that Ireland include a cell comment regarding subcategory 2.G.4 to clearly indicate that the emissions are indirect CO_2 emissions.	
Agriculture			
A.3	3.A.1 Cattle – CH_4	The NIR (p.154) states that the EFs for beef cattle are determined by calculating lifetime emissions from animals by partitioning between the first, second and third years of animal lives. NIR table 5.4 shows that the EF for male cattle >2 years is lower than the EF for male cattle aged 1–2 years, and the EF for female cattle >2 years is lower than the EF for female cattle aged 1–2 years. The ERT noted that the EF for male cattle >2 years decreased continuously from 1990 to 2016 (55.08 kg CH_4/head/year in 1990 and 35.46 kg CH_4/head/year in 2016). It is unclear to the ERT how input parameters such as digestible energy, weight gain, and kept duration of each year for male or female cattle influence the EF calculations. During the review, Ireland explained that the EFs for both male and female cattle >2 years are lower than those for cattle aged 1–2 years because cattle >2 years are only kept for part of their third year before slaughter. There are several factors associated with the reduction in the EFs between 1990 and 2016, including poorer silage, feed quality, lower concentrate consumption, and longer duration before slaughter in the early years of the time series. The ERT considers the explanations provided to be reasonable. The ERT recommends that Ireland 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.	Yes. Transparency
A.4	3.A.2 Sheep – CH_4	Ireland uses a tier 1 method to estimate enteric CH_4 emissions from sheep, even though it is a key category for level and trend assessment. Ireland stated in its NIR (p.158) that the inventory agency is in the process of investigating the applicability of developing tier 2 EFs for sheep enteric fermentation. However, the NIR is unclear about the workplan and progress of the investigation. During the review, Ireland explained that the inventory agency has recently funded a research project to investigate the development of tier 2 EFs for CH_4 emissions from sheep enteric fermentation. The ERT recommends that Ireland 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, the ERT recommends that the Party include an update on the progress of developing tier 2 EFs for enteric fermentation for sheep in the NIR.	Yes. Accuracy
A.5	3.D.b Indirect N_2O emissions from managed soils – N_2O	The ERT commends Ireland for the improved estimates calculated using country-specific values for the fraction of N that volatilizes from land spreading of sewage sludge. Ireland has split $Frac_{GASM}$ into $Frac_{GASM1}$ for NH_3-N from animal manure used in housing, storage and land spreading, and $Frac_{GASM2}$ for NH_3 volatilization from sewage sludge applied to soils. Ireland has also revised the IPCC equation for $N_2O_{(ATD)}$-N in its NIR (section 5.5.2.2) by adding a new symbol for the fraction of applied sewage sludge that volatilizes. The new symbol refers to the	

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?[a] If yes, classify by type*
		amount of sewage sludge N applied to soils. The ERT noted that the description of F_{ON} in the revised equation for $N_2O_{(ATD)}$-N and the equations for $N_2O_{(L)}$-N, N_2O-$N_{Ninputs}$ and N_2O-N_{prp} were not revised. The ERT considers that applying the revised equation could result in an overestimate of $N_2O_{(ATD)}$-N due to the double counting of sewage sludge N, since the definition of F_{ON} could be misunderstood. The misunderstanding could occur because animal manure and sewage sludge applied to soils (on p.165 of the NIR) and the amount of animal manure sewage sludge are separated, and $N_2O_{(ATD)}$-N from animal manure and sewage sludge application are separated (on p.169 of the NIR). The ERT noted that the value of 0.13 reported for $Frac_{GASM2}$ is different from the default value provided in the 2006 IPCC Guidelines (volume 4, chapter 11, table 11.3), which is cited in NIR table 5.7. Ireland explained that the amount of F_{ON} and sewage sludge N reported are correct and the reference for $Frac_{GASM2}$ in NIR table 5.7 is a typographical error. The reference should refer to the *EMEP/EEA air pollutant emission inventory guidebook 2016*. The ERT recommends that Ireland revise the description of F_{ON} in the equations for $N_2O_{(L)}$-N, N_2O-$N_{N\ inputs}$, N_2O-N_{prp} or the equation for $N_2O_{(ATD)}$-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 $Frac_{GASM2}$ in NIR table 5.7	
LULUCF			
L.7	4. General (LULUCF)	The ERT noted that there is a misprint in NIR table 6.3 for the area of forest land in 2016. Responding to a question raised by the ERT during the review, the Party indicated that the correct value is 759,571 ha (instead of 759.571 ha). The ERT recommends that Ireland correct the total forest land area reported in NIR table 6.3.	Yes. Adherence to the UNFCCC Annex I inventory reporting guidelines
L.8	4. General (LULUCF)	The ERT noted some discrepancies between information in the NIR (table 6.3) and various CRF tables. For example, the correct total area of forest land for 2016 according to the Party is 759,571 ha. However, according to CRF table 4.A, the total area of forest land in 2016 is 766,564 ha, while the area reported in CRF table 4.1 is 765,247 ha. During the review, the Party indicated that CRF table 4.1 includes the correct value and explained that the discrepancies are a consequence of the coincidence that the country reports and the European Union report were prepared at the same time as updating the CRF Reporter software. The ERT recommends that Ireland ensure the consistency of the land areas reported between NIR table 6.3, CRF tables 4.A–4.F and CRF table 4.1.	Yes. Transparency
L.9	4.A.1 Forest land remaining forest land – CO_2	The ERT noted the low correlation between the dynamics of CSC in the dead organic matter pool compared with the rest of the AD (e.g. area, gains and losses decreased with increasing emissions from the dead organic matter pool in 2013–2014). Responding to a question raised by the ERT during the review, the Party explained that the main drivers for CSC in the dead organic matter pool are (1) harvest residue inputs, logs and brash on-site, stumps and dead roots; (2) litter inputs from foliage turnover; (3) mortality as defined in the mortality model CARBWARE; and (4) decay constants for litter and deadwood. Ireland explained the modelling process and informed the ERT that the	Yes. Transparency

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and/or a problem?[a] If yes, classify by type
		final report on the CForRep research project is in preparation. Because of the project, reviewed decay coefficients for litter and deadwood will be available. The ERT recommends that the Party 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.	
Waste			
W.6	5.B.2 Anaerobic digestion at biogas facilities – CH_4	The Party reported category 5.B.2 anaerobic digestion at biogas facilities as "NO". The ERT noted that Ireland reports the use of biogas for heat or electricity production from several sources in its energy balance. Moreover, according to data from the Environmental Protection Agency of Ireland, there are several anaerobic digestion facilities outside of the wastewater treatment area digesting other forms of waste, including agricultural waste. During the review, Ireland explained that the inventory agency has not been able to estimate emissions from these plants yet and is not able to subtract the required amount of agricultural slurry that is digested at the plants. The ERT considers that the generated CH_4 used to produce heat or electricity should be reported in the energy sector and emissions of CH_4 from biogas facilities, due to unintentional leakage during process disturbances or other unexpected events, should be reported in the waste sector. According to the 2006 IPCC Guidelines such emissions vary between 0 and 10 per cent of the amount of CH_4 generated, and in the absence of further information a default value of 5 per cent should be used. The ERT believes that future ERTs should consider this issue further to ensure that there is no underestimation of emissions for this category. The ERT recommends that Ireland report CH_4 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.	Yes. Completeness
W.7	5.D.1 Domestic wastewater – CH_4	The Party indicated in its NIR that one third of the population of Ireland uses septic tanks to treat wastewater, mainly individual houses in non-urban areas. According to the long-term trends in soil temperature available from Ireland's National Meteorological Service, temperatures need to exceed 15 °C for two months of the year to generate suitable soil temperatures at the depths necessary for methanogenesis to occur (i.e. the bottom of the septic tank). Thus, the low prevailing temperature in septic tanks means that the methane correction factor from the 2006 IPCC Guidelines default value (0.5) had to be revised down to 0.083 (0.5 x 2/12 = 0.083). During the review, Ireland explained that the mean annual temperature in Ireland generally ranges between 9 and 12 °C from the northeast to the southwest, that long-term temperature reference data suggest that there are only two months of the year (July and August) in which the mean monthly temperature is above 15 °C and that this only occurs in specific areas of the country. The ERT considers that the revision of the methane correction factor was not based on measurements, literature or expert judgment to justify the use of country-specific data. The ERT believes that future ERTs should consider this issue further to ensure that there is no underestimation of emissions for this category. The ERT recommends that the Party 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.	Yes. Accuracy

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?[a] If yes, classify by type*
W.8	5.D.1 Domestic wastewater – CH_4	The NIR (p.311) indicates that there are between six and nine urban wastewater treatment plants with biogas recovery for heat only or for combined heat and power in Ireland. However, the ERT noted that according to research there are more such plants in Ireland. During the review, Ireland explained that it will amend the text in the NIR of future submissions to reflect the number of wastewater treatment plants with biogas recovery in the country. The ERT recommends that the Party amend the text in the NIR to reflect the number of wastewater treatment plants with biogas recovery in the country.	Yes. Accuracy
W.9	5.D.1 Domestic wastewater – CH_4 and N_2O	The NIR provides limited information in terms of AD and discharge pathways on domestic wastewater. It only mentions that approximately two thirds of the population of Ireland are served by centralized sewerage treatment plants, with the remaining third of the population using septic tanks to treat wastewater, mainly individual houses in non-urban areas. Further, the ERT noted that the 2006 IPCC Guidelines recommend that Parties characterize all wastewater treatment according to the percentages flowing to different treatment systems (aerobic and anaerobic) and the percentage of untreated wastewater, and that Parties ensure that all wastewater is characterized so that the wastewater flows sum to 100 per cent of the wastewater generated in the country. During the review, Ireland explained that there are an estimated 497,000 (2012) domestic wastewater treatment systems treating wastewater from single houses in Ireland that are not connected to a public sewer system (i.e. which utilize conventional septic tanks). These household systems serve approximately 1.5 million people, which is a third of Ireland's population. The ERT considers that it is a good practice to draw a diagram (e.g. as in figure 6.1 of the 2006 IPCC Guidelines) for the country to consider all potential anaerobic treatment and discharge systems and pathways, including collected and uncollected, as well as treated and untreated. The ERT also considers that the information provided by the Party during the review does not capture Ireland's wastewater flows. The ERT believes that future ERTs should consider this issue further to ensure that there is no underestimation of CH_4 and N_2O emissions for this category. The ERT recommends that Ireland report wastewater flows including treated (aerobically and anaerobically) and untreated wastewater in its NIR.	Yes. Accuracy
KP-LULUCF			
KL.7	General (KP-LULUCF)	The ERT noted that the Party does not provide any information in the documentation box of CRF table 4(KP-I)B.1.1 on how harvested wood products are included under the FMRL. Responding to a question raised by the ERT during the review, Ireland indicated that paragraph 11.5 of the NIR includes the relevant description. The ERT recommends that Ireland complete the documentation box of CRF table 4(KP-I)B.1.1 to provide information on how harvested wood products are included under the FMRL.	Yes. Transparency
KL.8	CM – CO_2	The ERT noted that the information regarding the land provision for cropland management under Article 3, paragraph 4, of the Kyoto Protocol in Ireland is not fully in accordance with decision 2/CMP.7, annex, paragraph 25, which requires Parties included in Annex I to ensure that lands are identifiable in accordance with Article 7 of the Kyoto Protocol. According to the NIR (p.346), Ireland considers all areas identified as being utilized for crop cultivation in the period 1990–2016 to be subject to CM. However, Ireland provided the time series of cropland area	Yes. Transparency

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?[a] If yes, classify by type*
		only in graphic format, and the total land area subject to CM in the NIR (table 6.3) for 1990 (700,656 ha) and 2016 (673,949 ha) only. The ERT notes that the area reported in NIR table 6.3 differs from the value reported in CRF table NIR-2 (674,999 ha). Responding to a question raised by the ERT during review, the Party provided the numerical data for cropland area. The ERT recommends that Ireland 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 to increase transparency in future submissions.	
KL.9	GM – CO_2	The ERT noted that the information regarding the land provision for GM under Article 3, paragraph 4, of the Kyoto Protocol in Ireland is not fully in accordance with decision 2/CMP.7, annex, paragraph 25, which requires Parties included in Annex I to ensure that lands are identifiable in accordance with Article 7 of the Kyoto Protocol. Ireland provided the time series of grassland area only in graphic format, and the total land area subject to GM in the NIR (table 6.3) for 1990 and 2016 only, which differ from the values in the CRF tables. Responding to a question raised by the ERT during the review, the Party provided the numerical data for grassland area. The ERT recommends that in the next submission Ireland provide the numerical values for grassland area and verify the consistency of the information between the CRF tables and the NIR.	Yes. Transparency
KL.10	Harvested wood products – CO_2	The ERT noted that CRF table 4(KP-I)C includes empty cells where information should be provided on harvest (columns D and E) and empty cells for numerical values and units (rows 10–20). The ERT also noted that transparent information is included in the appropriate cells under "information items". The ERT recommends that Ireland ensure that correct values and units are reported for harvesting activities (columns D and E) under Article 3, paragraphs 3 and 4, of the Kyoto Protocol in CRF table 4(KP-1)C.	Yes. Adherence to the UNFCCC Annex I inventory reporting guidelines

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

VI. Application of adjustments

11. The ERT did not identify the need to apply any adjustments to the 2018 annual submission of 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 has elected commitment period accounting and therefore the issuance and cancellation of units for KP-LULUCF activities is not applicable to the 2018 review.

VIII. Questions of implementation

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

Annex I

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

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

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

	Total GHG emissions excluding indirect CO_2 emissions		*Total GHG emissions including indirect CO_2 emissions[b]*		*Land-use change (Article 3.7 bis as contained in the Doha Amendment)[c]*	*KP-LULUCF activities (Article 3.3 of the Kyoto Protocol)[d]*	*KP-LULUCF activities (Article 3.4 of the Kyoto Protocol)*	
	Total including LULUCF	*Total excluding LULUCF*	*Total including LULUCF*	*Total excluding LULUCF*			*CM, GM, RV, WDR[e]*	*FM*
FMRL								–142.07
Base year	62 030.95	55 632.43	NA	NA	8.2299		7 276.18	
1990	61 781.89	55 383.38	NA	NA				
1995	65 392.84	59 111.43	NA	NA				
2000	74 825.76	68 514.33	NA	NA				
2010	66 287.34	61 252.97	NA	NA				
2011	62 052.07	57 127.62	NA	NA				
2012	63 403.04	57 765.75	NA	NA				
2013	62 781.06	57 649.03	NA	NA		–3 520.49	6 709.87	–435.55
2014	62 617.54	57 354.08	NA	NA		–3 479.46	6 632.34	–256.60
2015	64 543.44	59 472.07	NA	NA		–3 536.30	6 644.49	–529.69
2016	66 541.36	61 596.49	NA	NA		–3 655.10	6 598.54	–600.06

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

[a] "Base year" refers to the base year under the Kyoto Protocol, which is 1990 for CO_2, CH_4 and N_2O, and 1995 for HFCs, SF_6 and NF_3. The base year for CM and GM under Article 3, paragraph 4, of the Kyoto Protocol is 1990 for Ireland. For activities under Article 3, paragraph 3, of the Kyoto Protocol and FM under Article 3, paragraph 4, only the inventory years of the commitment period must be reported. CO_2, CH_4 and N_2O emissions included for the base year do not include the net emissions minus removals from

conversion of forests (deforestation) that were included in Ireland's initial report for the second commitment period of the Kyoto Protocol for the base year and subsequently used for calculation of the assigned amount.

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

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

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

[e] In accordance with decision 3/CMP.11, paragraph 8, Ireland previously reported that it will report emissions from CM and GM. The base year for the activities is 1990.

Table 7

Greenhouse gas emissions by gas for Ireland, excluding land use, land-use change and forestry, 1990–2016

(kt CO_2 eq)

	CO_2[a]	*CH_4*	*N_2O*	*HFCs*	*PFCs*	*Unspecified mix of HFCs and PFCs*	*SF_6*	*NF_3*
1990	32 877.94	14 760.88	7 709.33	1.23	0.12	NO	33.88	NO
1995	35 794.40	15 003.62	8 029.13	103.19	97.61	NO	79.11	4.37
2000	45 193.96	14 346.49	8 018.54	456.66	397.76	NO	51.76	49.17
2010	41 679.57	12 069.33	6 492.38	932.01	46.58	NO	33.09	NO
2011	38 009.36	12 033.51	6 068.27	955.15	15.88	NO	45.45	NO
2012	38 194.82	12 338.87	6 235.73	948.60	9.56	NO	37.39	0.78
2013	37 182.92	12 674.83	6 668.51	1 070.01	8.32	NO	43.53	0.90
2014	36 681.70	12 981.10	6 508.42	1 140.94	3.56	NO	37.40	0.96
2015	38 443.74	13 368.49	6 517.79	1 076.11	20.50	NO	44.49	0.96
2016	39 927.96	13 756.20	6 645.04	1 189.68	37.36	NO	39.30	0.96
Per cent change 1990–2016	**21.4**	**–6.8**	**–13.8**	**96 301.4**	**31 090.6**	**NA**	**16.0**	**NA**

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

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

Table 8

Greenhouse gas emissions by sector for Ireland, 1990–2016

(kt CO_2 eq)

	Energy	*IPPU*	*Agriculture*	*LULUCF*	*Waste*	*Other*
1990	31 012.80	3 309.41	19 514.36	6 398.52	1 546.80	NO
1995	33 822.94	3 274.83	20 190.65	6 281.41	1 823.02	NO
2000	42 488.83	4 743.83	19 792.58	6 311.43	1 489.09	NO

	Energy	*IPPU*	*Agriculture*	*LULUCF*	*Waste*	*Other*
2010	40 412.54	2 476.27	17 865.25	5 034.37	498.90	NO
2011	36 919.17	2 351.35	17 267.22	4 924.44	589.88	NO
2012	37 012.41	2 557.58	17 681.19	5 637.28	514.57	NO
2013	35 796.12	2 600.15	18 581.73	5 132.03	671.03	NO
2014	35 067.84	3 003.21	18 430.06	5 263.45	852.97	NO
2015	36 629.72	3 149.21	18 743.88	5 071.37	949.25	NO
2016	37 970.74	3 417.20	19 250.82	4 944.87	957.72	NO
Per cent change 1990–2016	**22.4**	**3.3**	**–1.4**	**–22.7**	**–38.1**	**NA**

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

Table 9

Greenhouse gas emissions/removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol by activity, base year[a]–2016, for Ireland

(kt CO_2 eq)

	Article 3.7 bis as contained in the Doha Amendment[b]	*Article 3.3 of the Kyoto Protocol*		*FM and elected Article 3.4 activities of the Kyoto Protocol*				
	Land-use change	*AR*	*Deforestation*	*FM*	*CM*	*GM*	*RV*	*WDR*
FMRL				–142.07				
Technical correction				–571.35				
Base year	8.2299				–18.82	7 295.00	NA	NA
2013		–3 711.44	190.94	–435.55	–32.65	6 742.52	NA	NA
2014		–3 702.66	223.20	–256.60	–75.42	6 707.76	NA	NA
2015		–3 802.49	266.20	–529.69	–93.60	6 738.09	NA	NA
2016		–3 860.98	205.89	–600.06	–133.54	6 732.09	NA	NA
Per cent change base year–2016					**609.5**	**–7.7**	**NA**	**NA**

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

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

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

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

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

Key parameters	*Values*
Periodicity of accounting	(a) AR: commitment period accounting (b) Deforestation: commitment period accounting (c) FM commitment period accounting (d) CM: commitment period accounting (e) GM: commitment period accounting (f) RV: not elected (g) WDR: not elected
Election of activities under Article 3, paragraph 4	CM and GM
Election of application of provisions for natural disturbances	Yes, for AR and FM
3.5% of total base-year period GHG emissions, excluding LULUCF	1 974.616 kt CO_2 eq (15 796.928 kt CO_2 eq for the duration of the commitment period)
Cancellation of assigned amount units, emission reduction units, certified emission reductions and/or issuance of removal units in the national registry for:	
1. AR in 2016	NA
2. Deforestation in 2016	NA
3. FM in 2016	NA
4. CM in 2016	NA
5. GM in 2016	NA
6. RV in 2016	NA
7. WDR in 2016	NA

Annex II

Information to be included in the compilation and accounting database

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

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

	Original submission	*Revised estimate*	*Adjustment*	*Final*
CPR	**309 167 903**			**309 167 903**
Annex A emissions for 2016				
CO_2[a]	39 928 118	39 927 955		39 927 955
CH_4	13 705 368	13 756 197		13 756 197
N_2O	6 645 039			6 645 039
HFCs	1 189 682			1 189 682
PFCs	37 357			37 357
Unspecified mix of HFCs and PFCs	NO			NO
SF_6	39 297			39 297
NF_3	961			961
Total Annex A sources	**61 545 821**	**61 596 488**		**61 596 488**
Activities under Article 3, paragraph 3, of the Kyoto Protocol for 2016				
3.3 AR	–3 860 984			–3 860 984
3.3 Deforestation	205 888			205 888
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol for 2016				
3.4 FM	–600 059			–600 059
3.4 CM	–133 544			–133 544
3.4 CM for the base year	–18 823			–18 823
3.4 GM	6 732 086			6 732 086
3.4 GM for the base year	7 295 001			7 295 001

[a] CO_2 emissions include indirect CO_2 emissions reported in CRF table 6.

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

	Original submission	*Revised estimate*	*Adjustment*	*Final*
Annex A emissions for 2015				
CO_2[a]	38 443 649	38 443 737		38 443 737
CH_4	13 323 002	13 368 491		13 368 491
N_2O	6 517 788			6 517 788
HFCs	1 076 109			1 076 109
PFCs	20 497			20 497
Unspecified mix of HFCs and PFCs	NO			NO

	Original submission	*Revised estimate*	*Adjustment*	*Final*
SF_6	44 490			44 490
NF_3	961			961
Total Annex A sources	**59 426 497**	**59 472 074**		**59 472 074**
Activities under Article 3, paragraph 3, of the Kyoto Protocol for 2015				
3.3 AR	–3 802 494			–3 802 494
3.3 Deforestation	266 196			266 196
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol for 2015				
3.4 FM	–529 689			–529 689
3.4 CM	–93 599			–93 599
3.4 CM for the base year	–18 823			–18 823
3.4 GM	6 738 089			6 738 089
3.4 GM for the base year	7 295 001			7 295 001

[a] CO_2 emissions include indirect CO_2 emissions reported in CRF table 6.

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

	Original submission	*Revised estimate*	*Adjustment*	*Final*
Annex A emissions for 2014				
CO_2[a]	36 681 625	36 681 704		36 681 704
CH_4	12 943 407	12 981 098		12 981 098
N_2O	6 508 416			6 508 416
HFCs	1 140 944			1 140 944
PFCs	3 563			3 563
Unspecified mix of HFCs and PFCs	NO			NO
SF_6	37 398			37 398
NF_3	961			961
Total Annex A sources	**57 316 313**	**57 354 083**		**57 354 083**
Activities under Article 3, paragraph 3, of the Kyoto Protocol for 2014				
3.3 AR	–3 702 659			–3 702 659
3.3 Deforestation	223 200			223 200
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol for 2014				
3.4 FM	–256 596			–256 596
3.4 CM	–75 416			–75 416
3.4 CM for the base year	–18 823			–18 823
3.4 GM	6 707 756			6 707 756
3.4 GM for the base year	7 295 001			7 295 001

[a] CO_2 emissions include indirect CO_2 emissions reported in CRF table 6.

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

	Original submission	*Revised estimate*	*Adjustment*	*Final*
Annex A emissions for 2013				
CO_2[a]	37 182 847	37 182 922		37 182 922

	Original submission	*Revised estimate*	*Adjustment*	*Final*
CH_4	12 640 736	12 674 834		12 674 834
N_2O	6 668 508			6 668 508
HFCs	1 070 006			1 070 006
PFCs	8 324			8 324
Unspecified mix of HFCs and PFCs	NO			NO
SF_6	43 535			43 535
NF_3	901			901
Total Annex A sources	**57 614 857**	**57 649 030**		**57 649 030**
Activities under Article 3, paragraph 3, of the Kyoto Protocol for 2013				
3.3 AR	–3 711 436			–3 711 436
3.3 Deforestation	190 942			190 942
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol for 2013				
3.4 FM	–435 552			–435 552
3.4 CM	–32 647			–32 647
3.4 CM for the base year	–18 823			–18 823
3.4 GM	6 742 518			6 742 518
3.4 GM for the base year	7 295 001			7 295 001

[a] CO_2 emissions include indirect CO_2 emissions reported in CRF table 6.

Annex III

Additional information to support findings in table 2

Missing categories that may affect completeness

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

(a) CO_2 emissions from natural gas exploration and processing (see ID# E.9 in table 3);

(b) CO_2 and CH_4 emissions from natural gas production and CH_4 emissions from natural gas processing (see ID# E.19 in table 5);

(c) CH_4 and N_2O emissions from natural gas flaring (see ID# E.22 in table 5);

(d) CH_4 emissions from anaerobic digestion at biogas facilities (see ID# W.6 in table 5).

Annex IV

Documents and information used during the review

A. Reference documents

Reports of the Intergovernmental Panel on Climate Change

IPCC. 2000. *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*. J Penman, D Kruger, I Galbally, et al. (eds.). Hayama, Japan: IPCC/Organisation for Economic Co-operation and Development/International Energy Agency/Institute for Global Environmental Strategies. Available at http://www.ipccnggip.iges.or.jp/public/gp/english/.

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

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

Annual review reports

Reports on the individual reviews of the 2013, 2014, 2015 and 2016 annual submissions of Ireland, contained in documents FCCC/ARR/2013/IRL, FCCC/ARR/2014/IRL, FCCC/ARR/2015/IRL and FCCC/ARR/2016/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%20report_2018.pdf.

Annual status report for Ireland for 2018. Available at https://unfccc.int/sites/default/files/resource/2018%20ASR%20of%20Ireland_complete_0.pdf.

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.

B. Additional information provided by the Party

Responses to questions during the review were received from Mr. Paul Duffy (Environmental Protection Agency of Ireland), including additional material on the methodology and assumptions used.