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Framework Convention on Climate Change

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Report on the individual review of the annual submission of Germany 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 Germany, 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 10 to 15 September 2018.

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

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Abbreviations and acronyms

2006 IPCC Guidelines	*2006 IPCC Guidelines for National Greenhouse Gas Inventories*
AAU	assigned amount unit
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"
C	carbon
CER	certified emission reduction
CH_4	methane
CM	cropland management
CO_2	carbon dioxide
CO_2 eq	carbon dioxide equivalent
CPR	commitment period reserve
CRF	common reporting format
DMI	dry matter intake
EF	emission factor
ERT	expert review team
ERU	emission reduction unit
EU ETS	European Union Emissions Trading System
FM	forest management
FMRL	forest management reference level
$Frac_{LEACH-(H)}$	fraction of nitrogen input to managed soils that is lost through leaching and run-off
GHG	greenhouse gas
GM	grazing land management
HCFC	hydrochlorofluorocarbon
HFC	hydrofluorocarbon
HWP	harvested wood product
IE	included elsewhere
IEF	implied emission factor
IPCC	Intergovernmental Panel on Climate Change
IPPU	industrial processes and product use
KP-LULUCF activities	LULUCF emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol
Kyoto Protocol Supplement	*2013 Revised Supplementary Methods and Good Practice Guidance Arising from the Kyoto Protocol*
LULUCF	land use, land-use change and forestry
MCF	methane correction factor
ME	metabolizable energy
N	nitrogen
NA	not applicable
NE	not estimated
Nex	nitrogen excretion
NF_3	nitrogen trifluoride
NH_3	ammonia
NIR	national inventory report
NO	not occurring

N_2O	nitrous oxide
PFC	perfluorocarbon
QA/QC	quality assurance/quality control
Revised 1996 IPCC Guidelines	*Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*
RMU	removal unit
RV	revegetation
SEF	standard electronic format
SF_6	sulfur hexafluoride
SOC	soil organic carbon
SRC	short-rotation coppice
TOW	total organics in wastewater
UNFCCC	United Nations Framework Convention on Climate Change
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"
VS	volatile solids
WDR	wetland drainage and rewetting
Wetlands Supplement	*2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands*

I. Introduction[1]

1. This report covers the review of the 2018 annual submission of Germany 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 10 to 15 September 2018 and was coordinated by Ms. Suvi Monni (secretariat). Table 1 provides information on the composition of the ERT that conducted the review of Germany.

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

Area of expertise	*Name*	*Party*
Generalist	Mr. Domenico Gaudioso	Italy
	Ms. Olia Glade	New Zealand
	Mr. Justin Goodwin	United Kingdom of Great Britain and Northern Ireland
Energy	Mr. Dario Gomez	Argentina
	Mr. Yves Marenne	Belgium
	Ms. Duduzile Nhlengethwa-Masina	Eswatini
IPPU	Mr. Kent Buchanan	South Africa
	Ms. Eva Krtkova	Czechia
Agriculture	Ms. Marci Baranski	United States of America
	Ms. Olga Gavrilova	Estonia
LULUCF	Ms. Diana Marcela Vargas	Colombia
	Ms. Marina Vitullo	Italy
Waste	Mr. Richard Claxton	United Kingdom
	Mr. Ole-Kenneth Nielsen	Denmark
Lead reviewers	Mr. Goodwin	
	Ms. Nhlengethwa-Masina	

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 Germany's 2017 annual submission did not take place during 2017 owing to insufficient funding for the review process.

3. The ERT has made recommendations that Germany resolve the findings related to issues,[2] including issues designated as problems.[3] Other findings and, if applicable, the encouragements of the ERT to Germany to resolve them, are also included.

[1] At the time of publication of this report, Germany 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.

[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.

4. A draft version of this report was communicated to the Government of Germany, 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 Germany, 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 Germany.

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. In accordance with paragraph 76 of the UNFCCC review guidelines and paragraphs 47 and 65 of the Article 8 review guidelines, the ERT has prioritized: the review of issues and/or problems identified in previous review reports or in the initial assessment; recalculations that have changed the emissions or removals estimate for a category by more than 2 per cent and/or national total emissions by more than 0.5 per cent for any of the recalculated years; and supplementary information reported under the Kyoto Protocol. Table 2 provides the assessment by the ERT of the annual submissions with respect to the tasks undertaken during the desk review. Further information on the issues identified, as well as additional findings, may be found in tables 3, 5 and 6.

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

Assessment				*Issue or problem ID#(s) in table 3, 5 and/or 6*[a]
Dates of submission	Original submission: 13 April 2018 (NIR), 5 April 2018, version 1 (CRF tables), 14 April 2018 (SEF-CP2-2017) and 20 April 2018 (SEF-CP1-2017)			
Review format	Desk review			
Application of the requirements of the UNFCCC Annex I inventory reporting guidelines and Wetlands Supplement (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	I.17, L.5, W.11, KL.5
		(c) Development and selection of EFs	Yes	W.14, W.15
		(d) Collection and selection of AD	Yes	KL.10
		(e) Reporting of recalculations	Yes	E.6, E.7, I.10, I.11
		(f) Reporting of a consistent time series	Yes	I.4
		(g) Reporting of uncertainties, including methodologies	Yes	G.2, G.12, I.23
		(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]	No	
		(j) Application of corrections to the inventory	No	

Assessment			*Issue or problem ID#(s) in table 3, 5 and/or 6*[a]
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	G.9, I.18
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	I.14
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 ERUs, CERs, AAUs and RMUs 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?	No	
	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	Yes	KL.13
	(b) Demonstration of methodological consistency between the reference level and reporting on FM in accordance with decision 2/CMP.7, annex, paragraph 14	Yes	KL.7
	(c) Reporting requirements of decision 6/CMP.9	No	
	(d) Country-specific information to support provisions for natural disturbances, in	NA	

Assessment			*Issue or problem ID#(s) in table 3, 5 and/or 6*[a]
	accordance with decision 2/CMP.7, annex, paragraphs 33 and 34		
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?	No	G.5
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	Germany 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 questions of implementation?	No	

[a] The ERT identified additional issues and/or problems in the general, energy, IPPU, agriculture, LULUCF and waste sectors and for KP-LULUCF activities that are not listed in this table but are included in table 3, 5 and/or 6.

[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 the previous review reports that were included in the previous review report, published on 12 April 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.

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

ID#	*Issue and/or problem classification*[a, b]	*Recommendation made in previous review report*	*ERT assessment and rationale*
General			
G.1	Uncertainty analysis (G.2, 2016) (G.2, 2015) Adherence to the UNFCCC Annex I	Include the contribution from each category in the trend uncertainties.	Resolved. The AD and EF uncertainty contributions from each category in the trend uncertainties are included in the NIR (table 551). In the categories for which the combined uncertainty of the emissions is reported instead of AD and EF uncertainties, this

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

ID#	*Issue and/or problem classification*[a, b]	*Recommendation made in previous review report*	*ERT assessment and rationale*
	inventory reporting guidelines		combined uncertainty is included in the contribution of EF uncertainties.
G.2	Uncertainty analysis (G.2, 2016) (G.2, 2015) Adherence to the UNFCCC Annex I inventory reporting guidelines	If Germany continues to include uncertainty estimates for AD and EFs in the combined uncertainty of the emissions, then provide clear documentation of this in the NIR.	Not resolved. Germany provided a general statement that uncertainties are quantified for EFs and AD and in some cases for emissions (NIR, section 1.7.1). However, no explanation for using zero uncertainties for AD in table 551 of the NIR was provided. During the review, the Party explained that when the combined uncertainty of the emissions is used, this uncertainty is reported in the EF uncertainty column of table 551 and the AD uncertainty column is filled with zero, in accordance with the 2006 IPCC Guidelines (volume 1, note A, p.3.32). Germany also explained that it plans to provide a reference to tables 551 and 552 in section 1.7 of the NIR to improve the transparency of reporting.
G.3	QA/QC and verification (G.3, 2016) (G.3, 2015) Adherence to the UNFCCC Annex I inventory reporting guidelines	Use the total national emissions excluding LULUCF for the latest reported inventory year when estimating the thresholds for determining insignificant sources.	Resolved. Germany used the correct value of total emissions without LULUCF for 2016 (909,404.50 kt CO_2 eq) for calculating the significance threshold (NIR, table 525).
G.4	CRF tables (G.4, 2016) (G.4, 2015) Transparency	Improve the transparency of the NIR and CRF table 2(I).A–H by including explanations of the allocation of and information on the origin of the N_2O emissions from other (metal industry), as well as the methods applied to estimate these emissions.	Resolved. Germany provided an explanation for the origin of N_2O emissions from category 2.C.7 (metal industry – other) in the NIR (section 4.4.1) and included the N_2O emissions in CRF table 2(I).A–H in a country-specific category 2.C.1 (iron and steel production) under 2.C.7 (see ID# G.7 in table 6).
G.5	CPR (G.5, 2016) (G.6, 2015) Adherence to reporting guidelines under Article 7, paragraph 1, of the Kyoto Protocol	Annually review, and if necessary update, the information in the NIR with respect to the calculation of the CPR, ensuring that it is calculated on the basis of the most recent information.	Addressing. Germany provided an updated value for the CPR (3,233,429,899 t CO_2 eq) (NIR, section 12.5). However, as noted in the previous annual review report and in the report to facilitate calculation of the assigned amount (FCCC/IRR/2016/DEU), based on the assigned amount for the second commitment period of the Kyoto Protocol, the previous and current ERT calculates the CPR to be 3,233,429,900 t CO_2 eq.
G.6	Article 3, paragraph 14, of the Kyoto Protocol (G.1, 2016) (G.1, 2015) (75, 2014) (87, 2013) Adherence to reporting guidelines under Article 7, paragraph 1, of the Kyoto Protocol	Report any changes in the information provided under Article 3, paragraph 14, of the Kyoto Protocol.	Resolved. Germany explicitly stated that there had been no changes in reporting under Article 3, paragraph 14, of the Kyoto Protocol since the previous annual submission (NIR, chapter 15).

ID#	*Issue and/or problem classification*[a, b]	*Recommendation made in previous review report*	*ERT assessment and rationale*
Energy			
E.1	1. General (energy sector) – all fuels – CO_2, CH_4 and N_2O (E.1, 2016) (E.1, 2015) (18, 2014) (21, 2013) Transparency	Provide more detailed information on the most significant recalculations in the energy sector and, to the extent possible, link the qualitative explanations for the major recalculations with the quantitative information reported in CRF table 8(a).	Resolved. Germany provided more detailed information on most recalculations; for example, for the category other sectors (1.A.4) (NIR, section 3.2.12.5). Recalculations were mainly due to the difference between the provisional and final national energy balances (see ID#s E.7 and E.8 in table 5).
E.2	1. General (energy sector) – all fuels – CO_2, CH_4 and N_2O (E.12, 2016) (E.12, 2015) Transparency	Clarify the use of the following EU ETS data in the inventory for the energy sector – (1) CO_2 EFs for fuel combustion (category 1.A); (2) fuel data for compressor stations (subcategory 1.A.3.e); (3) CO_2 emissions from catalyst regeneration (subcategory 1.A.1.b); (4) CO_2 emissions from calcination (subcategory 1.B.2.a); and (5) CO_2 emissions from the lignite coking plant (subcategory 1.B.1.b) – by including information provided during the review in NIR chapter 1.4.1.1.1 (data sources for energy) in order to give an overview of all EU ETS data in the energy sector.	Resolved. Germany explained the use of EU ETS data in areas not covered by national statistics (NIR, section 1.4.1.1.1). The specific categories identified in the previous review report have been noted in the NIR.
E.3	1. General (energy sector) – all fuels – CO_2, CH_4 and N_2O (E.13, 2016) (E.13, 2015) Transparency	Provide clear explanations in NIR chapter 10 (recalculations and improvements) where there are recalculations in the energy sector resulting from the changes due to the update of the national energy balance.	Resolved. Germany specified for each subcategory when recalculations were a result of the update of the national energy balance (NIR, chapter 3). The Party also explained that the most significant recalculations in the energy sector were due to the update of the energy balance for 2015 (NIR, section 10.1.1.2). During the review, Germany explained that because the recalculations are already explained in chapter 3, including the same information in NIR chapter 10 would be redundant. The ERT agreed with the view of Germany.
E.4	1.B.2 Oil and natural gas and other – liquid and gaseous fuels – CH_4 (E.17, 2016) Transparency	Provide information on the procedures used for performing the recalculations, any changes in the calculation methods, EFs and AD used, and the quantitative impact of the recalculations.	Resolved. Germany explained that the recalculations resulted from the update of previously used provisional statistics (AD) (NIR, chapter 3.3.2.5). During the review, the Party confirmed that the methods and EFs remained unchanged. The quantitative impact of the recalculations was provided in NIR table 179 (the table erroneously referred to recalculations between the 2016 and 2017 submissions, but included correct values for the impact of recalculations between the 2017 and 2018 submissions).

ID#	*Issue and/or problem classification*[a, b]	*Recommendation made in previous review report*	*ERT assessment and rationale*
E.5	1.C CO_2 transport and storage – gaseous fuels – CO_2 (E.18, 2016) (E.17, 2015) Comparability	Complete the blank cell for CO_2 captured for domestic storage and for storage in other countries using the appropriate notation key in CRF table 1s2.	Not resolved. In CRF table 1s2, cells B35 (for domestic storage) and B36 (for storage in other countries) are still blank.
IPPU			
I.1	2.B.1 Ammonia production – CO_2 (I.7, 2016) Transparency	Explain the drivers for the trends in the CO_2 IEF and CO_2 recovery in the NIR.	Resolved. Germany explained both the drivers of the IEF and the CO_2 recovery trends (NIR, section 4.3.1.1).
I.2	2.B.1 Ammonia production – CO_2 (I.8, 2016) (I.7, 2015) Transparency	Report on the updated methodology in the NIR.	Resolved. Germany clarified the number of plants operating (NIR, section 4.3.1.1) and explained the methodology for estimating CO_2 emissions, including recovery of CO_2, and noting in particular that as of 2013, all plant data have been obtained using a tier 3 method (NIR, section 4.3.1.2).
I.3	2.B.3 Adipic acid production – N_2O (I.9, 2016) (I.8, 2015) Transparency	For the third plant, which started operations in 2002 but began conducting measurements only in 2013, report on how the N_2O emissions were estimated for the period 2002–2012.	Not resolved. The required information is not included in the NIR. During the review, Germany explained that the producer calculated N_2O emissions using the quantity of adipic acid produced and an EF for two possible system statuses: unimpeded or reduced operation. The duration of both plant statuses and their related plant loads were determined. The amount of adipic acid produced was also calculated for both statuses (by daily weighing and tracing changes in stock). The EFs determined for both plant statuses were calculated on the basis of the quantity of adipic acid produced and the N_2O concentration of emissions, and were updated only when significant changes in the process occurred. The annual N_2O emissions were calculated by summing the emissions generated during both plant statuses. The Party stated that it plans to include this description in the next NIR.
I.4	2.B.3 Adipic acid production – N_2O (I.9, 2016) (I.8, 2015) Consistency	Report on how time-series consistency was ensured, given the use of different methods in the time series.	Not resolved. The required information is not included in the NIR.
I.5	2.B.4 Caprolactam, glyoxal and glyoxylic acid production – N_2O (I.10, 2016) (I.9, 2015) Comparability	Report N_2O emissions from the plant producing caprolactam under category 2.B.4 (caprolactam, glyoxal and glyoxylic acid production) as "C" (confidential), explain where these emissions are reported and improve the transparency of the NIR by providing explanations for including emissions from the plant in category 2.B.2 (nitric acid production) instead of category 2.B.4.	Resolved. Germany reported emissions from caprolactam as "IE" and "NE" in CRF table 2(I).A-Hs1, explained in CRF table 9 where the emissions reported as "IE" are included and provided a rationale for doing so in the NIR (section 4.3.4.2). The Party included emissions from one of the plants producing caprolactam in category 2.B.2 and explained that this was done to ensure consistency with emissions trading data; "IE" was used instead of "C" (confidential). The ERT considers this to be in accordance with the UNFCCC Annex I inventory reporting guidelines.

ID#	*Issue and/or problem classification*[a, b]	*Recommendation made in previous review report*	*ERT assessment and rationale*
I.6	2.B.4 Caprolactam, glyoxal and glyoxylic acid production – N_2O (I.11, 2016) (I.10, 2015) Transparency	Provide documentation in the NIR, in accordance with paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines, to demonstrate that emissions from caprolactam production are insignificant.	Resolved. Emissions from one of the caprolactam plants are reported under nitric acid production (see ID# I.5 above). For another plant, as described in the NIR (section 4.3.4.2) a one-time estimation of N_2O emissions, using a tier 2 method and default EFs from the 2006 IPCC Guidelines, was conducted to demonstrate that the emissions fall under the threshold of significance given in paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines. The ERT noted that the information in the NIR referred to the emissions from an installation (suggesting one facility) and it was not clear as to whether the test for significance also included the plant whose emissions were included in category 2.B.2. During the review, Germany stated that the emissions from both plants were determined to be below the threshold of significance in accordance with paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines. See ID# I.18 in table 6.
I.7	2.B.6 Titanium dioxide production – CO_2 (I.12, 2016) (I.11, 2015) Transparency	Provide in the NIR information on the plants in operation in Germany and the types of processes used.	Resolved. Several producers operate in Germany but only one produces titanium dioxide via the chloride process. The others use the sulfate process and do not emit process emissions (NIR, section 4.3.6).
I.8	2.B.6 Titanium dioxide production – CO_2 (I.12, 2016) (I.11, 2015) Transparency	Include a description of the methodology used to estimate emissions in support of the assumption of insignificance, including reporting in the NIR the AD and EFs used, if these are not confidential, to derive the likely level of emissions, in accordance with paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines.	Resolved. The estimation of emissions to support the assumption of insignificance was conducted using expert judgment and on the basis of production capacity and an EF (NIR, section 4.3.6). The data used are confidential and cannot be shared.
I.9	2.G.2 – SF_6 and PFCs from other product use – SF_6 (I.14, 2016) (I.13, 2015) Transparency	Include in the NIR descriptions of the methodological assumptions used to estimate SF_6 emissions from particle accelerators and the number of accelerators occurring in Germany in accordance with the 2006 IPCC Guidelines.	Resolved. Germany stated the number of accelerators in the country and discussed the methodological assumptions used to estimate the related SF_6 emissions (NIR, section 4.8.2.2.2). Tables 203 and 204 present the number of accelerators by user category and table 205 presents the EFs. See also ID# I.24 in table 6.
Agriculture			
A.1	3.A.1 Cattle – CH_4 (A.5, 2016) (A.5, 2015) Transparency	Provide in the NIR a transparent explanation of the methodology used to develop the applied DMI value for calves.	Resolved. Germany provided a brief description of the methodology used to develop the DMI value for calves in the agriculture sector methodology report of Haenel et al. (2018), section 4.4.2 (which is referred to throughout chapter 5 of the NIR). The Party also provided bibliographic details for a

ID#	*Issue and/or problem classification*[a, b]	*Recommendation made in previous review report*	*ERT assessment and rationale*
			scientific paper (Dämmgen et al., 2013) cited in Haenel et al. (2018).
A.2	3.A.2 Sheep – CH_4 (A.4, 2016) (A.4, 2015) Transparency	Describe the method used to derive the revised CH_4 EF for lambs in the NIR.	Resolved. Germany provided a reference to the data source explaining the method used to derive the enteric fermentation CH_4 EF for lambs in the agriculture sector methodology report of Haenel et al. (2018), which is referred to throughout chapter 5 of the NIR.
A.3	3.B Manure management – N_2O (A.6, 2016) (A.6, 2015) Transparency	Provide in the NIR clear information, including the rationale derived from the personal communication with experts, to justify the appropriateness of the EF used for deep bedding.	Resolved. Germany provided a rationale for the N_2O EF used for deep bedding (NIR, section 5.3.4.2.2). A reference to the expert judgment used is provided in the agriculture sector methodology report of Haenel et al. (2018, p.187).
A.4	3.D.a.6 Cultivation of organic soils (i.e. histosols) – N_2O (A.7, 2016) (A.7, 2015) Transparency	Provide a clear explanation of the derivation and application of the country-specific EF used for drained grassland in the NIR to justify the appropriateness of the EF used.	Addressing. Germany changed the value of the EF for drained grassland from 2.7 to 2.3 kg N_2O-N/ha for the entire time series in its 2017 submission. The impact of the recalculation between the 2016 and 2017 submissions was a reduction in emissions from the cultivation of organic soils of 5.4–6.8 per cent for the entire time series. The value of 2.3 kg N_2O-N/ha was also used in the 2018 submission (NIR, section 5.5.2.1.1). The NIR includes a citation to a scientific paper (Tiemeyer et al., 2016) that was the basis for the N_2O EF. Nevertheless, the ERT considered that the Party had not provided a clear enough explanation of the derivation of the country-specific EF used for drained grassland in the 2018 NIR that justified the appropriateness of its use. During the review, Germany explained that Tiemeyer et al. (2016) synthesized data sets from six publications containing 122 full annual measurements covering 12 peatland areas in Germany. The Party provided the ERT with a copy of the paper and additional information on the value used for drained grassland, including national N_2O measurements, to support the appropriateness of the EF used. Based on this information, the ERT considers that the value of 2.3 kg N_2O-N/ha is appropriate if sufficiently documented in the NIR, for example by explaining that the study of Tiemeyer et al. (2016), which was used to derive the updated N_2O EF, synthesized data sets from six publications with 122 full annual measurements covering 12 peatland areas in Germany.
A.5	3.D.b.2 Nitrogen leaching and run-off – N_2O (A.8, 2016) (A.8, 2015) Transparency	Revise the description in the NIR of the methodology used to estimate indirect N_2O emissions from managed soils, noting that $Frac_{LEACH-(H)}$ is applied to nitrogen inputs to the soil without adjusting it for nitrogen lost, and the recalculations in the NIR.	Resolved. Germany revised the description of the methodology used to estimate indirect N_2O emissions from managed soils (NIR, section 5.1.5.1.4).

ID#	*Issue and/or problem classification*[a, b]	*Recommendation made in previous review report*	*ERT assessment and rationale*
A.6	3.D.b.2 Nitrogen leaching and run-off – N_2O (A.8, 2016) (A.8, 2015) Transparency	Correct the AD in CRF table 3.D for the amount of nitrogen from fertilizers and other agricultural inputs that is lost through leaching and run-off.	Resolved. Germany revised the AD reported in CRF table 3.D.
A.7	3.G Liming – CO_2 (A.9, 2016) (A.9, 2015) Transparency	Explain the updated AD used to differentiate dolomite and limestone application for liming in the NIR.	Resolved. Germany provided separate estimates of CO_2 emissions from the application of limestone and dolomite fertilizers on agricultural soils in CRF table 3.G-I, and stated that the share of dolomite is estimated by expert judgment (NIR, section 5.1.5.2).
LULUCF			
L.1	4.A.1 Forest land remaining forest land – CO_2 (L.1, 2016) (L.1, 2015) (49, 2014) Adherence to the UNFCCC Annex I inventory reporting guidelines	Undertake a verification of the outputs of the national forest inventory, particularly with respect to forest harvesting/production.	Resolved. Germany classified this issue as resolved (NIR, table 455), referring to NIR section 6.1.3.3, where it stated that no comparable data are available to verify the inventory for the LULUCF sector. In the NIR and during the review, the Party provided information on the national forest inventory sampling design and quality assurance and verification of the collected data. In response to the ERT's request for additional information and data related to forest harvesting/production, Germany provided a table reporting the time series of total harvest of public forests derived from German logging statistics, total harvest derived from national forest inventories, and the corrected logging statistics calibrated with forest inventory data. Germany explained that the logging statistics include only public forests and provided the description of the estimation process (i.e. the official harvest statistics data are corrected based on information on the loss of merchantable wood derived from national forest inventories in Germany). The ERT noted that this information (i.e. a comparison of harvest statistics with national forest inventory data) showed that a verification activity had been carried out. See also ID# L.10 in table 6.
L.2	4.B.1 Cropland remaining cropland – CO_2 (L.7, 2016) (L.7, 2015) Completeness	Estimate and report the carbon stock changes for woody biomass in accordance with the 2006 IPCC Guidelines, taking into consideration the biomass accumulation from growth and the losses associated with harvest, gathering or disturbance.	Resolved. Germany reported estimates of carbon stock changes for woody biomass in CRF table 4.B, and a description of the estimation methodology is included in the NIR (section 6.1.2.3.1).
L.3	4.B.1 Cropland remaining cropland – CO_2 (L.8, 2016) (L.8, 2015) Completeness	Include in the NIR transparent and verifiable information to demonstrate that the cropland soil pool is not a net source, on the basis of the documentation on management practices provided during the review,	Resolved. Germany provided additional information to demonstrate that mineral soils, in the cropland category, are not a net source (NIR, section 6.5.2.3.2).

ID#	Issue and/or problem classification[a, b]	Recommendation made in previous review report	ERT assessment and rationale
		referring to national studies and research.	
L.4	4.B.1 Cropland remaining cropland – CO_2 (L.8, 2016) (L.8, 2015) Comparability	Use the notation key "NE" to report carbon stock changes for mineral soils when a tier 1 zero stock change method is used.	Not resolved. The notation key "NA" was used to report carbon stock changes for mineral soils.
L.5	4.E.2 Land converted to settlements – CO_2 (L.9, 2016) (L.9, 2015) Accuracy	Reassess the SOC value used to estimate soil carbon stock changes for land converted to settlements, taking into consideration the 2006 IPCC Guidelines, or provide transparent and verifiable evidence, based on national studies and research, to support the use of the country-specific SOC value.	Addressing. Germany provided additional information in the NIR (pp.526 and 527) to support the continued use of a SOC value of 58.67 t C/ha for settlements in table 326 of the NIR. During the review, Germany provided additional information on the study of SOC stocks in the Berlin metropolitan area referred to in the NIR (Edelmann, 2013), and stated that this study includes sealed surface and results in an area-weighted average carbon stock of 60.3 Mg/ha for 30 cm soil depth. When green areas are included, this value increases to 62.2 Mg/ha. These values were used by the Party to check the value derived from the countrywide soil map for settlement areas (58.67 t C/ha). The ERT noted that in the cited study the soil samples collected in built-up areas were taken from unpaved ground. It is reasonable to assume that paved areas have a lower SOC content than open areas; consequently, a discount factor should be applied to the measurements taken in built-up areas. Germany disagreed with the ERT's logic, stating that the study included paved areas. Further, the Party explained that the study included unsealed areas (27,291.4 ha, approximately 48.3 per cent) and sealed areas (29,190 ha, approximately 51.7 per cent); the average soil carbon content in the sealed areas (0.65 per cent) was significantly lower than in the unsealed areas (2.1 per cent). Germany further explained that characteristic values for sealed soils originated from investigations by the Senate of Berlin during subway construction. The sample is considered to be representative for the substrate under a fully enclosed asphalt surface. For Berlin, the average soil carbon stock for sealed areas is calculated to be 37.1 t C/ha, and for the unsealed areas 85 t C/ha, a difference of 56.5 per cent, which has been included in the calculation of the carbon stock for the total built-up area (60.3 t/ha). The ERT considers that the recommendation could be addressed by recalculating the SOC content to be used in the estimation process of soil carbon stock changes for deforestation activities for forest areas converted to settlements by using the weighted average value of natural areas (45 per cent in Edelmann (2013)) and of built-up areas (55 per cent), corrected by the discount factor for paved areas according to the proportion of paved and unpaved area in the built-up area.

ID#	*Issue and/or problem classification*[a, b]	*Recommendation made in previous review report*	*ERT assessment and rationale*
Waste			
W.1	5. General (waste) – CH_4 and N_2O (W.5, 2016) (W.5, 2015) Transparency	Ensure that all instances of the use of the notation key "IE" (including flaring of CH_4 from municipal solid waste, nitrogen in industrial effluent and the amount of CH_4 for energy recovery in industrial wastewater) are explained in CRF table 9.	Resolved. Relevant explanations are included in CRF tables 5.D and 9 and in the NIR.
W.2	5.A.1 Managed waste disposal sites – CH_4 (W.6, 2016) (W.6, 2015) Transparency	Revise the NIR to describe the updated methodology used to estimate CH_4 emissions from managed waste disposal sites, in particular the application of the IPCC default value for fraction of CH_4 in generated landfill gas (F) of 50 per cent.	Resolved. Germany described the updated methodology (NIR, section 7.2.1.2), including the application of the IPCC default value for fraction of CH_4 in generated landfill gas (F) (NIR, section 7.2.1.2.6).
W.3	5.A.1 Managed waste disposal sites – CH_4 (W.9, 2016) (W.9, 2015) Transparency	Include all references supporting the use of country-specific degradable organic carbon values as a footnote to table 397 of the NIR.	Not resolved. No additional information was provided in NIR table 428 (previously table 397). During the review, Germany informed the ERT that work on documenting the country-specific degradable organic carbon values (included in NIR table 428) is ongoing; the researcher undertaking this work has been contacted with a view to better documenting the basis of the values.
W.4	5.B.2 Anaerobic digestion at biogas facilities – N_2O (W.10, 2016) (W.10, 2015) Accuracy	Fully investigate the probable double counting between categories 3.B (manure management) and 5.B.2 (anaerobic digestion at biogas facilities) for the relevant inventory years (1998 onward) and correct the AD for anaerobic digestion, as appropriate, by subtracting the amount of manure processed under category 5.B.2.	Resolved. Germany recalculated the emissions excluding animal manure from the waste sector category anaerobic digestion at biogas facilities as the emissions are already included under the agriculture sector (NIR, section 7.3.2.1). See ID# W.13 in table 6.
W.5	5.B.2 Anaerobic digestion at biogas facilities – N_2O (W.11, 2016) (W.11, 2015) Transparency	Document the reporting of the agricultural application of compost/digestate to agricultural land in the NIR, confirming that the biological processing of kitchen and garden waste removes any nitrogen and therefore no N_2O emissions result from the application of residues to agricultural land in the agriculture sector.	Resolved. Germany explained that the N_2O EFs used for digestion of biowaste include emissions from the digestion process as well as from storage and application of digestates (NIR, section 7.3.2.2).
W.6	5.D Wastewater treatment and discharge – CH_4 and N_2O (W.4, 2016) (W.4,	Correctly report the AD values in the NIR.	Resolved. No errors were identified by the ERT with regard to the formulas used or AD for 2012. The examples showing a lack of transparency in reporting

ID#	*Issue and/or problem classification*[a, b]	*Recommendation made in previous review report*	*ERT assessment and rationale*
	2015) (54, 2014) Transparency		have been addressed by Germany (NIR, section 7.5.1.1).
W.7	5.D Wastewater treatment and discharge – CH_4 and N_2O (W.13, 2016) (W.13, 2015) Transparency	Ensure that sufficient information is provided in the NIR (including a description of the methods, relevant AD (including the number of people connected to cesspools and septic systems) and all underlying assumptions used) that would enable the replication of the emission estimates and AD reported in CRF table 5.D.	Resolved. The recommended AD on the number of people connected to cesspools and septic systems are presented in NIR section 7.5.1.1.5. The descriptions of methods and underlying assumptions are sufficiently transparent (NIR, section 7.5.1.1 and 7.5.1.3.2).
W.8	5.D.1 Domestic wastewater – CH_4 (W.12, 2016) (W.12, 2015) Transparency	Describe the updated methodology used in the NIR, in particular the derivation of the MCF value for domestic wastewater treatment.	Resolved. Germany clarified in the NIR (section 7.5.1.1.2) that the current references (e.g. Becker et al. (2012) and Grün et al. (2013)) are being used in the inventory following a recommendation from a previous review. The current ERT acknowledges the Party's efforts to obtain a more robust data set to update the MCF value. Germany informed the ERT that a research project addressing the issue is under way. See ID#s W.14 and W.16 in table 6.
W.9	5.D.2 Industrial wastewater – CH_4 (W.14, 2016) (W.14, 2015) Transparency	Provide the actual AD underpinning the CH_4 emission estimates from industrial wastewater in CRF table 5.D, as referenced in the document by Austermann-Haun and Witte (2014).	Not resolved. The TOW value reported in CRF table 5.D does not match the value provided in the reference (see also ID# W.17 in table 6).
KP-LULUCF			
KL.1	Deforestation – CO_2 (KL.1, 2016) (KL.1, 2015) (61, 2014) Yes. Transparency	Provide more detail on the individual effects of new data and methodologies on the time series.	Resolved. Germany did not carry out a recalculation for deforestation in its 2018 submission (NIR, section 11.3.1.4).
KL.2	Deforestation – CO_2 (KL.5, 2016) (KL.5, 2015) Yes. Transparency	Include in the NIR an explanation for the gain in carbon stock in above-ground and below-ground biomass on areas subject to deforestation.	Not resolved. No additional information was provided in the chapter on KP-LULUCF in the NIR. During the review, Germany clarified that the areas subject to deforestation activities have not been replanted and the reported gains result from the estimation process. The Party also clarified that regrowth of deforested areas to areas with forest cover does not happen on a significant basis and thus is considered as not occurring. Germany explained that the reported gains result from carbon stocks in biomass immediately after conversion from forest, in line with the methods in the Kyoto Protocol Supplement and the 2006 IPCC Guidelines. The Party stated that the gains and losses under deforestation are estimated based on the LULUCF sector estimates for forest land converted to other land uses, for which biomass gains are reported under all categories other than forest land converted to other land and forest land converted to flooded land. Germany explained that the gains reflect a

ID#	Issue and/or problem classification[a, b]	Recommendation made in previous review report	ERT assessment and rationale
			weighted average of all land (cropland, grassland, wetlands, settlements or other land) after deforestation, and that this procedure is described in the NIR (section 6.4.2.2). Germany stated that in the next submission the description would be included in the KP-LULUCF section in the NIR (section 11.3.1.1.2). In response to a draft version of this review report, Germany provided further information on the calculation of the gains and losses of above-ground and below-ground biomass carbon and the EFs used for the estimates of above-ground and below-ground biomass carbon stock changes, by type of land-use change. The ERT considers that if it is included in the NIR, this information, together with the corresponding values of carbon stocks (Mg ha^{-1}) for above-ground and below-ground biomass in forest land, before conversion to other land use, could explain the reported gain in carbon stock in above-ground and below-ground biomass on areas subject to deforestation.
KL.3	Deforestation – CO_2 (KL.5, 2016) (KL.5, 2015) Yes. Comparability	Use the notation key "NE" when a tier 1 zero stock change method is used.	Resolved. Carbon stock changes in all pools for deforestation activities are reported in CRF table 4(KP-I)A.2.
KL.4	Deforestation – CO_2 (KL.6, 2016) (KL.6, 2015) Yes. Transparency	Include in CRF table 4(KP-I)A.2 the land areas under deforestation by land-use category in the reporting year, and include in the NIR a table with the complete time series of land areas under deforestation for the reporting period.	Addressing. The land areas under deforestation by land-use category in the reporting year are included in CRF table 4(KP-I)A.2. However, Germany did not include in the NIR a table with the complete time series of land areas under deforestation for the reporting period.
KL.5	Deforestation – CO_2 (KL.7, 2016) (KL.7, 2015) Yes. Accuracy	Revise the estimates of soil carbon stock changes for deforestation, on the basis of the reassessment of the SOC value, or provide transparent and verifiable evidence, based on national studies and research, to support the use of the country-specific SOC value.	Addressing. During the review, Germany provided information in relation to ID# L.5 above. On the basis of the same rationale as for that issue, the ERT considered that the approach used by Germany may lead to an underestimation of emissions from deforestation activities. The Party disagreed with the ERT's logic. The ERT considers that the recommendation could be addressed by recalculating the SOC content to be used in the estimation process of soil carbon stock changes for deforestation activities for forest area converted to settlements by using the weighted average value of natural areas (45 per cent in Edelmann (2013)) and of built-up areas (55 per cent), corrected by the discount factor for paved areas according to the proportion of paved and unpaved area in the built-up area. During the review, Germany calculated that for Berlin the average soil carbon stock for sealed areas is 37.1 t C/ha (for 30 cm) and for unsealed areas is 85 t C/ha (for 30 cm), which results in a specific discount of 56.5 per cent taken into consideration by Germany in its calculation of the carbon stock for the total built-up area (60.3 t/ha).

ID#	*Issue and/or problem classification*[a, b]	*Recommendation made in previous review report*	*ERT assessment and rationale*
KL.6	Forest management – CO_2 (KL.9, 2016) (KL.9, 2015) Yes. Transparency	Include in the NIR an exhaustive list of methodological inconsistencies based on the checklist provided in table 2.7.1 of the Kyoto Protocol Supplement.	Resolved. The list of methodological inconsistencies triggering the need for the technical correction is included in the NIR (section 11.5.3.4).
KL.7	Forest management – CO_2 (KL.9, 2016) (KL.9, 2015) Accuracy	Apply a technical correction well before the end of the commitment period.	Not resolved. Germany did not apply a technical correction to the FMRL in the 2018 submission.
KL.8	Forest management – CO_2 (KL.10, 2016) (KL.10, 2015) Yes. Accuracy	Correct the error and report in the CRF accounting table the FMRL contained in the appendix to decision 2/CMP.7 (–22.418 Mt CO_2 eq).	Resolved. The FMRL contained in the appendix to decision 2/CMP.7 (–22.418 Mt CO_2 eq) is reported in the CRF table "Accounting".
KL.9	Forest management – CO_2 (KL.11, 2016) (KL.11, 2015) Yes. Accuracy	Correct the reporting of the FM cap in the CRF accounting table, and report a value of 351,007,813 t CO_2 eq. The ERT notes that this value is fixed for the duration of the commitment period, in accordance with decision 6/CMP.9, paragraph 12.	Resolved. The correct value (351,007,813 t CO_2 eq) is reported in the CRF table "Accounting".
KL.10	CM – CO_2 (KL.12, 2016) (KL.12, 2015) Yes. Accuracy	Stratify the CM estimates, taking into account the SRCs, on the basis of the methodology provided in the Kyoto Protocol Supplement.	Not resolved. Germany has not applied the stratification to the CM estimates consistent with good practice as contained in the Kyoto Protocol Supplement (section 2.9.3).
KL.11	CM – CO_2 (KL.12, 2016) (KL.12, 2015) Yes. Transparency	Include in the NIR detailed information on SRCs, including information on the fertilization occurring in the SRCs and HWP originating from the SRCs.	Addressing. Some of the required information is included in the NIR (section 6.1.2.3.4, and a reference to this section is in section 11.3.1.1.2). During the review, Germany explained that emissions from fertilization in the SRCs are included in the agriculture sector. The ERT noted that the information on HWP originating from the SRCs is not included in the NIR.
KL.12	CM – CO_2 (KL.13, 2016) (KL.13, 2015) Yes. Transparency	Estimate and report the carbon stock changes for woody biomass in accordance with the 2006 IPCC Guidelines and the Kyoto Protocol Supplement, taking into consideration the biomass accumulation from growth and the losses associated with harvest, gathering or disturbance.	Addressing. Germany used three subdivisions for CRF table 4(KP-I)B.2, reporting information for KP.B.2_1 ("cropland management remaining cropland"), KP.B.2_2 ("from cropland management") and KP.B.2_3 ("to cropland management"). For the subdivisions KP.B.2_1 and KP.B.2_3, carbon stock changes were estimated and reported for above-ground and below-ground biomass, while the notation keys "NO" and "IE" were used for KP.B.2_2. In the documentation box of CRF table 4(KP-I)B.2, Germany provided a reference to the NIR (section 11.1.3.3). However, the ERT considers that the information in the NIR is not sufficiently clear as it does not indicate where the emissions and removals reported as "IE" are

ID#	Issue and/or problem classification[a, b]	Recommendation made in previous review report	ERT assessment and rationale
			included. The ERT noted that the rationale for using the "NO" notation key is not included in the NIR.
KL.13	CM – CO_2 (KL.13, 2016) (KL.13, 2015) Yes. Transparency	Include in the NIR transparent and verifiable information to demonstrate that the CM soil pool is not a net source.	Addressing. Germany did not include the required information for CM in the KP-LULUCF section of the NIR, but the information is reported in the NIR (section 6.5.2.3) for the category cropland.
KL.14	Harvested wood products – CO_2 (KL.14, 2016) (KL.14, 2015) Yes. Transparency	Include in the NIR information on the assumptions used in the estimation process (i.e. that all HWP entering the accounting framework originate from FM).	Resolved. The required information is included in the NIR (section 11.3.1.1.7).
KL.15	Harvested wood products – CO_2 (KL.14, 2016) (KL.14, 2015) Yes. Comparability	Use the correct notation keys (i.e. "IE" for AR activities and "NO" for deforestation activities) in CRF table 4(KP-I)C.	Resolved. The correct notation keys are used in CRF table 4(KP-I)C.

[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 Germany did not take place during 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, and as documented in table 4, the ERT has assessed that there are no issues identified in three successive reviews that have not been addressed by the Party.

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

ID#	Previous recommendation for the issue identified	Number of successive reviews issue not addressed[a]
General		
	No such general issues were identified	
Energy		
	No such issues for the energy sector were identified	
IPPU		
	No such issues for the IPPU sector were identified	
Agriculture		
	No such issues for the agriculture sector were identified	
LULUCF		

ID#	*Previous recommendation for the issue identified*	*Number of successive reviews issue not addressed*[a]
	No such issues for the LULUCF sector were identified	
Waste		
	No such issues for the waste sector were identified	
KP-LULUCF		
	No such issues for KP-LULUCF activities were identified	

[a] The review of the 2017 annual submission of Germany did not take place during 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. Tables 5 and 6 contain findings made by the ERT during the individual review of the 2018 annual submission of Germany that are additional to those identified in table 3. In accordance with paragraph 76(b) of the UNFCCC review guidelines, the ERT has prioritized in table 5 recalculations that changed the total emissions/removals for a category by more than 2 per cent and/or national total emissions by more than 0.5 per cent for any of the recalculated years.

Table 5
Additional findings made during the individual review of the 2018 annual submission of Germany related to recalculations

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*
Energy			
E.6	Feedstocks, reductants and other non-energy use of fuels – bitumen	In CRF table 1.A(d) of the 2018 annual submission, Germany used the notation key "NE" for CO_2 emissions from the non-energy use of fuels for bitumen for all inventory years while in the 2017 submission, numerical values were reported for all inventory years. For 2015, this is a difference of –6,889.74 kt CO_2 (6,889.74 kt CO_2 in the 2017 annual submission versus "NE" in the 2018 annual submission). During the review, Germany explained that an error had been made. Because no emissions occur from bitumen (carbon is stored for a long time in road paving), the notation key "NO", used in the CRF tables of the 2016 annual submission (for all inventory years), is correct. The Party indicated that this error would be corrected in the next annual submission by using the notation key "NO". The ERT recommends that Germany use the correct notation key in CRF table 1.A(d) for CO_2 emissions from the non-energy use of bitumen (i.e. "NO" instead of "NE").	Yes. Comparability
E.7	1.A. Fuel combustion – sectoral approach – all fuels – CO_2, CH_4 and N_2O	Most of the recalculations made by Germany in the energy sector are due to the availability of the final national energy balance; that is, the replacement of provisional AD with final AD. The NIR does not, however, include sufficient information on the main assumptions used to establish the provisional energy balance. During the review, Germany explained that the provisional energy balance is provided by the compiler of the official national energy balance before the final balance is published. The provisional data are then replaced by the final data in the annual submission, resulting in corresponding recalculations. The ERT recommends that Germany include in its NIR the main assumptions used to establish the provisional energy balance.	Yes. Transparency
E.8	1.A. Fuel combustion – sectoral approach – all fuels – CO_2, CH_4 and N_2O	Germany did not use the documentation box of CRF table 8 to provide references to relevant sections of the NIR that contain additional information on the recalculations. During the review, Germany explained that it is difficult to include references to each recalculation in the documentation box of CRF table 8 and that it plans to investigate ways to provide useful information in this documentation box in the next annual submission. The ERT encourages Germany to improve the transparency of its reporting by exploring an efficient way to facilitate the comparison of qualitative explanations of recalculations in the NIR with the quantitative data in CRF table 8. The ERT considers that the documentation box of CRF table 8 could include references to the NIR sections where the most significant recalculations, which have been made as a result of the finalization of the national energy balance, are explained.	Not an issue/problem
E.9	1.A. Fuel combustion – sectoral approach –	Germany reported that recalculations were made for public electricity and heat production to take into account an extensive revision of the calculation model for waste fuel for the period 2004–2015 (NIR, p.174). Recalculations due to revision of the waste model were also reported for the non-metallic minerals category (1.A.2.f) (NIR, p.197) and for manufacturing industries and construction – other (1.A.2.g) (NIR, p.201), but for a different period of the	Not an issue/problem

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*
	other fossil fuels – CO_2, CH_4 and N_2O	time series (2011–2015). During the review, Germany explained further the methodological changes applied for waste fuel in the recalculations. In public electricity and heat production, the recalculations were made as a result of changes in the net calorific value. Before the methodological change, constant net calorific values were used, while after it, specific annual net calorific values derived from the energy statistics were used. The methodological change was applied from 2004 onward. In manufacturing industries and construction (1.A.2), recalculations were mostly made to correct double counting. The ERT considers that this explains why recalculations have not been made for the same years.	
E.10	1.A.3.a Domestic aviation – liquid fuels – CO_2, CH_4 and N_2O	Germany reported that recalculations for domestic aviation were carried out solely for the years 2014 and 2015 (NIR, p.212). During the review, Germany confirmed that these recalculations were made to use updated and more accurate AD from the revised TREMOD AV Model (a model for transport emissions from aviation). The Party also confirmed that no recalculations for CO_2, CH_4 or N_2O for years before 2014 had been made, and that AD for 2014 and 2015 were not recalculated owing to a change in methodology but to take into account updated annual information. This finding is related to the recommendation to transparently report the main assumptions used to establish the provisional energy balance (see ID# E.7 above).	Not an issue/problem
IPPU			
I.10	2.A.1 Cement production – CO_2	Germany reported that recalculations were made to include dust discharged via the bypass path for the entire time series (NIR, section 4.2.1.5). The ERT noted that the methodology used to estimate bypass dust was not explained in the NIR. During the review, Germany explained that the German Cement Works Association estimates the bypass dust for its members, which results in a similar value to the default EF of the IPCC (2 per cent). The Party stated that in the future, the IPCC default EF would be used. The ERT recommends that Germany include in its NIR a description of the methodology used for estimating bypass dust, and that the bypass dust estimate of the German Cement Works Association be used in the future, if deemed suitable by the Party, rather than the default EF of the IPCC for bypass dust.	Yes. Transparency
I.11	2.A.4 Other process uses of carbonates – CO_2	Germany reported that a new approach to estimating emissions for ceramics (2.A.4.a) was used for the 2018 annual submission (NIR, section 4.2.4.5). Recalculations resulted in an increase in CO_2 emissions (from 315.59 kt CO_2 for 2015 in the 2017 submission to 848.06 kt CO_2 in the 2018 submission). Previous estimates included only roof tiles and masonry bricks. In the 2018 submission, additional product categories were included, and CO_2 EFs were revised (NIR, table 188). However, the ERT noted that in table 188 multiple product groups were still not estimated and it was stated that their emissions are "negligible". During the review, Germany explained that in 2017 a project was carried out to identify the groups of ceramic products, the manufacturing of which causes process-related CO_2 emissions. In addition, Germany consulted the national EU ETS authority, which has information on installations in ceramics industry which emit CO_2. As a result, Germany identified eight product groups, the manufacturing of which include raw materials containing carbonate and organic materials. Table 188 was compiled as a result of the above-mentioned project and consultation with the EU ETS authority.	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*
		The ERT recommends that Germany provide in the NIR information which explains that certain product groups do not emit process-related CO_2 emissions, referring to the research project from 2017 as well as to the consultation with the EU ETS authority. The ERT further recommends that the Party indicate the CO_2 emissions from such product groups as "not occurring" instead of "negligible" in table 188 of the NIR.	
I.12	2.C.1 Iron and steel production – CO_2	Germany reported that recalculations were made for iron and steel production because updated statistical data became available for 2015 and because the values from the provisional energy balance were replaced by those from the final energy balance (NIR, section 4.4.1.5). During the review, Germany explained that the reference to the updated statistical data is an error and that updated statistical data other than those of the final energy balance did not become available. The Party stated that this sentence would be removed from future NIRs. The ERT encourages Germany to accurately explain in the NIR any recalculations owing to changes between the provisional and final energy balances.	Not an issue/problem
Agriculture			
A.8	3. General (agriculture)	Recalculations were made to the agriculture sector that changed the emission/removal estimate for a category by more than 2 per cent and/or national total emissions by more than 0.5 per cent; however, the ERT did not identify any issues or problems with these recalculations.	Not an issue/problem
LULUCF			
L.6	4. General (LULUCF)	Recalculations were made to the LULUCF sector that changed the emission/removal estimate for a category by more than 2 per cent and/or national total emissions by more than 0.5 per cent; however, the ERT did not identify any issues or problems with these recalculations.	Not an issue/problem
Waste			
W.10	5. General (waste)	Recalculations were made to the waste sector that changed the emission/removal estimate for a category by more than 2 per cent and/or national total emissions by more than 0.5 per cent; however, the ERT did not identify any issues or problems with these recalculations.	Not an issue/problem
KP-LULUCF			
KL.16	General (KP-LULUCF)	Recalculations were made to KP-LULUCF activities that changed the emission/removal estimate for a category by more than 2 per cent and/or national total emissions by more than 0.5 per cent; however, the ERT did not identify any issues or problems with these recalculations.	Not a problem

[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.

11. Table 6 contains additional findings made by the ERT during the individual review of the 2018 annual submission that are not covered in table 3 or 5, but are within the scope of the desk review as specified in paragraph 76 of the UNFCCC review guidelines or paragraph 65 of the Article 8 review guidelines and are findings that the ERT wishes to convey to the Party.

Table 6
Additional findings made during the individual review of the 2018 annual submission of Germany

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*
G.7	QA/QC and verification	Although overall Germany's NIR is of good quality, there are several errors, including some of a typographical nature, in the NIR that decrease the transparency of the inventory. For example, there is an error in the presentation of the impact of recalculations in 1990 with respect to the 2017 submission: the reported value in section 10.2.1 of the NIR is 0.08 per cent, while in section 10.2.1.1 it is 0.06 per cent. Chapter 9 of the NIR has an incorrect title, mentioning indirect nitrogen oxides rather than N_2O. The category structure for metal industry – other (2.C.7) is presented inconsistently between the NIR and the CRF tables: section 4.4 of the NIR indicates that category 2.C.7 has the subcategories copper production (2.C.7.a), nickel production (2.C.7.b) and other production (2.C.7.c), while CRF table 2(I).A-Hs2 includes two subcategories for 2.C.7: copper production (2.C.7.i) and iron and steel production (2.C.1). During the review, Germany acknowledged the errors and indicated that it planned to correct them in the next submission. See also ID# I.21 below. The ERT recommends that the Party correct the presentation of information in section 4.4 of the NIR with respect to the category 2.C.7 as well as the title of chapter 9 of the NIR.	Yes. Transparency
G.8	Inventory management	Although figure 5 of the NIR (p.85) refers to the inventory improvement plan, in the description of inventory planning and management activities (NIR, section 1.2) there is no reference to the scheduling of inventory improvement activities across the inventory cycle. The ERT noted, however, that all issues, including those originating from the review process, seem to have been taken into account in the preparation of the inventory. During the review, Germany provided details on the planning of inventory improvements and described the activities occurring at each phase of its three-stage inventory improvement process. The ERT encourages Germany to improve the transparency of its reporting by including in its NIR information on the structure and key features of its inventory improvement plan.	Not an issue/problem
G.9	Methods	A number of categories for which emissions are considered insignificant were not included in the inventory. These categories are reported in table 525 of the NIR together with their likely emissions in order to show that the level of emissions from categories considered as insignificant as well as the sum of their emissions is in accordance with the conditions established by the UNFCCC Annex I inventory reporting guidelines, paragraph 37(b). However, the NIR does not include any information on the basis for the assumptions made regarding the likely emission levels. During the review, Germany provided a detailed explanation and tables showing the assumptions used for the calculations. The ERT recommends that Germany include in its NIR the key assumptions underlying its assessment of the insignificance of the categories for which emissions are not estimated.	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*
G.10	CRF tables	For several categories reported as "IE", CRF table 9 does not include a transparent explanation of the reason for the allocation of emissions in a different category. For example, explanations are not provided for the allocation of CO_2, CH_4 and N_2O emissions from several subcategories of manufacturing industries and construction (1.A.2) to manufacturing industries and construction – other (1.A.2.g.viii) or for the use of the notation key "IE" for emissions and removals from drainage and rewetting and other management of organic and mineral soils in subcategories of wetlands. The ERT recommends that Germany include an explanation for each category reported as "IE" in CRF table 9, or provide a reference to the section in the NIR where the explanation is included.	Yes. Comparability
G.11	CRF tables	In CRF table 6, indirect emissions of CO_2 and N_2O from the energy and IPPU sectors were reported as "NO". Furthermore, neither a notation key nor a figure was reported for the indirect emissions of CO_2 and N_2O from the LULUCF and waste sectors. During the review, Germany explained that it applied the same approach to the calculation of indirect emissions as during the first commitment period of the Kyoto Protocol. The Party stated that the notation keys for indirect emissions would be changed to "NE" in the next submission. The ERT recommends that Germany use the notation key "NE" to report indirect CO_2 and N_2O emissions from the energy, IPPU and waste sectors in CRF table 6, as well as for indirect CO_2 emissions from the LULUCF sector, if appropriate. Noting that the Party reports indirect N_2O emissions from leaching and run-off under the LULUCF sector in CRF table 4(IV), the ERT recommends that Germany use the notation keys "NE" and "IE" to report indirect N_2O emissions from the LULUCF sector in CRF table 6.	Yes. Comparability
G.12	Uncertainty analysis	According to the UNFCCC Annex I inventory reporting guidelines, paragraph 15, "Annex I Parties shall quantitatively estimate the uncertainty of the data used for all source and sink categories using at least approach 1, as provided in the 2006 IPCC Guidelines, and report uncertainties for at least the base year and the latest inventory year and the trend uncertainty between these two years". The ERT noted that estimates of uncertainties for the base year are not included in the NIR, but that the Party explained that due to technical limitations, the base year used was 1995 (NIR, section 1.7.1.1). During the review, Germany explained the national circumstances relevant to this issue. The reunification of Germany formally occurred on 3 October 1990; that is, during the inventory base year. While both West Germany and East Germany had sophisticated statistical systems in place, the comparability of the two data sets was an issue. This situation is particularly challenging for base-year uncertainties, as the East German system no longer exists and the current system has significantly evolved to cover the whole country. The Party considers that simply assuming similar uncertainties for both parts of the country would not be a valid approach because industry standards, fuel composition and emission reduction technology, as well as overall economic structure, differed greatly in the two parts. It is difficult, therefore, to derive reliable estimates of base-year uncertainties. Germany's expectation is that the uncertainties for the base-year inventory would be slightly higher than those calculated for the most recent year even when the impact of the use of the provisional energy balance is taken into consideration in the uncertainties of the most recent year. The ERT acknowledged the Party's explanation.	Yes. 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 Germany estimate and report uncertainties for the base year in accordance with the UNFCCC Annex I inventory reporting guidelines. The ERT notes that the 2006 IPCC Guidelines (volume 1, chapter 3.2.1.3) indicate that well-informed expert judgments are appropriate data sources in the absence of other information, and that the uncertainty estimates available for the earlier years of the German inventory could serve as a starting point for expert judgments.	
G.13	Article 3, paragraph 14, of the Kyoto Protocol	The ERT noted that in the NIR (chapter 15) Germany reported that there is no change in its reporting of the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol since the previous annual submission. The ERT also noted that in its 2016 annual submission, the Party explained that termination of subsidized hard-coal production was planned for 2018. During the review, Germany explained that revision of the clause for the termination of subsidized hard-coal production has been cancelled and the country's last hard-coal mine will be closed at the end of 2018. This event falls under the coverage of the 2019 annual submission, where it will be reported. The ERT welcomed the Party's explanation and concluded that the information provided in chapter 15 of the NIR is complete and transparent.	Not an issue/problem
		The ERT encourages Germany to provide in its next submission an update on hard-coal subsidies and the impact of relevant government decisions.	
Energy			
		No findings beyond those contained in tables 3 and 5 above were made by the ERT during the 2018 individual review for the energy sector.	Not an issue/problem
IPPU			
I.13	2.A.2 Lime production – CO_2	Germany reported that "two separate, parallel channels" were used as data sources for lime production (NIR, section 4.2.2.3). During the review, Germany clarified that this statement refers to the two different data collection methods applied by BV Kalk: (1) a kiln survey; and (2) collection of annual production data from companies.	Yes. Transparency
		The ERT recommends that Germany improve the transparency of its reporting in the NIR by explaining what the two channels of data sources for lime production are and including a description of the data collection system.	
I.14	2.A.3 Glass production – CO_2	Since 2011 there has been an increasing trend in the CO_2 IEF of all glass types from 0.114 t CO_2/t glass in 2011 to 0.124 t CO_2/t glass in 2016 (NIR, table 183). Regarding this trend, Germany states that "discrepancies are due to annual fluctuations in production quantities of various individual glass types and in cullet inputs" (NIR, section 4.2.3.1); however, the increasing IEF is not explained. During the review, Germany clarified that the production share of more GHG-intensive products, such as stone wool and glass fibres, has increased, explaining the increase in the IEF.	Yes. Transparency
		The ERT recommends that Germany include in its NIR an explanation for the increasing CO_2 IEF trend since 2011, namely that the production share of more GHG-intensive products, such as stone wool and glass fibres, has increased.	

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*
I.15	2.A.3 Glass production – CO_2	Germany reported that the applicable rate of cullet input still needs to be improved (NIR, section 4.2.3.4); however, this was not mentioned in the section on planned improvements (4.2.3.6). During the review, Germany confirmed that no future improvements are currently planned owing to challenges relating to the complexity of cullet data as well as to a lack of sufficient information on cullet input. The ERT notes that this is not a key category in Germany. The ERT encourages Germany to improve the accuracy of its emission estimates for this category by improving cullet input data.	Not an issue/problem
I.16	2.B.2 Nitric acid production – N_2O	Germany reported that emission control technologies are used and "in some cases catalytic decomposition directly following ammonia combustion" occurs (NIR, section 4.3.2.2). During the review, Germany explained that secondary catalytic reduction of N_2O and NH_3 is used. The ERT noted the reporting and documentation section of the 2006 IPCC Guidelines (volume 3, chapter 3.3.4.2) indicates that it is good practice to document all information required to produce the inventory and that in the case of nitric acid production, the type of abatement technology is an example of specific documentation. The ERT recommends that Germany include in its NIR the type of technology used to control emissions at nitric acid plants.	Yes. Transparency
I.17	2.B.2 Nitric acid production – N_2O	Germany reported that for all but one of the nitric acid plants in the country, plant-specific data were used in the emission estimations, while for the remaining plant, estimates were used (NIR, section 4.3.2.2). The NIR does not include clear information on how this impacts the accuracy or the uncertainties of the estimates. During the review, Germany explained that the plant for which estimates rather than plant-specific data were used contributed a minor share of the total emissions for the category. The Party informed the ERT that an agreement has been formalized with the company so that plant-specific data from emissions trading will be available for the inventory. The ERT recommends that Germany use the newly available plant-specific data to estimate N_2O emissions for the plant for which estimates are currently used.	Yes. Accuracy
I.18	2.B.4 Caprolactam, glyoxal and glyoxylic acid production – N_2O	The ERT acknowledges Germany's approach to reporting N_2O emissions from caprolactam. In particular, the ERT agrees with the Party's approach to reporting emissions from the one plant under 2.B.2 (see ID# I.5 in table 3). The ERT further understands that the Party has calculated N_2O emissions from both caprolactam plants and determined that total emissions excluded from category 2.B.4.a (caprolactam) are below 0.05 per cent of total national GHG emissions, and that including both plants in the significance calculation still leads to the total of all emissions excluded from Germany's annual submission to remain below 0.1 per cent of national emissions. The ERT notes that, according to paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines, a Party may consider that a disproportionate amount of effort would be required to collect data for a gas from a specific category. The ERT finds that as long as the total emissions from caprolactam production (including the plant currently reported in 2.B.2, and any future caprolactam plants identified) continue to remain below the thresholds contained in paragraph 37(b) then the Party's reporting is consistent with the UNFCCC Annex I inventory reporting guidelines and the Party can continue reporting N_2O emissions from only one of the plants. The ERT notes, however, that the discussion of 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
		reporting on the significance of caprolactam could be improved (see ID# I.5 in table 3). NIR pages 319 and 320 refer only to an "installation" and therefore it was not clear to the ERT that emissions from both plants were determined to be below the threshold of significance in accordance with paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines. The ERT recommends that Germany clarify in the NIR that when assessing significance, the Party has used approximated data from both caprolactam plants and determined that both plants together fall below the threshold of significance.	
I.19	2.B.9 Fluorochemical production – HFCs	Germany reported that fluorochemical production data are "assumed to be very precise" in the uncertainties and time-series consistency section of the NIR (4.3.9.1.3). The ERT noted that an EF of 0.15 was stated to be "assumed for the period as of 2011" (NIR, section 4.3.9.1.2) but that information on the unit of the EF was not included. During the review, the ERT requested additional information to substantiate these statements. In response, Germany explained the closed-loop design of the facility in question, which is directly connected to a chlorofluorocarbon-cracking plant, resulting in a very small amount of emissions. The Party also explained that in earlier annual submissions it had reported zero emissions for this category; however, after a comparison with reporting of other Parties it decided to use an EF of 0.15. The ERT noted that the range of default EFs in table 3.28 of the 2006 IPCC Guidelines (volume 3) is from 0.02 to 0.04 kg HFC-23/kg HCFC-22 produced, and that it is stated below the table that the EF for optimized large plants may go down to 0.014 kg HFC-23/kg HCFC-22 produced. The ERT recommends that Germany clarify in its NIR the unit for its EF of 0.15 for fluorochemical production and provide further justification for the choice of the EF. The ERT encourages Germany to include in its NIR an explanation as to why the fluorochemical production data are considered to be precise.	Yes. Transparency
I.20	2.C.3 Aluminium production – SF_6	Germany reported that the SF_6 EF for secondary aluminium has been reduced to 1.5 per cent owing to "structural conversions" (NIR, section 4.4.3.2). During the review, the ERT requested clarification of what is meant by "structural conversions". In response, Germany explained that construction changes in the aluminium plant were the cause of the decreased EF. The details of the construction changes were not provided owing to confidentiality concerns. The Party explained that a confidential measurement protocol provided by the plant to the German Environment Agency justified the change in EF, and that the responsible regulatory authority had checked and approved the measurement protocol of the plant. The ERT recommends that Germany include in the NIR the explanation that the aluminium plant was redesigned, resulting in a reduction in the SF_6 EF for secondary aluminium. The ERT also recommends that the Party explain in detail how the change in the EF was justified, whether by confidential measurement results and/or by a measurement protocol, and that the measurement protocol was checked and verified by a third party.	Yes. Transparency
I.21	2.C.7 Other (metal industry) – CO_2	In the introduction to category 2.C, Germany reported that the category metal industry – other (2.C.7) includes copper, nickel and other production and that no emissions result from these categories in Germany (NIR, section 4.4, p.334). In the category-specific section of the NIR for metal industry – other (section 4.4.7.1), nickel is not	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*
		mentioned, and it is not listed in CRF table 2(I).A-Hs2. During the review, Germany explained that nickel production existed prior to 1991 but ceased after 1991. The ERT noted that the 2006 IPCC Guidelines do not include a method or an EF for nickel production. The ERT recommends that the Party clarify whether process emissions from nickel production are included in the inventory for the years 1990 and 1991 and if so, report the emissions in CRF table 2(I).A-Hs2 or, if emissions are included elsewhere, use an appropriate notation key in accordance with the UNFCCC Annex I inventory reporting guidelines, paragraph 37. If these emissions are reported, the ERT recommends that Germany include in its NIR the information that nickel production occurred in the country until 1991. If process emissions from nickel production are not included in the inventory for the years 1990 and 1991, the ERT recommends that the Party remove all references to nickel production in the NIR.	
I.22	2.C.7 Other (metal industry) – CO_2	Germany reported that the category metal industry – other (2.C.7) includes copper, nickel and other production (NIR, section 4.4, p.334). In section 4.4.7.1, the Party states that GHG emissions from copper production mainly occur as a result of combustion activities and that "greenhouse gas emissions that do not originate in process combustion are very low in comparison". Emissions associated with copper production are reported as "NA" in CRF table 2(I).A-Hs2. The ERT noted that the 2006 IPCC Guidelines do not include a method or an EF for process emissions from copper production. During the review, Germany explained that non-combustion emissions arise as part of the "fire refining" step of copper production and that the emissions from natural gas used in that step are included in the energy sector under non-ferrous metals. The ERT noted that the CO_2 emissions from gaseous fuels under non-ferrous metals are reported as "IE" in CRF table 1.A(a)s2 and that the emissions are included under category 1.A.2.g.viii. The ERT recommends that Germany include in its NIR a clarification of whether process emissions from copper production other than those included in the energy sector occur and are reported, and align the text in sections 4.4 and 4.4.7.1 accordingly. The ERT also recommends that the Party use the notation key "IE" in CRF table 2(I).A-Hs2 for process emissions from copper production if emissions are estimated but included elsewhere. The ERT notes that the current reporting of "NA" is correct if copper production does occur but there are no process emissions.	Yes. Transparency
I.23	2.E. Electronics industry – HFCs, PFCs, SF_6 and NF_3	For the categories integrated circuit or semiconductor (2.E.1), photovoltaics (2.E.3) and heat transfer fluid (2.E.4), Germany reported that "the uncertainties have been completely determined" (NIR, pp.365–367). The uncertainties were not, however, presented in the NIR except for the total category uncertainty for the electronics industry by gas (NIR, table 551). During the review, Germany provided the uncertainties for the categories in question. The ERT recommends that Germany include in its NIR the uncertainty values for the categories integrated circuit or semiconductor (2.E.1), photovoltaics (2.E.3) and heat transfer fluid (2.E.4).	Yes. Adherence to the UNFCCC Annex I inventory reporting guidelines
I.24	2.G.2 SF_6 and PFCs from other product use – SF_6	Germany reported the SF_6 stocks and SF_6 emissions of particle accelerators in tables 203 and 204 of the NIR. The data are presented by "user category" for the years 1995, 1997, 1999, 2001, 2003 and 2010. Two additional columns are included in the tables, "Type of equipment 1995 to 2003" and "Equipment, 2010", which are not clearly	Not an issue/problem

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*
		explained. During the review, Germany explained that these two columns present the number of accelerators existing by category type and year. The ERT encourages Germany to improve the labelling of tables 203 and 204 of the NIR in order to clarify what data the columns "Type of equipment 1995 to 2003" and "Equipment, 2010" contain.	
Agriculture			
A.9	3. General (agriculture) – CH_4 and N_2O	Germany reported that CH_4 emissions from enteric fermentation and CH_4 and N_2O emissions from manure management of buffaloes were estimated and reported under enteric fermentation and manure management of suckling cows until 2012 (NIR, p.443). Germany further explained that since 2013, the official animal population figures for cattle include buffaloes, and buffalo numbers cannot be separated from cattle numbers. The ERT noted, however, that FAOSTAT (http://www.fao.org/faostat/en/#home) and EUROSTAT (https://ec.europa.eu/eurostat) provide annual statistical data on buffalo livestock populations (e.g. FAOSTAT provides a value of 7,312 head in 2016). According to the agriculture sector methodology report of Haenel et al. (2018, p.105), buffalo husbandry in Germany is similar to suckler cow husbandry and animal size is comparable. Hence, Germany used the enteric fermentation EF, VS value and Nex rate developed for suckling cows to estimate emissions from enteric fermentation and manure management of buffaloes in the period 1990–2012. However, the ERT noted that Germany did not report the performance parameters used to estimate the EF, VS value and Nex rate for suckling cows, and did not provide a reference to support the statement that performance parameters and husbandry systems of buffaloes are similar to those of suckling cows. During the review, Germany stated that FAOSTAT data on buffalo livestock population are estimated rather than collected by an official national statistical authority, and therefore the Party does not consider that use of these data would improve the accuracy of its reporting. In addition, Germany explained that it is not known in which cattle categories the buffaloes have been included since 2013 (i.e. calves, growing male or female animals, adult animals). Further, the Party explained that the number of buffaloes (counted by the German Buffalo Association as 2,829 head in 2012) is so low that emissions from buffaloes, if reported separately, would fall below the threshold of significance given in paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines. Further elaboration of the estimates for buffaloes would therefore be disproportionate to their importance. The ERT recommends that Germany investigate and provide supplementary information in its NIR, or in a supplementary publication referenced in the NIR (such as Haenel et al. (2018)), on performance parameters of buffaloes (e.g. weight, milk yield, husbandry practices) to support and justify the appropriateness of the use of the EF, VS value and Nex rate developed for suckling cows in the estimation of emissions from enteric fermentation and manure management of buffaloes in the period 1990–2012. The ERT also recommends that the Party improve the transparency of its reporting by providing the information on buffalo numbers available for 2012 to justify the Party's view that, in accordance with paragraph 73 of the annex to decision 13/CP.20, the amount of effort and resources required for the improvement is disproportional to the impact on the level or trend of GHG emissions.	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*
A.10	3. General (agriculture) – CH_4 and N_2O	Germany stated that FAOSTAT does not list goat counts explicitly, as it includes them in a sheep and goats time series (NIR, p.448). However, the ERT noted that FAOSTAT does include data on the goat population in Germany for the entire time series, and that the FAOSTAT data for some years are different from the data reported by the Party (e.g. for 2011, 160,000 head in FAOSTAT versus 143,357 in CRF table 3.As1). During the review, Germany clarified that after the NIR 2018 was prepared, FAOSTAT was updated to include separate data on goats. The Party provided an explanation for the differences observed in some years between FAOSTAT data and inventory data for goat population. The ERT encourages Germany to provide an explanation for the inconsistencies between FAOSTAT data on goat population and inventory data.	Not an issue/problem
A.11	3.A.1 Cattle – CH_4	Germany stated in the agriculture sector methodology report (Haenel et al., 2018, section 4.7.2) that mean annual ME requirement of suckler cows is assumed to be constant at 36,000 MJ per animal, and that a share of 1,620 MJ per animal is consumed with concentrates and the rest is consumed with pasture grass and grass silage. During the review, in response to the ERT's request that performance parameters (e.g. weight, weight gain, milk yield) applied as the basis for ME and DMI of suckling cows be specified, Germany explained that constant ME and DMI values were used and that they were obtained from KTBL (2006). The reference represents data for a typical suckling cow, and is widely used by German farmers for planning purposes. Therefore, the Party considers that the reference correctly represents German agricultural practice and takes energy requirements from all activities into account. The ERT noted that Germany reported, in its supplementary Excel file to Haenel et al. (2018), data on mean percentage time spent on pasture by suckling cows (table AI1005CAT.130). This grazing time has an increasing trend, increasing from 41.5 per cent in 1990 to 47.3 per cent in 2016. In response to a question raised by the ERT on how energy required for activities (e.g. walking, eating from pasture) is considered in the estimation of ME and DMI of suckling cows, as DMI and ME values per head of suckling cow are kept constant to estimate the enteric fermentation CH_4 EF over the entire time series, the Party explained that, based on the calculations completed by KTBL (an enquiry was sent to KTBL during the review), the impact of the difference in grazing times between 1990 and 2016 on extra ME requirement is negligible (141 MJ per animal per year) and, hence, it might be accounted for under conservative rounding up, because Germany used, in the inventory, 36,000 MJ per animal per year instead of 35,766 MJ per animal per year as reported by KTBL. The ERT recommends that Germany improve the transparency of its reporting by including in its NIR, or in a supplementary publication referenced in the NIR (such as Haenel et al. (2018)), more information on the performance indicators (e.g. weight, weight gain, milk yield) used to calculate ME (MJ per animal per year) and DMI (kg dry matter per animal per year) of suckling cows, and explaining how the changes in energy required for activity at pasture contribute to the values of ME and DMI of suckling cows.	Yes. Transparency
A.12	3.A.1 Cattle – CH_4	Germany reported in the agriculture sector methodology report (Haenel et al. (2018), p.151) on the methodology applied to estimate ME requirements of heifers, which include the energy required for maintenance and for growth for various weight gains and during pregnancy. The ERT noted that Germany reported, in its supplementary Excel file to	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
		Haenel et al. (2018), data on mean percentage time spent on pasture by heifers (table AI1005CAT.69). This grazing time has a slightly increasing trend, increasing from 20.0 per cent in 1990 to 20.7 per cent in 2016. During the review, in response to a question raised by the ERT on how energy required for activities (e.g. walking, eating from pasture) is considered in the estimation of ME of heifers, Germany explained that average ME requirements due to grazing were taken into account, but variations in mean percentage time spent on pasture were not reflected in the estimations of average ME. In addition, the Party explained that is not clear how much grazing time was assumed when deriving the data in table 4.32 of Haenel et al. (2018) (ME requirements as a function of animal weight and weight gain). Moreover, Germany stated that the influence of weight gain and weight on ME requirements is of much more importance than the influence of grazing time, as the change in grazing times of heifers from 20.0 per cent in 1990 to 20.7 per cent in 2016 is small. The Party also stated that data on mean percentage time spent on pasture are considered in the calculation of ME contributions by pasture grass and grass silage, which has a slight impact on the estimations of VS value and Nex rate. The ERT recommends that Germany improve the transparency of its reporting by including in its NIR, or in a supplementary publication referenced in the NIR (such as Haenel et al. (2018)), an updated explanation of categories of energies taken into consideration in the estimates of ME, including time spent on pasture.	
LULUCF			
L.7	Land representation	Germany used several data sources in the land classification process to identify land use and land-use changes. The ERT noted that in table 364 of the NIR the difference between data from the main soil use survey and from the inventory for total area of cropland and grassland is 3,246 kha, almost 10 per cent of the total national territory. During the review, Germany provided additional information on the agricultural statistics of the Federal Statistical Office, which were used in the verification activities. The information illustrated that the difference in total area of cropland and grassland between the two data sources results from differences in definitions used and data collection methods. The Party explained that an accuracy issue is not involved regarding the land classification system as it consistently uses only a high-resolution digital system; in the Party's view there is, at most, an issue related to the verifiability of the data given there is no other directly comparable data collection system that would identify land areas using the same definitions and methods used for inventory reporting. Germany also explained that a different nomenclature system is adopted by the official statistics; that is, different definitions are used for important land-use categories, in particular agricultural areas (fields, grassland) and settlements. For example, the main soil survey excludes farm areas under 2 ha, traffic areas and boundary ridges, all of which are included in the inventory. The ERT encourages Germany to enhance the verification system, for example by setting up a process for the comparison of the statistical survey used with remote-sensing images, in order to ensure the overall accuracy of the land classification system.	Not an issue/problem

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*
L.8	4. General (LULUCF) – CO_2	Germany reported in table 341 of the NIR a time series for mean carbon stocks per area in phytomass pools of deforested areas that is apparently not in line with the EFs for biomass for forest land converted to other land uses reported in table 340 of the NIR. During the review, Germany explained that while table 341 shows the stocks of biomass for deforested areas, it includes only the loss of biomass during deforestation; table 340 (row 2) shows not only the loss of biomass but also the gain of biomass after land-use change. The ERT encourages Germany to improve the transparency of its reporting by including in its NIR the explanation that while table 341 of the NIR shows the stocks of biomass for deforested areas, it includes only the loss of biomass during deforestation; table 340 (row 2) shows not only the loss of biomass but also the gain of biomass after land-use change.	Not an issue/problem
L.9	4. General (LULUCF)	The area of cultivated organic soils reported in the agriculture sector for 2016 in CRF table 3.D (1,239.29 kha) is different from the area of organic soils under cropland and grassland categories reported in CRF tables 4.B (382.00 kha) and 4.C (1,079.53 kha). The area of cultivated organic soils is also different from the equivalent data from FAOSTAT; that is, 1,216.30 kha (FAOSTAT) compared with 1,465.43 kha (CRF tables 4.B and 4.C) in 2015. During the review, Germany clarified that the difference is due to the organic soils under grassland. Woody grassland is not included in agricultural land while it is included in the LULUCF sector. In addition, grassland contains an area of 71.41 kha in 2016 that has not been drained and was not considered in the calculation of emissions from organic soils in the agriculture sector. Regarding the comparison with FAOSTAT data, the Party explained that the database contains values that have not been updated. The ERT encourages Germany to improve the transparency of its reporting by including in its NIR the explanation that the difference in the area of cultivated organic soils in CRF table 3.D compared with CRF tables 4.B and 4.C occurs because: (1) woody grassland is not included in agricultural land while it is included in the LULUCF sector; and (2) the area of organic soils in grassland in the LULUCF sector contains an area (71.41 kha in 2016) that has not been drained and was not considered in the calculation of emissions from organic soils in the agriculture sector.	Not an issue/problem
L.10	4.A.1 Forest land remaining forest land – CO_2	See issue ID# L.1 in table 3. The ERT recommends that Germany include in the NIR a comparison of the times series of total harvest of public forests derived from German logging statistics, total harvest derived from national forest inventories, and the corrected logging statistics calibrated with forest inventory data. The ERT further recommends that Germany explain in the NIR that the logging statistics include only public forest and that Germany provide a description of the estimation process in the NIR (i.e. the official harvest statistics data are corrected based on information on the loss of merchantable wood derived from national forest inventories in Germany). Furthermore, if the values of "calibrated harvest" are not equal to the NFI data, for the years when the NFI has been carried out, the ERT recommends that the Party provide an explanation for the difference.	Yes. Transparency
L.11	4.B.1 Cropland remaining cropland – CO_2	Germany used remote-sensing data to assess land categories, while statistical information was used to assess the annual area covered by various crops (i.e. herbaceous plants of annual crops, fruit plantations, vineyards, Christmas tree plantations, tree nurseries, short-rotation plantations) and by grassland. During the review, Germany clarified that	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
		a specific biomass carbon stock was calculated using official statistics, crop by crop, using the relative share of each crop to the total cropland area. The calculated carbon stock was then used only for the calculations for the relevant reporting year. The Party stated that section 6.1.2.3.3 of the NIR would be further elaborated in the next submission. The ERT recommends that Germany improve the transparency of its reporting by including in its NIR an explanation of the estimation process for cropland biomass carbon stock, including how the EFs for different crops are derived from the official statistics and how the Party ensures that no overestimation or underestimation of EFs occurs, given that no information on crops is currently available in the land classification system used.	
Waste			
W.11	5.A.1 Managed waste disposal sites – CH_4	Table 430 of the NIR presents half-lives and CH_4 formation rates (k-values). The k-values do not match the IPCC defaults to which references are made in the table. For example, for food waste, a k-value of 0.173 is given in the table while the IPCC default is 0.185 (2006 IPCC Guidelines, volume 5, table 3.3). For some of the other waste fractions, there are slight differences. It is clear that this issue has arisen from rounding when converting between half-lives and k-values. However, the k-values are being used in the emission calculations, and the 2006 IPCC Guidelines state that the half-lives are based on k-values and not the other way around. During the review, Germany explained that an earlier version of the IPCC spreadsheet model for solid waste disposal on land used half-lives rather than k-values and that the Party had continued to apply this model. Germany informed the ERT that two research projects are under way to determine national k-values. The ERT noted that given that the landfilling of food waste has decreased significantly since 2005, there is an overestimation of emissions in the most recent years. The ERT recommends that Germany update the k-values used in the emission estimation as soon as the data from the research projects that will determine national k-values are available. If the results are not available in time for the 2019 annual submission, the ERT recommends that the Party include the status of these projects in the NIR, including a timeline for the implementation of their results in the inventory.	Yes. Accuracy
W.12	5.B. Biological treatment of solid waste – CH_4 and N_2O	Germany used country-specific EFs to estimate emissions from composting and anaerobic digestion (NIR, section 7.3.1.2). However, the report used as a reference (Cuhls et al., 2015) presents EFs both as mean and median values, and there are substantial differences between these values; for example, for CH_4 from composting the EF based on the mean is 2,600 g/t and that based on the median is 1,400 g/t. The NIR does not include information on the selection of the EFs. During the review, Germany informed the ERT that some measurement results included very high emissions, which led to a very high mean value. During an expert peer review these high values were evaluated as being outliers and not representative of normal operating conditions. Together with the researcher (Cuhls) it was therefore decided to use the median values as EFs. The Party explained that the EFs were first calculated for each technology as a weighted average before being aggregated, and that changes in atmospheric conditions were taken into account by conducting measurements at the same plants in summer and winter. The ERT recommends that Germany include in its NIR more information on the derivation of the CH_4 and N_2O EFs for composting and anaerobic digestion, in particular regarding the identification of outliers and the criteria for excluding a given measurement, and the information on the EFs being based on seasonal measurements.	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*
W.13	5.B.2 Anaerobic digestion at biogas facilities – N_2O	The previous review highlighted a potential double counting of emissions from anaerobic digestion of animal manure in the anaerobic digestion at biogas facilities (5.B.2) category and manure management (3.B) category (see ID# W.4 in table 3). In section 10.4.3 of the NIR, the issue is listed as resolved, with the explanation "Data are now reported solely in cat. 5.B.2". However, in section 7.3.2 of the NIR, it is clear that the amount of animal waste treated at biogas facilities has been subtracted. During the review, Germany clarified that the text in the NIR (section 10.4.3) is erroneous and that these emissions have been allocated to the agriculture sector. The ERT recommends that Germany include in the section on anaerobic digestion at biogas facilities in the NIR a reference to the section(s) in the agriculture sector where the methodology is described (in the NIR 2018, sections 5.1.3.6.5 and 5.1.4).	Yes. Transparency
W.14	5.D.1 Domestic wastewater – CH_4	During the previous review, it was recommended that Germany include more information on the methodology used to calculate CH_4 emissions from domestic wastewater treatment plants (see ID# W.8 in table 3). During the review, the current ERT requested the background documents from the Party (Becker et al., 2012; Grün et al., 2013). The EF used is derived from Becker et al. (2012) on the basis of measurements at only three plants, and the paper states that owing to the limited sample size, the EF should be considered a first estimate. The ERT considered that the data are not sufficiently robust to be extrapolated to the national level. During the review, Germany explained that the current approach had been implemented on the basis of a recommendation of the previous ERT. The Party informed the current ERT that a scientific study is under way that should produce better documented EFs. Considering the situation, the ERT does not recommend that Germany change the current approach until the results of this new study are available. The ERT recommends that Germany implement the results of the study that will produce better documented EFs as soon as the data are available. If the results are not available in time for the 2019 submission, the ERT recommends that the Party include the status of this study in the NIR, including a timeline for the implementation of its results in the inventory.	Yes. Accuracy
W.15	5.D.1 Domestic wastewater – CH_4	During the review, the ERT noted that the MCF value used for septic tanks (0.17) is different from the IPCC default of 0.5 (2006 IPCC Guidelines, volume 5, table 6.3) and refers to Gibbs and Woodbury (1993), which is not publicly available. Upon request, Germany provided the ERT with a copy of the reference. The paper presents MCF values for animal manure stored at different temperatures and Germany used the MCF values for slurry at 10 and 20 °C to calculate a weighted MCF based on the soil temperature in Germany. Gibbs and Woodbury (1993) refers to the same author (Hashimoto) that is referenced in the Revised 1996 IPCC Guidelines and the same MCF values of 10 and 35 per cent are provided. In response to a question raised by the ERT on the applicability of MCF values derived for animal manure to human sewage, the Party explained that no better data are considered to be available. The ERT agrees that the default MCF for septic tanks in the 2006 IPCC Guidelines does not represent the climatic conditions in Germany. The ERT recommends that Germany investigate whether it is reasonable to assume the same MCF for human sewage as for animal manure, noting that there are significant differences between swine and cattle slurry and that the	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*
		retention time might be different between a septic tank and a slurry tank. Depending on the results of this investigation, the ERT recommends that Germany either assess whether it would be better to use the appropriate MCF values reported in table 10.17 of the 2006 IPCC Guidelines (volume 4) rather than the data that were used in the Revised 1996 IPCC Guidelines or if animal manure is not found to be representative for human sewage, to use the IPCC default MCF.	
W.16	5.D.1 Domestic wastewater – CH_4	Germany used a national EF to estimate CH_4 emissions from domestic wastewater treatment plants (see ID# W.14 above). The EF was assumed to be applicable for the year 2014. According to section 7.5.1.1.2 of the NIR, the Party extrapolated this EF back to 1990 and forward to 2020 on the basis of Grün et al. (2013). This is a small case study consisting of few wastewater treatment plants in one area and assumes that the emissions in 2020 will be 50 per cent of the emission level in 1990. During the review, Germany explained that the underlying trend derived in Grün et al. (2013) was confirmed by the lead authors of that study to apply all over Germany. The ERT noted that the NIR (section 7.5.1.1.2) states that there are about 9,300 wastewater treatment plants in Germany, and the study from which the assumption is derived covers about 5.	Yes. Transparency
		The ERT recommends that Germany describe in more detail in its NIR the basis for the assumption that the study by Grün et al. (2013), covering only about 5 wastewater treatment plants, is representative for all of Germany.	
W.17	5.D.2 Industrial wastewater – CH_4	The methodology for estimating CH_4 emissions from industrial wastewater treatment is not transparently described, and it is not possible to verify the emission estimates on the basis of the information in the NIR and CRF tables. During the review, in response to a request from the ERT, Germany provided the reference Austermann-Haun and Witte (2014) and directed the ERT to where the relevant information could be located in this report. The ERT noted that some of the data in the report are confidential. Nevertheless, the ERT enquired whether some of the data, for example in aggregated form, could be included in the NIR. In response, Germany indicated that additional information in the form of a table showing TOW and CH_4 EFs for wastewater in different industries would be included in the NIR of the 2019 annual submission. Based on the information provided during the review, the ERT concluded that the emission estimates were correct.	Yes. Transparency
		The ERT recommends that Germany report in its NIR a table showing TOW and CH_4 EFs for wastewater in different industries.	
KP-LULUCF			
		No findings beyond those contained in tables 3 and 5 above were made by the ERT during the 2018 individual review for the KP-LULUCF activities.	Not a problem

[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 identified 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

12. The ERT has not identified the need to apply any adjustments to the 2018 annual submission of Germany.

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

13. Germany has elected commitment period accounting and therefore the issuance and cancellation of units for KP-LULUCF activities is not applicable for the 2018 review.

VIII. Questions of implementation

14. No questions of implementation were identified by the ERT during the individual review of the 2018 annual submission.

Annex I

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

1. Tables 7–10 provide an overview of total GHG emissions and removals as submitted by Germany.

Table 7
Total greenhouse gas emissions for Germany, 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*	*FM*
FMRL								–22 418.00
Base year	1 224 000.86	1 255 312.61	NA	NA	NA		38 440.46	
1990	1 220 323.43	1 251 635.18	NA	NA				
1995	1 090 313.92	1 123 368.77	NA	NA				
2000	1 007 008.40	1 044 968.80	NA	NA				
2010	926 414.47	942 783.09	NA	NA				
2011	904 571.69	920 304.96	NA	NA				
2012	910 152.46	924 628.11	NA	NA				
2013	927 716.94	942 004.48	NA	NA		–4 194.57	37 022.98	–54 367.62
2014	887 784.99	902 676.18	NA	NA		–4 387.25	36 769.14	–54 913.99
2015	892 376.33	906 751.85	NA	NA		–4 593.90	36 815.75	–54 648.83
2016	894 925.32	909 404.50	NA	NA		–4 794.21	36 918.55	–55 023.95

Note: Emissions/removals reported in the sector other (sector 6) are not included in 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, PFCs, SF_6 and NF_3. The base year for CM and GM under Article 3, paragraph 4, of the Kyoto Protocol is 1990 for Germany. 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 Party has not reported 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.

Table 8
Greenhouse gas emissions by gas for Germany, 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	1 052 997.50	120 226.70	65 024.50	50.32	3 060.42	5 840.87	4 428.00	6.88
1995	940 086.75	104 930.86	61 287.25	2 608.74	2 087.35	5 895.38	6 467.15	5.29
2000	900 960.09	87 678.36	43 086.74	6 010.19	958.68	2 193.31	4 072.50	8.92
2010	833 684.92	58 143.85	36 600.33	10 267.77	345.89	488.35	3 190.55	61.43
2011	810 802.33	57 017.81	37 933.93	10 697.31	278.95	259.69	3 253.74	61.21
2012	815 197.41	57 634.09	37 102.43	10 893.21	242.58	277.56	3 245.64	35.21
2013	832 643.00	56 968.44	37 635.16	10 849.21	257.27	283.58	3 351.79	16.03
2014	793 635.84	55 805.75	38 273.15	10 999.55	234.60	220.08	3 486.92	20.28
2015	797 078.17	55 602.19	38 808.71	11 112.00	244.18	242.30	3 652.41	11.89
2016	801 753.01	54 402.61	37 948.19	10 963.59	260.64	184.63	3 880.69	11.15
Per cent change 1990–2016	**–23.9**	**–54.7**	**–41.6**	**21 687.7**	**–91.5**	**–96.8**	**–12.4**	**62.0**

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

Table 9
Greenhouse gas emissions by sector for Germany, 1990–2016
(kt CO_2 eq)

	Energy	*IPPU*	*Agriculture*	*LULUCF*	*Waste*	*Other*
1990	1 036 735.77	97 147.66	79 398.01	–31 311.74	38 353.73	NA
1995	918 241.08	98 904.88	67 860.71	–33 054.85	38 362.10	NA
2000	870 548.16	78 354.94	67 415.18	–37 960.40	28 650.51	NA
2010	802 121.26	63 404.65	62 646.88	–16 368.63	14 610.30	NA
2011	778 781.92	63 408.95	64 285.78	–15 733.28	13 828.31	NA
2012	785 284.21	62 455.80	63 848.63	–14 475.65	13 039.48	NA
2013	802 412.94	62 330.16	65 003.77	–14 287.54	12 257.60	NA
2014	762 351.10	62 361.65	66 289.43	–14 891.19	11 674.00	NA
2015	768 071.74	60 925.14	66 689.97	–14 375.52	11 064.99	NA
2016	771 900.56	61 797.20	65 228.39	–14 479.18	10 478.35	NA
Per cent change 1990–2016	**–25.5**	**–36.4**	**–17.8**	**–53.8**	**–72.7**	**NA**

Notes: (1) Emissions/removals reported in the sector other (sector 6) are not included in total GHG emissions. (2) Germany did not report indirect CO_2 emissions in CRF table 6.

Table 10

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

(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				–22 418.00				
Technical correction				NE				
Base year	NA				12 668.64	25 771.82	NA	NA
2013		–6 230.29	2 035.72	–54 367.62	14 657.92	22 365.06	NA	NA
2014		–6 451.30	2 064.05	–54 913.99	14 452.56	22 316.58	NA	NA
2015		–6 688.59	2 094.69	–54 648.83	14 656.53	22 159.22	NA	NA
2016		–6 918.32	2 124.11	–55 023.95	14 875.24	22 043.31	NA	NA
Per cent change Base year–2016					**17.4**	**–14.5**	**NA**	**NA**

Note: Values in this table include emissions on lands 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 Germany. 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 11 provides an overview of relevant key data for Germany's reporting under Article 3, paragraphs 3 and 4, of the Kyoto Protocol.

Table 11
Key relevant data for Germany 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	No
3.5% of total base-year GHG emissions, excluding LULUCF	43 875.976 kt CO_2 eq (351 007.813 kt CO_2 eq for the duration of the commitment period)
Cancellation of AAUs, ERUs, CERs and/or issuance of RMUs 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 12–15 include the information to be included in the compilation and accounting database for Germany. Data shown are from the original annual submission of the Party, including the latest revised estimates submitted, adjustments (if applicable), as well as the final data to be included in the compilation and accounting database.

Table 12
Information to be included in the compilation and accounting database for 2016, including on the commitment period reserve, for Germany
(t CO_2 eq)

	Original submission	*Revised estimates*	*Adjustment*	*Final*
CPR	3 233 429 899	3 233 429 900		3 233 429 900
Annex A emissions for 2016				
CO_2	801 753 008			801 753 008
CH_4	54 402 611			54 402 611
N_2O	37 948 186			37 948 186
HFCs	10 963 590			10 963 590
PFCs	260 644			260 644
Unspecified mix of HFCs and PFCs	184 626			184 626
SF_6	3 880 689			3 880 689
NF_3	11 146			11 146
Total Annex A sources	**909 404 499**			**909 404 499**
Activities under Article 3, paragraph 3, of the Kyoto Protocol for 2016				
3.3 AR	–6 918 318			–6 918 318
3.3 Deforestation	2 124 108			2 124 108
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol for 2016				
3.4 FM	–55 023 952			–55 023 952
3.4 CM	14 875 235			14 875 235
3.4 CM for the base year	12 668 643			12 668 643
3.4 GM	22 043 312			22 043 312
3.4 GM for the base year	25 771 817			25 771 817

Table 13
Information to be included in the compilation and accounting database for 2015, for Germany
(t CO_2 eq)

	Original submission	*Revised estimates*	*Adjustment*	*Final*
Annex A emissions for 2015				
CO_2	797 078 165			797 078 165
CH_4	55 602 189			55 602 189
N_2O	38 808 710			38 808 710
HFCs	11 111 996			11 111 996
PFCs	244 183			244 183
Unspecified mix of HFCs and PFCs	242 305			242 305

	Original submission	*Revised estimates*	*Adjustment*	*Final*
SF_6	3 652 414			3 652 414
NF_3	11 885			11 885
Total Annex A sources	**906 751 848**			**906 751 848**
Activities under Article 3, paragraph 3, of the Kyoto Protocol for 2015				
3.3 AR	–6 688 590			–6 688 590
3.3 Deforestation	2 094 692			2 094 692
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol for 2015				
3.4 FM	–54 648 826			–54 648 826
3.4 CM	14 656 529			14 656 529
3.4 CM for the base year	12 668 643			12 668 643
3.4 GM	22 159 219			22 159 219
3.4 GM for the base year	25 771 817			25 771 817

Table 14
Information to be included in the compilation and accounting database for 2014, for Germany
(t CO_2 eq)

	Original submission	*Revised estimates*	*Adjustment*	*Final*
Annex A emissions for 2014				
CO_2	793 635 843			793 635 843
CH_4	55 805 753			55 805 753
N_2O	38 273 152			38 273 152
HFCs	10 999 554			10 999 554
PFCs	234 604			234 604
Unspecified mix of HFCs and PFCs	220 077			220 077
SF_6	3 486 916			3 486 916
NF_3	20 279			20 279
Total Annex A sources	**902 676 178**			**902 676 178**
Activities under Article 3, paragraph 3, of the Kyoto Protocol for 2014				
3.3 AR	–6 451 296			–6 451 296
3.3 Deforestation	2 064 047			2 064 047
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol for 2014				
3.4 FM	–54 913 988			–54 913 988
3.4 CM	14 452 558			14 452 558
3.4 CM for the base year	12 668 643			12 668 643
3.4 GM	22 316 579			22 316 579
3.4 GM for the base year	25 771 817			25 771 817

Table 15
Information to be included in the compilation and accounting database for 2013, for Germany
($t CO_2 eq$)

	Original submission	*Revised estimates*	*Adjustment*	*Final*
Annex A emissions for 2013				
CO_2	832 642 995			832 642 995
CH_4	56 968 444			56 968 444
N_2O	37 635 164			37 635 164
HFCs	10 849 206			10 849 206
PFCs	257 270			257 270
Unspecified mix of HFCs and PFCs	283 581			283 581
SF_6	3 351 787			3 351 787
NF_3	16 030			16 030
Total Annex A sources	**942 004 477**			**942 004 477**
Activities under Article 3, paragraph 3, of the Kyoto Protocol for 2013				
3.3 AR	–6 230 287			–6 230 287
3.3 Deforestation	2 035 718			2 035 718
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol for 2013				
3.4 FM	–54 367 619			–54 367 619
3.4 CM	14 657 918			14 657 918
3.4 CM for the base year	12 668 643			12 668 643
3.4 GM	22 365 059			22 365 059
3.4 GM for the base year	25 771 817			25 771 817

Annex III

Additional information to support findings in table 2

Missing categories that may affect completeness

No mandatory categories of the 2006 IPCC Guidelines were identified as missing.

Annex IV

Documents and information used during the review

A. Reference documents

IPCC reports

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B. Additional information provided by the Party

Responses to questions during the review were received from Mr. Dirk Guenther and Mr. Michael Strogies (German Environment Agency), including additional material on

the methodology and assumptions used. The following documents[1] were also provided by Germany:

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[1] Reproduced as received from the Party.