COMPLIANCE COMMITTEE **CC/ERT/ARR/2020/2**
7 February 2020

Report of the individual review of the annual submission of Sweden submitted in 2019

Note by the secretariat

The report of the individual review of the annual submission of Sweden submitted in 2019 was published on 30 January 2020. For purposes of rule 10, paragraph 2, of the rules of procedure of the Compliance Committee (annex to decision 4/CMP.2, as amended by decisions 4/CMP.4 and 8/CMP.9), the report is considered received by the secretariat on the same date. This report, FCCC/ARR/2019/SWE, contained in the annex to this note, is being forwarded to the Compliance Committee in accordance with section VI, paragraph 3, of the annex to decision 27/CMP.1.

United Nations FCCC/ARR/2019/SWE

Framework Convention on Climate Change

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Report on the individual review of the annual submission of Sweden submitted in 2019*

Note by the expert review team

Summary

Each Party included in Annex I to the Convention must submit an annual inventory of emissions and removals of greenhouse gases for all years from the base year (or period) to two years before the inventory due date (decision 24/CP.19). Parties included in Annex I to the Convention that are Parties to the Kyoto Protocol are also required to report supplementary information under Article 7, paragraph 1, of the Kyoto Protocol with the inventory submission due under the Convention. This report presents the results of the individual inventory review of the 2019 annual submission of Sweden, 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 23 to 28 September 2019.

* In the symbol for this document, 2019 refers to the year in which the inventory was submitted, not to the year of publication.

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Contents

Abbreviations and acronyms

2006 IPCC Guidelines	*2006 IPCC Guidelines for National Greenhouse Gas Inventories*
AAU	assigned amount unit
AD	activity data
Annex A source	source category included in Annex A to the Kyoto Protocol
AR	afforestation and reforestation
Article 8 review guidelines	"Guidelines for review under Article 8 of the Kyoto Protocol"
C	confidential
CER	certified emission reduction
CH_4	methane
CM	cropland management
CO_2	carbon dioxide
CO_2 eq	carbon dioxide equivalent
Convention reporting adherence	adherence to the "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual greenhouse gas inventories"
CP	commitment period of the Kyoto Protocol
CPR	commitment period reserve
CRF	common reporting format
EF	emission factor
ERT	expert review team
ERU	emission reduction unit
EU ETS	European Union Emissions Trading System
F-gas	fluorinated gas
FM	forest management
FMRL	forest management reference level
$Frac_{GASF}$	fraction of synthetic fertilizer nitrogen that volatilizes as ammonia and nitrogen oxides
GHG	greenhouse gas
GM	grazing land management
HFC	hydrofluorocarbon
HWP	harvested wood products
IE	included elsewhere
IEF	implied emission factor
IPCC	Intergovernmental Panel on Climate Change
IPCC good practice guidance for LULUCF	*Good Practice Guidance for Land Use, Land-Use Change and Forestry*
IPPU	industrial processes and product use
KP-LULUCF activities	activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol
LULUCF	land use, land-use change and forestry
N	nitrogen
N_2O	nitrous oxide
NA	not applicable
NCV	net calorific value
NE	not estimated
NF_3	nitrogen trifluoride
NH_3	ammonia
NIR	national inventory report
NK	nitrogen potassium

NO	not occurring
NP	nitrogen phosphorous
NPK	nitrogen phosphorous potassium
PFC	perfluorocarbon
QA/QC	quality assurance/quality control
RMU	removal unit
RV	revegetation
SEF	standard electronic format
SF_6	sulfur hexafluoride
UNFCCC Annex I inventory reporting guidelines	"Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual greenhouse gas inventories"
UNFCCC review guidelines	"Guidelines for the technical review of information reported under the Convention related to greenhouse gas inventories, biennial reports and national communications by Parties included in Annex I to the Convention"
WDR	wetland drainage and rewetting
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 2019 annual submission of Sweden 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 23 to 28 September 2019 and was coordinated by Suvi Monni (secretariat). Table 1 provides information on the composition of the ERT that conducted the review of Sweden.

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

Area of expertise	*Name*	*Party*
Generalist	Takeshi Enoki	Japan
	Mikhail Gitarskiy	Russian Federation
Energy	Takashi Morimoto	Japan
	Inga Valuntiene	Lithuania
IPPU	Emma Salisbury	United Kingdom of Great Britain and Northern Ireland
	Sina Wartmann	Germany
Agriculture	Yu'e Li	China
	Etienne Mathias	France
LULUCF and KP-LULUCF activities	Doru-Leonard Irimie	Romania
	Inge Jonckheere	Belgium
Waste	Qingxian Gao	China
	Hans Oonk	Netherlands
Lead reviewers	Takeshi Enoki	
	Qingxian Gao	

2. The basis of the findings in this report is the assessment by the ERT of the Party's 2019 annual submission in accordance with the UNFCCC review guidelines and the Article 8 review guidelines. The ERT notes that the individual inventory review of Sweden's 2018 annual submission did not take place in 2018 owing to insufficient funding for the review process.

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

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

[1] At the time of publication of this report, Sweden 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, para. 6, pending the entry into force of the Amendment.

[2] Issues are defined in decision 13/CP.20, annex, para. 81.

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

5. Annex I shows annual GHG emissions for Sweden, 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 Sweden, by gas, sector and activity.

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

II. Summary and general assessment of the 2019 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 emission or removal 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 submission 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 Sweden

Assessment			*Issue or problem ID#(s) in table 3, 5 and/or 6*[a]
Dates of submission	Original submission: 25 April 2019 (NIR), 12 April 2019 (CRF tables) version 1, 23 May 2019 (SEF-CP2-2018) (SEF tables)		
Review format	Desk review		
Application of the requirements of the UNFCCC Annex I inventory reporting guidelines and Wetlands Supplement (if applicable)	Have any issues been identified in the following areas:		
	(a) Identification of key categories?	No	
	(b) Selection and use of methodologies and assumptions?	No	
	(c) Development and selection of EFs?	Yes	L.6
	(d) Collection and selection of AD?	Yes	E.8
	(d) Reporting of recalculations?	No	
	(e) Reporting of a consistent time series?	No	
	(f) Reporting of uncertainties, including methodologies?	Yes	I.26
	(g) QA/QC?	QA/QC procedures were assessed in the context of the national system (see supplementary information under the Kyoto Protocol below)	
	(h) Missing categories/completeness?[b]	Yes	L.7
	(i) Application of corrections to the inventory?	No	
Significance threshold	For categories reported as insignificant, has the Party provided sufficient information showing that the likely level of emissions meets the criteria in paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines?	Yes	
Description of trends	Did the ERT conclude that the description in the NIR of the trends for the different gases and sectors is reasonable?	Yes	

Assessment			*Issue or problem ID#(s) in table 3, 5 and/or 6[a]*
Supplementary information under the Kyoto Protocol	Have any issues been identified related to the following aspects of the national system:		
	(a) Overall organization of the national system, including the effectiveness and reliability of the institutional, procedural and legal arrangements?	No	
	(b) Performance of the national system functions?	No	
	Have any issues been identified related to the national registry:		
	(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	
	Have any issues been identified related to reporting of information on AAUs, CERs, ERUs 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	
	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	
	Have any issues been identified related to the following reporting requirements for KP-LULUCF activities:		
	(a) Reporting requirements of decision 2/CMP.8, annex II, paragraphs 1–5?	No	
	(b) Demonstration of methodological consistency between the reference level and reporting on FM in accordance with decision 2/CMP.7, annex, paragraph 14?	No	
	(c) Reporting requirements of decision 6/CMP.9?	No	
	(d) Country-specific information to support provisions for natural disturbances, in accordance with decision 2/CMP.7, annex, paragraphs 33 and 34?	No	
CPR	Was the CPR reported in accordance with the annex to decision 18/CP.7, the annex to decision 11/CMP.1 and decision 1/CMP.8, paragraph 18?	Yes	
Adjustments	Has the ERT applied an adjustment under Article 5, paragraph 2, of the Kyoto Protocol?	No	
	Did the Party submit a revised estimate to replace a previously applied adjustment?	NA	The Party does not have a previously applied adjustment
Response from the Party during the review	Has the Party provided the ERT with responses to the questions raised, including the data and information necessary for the assessment of conformity with the UNFCCC Annex I inventory reporting guidelines and any further guidance adopted by the Conference of the Parties?	Yes	

Assessment			*Issue or problem ID#(s) in table 3, 5 and/or 6[a]*
Recommendation for an exceptional in-country review	On the basis of the issues identified, does the ERT recommend that the next review be conducted as an in-country review?	No	
Questions of implementation	Did the ERT list any questions of implementation?	No	

[a] The ERT identified additional issues and/or problems in the general, energy, IPPU, agriculture, LULUCF and waste sectors that are not listed in this table but are included in tables 5 and 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 previous review reports that were included in the previous review report, published on 11 April 2018.[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 2019 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 Sweden

ID#	*Issue and/or problem classification[a, b]*	*Recommendation made in previous review report*	*ERT assessment and rationale*
General			
G.1	NIR (G.4, 2017) Convention reporting adherence	Update table 9.5 of the NIR annually in order to reflect the actual status of the implementation of previous recommendations in the latest annual submission.	Resolved. Table 9.5 is no longer included in the NIR. Table 9.4 of the NIR presents the status of implementation of recommendations included in the previous review report.
G.2	CRF tables (G.5, 2017) Transparency	Make efforts to progress the collection of consent from plant operators and strive to report transparent data in future annual submissions while maintaining data confidentiality.	Addressing. The number of categories with data reported as "C" has decreased in the energy sector, even though some categories are still reported as "C" (see ID# E.1 below). In the IPPU sector, the number of categories reported as "C" has also decreased: for example, CO_2 emissions for category 2.C.1.e (iron and steel production – pellet) and CH_4 emissions for category 2.H.1 (pulp and paper) were reported as "C" for 2015 in the 2017 submission, but have been reported for the entire time series in the 2019 submission. However, some subcategories and gases under categories 2.B.10 (chemical industry – other) and 2.C.1 (iron and steel production) continue to be reported as "C". In addition, some gases and categories have been aggregated for confidentiality reasons (see ID#s I.33 and I.36 in table 6).

[4] FCCC/ARR/2017/SWE. The ERT notes that the report on the individual inventory review of Sweden's 2018 annual submission has not been published yet. As a result, the latest previously published annual review report reflects the findings of the review of the Party's 2017 annual submission.

ID#	*Issue and/or problem classification*[a, b]	*Recommendation made in previous review report*	*ERT assessment and rationale*
G.3	QA/QC and verification (G.3, 2017) (G.3, 2016) (G.3, 2015) Convention reporting adherence	Correct the outdated references to the IPCC good practice guidance for LULUCF in the NIR.	Resolved. The NIR no longer refers to the IPCC good practice guidance for LULUCF.
Energy			
E.1	1.A Fuel combustion – sectoral approach – solid, liquid and gaseous fuels – CO_2, CH_4 and N_2O (E.9, 2017) Comparability	Enhance the transparency of reporting by exploring ways to minimize the number of categories reported as "C" while protecting the confidentiality of company data, for example by (1) using weighted average EFs for one industry instead of directly citing each facility's data; (2) collecting consent from plant operators and reporting emissions in the CRF tables and NIR not as confidential information; or (3) for categories where AD and emissions are reported as confidential, maintaining AD as confidential but reporting emissions.	Addressing. As explained in NIR table 9.4, Sweden made efforts to obtain consent from plant operators during 2018, which has led to a decrease in the data reported as confidential. In the 2017 submission, some fuels, gases and/or subcategories under the following categories were reported as "C" for at least one year of the time series: 1.A.1.a, 1.A.1.b, 1.A.1.c, 1.A.2.a, 1.A.2.b, 1.A.2.c, 1.A.2.d, 1.A.2.e, 1.A.2.f, 1.A.2.g, 1.B.2.a and 1.B.2.c. In the 2019 submission, the following categories contain data reported as "C": 1.A.1.a, 1.A.2.a, 1.A.2.b, 1.A.2.c, 1.A.2.d, 1.A.2.e, 1.A.2.f,1.A.2.g, 1.B.2.a and 1.B.2.c. During the review, the Party indicated that efforts to reduce the number of categories with data reported as "C" will continue.
E.2	1.A Fuel combustion – sectoral approach – solid, liquid and gaseous fuels – CO_2, CH_4 and N_2O (E.9, 2017) Transparency	Provide clarification in the NIR on the key AD sources (the EU ETS, the national annual energy balance and other operator data provided to the inventory agency or obtained from annual environmental reports) and their use to derive estimates for the GHG inventory, for example by using a schematic diagram to illustrate how the data are combined.	Resolved. In annex 2 to the NIR, the Party included a new table A2.1 that summarizes the key sources of AD. Furthermore, table A2.2 ("Summarized properties of activity data sources used in the inventory for stationary combustion") of the 2019 submission is an elaborated version of table A2.1 from the 2017 submission. Tables A2.1 and A2.2 illustrate how the different data sources are combined for the GHG inventory. See also ID# E.6 in table 6.
E.3	1.A.2.a Iron and steel – solid fuels – CO_2 (E.10, 2017) Transparency	Explore in more detail the causes of the trend in IEFs for CO_2 emissions for this category and update the explanation in the NIR for the next submission.	Resolved. The Party provided an explanation of the issue in the NIR (section 3.2.9.3). The CO_2 IEFs for solid fuels in category 1.A.2.a (iron and steel) are higher than those for solid fuels in other industries, since a large proportion of the fuel used is blast furnace gas. The IEF used throughout the time series is highly dependent on the share of this fuel. For 2003 onwards, the share is based on plant-specific data. Up until 2003, the shares of blast furnace gas and coke oven gas are constant owing to the use of aggregated AD.
E.4	1.B.1.b Solid fuel transformation – biomass – CH_4 (E.7, 2017) (E.8, 2016) (E.7, 2015) Comparability	Report fugitive CH_4 emissions from charcoal production separately in category 1.A.1.c and describe in the NIR where in the CRF tables these emissions are reported.	Not resolved. According to the NIR (p.134), fugitive CH_4 emissions from charcoal production are reported in category 1.A.2.g (other). However, in CRF table 1.A(a)s1, Sweden continued to report "NO" for biomass consumed in manufacture of solid fuels (1.A.1.c.i). Sweden reported AD of 1.08 Mt for solid fuel transformation (1.B.1.b) in CRF table 1.B.1 for 2017 and

ID#	*Issue and/or problem classification*[a, b]	*Recommendation made in previous review report*	*ERT assessment and rationale*
			reported CH_4 emissions as "NA" instead of "IE", which would be the correct notation key if the emissions were reported under category 1.A.2.g, as explained in the NIR. During the review, the Party explained that CH_4 emissions from charcoal production were not estimated owing to a lack of default EFs in the 2006 IPCC Guidelines and were therefore reported as "NA". The ERT noted that this information is not in accordance with the information provided in the NIR. The Party indicated its plans to investigate the issue.
IPPU			
I.1	2. General (IPPU) – NF_3 (I.12, 2017) Comparability	Use the notation key "NO" for NF_3 both in the NIR (table ES.1) and in the CRF tables.	Addressing. The NF_3 emissions have now been reported as "NO" in the NIR (table ES.1). The cells in the CRF tables related to NF_3 emissions (e.g. in tables 10s5, 10s6 and summary2) are empty, while in some cells of the sector-specific CRF tables, such as table 2(II)B-Hs1, "NO" was reported. The Party clarified during the review that it experienced technical problems with the CRF Reporter software with regard to reporting F-gas data and that some cells in the CRF tables remained empty for that reason.
I.2	2.A.2 Lime production – CO_2 (I.11, 2017) Comparability	Correct the AD in the CRF table for 2015 for 2.A.2 (lime production).	Resolved. The AD have been corrected. Both the AD and the IEF for 2015 fit well within the respective trends.
I.3	2.A.2 Lime production – CO_2 (I.13, 2017) Transparency	Describe more clearly in the NIR the category-specific QA/QC and verification undertaken; for example, by presenting a summary of the findings of the 2015 study, while maintaining data confidentiality, and noting the results of consultation with data providers to explain observed differences in AD and emission data among the various data sources.	Resolved. Section 4.2.2.4 of the NIR on category-specific QA/QC presents key findings from the 2015 study, as well as a comparison of the AD from the various data sources and the reason why the AD provided by these sources may differ.
I.4	2.A.4 Other process uses of carbonates – CO_2 (I.14, 2017) Completeness	Access the available data (i.e. the EU ETS data set that is currently used for the national inventory) and top-down data from national statistical agencies on production, imports, exports and known consumption of carbonates in order to assess any potential underreporting of emissions owing to incomplete coverage of emissive uses of carbonates, and report in the NIR on the comparison between (1) the AD of limestone and dolomite reported in the inventory across all categories; and (2) the AD of total emissive uses of carbonates, which are derived from imports plus production minus exports and known uses.	Resolved. The NIR (section 4.2.4.4) states that data from Statistics Sweden on imports and exports of carbonates have been compared with production data provided by the Geological Survey of Sweden and data on known uses included in the national inventory. The ERT considers that the reported information is sufficient to justify that all emissive uses of carbonates have been included in the inventory.

ID#	*Issue and/or problem classification*[a, b]	*Recommendation made in previous review report*	*ERT assessment and rationale*
I.5	2.B.2 Nitric acid production – N_2O (I.11, 2017) Transparency	Remove the comment on confidentiality in the NIR and present time-series data in the NIR tables for 2.B.2 (nitric acid production).	Resolved. The NIR (section 4.3.2.1) no longer mentions confidentiality with regard to category 2.B.2. The AD, N_2O emissions and IEFs are presented in table 4.9 of the NIR.
I.6	2.B.5 Carbide production – CO_2 and CH_4 (I.11, 2017) Comparability	Report emissions from calcium carbide production under category 2.B.5.b; present the AD, CO_2 and CH_4 IEFs transparently; and report the emissions from the use of acetylene in accordance with the 2006 IPCC Guidelines.	Resolved. Emissions from calcium carbide production were reported under category 2.B.5.b. The Party reported CO_2 emissions only, in line with the 2006 IPCC Guidelines, which do not mention CH_4 emissions resulting from calcium carbide production. The NIR (section 4.3.5) presents the methodology used for category 2.B.5.b, the CO_2 EF, and the AD for calcium carbide production and use for acetylene production. The Party clarified that emissions from acetylene use were reported under category 2.B.5.b and provided a justification of why this is in line with the 2006 IPCC Guidelines. The Party explained that this would be further clarified in the next submission. See also ID# I.34 in table 6.
I.7	2.B.10 Other (chemical industry) – CO_2 (I.15, 2017) Comparability	Report the chemical category emissions in line with the 2006 IPCC Guidelines, including reporting emissions from ethylene production in the IPPU sector.	Resolved. The NIR (sections 4.3.10.4 and 4.3.10.5) describes how emissions have been reallocated between the energy and IPPU sectors as well as within the IPPU sector (in particular from categories 1.A.2.c (chemicals) and 1.B.2.c.2.i (flaring – oil) to category 2.B.10.a (other)). The NIR (section 4.3.10.4) states that an allocation strategy for emissions from chemical industry has been developed that aims at achieving correct allocation of emissions between the energy and IPPU sectors in accordance with the 2006 IPCC Guidelines, where possible, while prioritizing the consistency of the total reported emissions with plant-specific data. See also ID# I.10 below.
I.8	2.B.10 Other (chemical industry) – CO_2 (I.15, 2017) Transparency	Report on progress and any recalculations in reporting the emissions in line with the 2006 IPCC Guidelines (see ID# I.7 above).	Resolved. The NIR (section 4.3.10.4) describes how emissions have been reallocated between the energy and IPPU sectors as well as within the IPPU sector (see ID# I.7 above). The NIR (section 4.3.10.5) presents the recalculations carried out for category 2.B.10 due, among other reasons, to the reallocation of emissions.
I.9	2.B.10 Other (chemical industry) – CO_2 (I.15, 2017) Transparency	Describe more clearly in the NIR the methodology, including the information provided to the ERT during the review, to clarify the allocation of emissions from the production of secondary fuels obtained from feedstocks and also from the combustion of process off-gases and residues where they are transferred to other source categories (including in the energy sector).	Not resolved. The NIR (section 4.3.10.5) explains how emissions have been reallocated between the energy and IPPU sectors and presents the recalculations carried out subsequently. The NIR does not, however, describe in detail the allocation of emissions from the production of secondary fuels obtained from feedstocks and from the combustion of process off-gases and residues where they are transferred to other categories. During the review, the Party indicated that it would aim to clarify the

ID#	Issue and/or problem classification[a, b]	Recommendation made in previous review report	ERT assessment and rationale
			allocation method used in its next submission.
I.10	2.B.10 Other (chemical industry) – CO_2 (I.15, 2017) Transparency	Describe more clearly in the NIR the data reconciliation checks for chemicals, for example by presenting information on: (a) A comparison of emissions reported in the national inventory across categories 2.B and 1.A with operator data from the EU ETS or environmental reports; (b) A comparison of AD from the chemical installations with the national energy balance for primary and secondary fuels so as to provide detailed data for ERTs to assess the accuracy and completeness of the inventory while protecting commercially confidential data.	Resolved. The NIR (section 4.3.10.4) describes in detail how data reconciliation checks between the energy and IPPU sectors have been carried out, using the cross-sectoral tool described in the NIR (section 1.3.5), by using data provided by Statistics Sweden and by comparing IEFs with default EFs from the 2006 IPCC Guidelines. In the tool, for each of the relevant facilities, the emissions reported in the energy sector (category 1.A) are aggregated with the emissions reported in category 2.B.10, and the sum is compared with both the EU ETS data (if available) and environmental reports provided by facilities. QC is therefore conducted at facility level. The comparison of AD with national production data from Statistics Sweden showed that all production of ethylene, vinyl chloride monomer, ethylene oxide and carbon black is accounted for in the emissions inventory.
I.11	2.C Metal industry – CO_2 (I.2, 2017) (I.4, 2016) (I.4, 2015) Transparency	Report transparently the methodology applied for categories 2.C.2 and 2.C.7 in the IPPU sector in both the NIR and the CRF tables.	Addressing. For category 2.C.2 (ferroalloys production) the methodology is reported transparently in table 4.22 of the NIR as well as in CRF table summary 3s1. For category 2.C.7 (other), the information provided in the NIR and in CRF table summary 3s1 is inconsistent. Table 4.29 of the NIR indicates that a tier 3 methodology was used, which is in line with the methodological description provided in the NIR (section 4.4.7.2). The data aggregated in CRF table summary 3s1 indicate that a plant-specific EF was used; however, with regard to the method, the data aggregated in CRF table summary 3s1 indicate that both a tier 3 method and a default method were used. During the review, the Party indicated that the information provided in the CRF table would be corrected in its next submission.
I.12	2.C.1 Iron and steel production – CO_2 (I.16, 2017) Transparency	Review and update the description in the NIR of the methodology for estimating emissions from iron and steel production.	Resolved. The description of the methodology has been extensively updated and restructured in the NIR (section 4.4.1.2.2).
I.13	2.C.1 Iron and steel production – CO_2 (I.16, 2017) Transparency	Review and update the descriptions in the NIR of data reconciliation checks for integrated steelworks, for example by presenting information on: (i) A comparison of emissions reported in the national inventory across categories 1.A.1.a, 1.A.1.c, 1.A.2.a, 1.B.1.c and 2.C.1.b with operator data	Resolved. The NIR (section 4.4.1.2.2) provides a restructured and updated description of the methodology used, which helps to better understand which processes result in emissions, the sources of the AD, the categories to which the emissions are allocated, how overlaps and gaps in the allocation of emissions to these categories are avoided, the extent to which information

ID#	Issue and/or problem classification[a, b]	Recommendation made in previous review report	ERT assessment and rationale
		from the EU ETS or environmental reports; (ii) A comparison of AD from the integrated steelworks with the national energy balance for primary and secondary fuels so as to provide sufficient detail for ERTs to assess the accuracy and completeness of the submission while protecting commercially confidential data.	under the EU ETS can be used and how it has been used for verification purposes.
I.14	2.C.1 Iron and steel production – CO_2 (I.16, 2017) Transparency	Report a full time series of the coking coal carbon emission factor used to generate the emission estimates for integrated steelworks, including references for the data sources across the time series. If these data cannot be published in future submissions because of commercial confidentiality concerns, they may be provided solely to the ERT for the purpose of the review.	Resolved. The NIR (section 4.4.1.2.2) states that a time series for the carbon content and the calorific value of coking coal were developed. These were not reported in the NIR for confidentiality reasons; however, in the NIR, the Party stated that the time series can be provided to reviewers upon request.
I.15	2.C.1 Iron and steel production – CO_2 (I.17, 2017) Accuracy	Make efforts to harmonize and improve the accuracy of the data reported by the steelworks operators and the Swedish Energy Agency and report on progress in the next NIR.	Resolved. Updated information on AD and emissions was provided in the NIR (section 4.4.1). The NIR (annex 4, section 4.4, comparing the sectoral and reference approaches) discusses how plant-level AD and statistical data for non-energy fuel consumption differ with regard to steelworks. The harmonization of data is ongoing. The NIR (section 9.4) states that the inventory compilers are conducting a project together with the Swedish Energy Agency in order to reduce the differences between the reference approach and the sectoral approach. As part of this project, it has been confirmed that there are differences in how the integrated steelworks include the used amounts of carbon in the reporting on which the energy balance is based. The following activities are planned to allow for the reporting of updated information in the 2020 annual submission: (a) Understanding the reason for the discrepancies in amounts of AD reported through continued discussion with the operators of the integrated steelworks; (b) Reducing uncertainty in the emission estimates due to the NCV through discussions with the Swedish Energy Agency on the discrepancies regarding the NCV and the EF. During the review, the Party indicated that a project aimed at investigating other sources of non-energy use AD is currently under development. The outcomes of this project will allow the non-energy use AD for all fuels to be updated in the Party's next submission.

ID#	*Issue and/or problem classification*[a, b]	*Recommendation made in previous review report*	*ERT assessment and rationale*
I.16	2.C.1 Iron and steel production – CO_2 (I.17, 2017) Transparency	Provide full details of AD and emissions for all source categories affected across energy and IPPU, including data on fuel NCVs and carbon emission factors following the harmonization of data (see ID# I.15 above). If these data cannot be published in future submissions because of commercial confidentiality concerns, they may be provided solely to the ERT for the purpose of the review so as to facilitate assessment of the completeness and accuracy of the reporting.	Addressing. Detailed information on updated AD and emissions was provided in the NIR (section 4.4.1). The NCVs and EFs were calculated but not published in the NIR for reasons of confidentiality. Further updating of AD, EFs and emissions will be carried out once the ongoing harmonization of data has been finalized, which is planned to be in time for the 2020 submission (see ID# I.15 above).
I.17	2.C.1 Iron and steel production – CO_2 (I.17, 2017) Transparency	Report on any recalculations to emissions and AD across the time series of sources in the energy and IPPU sectors affected by the integrated steelworks (i.e. categories 1.A.1.a, 1.A.1.c, 1.A.2.a, 1.B.1.c and 2.C.1.b) (as a result of harmonization of the data; see ID# I.15 above).	Addressing. The harmonization of data related to the integrated steelworks is ongoing (see ID# I.15 above). Recalculations of emissions and AD across the time series can only be reported once the harmonization of data has been finalized, which is planned to be in time for the 2020 submission.
I.18	2.C.1 Iron and steel production – CO_2 (I.17, 2017) Transparency	Present a clear plan of tasks and associated time frames for completing the improvements related to harmonizing and improving the accuracy of the data reported by steelworks operators and the Swedish Energy Agency.	Resolved. The NIR (section 9.4) provides information on planned improvements to be achieved for the 2020 submission (see ID# I.15 above).
I.19	2.C.1 Iron and steel production – CO_2 (I.17, 2017) Transparency	Report on the comparison between the reference approach and the sectoral approach for solid fuel energy use and emissions, and outline changes in the overall comparison as a result of improvements in the harmonization of NCVs and AD for solid fuels between steelworks operators and the Swedish Energy Agency.	Addressing. The NIR (annex 4, section 4.4) discusses the differences between the reference and sectoral approaches for solid fuels owing to the allocation of emissions from non-energy use of solid fuels in iron and steel production to the energy and IPPU sectors. The harmonization of data is, however, ongoing (see ID# I.15 above). This issue can only be resolved once the harmonization of data has been finalized, which is planned to be in time for the 2020 submission.
I.20	2.C.4 Magnesium production – SF_6 (I.3, 2017) (I.6, 2016) (I.6, 2015) Transparency	Ensure that both the AD and SF_6 emissions are reported for magnesium production.	Resolved. The NIR (section 4.4.4.1) indicates that there is no production of magnesium but there are four magnesium foundries in Sweden using SF_6 as cover gas. The emissions are estimated on the basis of information from companies using SF_6 as cover gas (NIR, section 4.4.4.2). The NIR (section 4.4.4.4) explains that Sweden has not been able to collect national data on the total amount of magnesium cast and has therefore reported the amounts of magnesium cast as "NE". The amount of magnesium cast is, however, available for the largest magnesium foundry and IEFs for this foundry are presented in the NIR (figure 4.11). The ERT therefore considers that the Party's reporting is sufficiently transparent.

ID#	*Issue and/or problem classification*[a, b]	*Recommendation made in previous review report*	*ERT assessment and rationale*
I.21	2.C.7 Other (metal industry) – CO_2 (I.18, 2017) Transparency	Further improve the reporting of category 2.C.7 (other (metal industry)) emissions to bring it in line with the 2006 IPCC Guidelines by transparently reporting energy use and emissions between the energy and IPPU sectors, and report on progress and any recalculations in the NIR.	Resolved. The Party has introduced a cross-sectoral QC tool ensuring improved alignment of reporting between emissions from energy and non-energy fuel consumption in the energy and IPPU sectors. The category 2.C.7 (other (metal industry)) is covered by the QC tool. A detailed description of the tool can be found in the NIR (section 1.3.5). The improved QC checks did not highlight any need for the Party to recalculate the emissions. The ERT considers that the Party's reporting is in accordance with the 2006 IPCC Guidelines.
I.22	2.D.1 Lubricant use – CO_2 (I.4, 2017) (I.7, 2016) Transparency	Provide in the NIR a detailed explanation of and justification for the chosen method for estimating CO_2 emissions from lubricant use (e.g. holding AD constant for the latest year) to ensure transparency of the methodological approach to estimating emissions from lubricant use.	Resolved. The Party explained in the NIR (section 4.5.1.2) that because data for 2017 were not available in time for the inventory preparation, and no obvious trend can be discerned, holding AD constant for 2017 (i.e. using the 2016 value as AD) was considered to be the best available method. The NIR clarifies that the data reported for 2017 are therefore preliminary and will be updated in the next annual submission.
I.23	2.D.2 Paraffin wax use – CO_2 (I.11, 2017) Comparability	Provide the AD and the CO_2 IEFs across the time series for category 2.D.2 (paraffin wax use).	Resolved. Information on paraffin wax use is presented in CRF table 2(I).A-Hs2 for the entire time series.
I.24	2.D.3 Other (non-energy products from fuels and solvent use) – CO_2 (I.19, 2017) Transparency	Report in the NIR the method, source data, assumptions and extrapolation back to 1990 related to urea use as a catalyst.	Resolved. The NIR (section 4.5.3.2.3) provides the data source, AD, calculation method and assumptions used to extrapolate emissions back to 1990.
I.25	2.D.3 Other (non-energy products from fuels and solvent use) – CO_2 (I.19, 2017) Transparency	Correct the discrepancies between the NIR and the CRF tables related to urea use as a catalyst in order to clarify in the NIR that emissions are estimated for 1990.	Resolved. The NIR (table 4.36) provides an emission estimate for 1990 (4.7 kt CO_2), which is the same as the value reported in CRF table 2(I).A-Hs2.
I.26	2.F.1 Refrigeration and air conditioning – HFCs (I.7, 2017) (I.3, 2016) (I.3, 2015) (45, 2014) Transparency	Document in the NIR the methodology used to derive the uncertainty data using expert judgment and revise the uncertainty estimates, if appropriate.	Not resolved. The NIR (section 4.7.1.3) presents information regarding the level of uncertainty applied for the AD, EFs and overall for category 2.F.1, but does not provide documentation on the methodology used to estimate uncertainty. During the review, Sweden indicated that it would aim to clarify the methodology used to estimate uncertainty in its next submission.
I.27	2.F.1 Refrigeration and air conditioning – HFCs (I.8, 2017) (I.9, 2016) (I.8 2015) Accuracy	Provide additional documented information in order to justify the use of a country-specific product life factor for HFC-125 emissions for category 2.F.1.	Resolved. The NIR (section 4.7.1.2, p.286) states that there are currently no national statistics allowing the Party to generate more appropriate country-specific EFs for manufacture and operation of equipment containing HFC-125. Therefore, the Party used the default factor for HFC-125

ID#	Issue and/or problem classification[a, b]	Recommendation made in previous review report	ERT assessment and rationale
			provided in the 2006 IPCC Guidelines in its submission.
I.28	2.F.1 Refrigeration and air conditioning – HFCs and PFCs (I.20, 2017) Accuracy	Update the product life factors, either by utilizing new country-specific factors, providing supporting evidence for their use, or by applying default factors from the 2006 IPCC Guidelines, while ensuring that time-series consistency is maintained in the Swedish F-gas model. If this is not achieved before the 2018 submission, report on the progress of the F-gas model improvement and present a clear plan of tasks and associated time frames for their completion.	Resolved. The NIR (section 4.7.1.2, p.286) states that there are currently no national statistics allowing the Party to generate more appropriate country-specific EFs for HFCs and PFCs from the manufacture and use phase of equipment in categories 2.F.1.a (commercial refrigeration), 2.F.1.c (industrial refrigeration) and 2.F.1.f (stationary air conditioning). Therefore, the Party used the default factors provided in the 2006 IPCC Guidelines for estimating emissions for these categories, with the exception of emissions from heat pumps. Country-specific leakage factors for the recovery phase continued to be used. The NIR (annex 3.5) provides signed statements from the Swedish Refrigeration and Heat Pump Association and the Swedish Car Recyclers Association indicating that the values used are considered appropriate.
I.29	2.F.1 Refrigeration and air conditioning – HFCs and PFCs (I.20, 2017) Accuracy	Include the new data on F-gases in pre-filled units imported into the country.	Resolved. The NIR (section 4.7, p.283) states that this information was included in the model used for the 2019 submission.
I.30	2.F.1 Refrigeration and air conditioning – HFCs and PFCs (I.21, 2017) Comparability	Report emissions from heat pumps separately under category 2.F.1.f, including any details of recalculations from the redesign of the refrigeration and air-conditioning model.	Resolved. Emissions from heat pumps were reported in category 2.F.1.f (stationary air conditioning). Recalculations were not conducted, as country-specific EFs continue to be used for heat pumps.
I.31	2.H Other (industrial processes and product use) – CH_4 and N_2O (I.10, 2017) (I.12, 2016) (I.11, 2015) Comparability	Report AD for category 2.H.1 (pulp and paper).	Resolved. AD for category 2.H.1 (pulp and paper) were reported in CRF table 2(I).A-Hs2.
Agriculture			
A.1	3.A.1 Cattle – CH_4 (A.2, 2017) Transparency	Correct the unit used for total milk delivered.	Resolved. The unit used for total milk delivered in table 5.6 of the NIR was revised to kt (rather than t used in the previous submissions).
A.2	3.B.3 Swine – CH_4 and N_2O (A.3, 2017) Transparency	Report on any recalculations that have an impact on manure management systems for swine.	Resolved. All recalculations were reported in the NIR (section 5.3.5).
A.3	3.D.b.1 Atmospheric deposition – N_2O (A.4, 2017) Transparency	Provide in the NIR the data sources for NH_3 emissions from all fertilizers.	Resolved. The data source for $Frac_{GASF}$, which was used to estimate the volatilization of NH_3 from all fertilizers, was reported in the NIR (p.341).
A.4	3.D.b.1 Atmospheric deposition – N_2O (A.4, 2017) Transparency	Provide in the NIR the correct units for $Frac_{GASF}$.	Resolved. The unit for $Frac_{GASF}$ was revised from kg NH_3/kg N to g NH_3/kg N in the NIR (p.341, table 5.26).

ID#	*Issue and/or problem classification*[a, b]	*Recommendation made in previous review report*	*ERT assessment and rationale*
A.5	3.D.b.1 Atmospheric deposition – N_2O (A.4, 2017) Transparency	Provide in the NIR the $Frac_{GASF}$ used to calculate emissions of NH_3 from "other NK and NPK fertilizers".	Resolved. The Party provided the $Frac_{GASF}$ used to calculate emissions of NH_3 from fertilizers of NK, NP and NPK mixtures in the NIR (p.341, table 5.26).
LULUCF			
L.1	4.A Forest land – CO_2 (L.6, 2017) Transparency	Delete the erroneous wording in the NIR (annex 3, p.96) that states that carbon inputs from litter were not considered.	Resolved. The Party has revised the NIR (annex 3, section 3.1.8, p.129), explaining that the EF for organic soils is assumed to include the carbon inputs from litter, while the carbon stock change in litter reported in CRF table 4.A refers to the litter in mineral soils.
L.2	4.A Forest land – CO_2 (L.7, 2017) Transparency	Report transparently the change of forest land to wetlands and other land, and the change from wetlands and other land to forest land, as well as the accompanying gains and losses in the carbon pools where methods are provided in the 2006 IPCC Guidelines, by providing information on whether a land-use change from forest land is caused by the fact that the national requirements for forest land are no longer met or by the fact that the dominant land use is no longer forestry, and, in cases where the allocation of the land under forest land was not "temporary unstocked" but the land use really changed, consider using a subcategory for this land-use change.	Not resolved. The ERT could not identify improvements in the transparency of the Party's reporting (in the NIR or CRF table 4.1). The Party explained during the review that, in cases where the national requirements for forest land are no longer met and where the main land use is no longer forestry, it considers that there has been a land-use conversion from forest land. The Party stated that it reported carbon stock changes from other land and wetlands converted to forest land and also carbon stock changes from forest land converted to other land.
L.3	4.A Forest land – CO_2 (L.7, 2017) Transparency	Document and report the procedure describing when forest land is considered to have changed to other land taking into consideration that the definition of forest land use by the Party does not restrict forest land to productive forest and that the 2006 IPCC Guidelines also include, under managed land, land that performs ecological or social functions.	Not resolved. During the review, the Party referred to the NIR (section 10.4.1) and explained that all conversions from forest land to other managed land are considered as direct human-induced changes. Referring to the NIR (section 10.1.5), the Party also explained that forest land may also be naturally degraded, while all forest land in Sweden is considered managed (broad definition; section 6.2.1 of the NIR). However, the ERT did not identify improvements in the transparency of the NIR of the 2019 submission compared with the 2017 submission.
L.4	4.A Forest land – CO_2 (L.7, 2017) Transparency	Report in the NIR how the carbon pools other than biomass are estimated in case of a land-use change from unmanaged land to managed forest land.	Resolved. The NIR (annex, section 3.1.12) includes the methodology used for the estimation of dead organic matter and soil organic carbon for land-use conversions, including from unmanaged land to forest land.
L.5	4.A Forest land – CO_2 (L.7, 2017) Transparency	Report on the improved national system of rules for the assessment of land-use changes.	Not resolved. During the review, the Party referred to the information reported in the NIR (sections 6.2.8 and 6.4.1.1, table 6.3 and figure 6.5) but the ERT could not identify any new information on the improved national system of rules for the assessment of land-use changes.

ID#	*Issue and/or problem classification*[a, b]	*Recommendation made in previous review report*	*ERT assessment and rationale*
L.6	4.C Grassland – CO_2 (L.8, 2017) Accuracy	Provide information on the choice of the country-specific CO_2 EF for drained organic soils in grassland.	Not resolved. The text in the NIR has not been amended. During the review, the Party stated that it considered the explanation provided in the NIR (annex 3:2, p. 130) to be sufficient to justify the EF used. However, the ERT notes that the explanation is the same as that included in the 2017 NIR (annex 3:2, p. 97) and therefore transparency has not been improved. The ERT also notes that the default EFs in the Wetlands Supplement (chap. 2, table 2.1) for temperate and boreal drained grassland soils are 5.3–6.1 and 5.7 t CO_2-carbon ha^{-1} $year^{-1}$, respectively, and thus are considerably higher than the EFs used by Sweden (NIR, annex, table A3:2.8), 2.6 and 0.25–0.93 t CO_2-carbon ha^{-1}, respectively. The ERT is of the view that the application of the EFs for drained forest land as country-specific EFs for drained grassland should be justified and documented in accordance with paragraph 50(a) of the UNFCCC Annex I inventory reporting guidelines.
L.7	4.F.2 Land converted to other land – CO_2 (L.3, 2017) (L.8, 2016) (L.8, 2015) Completeness	Report emissions from the loss of living biomass and emissions/removals from mineral soil carbon for all conversions to other land.	Addressing. The net carbon stock change in living biomass and the carbon stock change in mineral soils were reported in CRF table 4.F for forest land converted to other land, as explained in the NIR (sections 6.3.1.1 and 6.4.5.3). The area of, and carbon stock changes in, cropland converted to other land were reported as "NO". For grassland, wetlands and settlements, the converted area was reported, while the carbon stock changes in biomass and soils were reported as "NO".
L.8	4(II) Emissions and removals from drainage and rewetting and other management of organic/mineral soils – CH_4 (L.9, 2017) Transparency	Report in the NIR that the ditches reported under category 9 (road and railroad) are ditches alongside roads and railroads only.	Resolved. The NIR has been amended and the explanation provided in table 6.3.
L.9	4(II) Emissions and removals from drainage and rewetting and other management of organic/mineral soils – CH_4 (L.9, 2017) Transparency	Report in the NIR that the EF per ha for all ditches is country-specific, because the area of ditches is estimated based on a factor for the fraction of the drained area (i.e. 2.5 per cent for forest land and 5 per cent for grassland and cropland) and this factor is applied to the country-specific EF by land use.	Not resolved. During the review, the Party referred to improvements made to table 6.3 and the text on p. 141 in the annex to the NIR. The ERT noted that table 6.3 and the text are the same as that included in the 2017 NIR (annex, p. 108) and considers that transparency regarding the country-specific EF for ditches has not been improved.
L.10	4 (III) Direct N_2O emissions from N mineralization/ immobilization – N_2O (L.4, 2017) (L.4, 2016) (L.4, 2015) (58, 2014)	Make efforts to develop country-specific carbon to nitrogen ratios based on measurements of soil organic carbon to improve the accuracy of the N_2O emission calculations using a tier 2 method.	Resolved. As explained in the NIR (section 6.4.2.10 and annex 3, section 3.2.3), Sweden has developed country-specific carbon to nitrogen ratios and applied them in the tier 2 method for most of the categories to take into consideration the

ID#	*Issue and/or problem classification*[a, b]	*Recommendation made in previous review report*	*ERT assessment and rationale*
	(78, 2013) Accuracy		initial conditions before land-use change and/or the management system.
L.11	4(V) Biomass burning – CO_2, CH_4 and N_2O (L.10, 2017) Transparency	Provide information on how the country-specific value (25 per cent) for the pre-fire biomass stock that is combusted during a fire is estimated.	Resolved. The Party provided information on the country-specific value in the NIR (section 6.4.2.12).
Waste			
W.1	5.C.1 Waste incineration – indirect gases (W.2, 2017) Transparency	Present information on the emission estimates of indirect GHGs from waste incineration in the NIR.	Resolved. An extended paragraph specifying the methodology used for the quantification of emissions of indirect GHGs from waste incineration was included in the NIR (section 7.4.1.2).
KP-LULUCF activities			
KL.1	Article 3.3 activities – CO_2, CH_4 and N_2O (KL.7, 2017) Transparency	Revise the comment to table NIR-2 to clarify that the extrapolation of areas for land use and land-use conversion is done using the trends and not using extrapolated land-use conversions for individual plots.	Not resolved. The previous annual review report referred to page 475 of the 2017 NIR, which explained that "the extrapolation has one disadvantage that the NIR-2 table cannot be filled in appropriately, because we find it inaccurate to extrapolate areas of land use conversions". During the previous review, Sweden had explained that it extrapolates areas for land use and land-use conversion using the trends, and that the comment to table NIR-2 is intended to explain that the Party does not extrapolate land-use conversions for individual plots. However, the ERT notes that the same sentence has been included in the 2019 NIR (p.466).
KL.2	FM – CO_2, CH_4 and N_2O (KL.3, 2017) (KL.5, 2016) (KL.5, 2015) Transparency	Provide in the NIR information on the technical corrections in accordance with the annex to decision 2/CMP.7 and annex II to decision 2/CMP.8, including how the technical corrections impact areas under FM and the reasons for the deviation between FM activities and the FMRL.	Resolved. The Party recalculated the technical correction and explained the reasons for the deviation between the FM activities and the FMRL as well as how the technical correction affects the areas (NIR, section 10.5.6).
KL.3	FM – CO_2, CH_4 and N_2O (KL.8, 2017) Transparency	Report information that supports the assumption that land-use changes from forest to wetlands or other land (if they happen) are not taking place in combination with deforestation activities.	Not resolved. The text in the NIR has not been amended. During the review, the Party stated that all sample plots are visited during each forest inventory and all land-use conversions are identified. A change from forest land to other land or wetlands occurs as a result of natural forest degeneration. As such change is not due to deforestation, the land continues to be reported under FM under the Kyoto Protocol, even though under the Convention it is reclassified from forest land to other land or wetlands. The Party clarified that after the land-use conversion, trees may remain, and this may lead to small net removals. The ERT considers that including this explanation in the NIR would contribute to resolving this issue.

ID#	*Issue and/or problem classification*[a, b]	*Recommendation made in previous review report*	*ERT assessment and rationale*
KL.4	HWP – CO_2 (KL.6, 2017) (KL.9, 2016) (KL.9, 2015) Transparency	Include information on the rationale for the country-specific HWP conversion factors for panels and sawn wood in the NIR (see document FCCC/ARR/2017/SWE, table 3, ID# KL.5).	Resolved. The Party provided information on the country-specific HWP conversion factors for panels, sawn wood and paper. The text has been amended in the NIR (section 6.4.2.6).

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

[b] The report on the review of the 2018 annual submission of Sweden was not available at the time of the 2019 review. Therefore, the previous recommendations reflected in table 3 are taken from the 2017 annual review report. For the same reason, 2018 is excluded from the list of review years in which the issue could have been identified.

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

9. In accordance with paragraph 83 of the UNFCCC review guidelines, the ERT noted that the issues included in table 4 have been identified in three successive reviews, including the review of the 2019 annual submission of Sweden, and have not been addressed by the Party.

Table 4
Issues and/or problems identified in three successive reviews and not addressed by Sweden

ID#	*Previous recommendation for the issue identified*	*Number of successive reviews issue not addressed*[a]
General	No issues identified	
Energy		
E.4	Report fugitive CH_4 emissions from charcoal production separately in category 1.A.1.c and describe in the NIR where in the CRF tables these emissions are reported	3 (2015/2016–2019)
IPPU		
I.26	Document in the NIR the methodology used to derive the uncertainty data using expert judgment and revise the uncertainty estimates, if appropriate	4 (2014–2019)
Agriculture	No issues identified	
LULUCF		
L.7	Report emissions from the loss of living biomass and emissions/removals from mineral soil carbon for all conversions to other land	3 (2015/2016–2019)
Waste	No issues identified	
KP-LULUCF activities	No issues identified	

[a] The report on the review of the 2018 annual submission of Sweden has not yet been published. Therefore, 2018 was not included when counting the number of successive years in table 4. As the reviews of the Party's 2015 and 2016 annual submissions were conducted together, they are not considered successive and 2015/2016 is considered as one year.

V. Additional findings made during the individual review of the 2019 annual submission

10. Tables 5–6 contain findings made by the ERT during the individual review of the 2019 annual submission of Sweden 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 or 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 2019 annual submission of Sweden related to recalculations

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?*[a]
Energy			
E.5	1. General (energy sector)	Recalculations were made for the energy sector that changed the emission or 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
IPPU			
I.32	2. General (IPPU)	Recalculations were made for the IPPU sector that changed the emission or 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
Agriculture			
A.6	3. General (agriculture)	Recalculations were made for the agriculture sector that changed the emission or removal estimate for a category by more than 2 per cent; however, the ERT did not identify any issues or problems with these recalculations.	Not an issue/problem
LULUCF			
L.12	4. General (LULUCF)	Recalculations were made for the LULUCF sector that changed the emission or 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.2	5. General (waste)	Recalculations were made for the waste sector that changed the emission or 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 activities			
KL.5	General (KP-LULUCF activities)	Recalculations were made for KP-LULUCF activities that changed the emission or 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 para. 81 of the UNFCCC review guidelines or problems as defined in para. 69 of the Article 8 review guidelines.

11. Table 6 contains additional findings made by the ERT during the individual review of the 2019 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 2019 annual submission of Sweden

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?[a] If yes, classify by type*
General			
G.4	QA/QC and verification	The NIR (annex 5, table A5.1) indicates that a number of categories were not estimated owing to lack of data. However, during the review, Sweden clarified that for the following categories the reason for not estimating the emissions is the lack of methodology or EF in the 2006 IPCC Guidelines: CO_2, CH_4 and N_2O emissions for several subcategories under 2.B.10 (other) (CO_2, CH_4 and N_2O emissions from other non-specified; CH_4 emissions from pharmaceutical industry; and CO_2 emissions from sulfuric acid production), CH_4 emissions for category 2.C.1.e (pellet), CH_4 emissions for category 2.C.7.c (metal production – other) and CO_2 emissions for category 2.G.4 (tobacco smoking). During the review, the Party indicated that it plans to update section 5.1.1 in annex 5 to the NIR. The ERT recommends that the Party review and revise table A5.1 of the NIR to accurately clarify the justification of why the categories reported as "NE" were not estimated.	Yes. Transparency
G.5	QA/QC and verification	The ERT noted blank cells in CRF tables 1.A(b), 1.C, 2(I)s1, 2(I)s2, 2(II) and 4(II). During the review, Sweden clarified that "NO" should be reported in the blank cells for CRF tables 1.A(b) (carbon stored (carbon excluded)), 1.C (AD and emissions for CO_2 transport and storage), 2(I)s1 (F-gas emissions for categories 2.B.9 and 2.B.10), 2(I)s2 (F-gas emissions for several subcategories under 2.E, 2.F and 2.G) and 2(II) (F-gas emissions for several subcategories under 2.B, 2.C, 2.E, 2.F, 2.G and 2.H and the total F-gas emissions of the categories for some gases). However, the Party explained that it encountered problems with the CRF Reporter software and was therefore unable to fill in the blank cells (see also ID# I.36 below). The Party also explained that, regarding the blank cells in CRF table 4(II), rewetted mineral soils under flooded lands, as well as other wetlands, do not exist in Sweden. The ERT notes that, in this case, reporting "NO" would also be appropriate. The Party clarified during the review that in the next submission it plans to complete all cells in CRF tables 1.C and 4(II) with notation keys. Regarding the empty cells in CRF tables 2(I)s1, 2(I)s2 and 2(II), the Party explained that it may include text in the documentation boxes explaining that all empty cells in these CRF tables should be read as including "NO". The ERT recommends that Sweden fill each blank cell in CRF tables 1.A(b), 1.C, 2(I)s1, 2(I)s2, 2(II) and 4(II) with either the appropriate value or a notation key. The ERT encourages Sweden to conduct a QC check to ensure that all cells are filled. If the notation keys cannot be reported owing to problems with the use of CRF Reporter, the ERT encourages Sweden to include in the NIR a table listing such categories and the corresponding notation keys.	Yes. Convention reporting adherence
Energy			
E.6	1.A Fuel combustion – sectoral approach – all fuels and gases	In the NIR (section 3.2), the Party explained the AD sources used. Further explanations of data sources were provided in annex 2 to the NIR, including in summaries in tables A2.1 and A2.2. However, the Party used different titles for the same data sources, making it difficult to understand the AD sources used. For example, section 3.2.9.2 of the NIR (entitled "Methodological issues iron and steel, CRF 1.A.2.a") states that AD for all other facilities are, if not otherwise stated, collected from industrial energy statistics. However, "industrial energy statistics" are 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*
		referred to in table A2.1 (“Summary of main activity data sources used in the inventory for stationary combustion”) or A2.2 (“Summarized properties of activity data sources used in the inventory for stationary combustion”). The ERT recommends that the Party ensure consistency in its references to data sources throughout the NIR.	
E.7	International navigation – gas/diesel oil – CO_2, CH_4 and N_2O	The amounts of gas/diesel oil reported for international marine bunkers are different in CRF tables 1.D and 1.A(b). For example, for 2017, 31,322.88 TJ of gas/diesel oil use for international navigation was reported in CRF table 1.D, while the value reported in CRF table 1.A(b) is 30,579.27 TJ. During the review, the Party explained that the amount of gas/diesel oil used in the reference approach (CRF table 1.A(b)) is based on national energy balance data, whereas the amount used to report international navigation in CRF table 1.D is based on the monthly fuel supply statistics. These figures are consistent in terms of AD (m^3) but, owing to different NCVs, the energy quantities differ. During the review, the Party described its plans to include the explanation provided to the ERT in the next NIR. The ERT recommends that Sweden explain in the NIR, for example in annex 2, section 2.2, the reason why the reported amount of gas/diesel oil used in international navigation is different in CRF tables 1.D and 1.A(b).	Yes. Transparency
E.8	International navigation – residual fuel oil – CO_2	The amounts of residual fuel oil reported for international marine bunkers are different in CRF tables 1.D and 1.A(b). For example, for 2017, 69,351.51 TJ of residual fuel oil use for international navigation was reported in CRF table 1.D, while the value reported in CRF table 1.A(b) is 66,947.98 TJ. During the review, the Party explained that the amount of residual fuel oil used in the reference approach (CRF table 1.A(b)) is based on national energy balance data, whereas the amount reported in CRF table 1.D is based on the monthly fuel supply statistics. The difference is due to a mistake in the energy balance calculations. During the review, the Party explained its plans to correct the identified error in the next submission. The ERT recommends that Sweden correct the erroneous values of residual fuel oil consumption reported in CRF table 1.A(b) for the entire time series. The ERT also recommends that the Party improve QC to ensure that data used in the CRF tables are consistent throughout.	Yes. Accuracy
IPPU			
I.33	2. General (IPPU) – HFCs and N_2O	In several instances, the NIR refers to data as being confidential when this is not actually the case. Specifically, the ERT noted that: (a) The NIR (section 4.7.4.4 on category-specific QA/QC and verification) states, with regard to category 2.F.4 (aerosols), that data and information from the products register, hosted by the Swedish Chemicals Agency, could not be used directly for validation and reporting purposes owing to confidentiality. During the review, the Party clarified that confidentiality was not the reason why the information from the products register could not be used for validation and reporting purposes. Instead, the emissions reported in category 2.F.4 are largely from products imported to Sweden, while the information in the products register hosted by the Swedish Chemicals Agency contains only information on imports in bulk and is thus not suitable for validation purposes. During the review, the	Yes. Convention reporting adherence

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
		Party indicated that the justification for not being able to use data and information from the products register for validation and reporting purposes would be corrected in its next submission; (b) The NIR (section 4.8.3) states that data on use of N_2O for medical applications (category 2.G.3.a) and use of N_2O for propellant for pressure and aerosol products (category 2.G.3.b) cannot be reported separately for confidentiality reasons. During the review week, the Party stated that the actual reason for not reporting disaggregated data was that they were not available at such a level. However, in response to the provisional main findings, the Party repeated the explanation in the NIR that data were aggregated for confidentiality reasons, and that it is currently assessing whether it would be possible to obtain confidential data at a disaggregated level in the future. The ERT recommends that the Party check the sections in the NIR that refer to confidential data and evaluate whether the data in these cases are actually confidential and whether the justification for not reporting data for confidentiality reasons is reported transparently, and revise the NIR text accordingly.	
I.34	2.B.5 Carbide production – CO_2	The NIR (section 4.3.5) states that emissions from calcium carbide production and use for acetylene production are included under category 2.B.5.b (calcium carbide). The section also mentions emissions from acetylene use once, but does not present the methodology for estimating CO_2 emissions from acetylene use. During the review, the Party clarified that, where the NIR states "acetylene use", it should actually state "calcium carbide use for acetylene production" and that this would be corrected in the next submission. The Party also clarified that emissions from acetylene use occur in Sweden, and that these emissions were included under category 2.B.5.b. The Party summarized the methodology used for estimating emissions from acetylene use and indicated that it would present the methodology, AD and EFs used for the estimation of emissions from acetylene use in its next submission. The ERT recommends that the Party report transparently the methodology used for estimating CO_2 emissions from acetylene use, including the AD and EFs used, in the section of the NIR on calcium carbide (category 2.B.5.b).	Yes. Transparency
I.35	2.B.10 Other (chemical industry) – non-methane volatile organic compounds	With regard to emissions of non-methane volatile organic compounds reported under category 2.B.10 (other), the NIR (section 4.3.10.1) states that, potentially, part of the emissions of non-methane volatile organic compounds reported under category 2.B.10 should be reported under category "CRF 3C (e.g. pharmaceutical industries)". During the review, the Party clarified that the reference should be to category 2.D.3 (non-energy products from fuels and solvent use – other) and that this would be corrected in the next submission. The ERT encourages Sweden to replace the erroneous reference to category 3.C in the NIR (section 4.3.10.1) with a reference to "2.D.3 other – solvent use" and to implement QC processes to ensure correct cross-referencing to other categories.	Not an issue/problem
I.36	2.F Product uses as substitutes for ozone-depleting substances – HFCs	The reporting in the NIR and the CRF tables across several IPPU categories was not fully consistent and, in some cases, undermined the transparency of the submission for key and non-key categories. Specifically, the ERT noted that: (a) The NIR (p.283) states that for categories 2.F.1.a (commercial refrigeration), 2.F.1.c (industrial refrigeration) and 2.F.1.f (stationary air-conditioning), the leakage rates and lifetimes used for the estimation of HFC emissions have been changed from country-specific to default EFs from the 2006 IPCC Guidelines since the 2018 submission. The NIR also states that for heat pumps, reported under category 2.F.1.f, country-specific EFs continued to be used. CRF	Yes. Convention reporting adherence

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*
		table summary3s1 indicates that a combination of country-specific and default EFs were used to report HFC emissions under category 2.F.1 (refrigeration and air conditioning). The NIR (p.284, table 4.40) indicates, however, that the EFs for HFCs under category 2.F.1 are country-specific. During the review, the Party clarified that the EFs are indeed default EFs from the 2006 IPCC Guidelines, with the exception of HFCs from heat pumps under category 2.F.1.f, where country-specific EFs continued to be used, and that this would be corrected in the next submission; (b) The NIR (p.283) states that consumption data for HFC-245fa and HFC-134 are classified as confidential and that the consumption amounts of both gases were each aggregated with another gas with a comparable global warming potential. During the review, the Party clarified that the amounts of HFC-245fa and HFC-134 that were aggregated with other gases for reporting purposes were corrected to account for the difference in their global warming potential and the global warming potential of the F-gas with which they were aggregated. The ERT noted that, by doing so, accuracy was maintained. In CRF table 2(II), the cells for HFC-245fa and HFC-134 are empty, and the notation key "IE" was not used. During the review, the Party clarified that, owing to technical problems, it was not able to insert notation keys in the table. The Party indicated that, in future submissions, it would report in the NIR where notation keys could not be inserted in the CRF tables. The ERT recommends that Sweden improve its QA/QC procedures for the NIR and the CRF tables in order to minimize errors and inconsistencies, in particular regarding reporting on the methodologies and EFs used for the subcategories under 2.F.1 and regarding the use of the notation key "IE" in CRF table 2(II) for gases that have been aggregated with other gases. The ERT encourages Sweden to report in the NIR if notation keys could not be inserted in the CRF tables for technical reasons.	
Agriculture			
A.7	3.A.1 Cattle – CH_4	The ERT was unable to reproduce the calculation of dry matter intake, gross energy intake and the EF for the three subcategories of bulls and steers (<1 year, 1–2 years and >2 years). For example, the values calculated by the ERT for the dry matter intake for bulls and steers for the subcategories <1 year, 1–2 years and >2 years are 5.8, 9.1 and 10.3 kg dry matter/head/day, respectively, rather than 5.5, 8.7 and 9.8 kg dry matter/head/day, respectively, reported in table 5.4 of the NIR. During the review, the Party explained that the dry matter intake of the Hereford and Angus breeds were corrected by decreasing the recommended daily intake by 5 per cent on the basis of a study by the Swedish University of Agricultural Sciences. The ERT recommends that Sweden provide more detailed information and rationale in the NIR regarding the assumptions used in the calculation of dry matter intake for bulls and steers, in particular by explaining the correction of dry matter intake for the Hereford and Angus breeds.	Yes. Transparency
A.8	3.A.1 Cattle – CH_4	Sweden reported in the NIR (section 5.2.2.1.2) that the equations for dairy cattle were also used for suckler cows, with some modification in relation to milk production, live weight, additional energy requirement for pregnancy and the fraction of concentrates in the feed. The ERT was unable to reproduce the calculations of dry matter intake and the EF for suckler cows using the equations provided in section 5.2.2.1.1 of the NIR, the AD provided in section 5.2.2.1.2 and the values of energy content in silage and fat content in silage provided in section 5.2.2.1.1. During the review, the Party explained that the quality of silage for suckler cows has not improved since 1990. The energy content in silage is 9.5 MJ/kg dry matter for suckler cows for 2017, rather than 10.1 MJ/kg dry matter for dairy	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
		cattle. The Party also explained that the metabolizable energy calculation did not follow the equation for dairy cattle. A rounded value of 73 MJ was used to replace the value obtained from the calculation of $0.507 \times 750^{\wedge 0.75}$ for the estimation of metabolizable energy for suckler cows. The ERT recommends that Sweden provide in its NIR information on, and the rationale for, the methodology used for the calculation of the dry matter intake and EF for suckler cows. The ERT also recommends that the Party provide in its NIR information on, and the rationale for, the value of energy content in silage used for suckler cows.	
A.9	3.B Manure management – CH_4 and N_2O	NIR table 5.13 is entitled "Anaerobic digestion and composting waste management systems (fractions)". The ERT noted that some data in the table are >1. During the review, the Party clarified that the data in the table are in percentages, not fractions. The ERT recommends that Sweden correct the values from percentages to fractions in NIR table 5.13.	Yes. Convention reporting adherence
A.10	3.B Manure management – N_2O	The Party reported in table 5.17 of the NIR that the N_2O EF for composting is 0.01 per cent. The ERT noted that this is much lower than the values included in the 2006 IPCC Guidelines (vol. 4, table 10.21) for composting (in-vessel and static pile, 0.6 per cent; intensive windrow, 10 per cent; and passive windrow, 1 per cent). During the review, the Party clarified that there was a typographical error in table 5.17 and that an EF of 1 per cent was used in the calculations. The ERT recommends that Sweden correctly report the N_2O EF for composting in table 5.17 of the NIR.	Yes. Convention reporting adherence
A.11	3.D Direct and indirect N_2O emissions from agricultural soils – N_2O	The ERT noted that the N in applied organic fertilizers was 71,064 t according to table 5.21 of the NIR, while it was 79,571 t in CRF table 3.D for 2017. During the review, Sweden clarified that the title of the third column of NIR table 5.21 should be "Animal manure applied to soils". The ERT recommends that the Party correct the title of the third column in NIR table 5.21 from "N in applied organic fertilizers" to "N in animal manure applied to soils".	Yes. Convention reporting adherence
LULUCF			
L.13	4. General (LULUCF) – all gases	There was no transparent explanation in the 2019 submission regarding how the area data from different data sources, referred to in section 6.3.2 of the NIR, were combined. During the review, Sweden clarified that three sources of AD were used in combination with the national forest inventory. The areas of wildfire (from the Swedish Civil Contingencies Agency) and areas of controlled burning (from the Swedish Forest Agency) overlap the area assessed for the national forest inventory and, therefore, the carbon stock changes due to fire are included in the carbon stock changes in forest land remaining forest land or grassland remaining grassland. Areas of wetlands remaining wetlands are also obtained from the national forest inventory, while peat extraction areas are separated from the remaining area of wetlands remaining wetlands by using the area data obtained from the Swedish Geological Survey. The ERT recommends that the Party include in the NIR the explanation of how different sources of area data have been used and combined in the inventory, in particular the data sources mentioned in section 6.3.2 of the NIR.	Yes. Transparency
Waste			

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.3	5.A Solid waste disposal on land – CH_4	In the NIR (p.394, table 7.5), Sweden provided information on the energy recovery and flaring of landfill gas, referring to information from Avfall Sverige (the Swedish Waste Management Association). Upon evaluation of this reference, the ERT noticed a difference between the energy recovery and flaring reported in table 7.5 and the amounts reported by Avfall Sverige. During the review, Sweden explained that the information from Avfall Sverige covers mostly landfills in operation. The inventory compilers supplemented the data with information on landfill gas recovery at landfills in operation, which Avfall Sverige may have excluded, and at closed landfills, which Avfall Sverige does not cover. This explains why NIR table 7.5 provides a more complete picture of the energy recovery and flaring at landfills in Sweden than the document provided by Avfall Sverige. Furthermore, the ERT noted that the NIR lacked transparency regarding how the amount of CH_4 was calculated on the basis of the amount of energy recovery. During the review, the Party explained that the calculation was based on the energy production in MWh and on the lower heating value of CH_4. The ERT recommends that Sweden describe more transparently in the NIR how the amount of CH_4 recovered and used for energy and the amount flared is determined, in particular that the information from Avfall Sverige is supplemented by information on additional landfills in operation and all closed landfills, which are excluded from the data provided by Avfall Sverige. The ERT also recommends that Sweden describe how CH_4 use and flaring are calculated (i.e. on the basis of the energy production in MWh and using the lower heating value for CH_4).	Yes. Transparency
W.4	5.D Wastewater treatment and discharge – N_2O	In the NIR (p.424), Sweden explained that equation 6.7 of the 2006 IPCC Guidelines (vol. 5) was used to quantify N_2O emissions from wastewater. However, the NIR lacked transparency as to whether the reported emissions were direct and/or indirect N_2O emissions from wastewater treatment plants, and which AD and EFs were used. During the review, Sweden provided additional information, which clarified that the Party quantifies both direct and indirect N_2O emissions on the basis of available statistics of N in both the influent and effluent of wastewater treatment plants and assuming a country-specific EF for direct emissions from wastewater treatment plants. The ERT recommends that Sweden describe more transparently in the NIR the methodologies used for the estimation of N_2O emissions from wastewater, along with the AD and EFs used. Specifically, the ERT recommends that the Party explain that (1) it estimates both direct emissions from wastewater treatment plants and indirect emissions due to discharge of N on open waters; (2) direct emissions are estimated on the basis of available statistics on N in the influent of large wastewater treatment plants and a country-specific EF of 0.0074 kg N_2O-N/kg N in the influent; (3) indirect emissions are calculated using the default EF from the 2006 IPCC Guidelines (vol. 5, chap. 6.3.1.2); (4) available statistics on N in the effluent of large wastewater treatment plants are used as AD for indirect emissions; and (5) for the part of the population not connected to large wastewater treatment plants an estimate is made of N discharge on open waters on the basis of the amount of N per capita in the influent of wastewater treatment plants.	Yes. Transparency
W.5	5.D.1 Domestic wastewater – CH_4	In the NIR (p.422), Sweden explained that equation 6.1 of the 2006 IPCC Guidelines (vol. 5) was used to quantify emissions from domestic wastewater. However, the NIR lacked transparent information on how the emissions from wastewater treatment plants were estimated, including the justifications for the CH_4 correction factors and EFs applied and methodologies used to estimate emissions from sludge treatment. During the review, Sweden provided	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
		additional information clarifying that it distinguishes emissions from wastewater treatment ponds from emissions from on-site sludge treatment. Emissions from on-site sludge treatment were estimated on the basis of CH_4 generation from sludge treatment and an EF per kg of CH_4 generated. The ERT recommends that Sweden describe more transparently in the NIR how the amount of CH_4 generated and emitted at wastewater treatment plants is estimated (i.e. that emissions from the wastewater treatment ponds and sludge treatment are estimated separately). The ERT also recommends that the Party explain that (1) all wastewater treatment plants are well managed and the CH_4 correction factor is assumed to be 0; (2) the application of equation 6.1 from the 2006 IPCC Guidelines (vol. 5, chap. 6) results in negligible CH_4 emissions from water ponds; and (3) CH_4 generation from anaerobic digestion of sludge treatment is estimated on the basis of total organics in wastewater removed, the amount of sludge generated and the CH_4 potential of the sludge, and that 4 per cent of CH_4 generation is assumed to be emitted.	
W.6	5.D.1 Domestic wastewater – CH_4	According to the NIR (p.420), 1.3 million people in Sweden are not connected to the sewer system. However, the NIR does not describe how the wastewater is treated and whether it results in CH_4 emissions. During the review, Sweden indicated that a wide range of technologies are used for on-site treatment of wastewater in Sweden, but it is most common that the technologies involve a septic tank. The sludge in the septic tank is pumped and transported to a municipal wastewater treatment plant and co-digested with the sludge generated at the wastewater treatment plant. The CH_4 emissions due to co-digestion of sludge from septic tanks are included in the inventory. CH_4 emissions due to methanogenesis of total organics in wastewater in the septic tanks themselves are expected to be very low owing to the low temperatures in the septic tanks at annual average air temperatures in Sweden of just 4.8 °C in 1991–2005. The ERT agreed with the explanation and noted that, according to the 2006 IPCC Guidelines (vol. 5, chap. 6, p.6.7), CH_4 production is unlikely below 15 °C because methanogens are not active. The ERT recommends that Sweden describe clearly in the NIR that the average temperatures in Sweden are low, and that therefore direct emissions due to methanogenesis in septic tanks are assumed to be at a very low level, as explained in the 2006 IPCC Guidelines (vol. 5, chap. 6, p.6.7), according to which CH_4 production is unlikely below 15 °C because methanogens are not active.	Yes. Transparency
W.7	5.D.2 Industrial wastewater – CH_4	In the NIR (p.422), Sweden explained that equation 6.4 of the 2006 IPCC Guidelines (vol. 5) was used to quantify CH_4 emissions from industrial wastewater treatment. However, the NIR lacked transparent information on how the emissions from industrial wastewater treatment plants were estimated, such as the justifications for the CH_4 correction factors and EFs applied and methodologies used to estimate emissions from sludge treatment and anaerobic digestion of wastewater. During the review, Sweden provided additional information that clarified how the Party quantifies the emissions. The ERT recommends that Sweden describe more transparently in the NIR how the amount of CH_4 generated and emitted from industrial wastewater treatment is estimated; in other words, that Sweden distinguish between	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*
		emissions from aerobic wastewater treatment ponds, on-site treatment of sludge generated in those aerobic ponds, and anaerobic digestion of wastewater. The ERT also recommends that Sweden explain in the NIR that: (a) All aerobic wastewater treatment plants are well managed, and the CH_4 correction factor is assumed to be 0. For these installations, the application of equation 6.1 of the 2006 IPCC Guidelines results in negligible CH_4 emissions; (b) CH_4 generation from sludge treatment is estimated on the basis of statistics for energy recovery. Similar energy statistics are used to quantify CH_4 generation from anaerobic digestion of wastewater; (c) CH_4 emissions from both sludge treatment and anaerobic digestion of wastewater are subsequently estimated, assuming 5 per cent of CH_4 being emitted in 1990–2000; a gradual decrease from 5 to 2 per cent in 2001–2009; and 2 per cent from 2010 onwards. The ERT also recommends that Sweden improve the justification provided for the trend in the EF (from 5 to 2 per cent), making clear that it is based on expert judgment on the effect of an increased awareness of CH_4 leakages at biogas facilities and efforts to minimize CH_4 leakages from those facilities.	
KP-LULUCF activities			
KL.6		No additional findings beyond those contained in table 3 were made by the ERT for KP-LULUCF activities during the 2019 review.	Not a problem

[a] Recommendations made by the ERT during the review are related to issues as defined in para. 81 of the UNFCCC review guidelines or problems as identified in para. 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 did not identify the need to apply any adjustments to the 2019 annual submission of Sweden.

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

13. Sweden has elected commitment period accounting and therefore the issuance and cancellation of units for KP-LULUCF activities is not applicable to the 2019 review.

VIII. Questions of implementation

14. No questions of implementation were identified by the ERT during the individual review of the Party's 2019 annual submission.

Annex I

Overview of greenhouse gas emissions and removals for Sweden for submission year 2019 and data and information on activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, as submitted by Sweden in its 2019 annual submission

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

Table 1
Total greenhouse gas emissions for Sweden, base year[a]–2017
(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								–41 336.10
Base year	37 034.36	71 429.98	NA	NA	NA		NA	
1990	36 908.06	71 303.68	NA	NA				
1995	42 162.69	73 287.20	NA	NA				
2000	31 887.62	68 482.63	NA	NA				
2010	20 335.52	64 282.22	NA	NA				
2011	22 921.49	60 207.29	NA	NA				
2012	14 474.12	56 872.55	NA	NA				
2013	15 802.43	55 366.28	NA	NA		1 438.12	NA	–46 226.86
2014	12 684.56	53 831.57	NA	NA		1 393.32	NA	–47 729.15
2015	8 005.38	53 460.58	NA	NA		1 498.01	NA	–48 152.68
2016	8 405.06	52 942.81	NA	NA		467.83	NA	–49 924.45
2017	8 932.83	52 660.27	NA	NA		13.68	NA	–49 168.64

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

[a] "Base year" refers to the base year under the Kyoto Protocol, which is 1990 for CO_2, CH_4 and N_2O, and 1995 for HFCs, PFCs, SF_6 and NF_3. Sweden has not elected any activities under Article 3, para. 4, of the Kyoto Protocol. For activities under Article 3, para. 3, of the Kyoto Protocol and FM under Article 3, para. 4, only the inventory years of the commitment period must be reported.

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

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

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

Table 2
Greenhouse gas emissions by gas for Sweden, excluding land use, land-use change and forestry, 1990–2017
(kt CO_2 eq)

	CO_2[a]	*CH_4*	*N_2O*	*HFCs*	*PFCs*	*Unspecified mix of HFCs and PFCs*	*SF_6*	*NF_3*
1990	57 445.98	7 421.50	5 759.20	6.49	568.78	–	101.73	–
1995	59 199.63	7 370.92	5 913.36	135.76	532.35	–	135.19	–
2000	54 677.64	6 840.14	5 700.59	769.55	375.93	–	118.78	–
2010	52 845.02	5 242.79	4 807.24	1 135.92	187.79	–	63.46	–
2011	48 895.03	5 098.35	4 830.11	1 113.27	215.08	–	55.44	–
2012	46 323.48	4 935.77	4 383.39	1 098.10	78.68	–	53.13	–
2013	44 737.62	4 870.42	4 577.61	1 087.34	51.22	–	42.06	–
2014	43 175.56	4 738.44	4 675.91	1 113.77	82.02	–	45.88	–
2015	43 056.75	4 631.07	4 552.14	1 132.35	35.13	–	53.14	–
2016	42 582.49	4 553.62	4 569.04	1 149.02	31.18	–	57.46	–
2017	42 049.89	4 518.22	4 870.19	1 138.31	36.58	–	47.09	–
Per cent change 1990–2017	**–26.8**	**–39.1**	**–15.4**	**17 446.4**	**–93.6**	**NA**	**–53.7**	**NA**

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

Table 3
Greenhouse gas emissions by sector for Sweden, 1990–2017
(kt CO_2 eq)

	Energy	*IPPU*	*Agriculture*	*LULUCF*	*Waste*	*Other*
1990	52 292.57	7 610.53	7 658.27	–34 395.62	3 742.30	–
1995	53 925.09	7 887.94	7 912.24	–31 124.51	3 561.93	–
2000	49 128.01	8 358.17	7 774.01	–36 595.00	3 222.44	–
2010	47 146.60	8 391.01	6 820.38	–43 946.70	1 924.23	–
2011	43 352.48	7 885.94	7 136.14	–37 285.80	1 832.72	–
2012	40 995.78	7 522.58	6 660.65	–42 398.43	1 693.54	–
2013	39 388.82	7 480.28	6 888.64	–39 563.85	1 608.53	–
2014	37 985.06	7 363.38	6 988.83	–41 147.01	1 494.30	–
2015	37 888.34	7 311.86	6 860.09	–45 455.20	1 400.28	–
2016	36 899.65	7 854.36	6 870.52	–44 537.75	1 318.29	–

	Energy	*IPPU*	*Agriculture*	*LULUCF*	*Waste*	*Other*
2017	36 631.72	7 588.43	7 186.73	–43 727.44	1 253.40	–
Per cent change 1990–2017	**–29.9**	**–0.3**	**–6.2**	**27.1**	**–66.5**	**NA**

Notes: (1) Emissions/removals reported in the sector other (sector 6) are not included in the total GHG emissions. (2) Sweden did not report emissions/removals in the sector other (sector 6); the corresponding cells in the CRF tables were blank. (3) Sweden did not report indirect CO_2 emissions in CRF table 6.

Table 4

Greenhouse gas emissions/removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol by activity, base year[a]–2017, for Sweden

(kt CO_2 eq)

	Article 3.7 bis as contained in the Doha Amendment[b]	*Activities under Article 3, paragraph 3, of the Kyoto Protocol*		*FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol*				
	Land-use change	*AR*	*Deforestation*	*FM*	*CM*	*GM*	*RV*	*WDR*
FMRL				–41 336.10				
Technical correction				9 339.94				
Base year	NA				NA	NA	NA	NA
2013		–1 246.78	2 684.90	–46 226.86	NA	NA	NA	NA
2014		–1 310.24	2 703.57	–47 729.15	NA	NA	NA	NA
2015		–1 344.17	2 842.18	–48 152.68	NA	NA	NA	NA
2016		–1 408.06	1 875.89	–49 924.45	NA	NA	NA	NA
2017		–1 470.07	1 483.76	–49 168.64	NA	NA	NA	NA
Per cent change base year–2017					**NA**	**NA**	**NA**	**NA**

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

[a] Sweden has not elected to report on any activities under Article 3, para. 4, of the Kyoto Protocol. For activities under Article 3, para. 3, of the Kyoto Protocol, and FM under Article 3, para. 4, only the inventory years of the commitment period must be reported.

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

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

Table 5
Key relevant data for Sweden under Article 3, paragraphs 3 and 4, of the Kyoto Protocol in the 2019 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: not elected (e) GM: not elected (f) RV: not elected (g) WDR: not elected
Election of activities under Article 3, paragraph 4	None
Election of application of provisions for natural disturbances	Yes, for AR and FM
3.5% of total base-year GHG emissions, excluding LULUCF	2 521.999 kt CO_2 eq (20 175.994 kt CO_2 eq for the duration of the commitment period)
Cancellation of AAUs, CERs and ERUs and/or issuance of RMUs in the national registry for:	
1. AR	NA
2. Deforestation	NA
3. FM	NA
4. CM	NA
5. GM	NA
6. RV	NA
7. WDR	NA

Annex II

Information to be included in the compilation and accounting database

Tables 1–5 include the information to be included in the compilation and accounting database for Sweden. Data shown are from the original annual submission of the Party, including the latest revised estimates submitted, adjustments (if applicable) and the final data to be included in the compilation and accounting database.

Table 1
Information to be included in the compilation and accounting database for 2017, including on the commitment period reserve, for Sweden
(t CO_2 eq)

	Original submission	*Revised estimate*	*Adjustment*	*Final*
CPR	283 999 121	–	–	283 999 121
Annex A emissions for 2017	–	–	–	–
CO_2[a]	42 049 886	–	–	42 049 886
CH_4	4 518 217	–	–	4 518 217
N_2O	4 870 186	–	–	4 870 186
HFCs	1 138 313	–	–	1 138 313
PFCs	36 578	–	–	36 578
Unspecified mix of HFCs and PFCs	–	–	–	–
SF_6	47 087	–	–	47 087
NF_3	–	–	–	–
Total Annex A sources	**52 660 267**	–	–	**52 660 267**
Activities under Article 3, paragraph 3, of the Kyoto Protocol for 2017	–	–	–	–
AR	–1 470 073	–	–	–1 470 073
Deforestation	1 483 756	–	–	1 483 756
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol for 2017	**–**	**–**	**–**	**–**
FM	–49 168 637	–	–	–49 168 637

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

Table 2
Information to be included in the compilation and accounting database for 2016 for Sweden
(t CO_2 eq)

	Original submission	*Revised estimate*	*Adjustment*	*Final*
Annex A emissions for 2016	–	–	–	–
CO_2[a]	42 582 492	–	–	42 582 492
CH_4	4 553 618	–	–	4 553 618
N_2O	4 569 040	–	–	4 569 040
HFCs	1 149 024	–	–	1 149 024
PFCs	31 177	–	–	31 177
Unspecified mix of HFCs and PFCs	–	–	–	–
SF_6	57 463	–	–	57 463
NF_3	–	–	–	–
Total Annex A sources	**52 942 814**	–	–	**52 942 814**
Activities under Article 3, paragraph 3, of the Kyoto Protocol for 2016	–	–	–	–

	Original submission	*Revised estimate*	*Adjustment*	*Final*
AR	–1 408 060	–	–	–1 408 060
Deforestation	1 875 889	–	–	1 875 889
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol for 2016	**–**	**–**	**–**	**–**
FM	–49 924 453	–	–	–49 924 453

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

Table 3
Information to be included in the compilation and accounting database for 2015 for Sweden
(t CO_2 eq)

	Original submission	*Revised estimate*	*Adjustment*	*Final*
Annex A emissions for 2015	–	–	–	–
CO_2[a]	43 056 752	–	–	43 056 752
CH_4	4 631 067	–	–	4 631 067
N_2O	4 552 138	–	–	4 552 138
HFCs	1 132 350	–	–	1 132 350
PFCs	35 131	–	–	35 131
Unspecified mix of HFCs and PFCs	–	–	–	–
SF_6	53 136	–	–	53 136
NF_3	–	–	–	–
Total Annex A sources	**53 460 575**	–	–	**53 460 575**
Activities under Article 3, paragraph 3, of the Kyoto Protocol for 2015	–	–	–	–
AR	–1 344 172	–	–	–1 344 172
Deforestation	2 842 178	–	–	2 842 178
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol for 2015	**–**	**–**	**–**	**–**
FM	–48 152 680	–	–	–48 152 680

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

Table 4
Information to be included in the compilation and accounting database for 2014 for Sweden
(t CO_2 eq)

	Original submission	*Revised estimate*	*Adjustment*	*Final*
Annex A emissions for 2014	–	–	–	–
CO_2[a]	43 175 556	–	–	43 175 556
CH_4	4 738 442	–	–	4 738 442
N_2O	4 675 907	–	–	4 675 907
HFCs	1 113 767	–	–	1 113 767
PFCs	82 024	–	–	82 024
Unspecified mix of HFCs and PFCs	–	–	–	–
SF_6	45 879	–	–	45 879
NF_3	–	–	–	–
Total Annex A sources	**53 831 574**	–	–	**53 831 574**
Activities under Article 3, paragraph 3, of the Kyoto Protocol for 2014	–	–	–	–
AR	–1 310 242	–	–	–1 310 242
Deforestation	2 703 566	–	–	2 703 566
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol for 2014	**–**	**–**	**–**	**–**

	Original submission	*Revised estimate*	*Adjustment*	*Final*
FM	–47 729 148	–	–	–47 729 148

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

Table 5
Information to be included in the compilation and accounting database for 2013 for Sweden
($t\ CO_2\ eq$)

	Original submission	*Revised estimate*	*Adjustment*	*Final*
Annex A emissions for 2013	–	–	–	–
CO_2[a]	44 737 618	–	–	44 737 618
CH_4	4 870 423	–	–	4 870 423
N_2O	4 577 611	–	–	4 577 611
HFCs	1 087 342	–	–	1 087 342
PFCs	51 224	–	–	51 224
Unspecified mix of HFCs and PFCs	–	–	–	–
SF_6	42 058	–	–	42 058
NF_3	–	–	–	–
Total Annex A sources	**55 366 277**	–	–	**55 366 277**
Activities under Article 3, paragraph 3, of the Kyoto Protocol for 2013	–	–	–	–
AR	–1 246 776	–	–	–1 246 776
Deforestation	2 684 899	–	–	2 684 899
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol for 2013	**–**	**–**	**–**	**–**
FM	–46 226 861	–	–	–46 226 861

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

Annex III

Additional information to support findings in table 2 in this report

Missing categories that may affect completeness

The category for which methods are included in the 2006 IPCC Guidelines that was reported as "NE" or for which the ERT otherwise determined that there may be an issue with the completeness of the reporting in the Party's inventory is 4.F.2 – CO_2 from the loss of living biomass and emissions and removals from mineral soil carbon for grassland, wetlands and settlements converted to other land (see ID# L.7 in table 3 in this report).

Annex IV

Reference documents

A. Reports of the Intergovernmental Panel on Climate Change

IPCC. 2003. *Good Practice Guidance for Land Use, Land-Use Change and Forestry*. J Penman, M Gytarsky, T Hiraishi, et al. (eds.). Hayama, Japan: Institute for Global Environmental Strategies. Available at http://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf.html.

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

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

B. UNFCCC documents

Annual review reports

Reports on the individual reviews of the 2013, 2014, 2015, 2016 and 2017 annual submissions of Sweden, contained in documents FCCC/ARR/2013/SWE, FCCC/ARR/2014/SWE, FCCC/ARR/2015/SWE, FCCC/ARR/2016/SWE and FCCC/ARR/2017/SWE, respectively.

Other

Aggregate information on greenhouse gas emissions by sources and removals by sinks for Parties included in Annex I to the Convention. Note by the secretariat. Available at https://unfccc.int/sites/default/files/resource/AGI%202019.pdf.

Annual status report for Sweden for 2019. Available at https://unfccc.int/sites/default/files/resource/asr_SWE.pdf.

C. Other documents used during the review

Responses to questions during the review were received from Erik Adriansson and Joel Bengtsson (Swedish Environmental Protection Agency), including additional material on the methodology and assumptions used. The following references are reproduced as received:

Avfall Sverige. 2017. *Svensk Avfallshantering 2017*. https://www.avfallsverige.se/fileadmin/user_upload/Publikationer/svensk_avfallshantering_2017.pdf.

Bertlisson, J. 2017. *Updating Swedish emission factors for cattle to be used for calculations of greenhouse gases. On commission of the Swedish Environmental Protection Agency 2016. 2nd edition, updated September 27, 2017*. Uppsala: Department of Animal Nutrition and Management, Swedish University of Agricultural Sciences.