COMPLIANCE COMMITTEE **CC/ERT/ARR/2021/11**
26 April 2021

Report of the individual review of the annual submission of Sweden submitted in 2020

Note by the secretariat

The report of the individual review of the annual submission of Sweden submitted in 2020 was published on 24 April 2021. For purposes of rule 10, paragraph 2, of the rules of procedure of the Compliance Committee (annex to decision 4/CMP.2, as amended by decisions 4/CMP.4 and 8/CMP.9), the report is considered received by the secretariat on the same date. This report, FCCC/ARR/2020/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/2020/SWE

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Report on the individual review of the annual submission of Sweden submitted in 2020*

Note by the expert review team

Summary

Each Party included in Annex I to the Convention must submit an annual inventory of emissions and removals of greenhouse gases for all years from the base year (or period) to two years before the inventory due date (decision 24/CP.19). Parties included in Annex I to the Convention that are Parties to the Kyoto Protocol are also required to report supplementary information under Article 7, paragraph 1, of the Kyoto Protocol with the inventory submission due under the Convention. This report presents the results of the individual review of the 2020 annual submission of 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 21 to 25 September 2020 remotely.

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

Contents

Abbreviations and acronyms

AAU	assigned amount unit
AD	activity data
Annex A source	source category included in Annex A to the Kyoto Protocol
AR	afforestation and reforestation
Article 8 review guidelines	"Guidelines for review under Article 8 of the Kyoto Protocol"
C	carbon
CER	certified emission reduction
CH_4	methane
CM	cropland management
Convention reporting adherence	adherence to the "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual greenhouse gas inventories"
CO_2	carbon dioxide
CO_2 eq	carbon dioxide equivalent
CP	commitment period
CPR	commitment period reserve
CRF	common reporting format
CSC	carbon stock change
DOC	degradable organic carbon
EEA	European Environment Agency
EF	emission factor
EMEP	Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe
ERT	expert review team
ERU	emission reduction unit
EWC-Stat	European Waste Classification for Statistics
F-gas	fluorinated gas
FM	forest management
FMRL	forest management reference level
$Frac_{LeachMS}$	percentage of managed manure nitrogen losses for livestock category due to run-off and leaching during solid and liquid storage of manure
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 under Article 3, paragraphs 3–4, of the Kyoto Protocol
LULUCF	land use, land-use change and forestry
N	nitrogen
NA	not applicable
NCV	net calorific value

NE	not estimated
NF_3	nitrogen trifluoride
NIR	national inventory report
NO	not occurring
NO_X	nitrogen oxides
N_2	dinitrogen
N_2O	nitrous oxide
PFC	perfluorocarbon
QA/QC	quality assurance/quality control
RMU	removal unit
RV	revegetation
SEF	standard electronic format
SF_6	sulfur hexafluoride
SMED	Swedish Environmental Emissions Data
SOM	soil organic matter
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*
2006 IPCC Guidelines	*2006 IPCC Guidelines for National Greenhouse Gas Inventories*
2019 Refinement to the 2006 IPCC Guidelines	*2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories*

I. Introduction

1. This report covers the review of the 2020 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" (annex to decision 13/CP.20). The review took place from 21 to 25 September 2020 remotely[1] and was coordinated by Ruta Bubniene, Peter Iversen and Roman Payo (secretariat). Table 1 provides information on the composition of the ERT that conducted the review for Sweden.

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

Area of expertise	*Name*	*Party*
Generalist	Ioannis Sempos	Greece
Energy	Constantin Harjeu	Romania
	Lawrence Kotoe	Ghana
	Haakon Marold	Australia
IPPU	Niculina Mihaela Balanescu	Romania
	Jolanta Merkeliene	Lithuania
Agriculture	Marci Baranski	United States
	Fatou Gaye	Gambia
LULUCF and KP-LULUCF	Koki Okawa	Japan
	Igor Onopchuk	Ukraine
Waste	Medeia Inashvili	Georgia
	Tatiana Tugui	Republic of Moldova
Lead reviewers	Ioannis Sempos	
	Tatiana Tugui	

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

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

5. Annex I presents the annual GHG emissions of Sweden, including totals excluding and including LULUCF, indirect CO_2 emissions, and emissions by gas and by sector, and contains background data on emissions and removals from KP-LULUCF, if elected by the Party, by gas, sector and activity.

[1] Owing to the circumstances related to the coronavirus disease 2019, the review had to be conducted remotely.
[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.

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

II. Summary and general assessment of the Party's 2020 annual submission

7. Table 2 provides the assessment by the ERT of the Party's 2020 annual submission with respect to the tasks undertaken during the review. Further information on the issues identified, as well as additional findings, may be found in tables 3 and 5.

Table 2
Summary of review results and general assessment of the 2020 annual submission of Sweden

Assessment			*Issue/problem ID#(s) in table 3 or 5*[a]
Date of submission	Original submission: NIR, 14 April 2020; CRF tables (version 3), 14 April 2020; SEF tables (SEF-CP1-2019 and SEF-CP2-2019), 14 April 2020		
Review format	Centralized review conducted remotely		
Application of the requirements of the UNFCCC Annex I inventory reporting guidelines and the Wetlands Supplement (if applicable)	Have any issues been identified in the following areas:		
	(a) Identification of key categories?	No	
	(b) Selection and use of methodologies and assumptions?	Yes	L.18
	(c) Development and selection of EFs?	Yes	A.11, L.5, L.8, L.15
	(d) Collection and selection of AD?	No	
	(e) Reporting of recalculations?	No	
	(f) Reporting of a consistent time series?	No	
	(g) Reporting of uncertainties, including methodologies?	Yes	G.4
	(h) QA/QC?	QA/QC procedures were assessed in the context of the national system (see supplementary information under the Kyoto Protocol below)	
	(i) Missing categories, or completeness?[b]	Yes	A.9, L.6
	(j) Application of corrections to the inventory?	No	
Significance threshold	For categories reported as insignificant, has the Party provided sufficient information showing that the likely level of emissions meets the criteria in paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines?	Yes	G.6
Description of trends	Did the ERT conclude that the description in the NIR of the trends for the different gases and sectors is reasonable?	Yes	
Supplementary information under the Kyoto Protocol	Have any issues been identified related to the following aspects of the national system:		
	(a) Overall organization of the national system, including the effectiveness and reliability of the institutional, procedural and legal arrangements?	No	
	(b) Performance of the national system functions?	No	
	Have any issues been identified related to the national registry:		
	(a) Overall functioning of the national registry?	No	
	(b) Performance of the functions of the national registry and the adherence to technical standards for data exchange?	No	

Assessment			*Issue/problem ID#(s) in table 3 or 5*[a]
	Have any issues been identified related to the reporting of information on AAUs, CERs, ERUs and RMUs and on discrepancies in accordance with decision 15/CMP.1, annex, chapter I.E, in conjunction with decision 3/CMP.11, taking into consideration any findings or recommendations contained in the standard independent assessment report?	No	
	Have any issues been identified in matters related to Article 3, paragraph 14, of the Kyoto Protocol, specifically problems related to the transparency, completeness or timeliness of the reporting on the Party's activities related to the priority actions listed in decision 15/CMP.1, annex, paragraph 24, in conjunction with decision 3/CMP.11, including any changes since the previous annual submission?	No	
	Have any issues been identified related to the following reporting requirements for KP-LULUCF:		
	(a) Reporting requirements of decision 2/CMP.8, annex II, paragraphs 1–5?	Yes	KL.3
	(b) Demonstration of methodological consistency between the reference level and reporting on FM in accordance with decision 2/CMP.7, annex, paragraph 14?	No	
	(c) Reporting requirements of decision 6/CMP.9?	No	
	(d) Country-specific information to support provisions for natural disturbances in accordance with decision 2/CMP.7, annex, paragraphs 33–34?	No	
CPR	Was the CPR reported in accordance with decision 18/CP.7, annex; decision 11/CMP.1, annex; and decision 1/CMP.8, paragraph 18?	Yes	
Adjustments	Has the ERT applied any adjustments under Article 5, paragraph 2, of the Kyoto Protocol?	No	
	Has the Party submitted a revised estimate to replace a previously applied adjustment?	No	
Response from the Party during the review	Has the Party provided the ERT with responses to the questions raised, including the data and information necessary for assessing conformity with the UNFCCC Annex I inventory reporting guidelines and any further guidance adopted by the Conference of the Parties?	Yes	
Recommendation for an exceptional in-country review	On the basis of the issues identified, does the ERT recommend that the next review be conducted as an in-country review?	No	
Question of implementation	Did the ERT list any questions of implementation?	No	

[a] Further information on the issues identified, as well as additional findings, may be found in tables 3 and 5.

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

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

8. Table 3 compiles the recommendations from previous review reports that were included in the most recent previous review report, published on 30 January 2020,[4] and had not been resolved by the time of publication of the review report of the Party's 2019 annual submission. The ERT has specified whether it believes the Party had resolved, was addressing or had not resolved each issue or problem by the time of publication of this review report and has provided the rationale for its determination, which takes into consideration the publication date of the most recent previous review report and national circumstances.

Table 3
Status of implementation of recommendations included in the previous review report for Sweden

ID#	*Issue/problem classification*[a]	*Recommendation made in previous review report*	*ERT assessment and rationale*
General			
G.1	CRF tables (G2, 2019) (G5, 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 ERT noted that Sweden transparently reported in the NIR (pp.64–65) the annual statistical disclosure control procedure for checking for issues regarding confidentiality. During the review, the Party presented its plans to improve transparency for its next annual submission. As part of its disclosure control procedure, Sweden has contacted the companies that have a greater impact on emissions, and have previously not been willing to give their consent to publication of their data, in order to understand their point of view and investigate whether there is any further information that the Party can provide concerning how it publishes and makes use of the data that would encourage the organizations concerned to give their consent to publication (see also ID# E.2 below). The ERT considers that the recommendation has not yet been fully addressed because the Party is still working on its disclosure control procedures.
G.2	QA/QC and verification (G4, 2019) Transparency	Review and revise table A5.1 of the NIR to accurately clarify the justification of why the categories reported as "NE" were not estimated.	Resolved. The Party has revised NIR table A5.1 for those categories for which the reason for not estimating the emissions is the lack of methodologies or EFs in the 2006 IPCC Guidelines. The ERT noted that the justification of why the categories reported as "NE" were not estimated was accurately reported.
G.3	QA/QC and verification (G5, 2019) Convention reporting adherence	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.	Resolved. The ERT noted that all cells in CRF tables 1.A(b), 1.C and 4(II) contain either a value or a notation key. CRF tables 2(I)s1, 2(I)s2 and 2(II) contain some blank cells that relate to F-gases. However, the documentation boxes to the tables explain that the empty cells for HFCs, PFCs, SF_6 and NF_3 should contain "NO" but the notation key is missing owing to the specific CRF Reporter settings. During the review, the Party clarified that the empty cells are 'green' cells in the CRF Reporter, which it cannot edit. In addition, the Party explained that information on the notation keys used for F-gases with no reported emissions is included in the

[4] FCCC/ARR/2019/SWE.

ID#	Issue/problem classification[a]	Recommendation made in previous review report	ERT assessment and rationale
			NIR (section 4.7, p.291), as is information regarding F-gases reported as "IE" (p.294).
Energy			
E.1	1.A Fuel combustion – sectoral approach – all fuels and gases (E6, 2019) Transparency	Ensure consistency in references to data sources throughout the NIR.	Addressing. In the NIR (section 3.2) the Party continues to use "industrial energy statistics" as the source for AD for the sector, while in the annex to the NIR tables A.2.1 ("Summary of main activity data sources used in the inventory for stationary combustion") and A.2.2 ("Summarized properties of activity data sources used in the inventory for stationary combustion") use different names for the AD sources. The Party reported in its NIR (annex 2, section 2.1.2) that "industrial energy statistics" in all cases refers to the annual statistics on energy use in manufacturing industries. During the review, the Party clarified that the term "industrial energy statistics" appeared around 10 times in the NIR. This will be revised for the next annual submission: all mentions of "industrial energy statistics" will be changed to "annual statistics on energy use in manufacturing industries (ISEN)" or in some cases "quarterly fuel statistics".
E.2	1.A Fuel combustion – sectoral approach – solid, liquid and gaseous fuels – CO_2, CH_4 and N_2O (E1, 2019) (E9, 2017) Comparability	Enhance the transparency of reporting by exploring ways to minimize the number of categories reported as confidential 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. The Party reported in its NIR (table 9.4) that it made efforts to collect consent from plant operators in 2018, which has led to fewer data reported as confidential (less than half of the categories were reported as confidential in the 2018 CRF tables compared with those for 2015). During the review, the Party clarified that it will continue efforts to seek consent from plant operators in order to further reduce the reporting of categories as confidential in the CRF tables.
E.3	1.B.1.b Solid fuel transformation – biomass – CH_4 (E4, 2019) (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.	Addressing. The Party reported in its NIR (table 9.4) that it is not possible to report energy-related emissions from charcoal production separately, so they have been included in category 1.A.2.g. During the review, the Party clarified that the notation key for fugitive emissions from charcoal production, which should be reported in category 1.B.1.b in accordance with the notes to the CRF tables, will be changed from "NA" to "NE" for its next submission. Further information on what is reported under category 1.B.1.b will be provided in the next NIR.

ID#	*Issue/problem classification*[a]	*Recommendation made in previous review report*	*ERT assessment and rationale*
E.4	International navigation – gas/diesel oil – CO_2, CH_4 and N_2O (E7, 2019) Transparency	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).	Addressing. The amounts of gas/diesel oil reported for international marine bunkers remain different in CRF tables 1.D and 1.A(b). For example, for 2018, 18,045.95 TJ gas/diesel oil used for international navigation was reported in CRF table 1.D, while the value reported in CRF table 1.A(b) is 17,851.79 TJ. During the review, the Party stated that it had harmonized the AD for international marine bunkers in the national energy balance with those reported in CRF table 1.D. The Party clarified that the NCVs used were not consistent owing to different densities being applied in preparing the national energy balance and the GHG inventory. This was also explained in the NIR (annex 4, section 4.1). Sweden indicated that it will investigate ways to harmonize the NCVs for its next annual submission.
E.5	International navigation – residual fuel oil – CO_2 (E8, 2019) Convention reporting adherence	Correct the erroneous values of residual fuel oil consumption reported in CRF table 1.A(b) for the entire time series; and improve QC to ensure that data used in the CRF tables are consistent throughout.	Addressing. The amounts of residual fuel oil reported for international marine bunkers remain different in CRF tables 1.D and 1.A(b). For example, for 2018, 90,326.68 TJ residual oil used for international navigation was reported in CRF table 1.D, while the value reported in CRF table 1.A(b) is 87,196.79 TJ. During the review, the Party stated that during 2019 the inventory compilers consulted with the Swedish Energy Agency (responsible for the energy balances used in CRF table 1.A(b)) in order to harmonize the fuel consumption data in the sectoral approach. Consequently, it harmonized the AD for international marine bunkers in the national energy balance with those reported in CRF table 1.D. The Party clarified that the NCVs used were not consistent because of the different densities being applied in preparing the national energy balance and the GHG inventory (NCV of 35.16 GJ/m^3 in the reference approach and 39.53 GJ/m^3 in CRF table 1.D). Sweden indicated that it will investigate ways to harmonize the NCVs for its next submission.
IPPU			
I.1	2. General (IPPU) – NF_3 (I.1, 2019) (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 Party reported NF_3 as "NO" in its NIR (table ES.1) but notation keys were not used in the CRF tables. In NIR table 9.4 the Party explained that, despite its efforts, it was unable to include the correct notation key in the CRF tables due to technical reasons. During the review, the Party clarified that the notation keys will be reported for NF_3 in the NIR and the CRF tables of the next annual submission.
I.2	2. General (IPPU) – HFCs and N_2O (I.33, 2019) Convention reporting adherence	Check the sections in the NIR that refer to confidential data and evaluate whether the data in the cases of HFC emissions from aerosols (category 2.F.4) and use of N_2O for medical applications (category 2.G.3.a) and for propellant for pressure and aerosol products (category 2.G.3.b) are actually confidential and whether the	Resolved. With regard to category 2.F.4 (aerosols), the NIR (section 4.7.4.4) was corrected and now provides the reason why the information from the products register of the Swedish Chemicals Agency could not be used for validation and reporting purposes. The register contains only information on imports in bulk and thus cannot be used for validation purposes.

ID#	Issue/problem classification[a]	Recommendation made in previous review report	ERT assessment and rationale
		justification for not reporting data for confidentiality reasons is reported transparently, and revise the NIR text accordingly.	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. Aggregated emissions are therefore reported under category 2.G.3.b and "IE" is used for category 2.G.3.a. During the review, the Party confirmed that the data for categories 2.G.3.a and 2.G.3.b can be reported only as aggregated data for confidentiality reasons.
I.3	2.B.5 Carbide production – CO_2 (I.34, 2019) Transparency	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).	Addressing. The Party reported the methodology used for estimating emissions from the use of calcium carbide (comprising emissions from production and use of acetylene) in its NIR (section 4.3.5.2.1). The ERT noted a discrepancy in the reporting of EFs in the NIR: in table 4.3.3 a plant-specific EF was reported, while in section 4.3.5.2 it is stated that default EFs were used for emissions from both calcium carbide production and calcium carbide use. During the review, the Party clarified that the EFs used for calculations in this category are not plant-specific, but default, and indicated that the text in the NIR will be corrected for its next annual submission.
I.4	2.B.10 Other (chemical industry) – CO_2 (I.9, 2019) (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).	Resolved. The Party clarified in its NIR (section 4.3.10.2) that the allocation of emissions from the production of secondary fuels obtained from feedstocks and from the combustion of process off-gases was reported under category 2.B.10 since they are associated with petrochemical processes and the fuels and off-gases are combusted within the same chemical processes and not combusted for energy, for example for district heating purposes. Fuels and off-gases derived from chemical processes that are combusted for energy purposes only, for example within district heating, are registered in the fuel statistics that are used for emission calculations in the energy sector.
I.5	2.C Metal industry – CO_2 (I.11, 2019) (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.	Resolved. For categories 2.C.2 (ferroalloys production) and 2.C.7 (other), the methodology used (tier 3 method and plant-specific EFs for both categories) was reported transparently and consistently in the NIR (tables 4.4.6 and 4.4.13, respectively) and CRF table summary 3s1.
I.6	2.C.1 Iron and steel production – CO_2 (I.16, 2019) (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 EFs following the harmonization of data. 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	Resolved. The Party reported detailed information on AD and emissions for source categories affected across the energy and IPPU sectors in its NIR (sections 3.2.9 and 4.4.1, respectively). Compiled NCVs and EFs were not published in the NIR for confidentiality reasons but were made available to the ERT for the purpose of the review.

ID#	*Issue/problem classification*[a]	*Recommendation made in previous review report*	*ERT assessment and rationale*
		assessment of the completeness and accuracy of the reporting.	
I.7	2.C.1 Iron and steel production – CO_2 (I.17, 2019) (I.17, 2017) Transparency	Report on any recalculations to emissions and AD across the time series for 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).	Addressing. The Party reported recalculations of emissions for categories 1.A.1.a and 2.C.1.b in its NIR (sections 3.2.6.5 and 4.4.1.5, respectively) and CRF tables. However, the recalculations were not related to the results of the harmonization of the data of Sweden's integrated steelworks and the national energy balance, which is ongoing (NIR table 9.4). During the review, the Party clarified that, in working on reducing the differences between the reference approach and the sectoral approach for the 2020 submission, it focused on revising the AD used for the reference approach and the non-energy use of fuels used in the IPPU sector. In particular, amounts of fuels bound in products or lost during the process, which had not previously been included in the non-energy use of fuels, are now accounted for as a result of this work; and this has improved AD compliance between the reference approach and the sectoral approach. The harmonization work in relation to the non-energy use of fuels affected only CRF table 1.A(d), specifically the reported fuel quantity for non-energy use, and had no direct effect on the estimated emissions or AD reported for categories 1.A.1.a, 1.A.1.c, 1.A.2.a, 1.B.1.c and 2.C.1.b. As the harmonization of data is ongoing (see ID# I.8 below), this issue can only be resolved once the process has been finalized.
I.8	2.C.1 Iron and steel production – CO_2 (I.19, 2019) (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) addresses the differences between the reference and sectoral approaches for solid fuels and outlines changes in the overall comparison as a result of improvements in the harmonization of solid fuels data between steelworks operators and the Swedish Energy Agency. Information on the harmonization of NCVs for solid fuels was not provided in the NIR. According to the NIR (annex 4, section 4.7) the differences between the reference approach and the sectoral approach for solid fuel are mainly caused by inconsistencies in total amounts of coal reported according to the different data sources used in each approach, and future work will focus on the amounts of fuel reported to surveys and on the data sources used in the sectoral approach. During the review, the Party explained the main work that had been done for the 2020 submission to reduce the differences between the reference approach and the sectoral approach, and presented the main results of the harmonization work, including a 2020 SMED project report. For the 2020 submission the focus was mostly on non-energy use of fuels as it affects the apparent consumption estimated in the reference approach for the comparison between the reference approach and the sectoral approach. During the project, new time series data for non-energy use of solid fuels for the IPPU sector were produced. The improved data sets helped in reducing differences between the two approaches, especially with regard to fuel consumption. The harmonization work related to the non-energy use of fuels

ID#	Issue/problem classification[a]	Recommendation made in previous review report	ERT assessment and rationale
			affected only CRF table 1.A(d), specifically the reported fuel quantity for non-energy use, and had no direct effect on the estimated emissions or AD reported within categories 1.A.1.a, 1.A.1.c, 1.A.2.a, 1.B.1.c and 2.C.1.b. Regarding the harmonization of NCVs for solid fuels, there was an issue of different NCVs reported to the energy balances and to the environmental reports. However, since the 2020 submission this is no longer an issue, because the AD and EFs used for the reference approach are the same as those used in the sectoral approach. Sweden explained that the improvements are ongoing and that for the next submission the work will focus on the mix of non-energy use of solid fuels and on investigating the differences for other groups of fuels (especially other fossil fuels) with a view to further decreasing the differences between the reference approach and the sectoral approach. In order to enhance transparency, for the next submission the Party plans to revise NIR annex 4, section 4.4, by providing a more accurate description of the differences between the reference and the sectoral approach and other relevant information.
I.9	2.F Product uses as substitutes for ozone-depleting substances – HFCs (I.36, 2019) Convention reporting adherence	Improve 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.	Resolved. Inconsistencies in the NIR and the CRF tables regarding reporting on the methodologies and EFs used for the subcategories under 2.F.1 have been corrected. Information on the aggregation of HFC-245fa, HFC-365 and HFC-134, after correcting the amounts using the global warming potential values of the substance with HFC-134a and HFC-32 for confidentiality reasons, was provided in the NIR (p.293), although "IE" was not reported for the aggregated gases in CRF table 2(II). The Party reported in the NIR (p.291) that notation keys could not be inserted in the CRF tables for technical reasons.
I.10	2.F.1 Refrigeration and air conditioning – HFCs (I.26, 2019) (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.	Resolved. The Party stated in its NIR (section 4.7.1.3, p.299) that all uncertainties for AD and EFs under category 2.F.1 are based on expert judgment resulting from a collaboration between inventory experts and experts at the Swedish Chemicals Agency. During the review, the Party provided the ERT with the documentation of the expert judgment of the uncertainty estimates for category 2.F.1. In the latest submission the Party has revised the uncertainty estimates (correction of error in uncertainty of domestic refrigeration).
Agriculture			
A.1	3.A.1 Cattle – CH_4 (A.7, 2019) Transparency	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.	Not resolved. In its NIR (table 5.3), the Party updated the reported energy requirements for bulls and steers of <1 year, 1–2 years and >2 years from 71, 106.5 and 107.5 to 67.5, 101.2 and 102.1 MJ, respectively. During the review, the Party clarified that the rationale for all parameters used for all types of cattle can be found in Bertilsson (2016) and Spörndly (2003). The Party indicated that a sentence will be added in the next NIR documenting the correction.

ID#	*Issue/problem classification*[a]	*Recommendation made in previous review report*	*ERT assessment and rationale*
A.2	3.A.1 Cattle – CH_4 (A.8, 2019) Transparency	Provide in the NIR information on, and the rationale for, the methodology used for the calculation of the dry matter intake and EF for suckler cows.	Resolved. The rationale for the methodology used for calculating the dry matter intake and EF for suckler cows are provided in the NIR (section 5.2.2.1.2). During the review, the Party clarified that the exact value of 0.507 × 750 ^ 0.75 instead of the rounded value of 73 was used in the intermediate step of the EF calculation. As a result, the final EF has been adjusted from 92 to 91.5 kg/head/year (NIR table 5.7).
A.3	3.A.1 Cattle – CH_4 (A.8, 2019) Transparency	Provide in the NIR information on, and the rationale for, the value of energy content in silage used for suckler cows.	Resolved. The Party reported in its NIR (p.328) that, owing to the slightly lower quality of feed compared with feed for dairy cows, the energy content in silage is estimated to be 9.5 MJ/kg dry matter for the complete time series.
A.4	3.B Manure management – CH_4 and N_2O (A.9, 2019) Convention reporting adherence	Correct the values from percentages to fractions in NIR table 5.13.	Resolved. Manure handled in anaerobic digesters and compost has now been reported in percentages and the title of NIR table 5.13 has been corrected. This has also been updated in other tables in the same section for consistency.
A.5	3.B Manure management – N_2O (A.10, 2019) Convention reporting adherence	Correctly report the N_2O EF for composting in table 5.17 of the NIR.	Resolved. The Party updated the table now called NIR table 5.18 (“Emission factors for manure management”) to reflect the EF of 1 per cent for composting.
A.6	3.D Direct and indirect N_2O emissions from agricultural soils – N_2O (A.11, 2019) Convention reporting adherence	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”.	Resolved. The Party updated the table now called NIR table 5.22 with the column heading “Animal manure applied to soils (t N)”.
LULUCF			
L.1	4. General (LULUCF) – all gases (L.13, 2019) Transparency	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.	Resolved. The Party provided information on sources mentioned in section 6.3.2 of the NIR in corresponding sections on biomass burning (section 6.4.1.9) and peat extraction on wetlands (section 6.4.2.7) and explained in section 6.4.3.6 that completeness has been ensured by using only one source of information for the overall land area representation.
L.2	4.A Forest land – CO_2 (L.2, 2019) (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	Not resolved. The Party did not provide any additional information in the 2020 NIR compared with the 2019 NIR, although some information on CSC on forest land converted to wetlands and other land and vice versa was provided in the 2020 NIR (sections 6.3.1.1 and 6.4.1.1). During the review, the Party provided additional information, particularly with regard to the conversion of land due to a natural degradation process, as well as the

ID#	Issue/problem classification[a]	Recommendation made in previous review report	ERT assessment and rationale
		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.	carbon stock of biomass before and after conversion, and where these areas are converted back to forest land. The ERT considers that the recommendation has not yet been addressed because of the lack of description of the assumptions used by the Party in relation to land-use conversions between the different IPCC land-use categories (including the clarification provided by the Party during the review), in particular concerning conversions not caused by human activities, including assumptions on CSC.
L.3	4.A Forest land – CO_2 (L.3, 2019) (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 used 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. According to the definition provided in section 6.2.1 of the NIR all forest land is considered managed. Thus, the Party has chosen the broad definition of managed forest land. If, for instance, forest land is degrading and the definition provided in section 6.2.1 no longer applies, forest land is considered converted to either other land or wetlands. In practice, this is assessed on around 30,000 sample plots of the national forest inventory, tracked over time. Land definitions are provided in sections 6.2.1–6.2.6 of the NIR, and practical monitoring is described in sections 6.2.1–6.3.6 and annex 3.2. The Party further explained in section 6.3.1.1 that, although carbon stocks on unmanaged land are considered zero, they are still monitored and CSC is reported when land moves between managed and unmanaged land and vice versa. In section 10.4.1 of the NIR the Party explained that all conversions to other managed land are considered to be directly human induced. During the review, the Party also explained that for conversions to unmanaged land the biomass is usually not harvested; rather, trees are slowly dying naturally. Moreover, harvesting is not allowed in forest land converted to wetlands or other land. The ERT considers that including this valuable clarification in the NIR would contribute to resolving this issue.
L.4	4.A Forest land – CO_2 (L.5, 2019) (L.7, 2017) Transparency	Report on the improved national system of rules for the assessment of land-use changes.	Not resolved. Rules for land-use transfers are presented in the NIR (section 6.3.1.3) and have not been improved compared with the previous submission. The ERT notes that the recommendation is closely connected with ID# L.3 above, and thus will be resolved once that recommendation is considered to have been addressed.
L.5	4.C Grassland – CO_2 (L.6, 2019) (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 previous ERT noted no change in the information on the CO_2 EF for drained organic soil in grassland and was 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. There were no changes in the explanation included in the 2020 NIR. The Party explained during the review that the text was not amended owing to the tight schedule between the review and the finalization of the NIR.

ID#	*Issue/problem classification*[a]	*Recommendation made in previous review report*	*ERT assessment and rationale*
L.6	4.F.2 Land converted to other land – CO_2 (L.7, 2019) (L.3, 2017) (L.8, 2016) (L.8, 2015) Completeness	Report emissions from the loss of living biomass and emissions and removals from mineral soil carbon for all conversions to other land.	Not resolved. The Party still reported CSC from forest land converted to other land only. Despite reporting areas of conversion from grassland, wetlands and settlements to other land, the Party reported "NO" and "NA" for CSC in these categories. During the review, the Party indicated that the 2006 IPCC Guidelines provide a methodology for estimating emissions from conversion of forest land to other land only. Furthermore, the Party provided an example of estimated small amounts of removals from settlements converted to other land for 2017, which nevertheless were not reported. The ERT noted that the 2006 IPCC Guidelines provide methodologies for estimating emissions from conversion of land to other land based on a stock-difference method (vol. 4, chap. 2, equation 2.5).
L.7	4(II) Emissions/removals from drainage and rewetting and other management of organic/mineral soils – CH_4 (L.9, 2019) (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. The Party did not provide any additional information in the 2020 NIR (annex 3, section 3.2.2.2) compared with that in the 2019 NIR. During the review, the Party indicated that the information related to the fraction of ditches found in the NIR (annex, p.145) refers to an external document (Lindgren and Lundblad, 2014). The ERT considers that this recommendation has not yet been addressed because the NIR does not contain the numerical values used by Sweden to calculate the fraction of the drained area of ditches.
Waste			
W.1	5.A Solid waste disposal on land – CH_4 (W.3, 2019) Transparency	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, the Swedish waste management association, is supplemented by information on additional landfills in operation and all closed landfills, which are excluded from the data provided by Avfall Sverige.	Not resolved. The text in the 2020 NIR has not been amended. During the review, the Party provided the same explanation as in the previous review that information from Avfall Sverige covers mostly active landfills. SMED investigates landfill gas recovery at the active landfills that did not respond to Avfall Sverige's survey and at the 'closed' landfills, which are excluded from the survey. SMED collects and compiles plant-specific data on produced amounts of CH_4 (in MWh) for energy recovery and for flaring. The data sources are environmental reports and, when necessary, emails and telephone calls. SMED has created a database that facilitates the monitoring of the reporting from the landfills. The Party stated that this information will be provided in the NIR of the next annual submission. The ERT considers that including this explanation in the NIR would contribute to resolving this issue.
W.2	5.A Solid waste disposal on land – CH_4 (W.3, 2019) Transparency	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).	Not resolved. The text in the 2020 NIR has not been amended. During the review, the Party confirmed that in the previous review report the ERT concluded that CH_4 use and flaring are calculated on the basis of the energy production in MWh and using the lower heating value for CH_4. The Party also

ID#	Issue/problem classification[a]	Recommendation made in previous review report	ERT assessment and rationale
			confirmed that this information will be provided in the NIR of the next annual submission.
W.3	5.D Wastewater treatment and discharge – N_2O (W.4, 2019) Transparency	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, explain that: (a) Both direct emissions from wastewater treatment plants and indirect emissions due to discharge of N on open waters are estimated; (b) 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; (c) Indirect emissions are calculated using the default EF from the 2006 IPCC Guidelines (vol. 5, chap. 6.3.1.2); (d) Available statistics on N in the effluent of large wastewater treatment plants are used as AD for indirect emissions; (e) 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.	Not resolved. The NIR (section 7.5.1.2.5) mentions a reference paper ("Comments on table 4D1 Calculation of nitrous oxide emissions from domestic and industrial wastewater treatment") that describes the methodologies used for estimating NO_2 emissions from wastewater, along with the AD and EFs used. The Party explained that the paper focuses on 1990 and 2010 but the same approach has been used for the whole time series. The Party also confirmed that this information will be provided in the NIR of the next annual submission.
W.4	5.D.1 Domestic wastewater – CH_4 (W.5, 2019) Transparency	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).	Not resolved. The Party did not report any additional information in the 2020 NIR compared with that in the 2019 NIR. During the review, the Party submitted a reference paper ("Comments on table 4D1 Calculation of methane emissions from domestic wastewater treatment") that describes the methodologies used for estimating CH_4. The Party explained that the paper focuses on 1990 and 2010 but the same approach has been used for the whole time series. The Party stated that this information will be provided in the NIR of the next annual submission.
W.5	5.D.1 Domestic wastewater – CH_4 (W.5 2019) Transparency	Explain that: (a) All wastewater treatment plants are well managed and the CH_4 correction factor is assumed to be 0;	Not resolved. The Party did not report any additional information in the 2020 NIR compared with that in the 2019 NIR. During the review, the Party stated that the information is available and will be provided in the NIR of future submissions. The Party also stated that the emissions from wastewater treatment ponds and sludge treatment are estimated separately and that the reference to the relevant paper is

ID#	Issue/problem classification[a]	Recommendation made in previous review report	ERT assessment and rationale
		(b) The application of equation 6.1 from the 2006 IPCC Guidelines (vol. 5, chap. 6) results in negligible CH_4 emissions from water ponds; (c) 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.	already provided in the NIR (p.533). The Party noted that further information will be included in the NIR of its next annual submission.
W.6	5.D.1 Domestic wastewater – CH_4 (W.6, 2019) Transparency	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.	Not resolved. The Party did not report any additional information in the 2020 NIR compared with that in the 2019 NIR. During the review, the Party clarified that the temperature in septic tanks in Sweden is quite low for a large part of the year, and CH_4 production can be expected to be very low. The average annual air temperature in Sweden was just 4.8 °C in 1991–2005. There is also a permanent inflow of oxygen dissolved in the water that will disturb the anaerobic conditions. The Party stated that this information will be provided in the NIR of its next annual submission.
W.7	5.D.2 Industrial wastewater – CH_4 (W.7, 2019) Transparency	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 emissions from aerobic wastewater treatment ponds, on-site treatment of sludge generated in those aerobic ponds, and anaerobic digestion of wastewater.	Not resolved. The Party did not report any additional information in the 2020 NIR compared with that in the 2019 NIR. During the review, the Party indicated that the requested information will be provided in the NIR of its next annual submission.
W.8	5.D.2 Industrial wastewater – CH_4 (W.7, 2019) Transparency	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;	Not resolved. The Party did not report any additional information in the 2020 NIR compared with that in the 2019 NIR. The Party has not yet explained in the NIR how it distinguishes between emissions from aerobic wastewater treatment ponds, on-site treatment of sludge generated in those aerobic ponds and anaerobic digestion of wastewater. During the review, the Party indicated that the requested information will be provided in the NIR of future submissions.

ID#	Issue/problem classification[a]	Recommendation made in previous review report	ERT assessment and rationale
		(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 onward.	
W.9	5.D.2 Industrial wastewater – CH_4 (W.7, 2019) Transparency	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.	Not resolved. The Party did not report any additional information in the 2020 NIR compared with that in the 2019 NIR. During the review, the Party indicated that it plans to provide the requested information in the NIR of future submissions.
KP-LULUCF			
KL.1	Article 3.3 activities – CO_2, CH_4 and N_2O (KL.1, 2019) (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 text in the 2020 NIR (section 10.2.2) has not been amended and still refers to extrapolation areas of land-use conversions. During the review, the Party indicated that the explanation will be changed in the next submission.
KL.2	FM – CO_2, CH_4 and N_2O (KL.3, 2019) (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.	Addressing. The Party reported some information on conversion of forests to wetlands and other land due to natural degradation in the NIR (sections 10.1.2 and 10.5.1). However, the Party did not include any information on management activities that could lead to conversion or on management practices after conversion. During the review, the Party provided valuable information indicating that CSCs on forest land converted to other land and wetlands due to natural degradation were estimated and included in the FM totals. The ERT considers it important that this information be included in the NIR for the recommendation to be considered to have been addressed.

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

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

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

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

ID#	*Previous recommendation for the issue*	*Number of successive reviews issue not addressed*[a]
General		
G.1	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.	3 (2017–2020)
Energy		
E.2	Enhance the transparency of reporting by exploring ways to minimize the number of categories reported as confidential 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.	3 (2017–2020)
E.3	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.	5 (2015–2020)
IPPU		
I.1	Use the notation key "NO" for NF_3 both in the NIR (table ES.1) and in the CRF tables.	3 (2017–2020)
I.7	Report on any recalculations to emissions and AD across the time series for 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).	3 (2017–2020)
I.8	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.	3 (2017–2020)
Agriculture	No issues identified.	
LULUCF		
L.2	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.	3 (2017–2020)
L.3	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 used 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.	3 (2017–2020)

ID#	*Previous recommendation for the issue*	*Number of successive reviews issue not addressed*[a]
L.4	Report on the improved national system of rules for the assessment of land-use changes.	3 (2017–2020)
L.5	Provide information on the choice of the country-specific CO_2 EF for drained organic soils in grassland.	3 (2017–2020)
L.6	Report emissions from the loss of living biomass and emissions and removals from mineral soil carbon for all conversions to other land.	4 (2015/2016–2020)
L.7	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.	3 (2017–2020)
Waste	No issues identified.	
KP-LULUCF		
KL.1	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.	3 (2017–2020)
KL.2	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.	3 (2017–2020)

[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 for this table. In addition, as the reviews of the Party's 2015 and 2016 annual submissions were conducted together, they are not considered successive reviews and 2015/2016 is counted as one year.

V. Additional findings made during the individual review of the Party's 2020 annual submission

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

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

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue/problem?*[a]
General			
G.4	Uncertainty analysis	The Party did not include in the NIR an uncertainty analysis for 1990 (the base year under the Convention). According to paragraph 15 of the UNFCCC Annex I inventory reporting guidelines, Parties should report uncertainties for at least the base year and the latest inventory year. During the review, the Party provided an uncertainty analysis for 1990 (including and excluding LULUCF) and indicated that this will be included in the NIR of its next annual submission. The ERT recommends that the Party include in the NIR an uncertainty analysis for 1990 (the base year under the Convention).	Yes. Convention reporting adherence

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue/problem?*[a]
G.5	Other	According to the UNFCCC Annex I inventory reporting guidelines, the NIR should include a chapter entitled "Indirect CO_2 and nitrous oxide emissions" containing information on indirect CO_2 and N_2O emissions in addition to that reported in CRF table 6. Sweden's 2020 NIR does not include this chapter and no information was provided in the general chapters of the NIR about indirect CO_2 and N_2O emissions. In addition, CRF table 6 contains empty ('white') cells with reference to ammonia and indirect CO_2 and N_2O emissions, with the exception of indirect CO_2 and N_2O emissions from the energy sector. These emissions were reported as "NO", although indirect CO_2 and N_2O emissions are likely to occur from energy activities (e.g. indirect CO_2 emissions associated with fugitive CH_4 emissions, indirect N_2O emissions from NO_X emissions from combustion activities). During the review, the Party clarified that it does not estimate or include indirect CO_2 and N_2O emissions in the inventory. The Party acknowledged that CRF table 6 has not been correctly filled out with "NE". It also indicated that it will include the missing chapter in the NIR (chap. 9) of its next annual submission and will complete CRF table 6 with the correct notation keys. The ERT recommends that the Party complete the empty cells of CRF table 6 in its next submission by including either the indirect CO_2 and N_2O emissions or the correct notation keys in accordance with paragraph 37 of the UNFCCC Annex I inventory reporting guidelines. The ERT also recommends that the Party include in its next NIR information about indirect CO_2 and N_2O emissions in order to improve transparency.	Yes. Comparability
G.6	Notation keys	The Party reported "NO" for several sources it considered insignificant in line with paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines (NIR section 1.8 and annex 5). However, the Party did not provide information demonstrating that the total national aggregate of estimated emissions for all gases and categories considered insignificant remains below 0.1 per cent of the national total GHG emissions. During the review, the Party clarified that the sum of the categories considered insignificant amounts to 4.13–6.28 kt CO_2 eq, which is well below 0.1 per cent of the national total GHG emissions. The categories with insignificant amounts of emissions are CH_4 emissions from direct reduced iron and ethylene production, and CO_2, CH_4 and N_2O emissions from landfill fires. The ERT acknowledges the Party's response. The ERT recommends that the Party include in its NIR information that demonstrates that the total national aggregate of estimated emissions for all gases and categories considered insignificant remains below 0.1 per cent of the national total GHG emissions in accordance with paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines.	Yes. Transparency
Energy			
E.6	1.B.2.a Oil – CO_2	The Party reported on hydrogen production plants at refineries in its NIR (p.204) and CRF table 1.B.2 under category 1.B.2.a.1 (exploration). The ERT noted that this is not in accordance with the 2006 IPCC Guidelines (vol. 2, chap. 4.2.2 (methodological issues)), which state that such emissions should be reported under category 1.B.2.a.i. During the review, the Party noted that it had concluded that category 1.B.2.a.1 in the CRF tables corresponded to category 1.B.2.a.i in table 4.2.1 of the 2006 IPCC Guidelines, which explains the allocation of the emissions. The Party further noted that the 2019 Refinement to the 2006 IPCC Guidelines (vol. 2, chap. 4.2.2 (methodological issues)) states that the CO_2 resulting from the production of hydrogen at refineries and heavy oil/bitumen upgraders should be reported under subcategory 1.B.2.a.iv (oil refining).	Yes. Comparability

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue/problem?[a]
		The ERT recommends that the Party report on hydrogen production plants at refineries under subcategory 1.B.2.a.iv (oil refining) in CRF table 1.B.2.	
IPPU			
I.11	2.A.2 Lime production – CO_2	According to the NIR (section 4.2.2.1), the Party uses a tier 3 method for estimating emissions from lime production. According to the 2006 IPCC Guidelines (vol. 3, chap. 2.3.1), tier 2 and 3 approaches should be used for estimating emissions associated with lime kiln dust. Information on whether emissions from lime production include emissions from lime kiln dust generated during the production of lime was not provided in the NIR. During the review, the Party clarified that the estimates of emissions from lime production are mainly based on data from the operators within the European Union Emissions Trading System and that according to European Union regulation 2018/2066 emissions from lime kiln dust should be included in the reported CO_2 emissions where relevant. For one sugar production plant, a data source other than the European Union Emissions Trading System is used, but emissions from this plant account for less than 0.5 per cent of reported emissions for 2005 onward. The ERT recommends that the Party provide in its next submission an explanation of how it estimates emissions associated with lime kiln dust generated during the production of lime.	Yes. Transparency
I.12	2.F.2 Foam blowing agents – HFCs	The Party reported that it used a national model corresponding to the IPCC tier 2 approach to estimate F-gas emissions with a combination of top-down and bottom-up approaches. For foam blowing, the Party specified that it used a tier 2a method in combination with plant-specific EFs. According to the 2006 IPCC Guidelines (vol. 3, chap. 7.4.2.3), two types of AD are needed in order to prepare the emission estimates for category 2.F.2 (foam blowing agents): the amount of chemical used in foam manufacturing in a country and the amount of chemical contained in foam imported into the country. According to the NIR (section 4.7.2.2), emission estimates from foam blowing agents are based on data provided by one national manufacturing company only and the NIR does not mention whether data on chemicals contained in foam imported into the country were taken into account for the emission estimates. During the review, the Party clarified that no data that could be used to calculate HFC emissions from imported quantities of foam are available. The Party explained that an increasing proportion of produced quantities of extruded polystyrene foam currently use blowing agents other than HFCs, such as CO_2 and hydrofluoroolefins. Sweden also provided a comparison of per capita emissions with neighbouring countries, which indicated that any underestimation would be below the threshold of significance. The Party further informed the ERT that it will include an explanation in its next NIR for why it could not take into account emissions from imported foam. The ERT agrees with the explanation provided by Sweden and recommends that the Party provide in its next annual submission the justification for not taking into account foam imported into the country in the AD used for estimating the emissions.	Yes. Transparency
Agriculture			
A.7	3.A.1 Cattle – CH_4	The Party reported that a country-specific methodology was used to determine dry matter intake and the total energy content in the CH_4 emitted for dairy and suckler cows in its NIR (p.327). The ERT noted that the equations provided are not replicable without knowing the units of milk yield, fat, protein and amount of energy corrected milk, which are not specified in the NIR. During the review, the Party clarified the units as milk yield (kg/day), fat (%), protein (%) and amount of energy corrected milk (kg/day); however, the ERT believes that milk yield and amount of energy	Yes. Transparency

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue/problem?*[a]
		corrected milk in the first equation are in kg/year. The ERT also noted that the methodology used to determine gross energy intake and the average methane conversion rate reported in the CRF table was not provided in the NIR for dairy and suckler cattle. During the review, the Party clarified that it did not use gross energy intake as AD in the model but estimated it afterwards to report it in the CRF table, and explained that it estimated the methane conversion rate by dividing energy content in emitted CH_4 by gross energy intake. The ERT recommends that the Party include the units for all input parameters (e.g. milk yield, fat, protein and amount of energy corrected milk) used in the equations presenting the country-specific methodology used to determine dry matter intake and the total energy content in the CH_4 emitted for dairy and suckler cows. The ERT also recommends that the Party explain the methods used to determine gross energy intake and the average methane conversion rate for dairy and suckler cows.	
A.8	3.A.1 Cattle – CH_4	The Party reported the AD and methods used to determine the enteric fermentation EFs for heifers and bulls in its NIR (p.328). The equation in section 5.2.2.1.3 contains the variable "ConcP", which is the fraction of concentrates in the feed. However, the variable "FracConc" in table 5.3 was not explained. During the review, the ERT inquired whether "FracConc" was equivalent to "ConcP", which the Party confirmed. The ERT recommends that the Party use a consistent variable name for the fraction of concentrates in the feed for all cattle subpopulations.	Yes. Transparency
A.9	3.B Manure management – N_2O	The ERT was unable to replicate the total N excreted for cattle and swine for 2018 using the values for population size and nitrogen excretion rate provided in CRF table 3.B(b). The values calculated by the ERT for total N excreted for cattle and swine were slightly higher than the values reported in column N of CRF table 3.B(b) for 2018. During the review, the Party clarified that this discrepancy is likely to be due to some co-digested manure being reported in the waste sector. The ERT recommends that the Party explain that manure used in co-digestion is omitted from CRF table 3.B(b) and provide the fraction of manure co-digested for the aggregate categories of dairy cattle, non-dairy cattle and swine along with the disaggregated values currently provided in NIR table 5.14.	Yes. Completeness
A.10	3.B Manure management – CH_4 and N_2O	The Party has updated NIR table 5.12 (deep litter waste management systems) to report percentages rather than fractions for the ratio of manure handled in deep litter systems in response to ID# A.4 in the previous review report. However, the ERT noted that the values for 2017 and 2018 for all livestock species appear to be in fractions, which is inconsistent with the rest of the table. During the review, the Party noted that this assessment is correct. The ERT recommends that the Party correct the values for the ratio of manure handled in deep litter systems for 2017 and 2018 for all livestock species and update NIR table 5.12 so that all values are reported in percentages.	Yes. Convention reporting adherence
A.11	3.B.4 Other livestock – N_2O	The Party reported in its NIR (p.349) that the nitrogen excretion rate for reindeer was updated from 10 to 6 kg/year/head and emissions were recalculated for the full time series. During the review, the Party clarified that a value reported in Finland's NIR was previously used, but Finland is no longer using that value so Sweden is using the value reported by Norway in its NIR. The ERT recommends that the Party justify that the nitrogen excretion rate applied for reindeer is appropriate to national circumstances compared with the default value and the higher value previously used in the NIR.	Yes. Accuracy

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue/problem?*[a]
A.12	3.B.5 Indirect N_2O emissions – N_2O	The Party reported N lost through leaching and run-off in CRF table 3.B(b) as "IE" and did not provide an explanation in CRF table 3.B(b) or in CRF table 9 on the allocation of the emissions. During the review, the Party clarified that in the model used to estimate N loss from leaching and run-off it is not possible to distinguish between N leakages from storage and those from application, and hence all emissions were reported under category 3.D.b. The ERT recommends that the Party explain in the documentation box of CRF table 3.B(b) and in CRF table 9 that N lost through leaching and run-off from manure handling and storage is reported under category 3.D.b.	Yes. Transparency
A.13	3.B.5 Indirect N_2O emissions – N_2O	The Party reported in the NIR (pp.339–340) that in order to estimate the amount of N remaining in manure after storage, the volatile N losses of N_2O, NO_X and N_2 and leaching and run-off during storage are calculated using the *EMEP/EEA air pollutant emission inventory guidebook 2016* for NO_X and a default fraction of N_2O, NO_X and N_2 and leaching and run-off based on the difference between tables 10.22 and 10.23 in the 2006 IPCC Guidelines. Ammonia emissions are calculated using country-specific data and methods from the national ammonia inventory. The Party estimated N_2O emissions from manure leaching and run-off by applying SOILNDB, a model system for calculating N losses that does not differentiate between manure handling and storage and application. The ERT commends the Party for applying a higher-tier method to estimate indirect N_2O emissions from manure. However, footnote b to table 10.23 in the 2006 IPCC Guidelines states that "values represent average rates for typical housing and storage components without any significant nitrogen control measures in place. Ranges reflect values that appear in the literature. Where measures to control nitrogen losses are in place, alternative rates should be developed to reflect those measures". The Party reported in the NIR (p.339) that Swedish law regulates that the storage must be designed to minimize the leaching and run-off from manure into the environment. Thus, the Party may be overestimating N lost through leaching and underestimating the amount of N applied to the soil in manure. During the review, the Party explained that it does not have a country-specific or a default value for the fraction N lost as N_2 during manure management, but that the approach used nevertheless complies with the reporting guidelines. The ERT encourages the Party to develop a country-specific $Frac_{LeachMS}$ value in order to consistently apply a tier 2 or 3 method for calculating indirect N_2O emissions from manure management rather than using the default values from table 10.23 of the 2006 IPCC Guidelines. The Party may also wish to refer to the 2019 Refinement to the 2006 IPCC Guidelines, which provides updated methods for estimating indirect N_2O emissions from manure and a new equation for estimating the fraction of manure N lost as inert N_2.	Not an issue/problem
A.14	3.D.a.2 Organic N fertilizers – N_2O	The Party reported the fraction of N volatilized as N_2O, NO_X and N_2 and lost through leaching and run-off during storage of animal manure for 2018 as 0.0586 in NIR table 5.22. Using this value, the ERT was unable to replicate the calculation of N content in animal manure applied to soils. During the review, the Party noted that the value in NIR table 5.22 was incorrect and should be 0.0310 for 2018, which allowed the ERT to replicate the calculation. The ERT recommends that the Party correct the value reported for 2018 in column 7 (fraction of N volatilized as N_2O, NO_X and N_2 and lost through leaching and run-off during storage of animal manure) of NIR table 5.22 and perform QA/QC checks for the other years.	Yes. Convention reporting adherence
A.15	3.G Liming – CO_2	The Party estimated CO_2 emissions from liming by applying the tier 1 method from the 2006 IPCC Guidelines. The ERT noted that the recommended method that corresponds to the decision tree in the 2006 IPCC Guidelines (i.e. figure 11.4) is a tier 2 or 3 method, because category 3.G is a key category. The Party did not provide information in the NIR explaining why the recommended method was not followed.	Yes. Accuracy

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue/problem?*[a]
		During the review, the Party clarified that the emissions for category 3.G are only around 1.9 per cent of the emissions of the agriculture sector, and only a key category when using approach 1 and not approach 2. Therefore, Sweden is of the opinion that, because such emissions contribute very little to the overall inventory, there is no strategic motivation to spend limited resources on improving the estimations for this source. To improve accuracy, the ERT recommends that the Party estimate CO_2 emissions from liming by applying the recommended method from figure 11.4 in the 2006 IPCC Guidelines. If the Party continues to use the tier 1 method, the ERT recommends that the Party explain in its NIR why a recommended method from the 2006 IPCC Guidelines has not been followed as required by paragraph 11 of the UNFCCC Annex I inventory reporting guidelines.	
LULUCF			
L.8	4. General (LULUCF) – CO_2	The Party applied an EF of 0.12 CO_2-C ha^{-1} $year^{-1}$ for estimating DOC emissions from drained organic soils for forest land, cropland and grassland. The literature (Lindgren and Lundblad, 2014) suggests that, on the basis of communication with national experts, the value of the EF for the temperate zone is too high and the value for the boreal zone should be used instead. The ERT noted that this value is outside the range provided in the Wetlands Supplement (table 2.2). During the review, the Party clarified that, on the basis of a study by Hytteborn et al. (2015), there is no evidence that latitude is an explanatory factor for differentiated EFs between the temperate and boreal zone in Sweden. The ERT noted that the above-mentioned study estimated a concentration of total organic carbon per volume, which differs from the Wetlands Supplement EF. Nevertheless, the ERT also noted that the mean values of total organic carbon in the eastern and southern parts of Sweden (according to Hytteborn et al. (2015), figure 1.b) are generally higher than those in the western and northern parts, which is largely in line with the natural zone map from the 2006 IPCC Guidelines (vol. 4, chap. 3, figure 3A.5.1). The ERT recommends that the Party justify the use of the country-specific EF of 0.12 CO_2-C ha^{-1} $year^{-1}$ for DOC emissions from drained organic soils for forest land, cropland and grassland for the temperate region on the basis of its national circumstances or, alternatively, apply the default EF for DOC from the Wetlands Supplement (table 2.2) for the temperate region while collecting new information.	Yes. Accuracy
L.9	4. General (LULUCF)	The Party reported in CRF table 4.1 that conversions to wetlands in 2018 occurred only from other land (13.38 kha), while data in CRF table 4.D show that the area of forest land converted to wetlands increased by 0.07 kha, and cropland converted to wetlands increased by 0.06 kha. During the review, the Party clarified that the data in CRF table 4.1 are based on actual observations from the annual sample, whereas areas in CRF table 4.D are based on the extrapolation of areas for each category. In addition, no land-use change occurred in 2018 according to the annual sample (6,000 plots) but the general trend represented in both the annual data and the extrapolated data indicates that land-use change occurred (as reported in CRF table 4.D). The ERT recommends that the Party report comparable information on areas of land conversion across CRF tables 4.1 and CRF tables 4.A–4.F. If there are remaining inconsistencies, the ERT recommends that the Party provide a detailed explanation for the difference in the areas reported in CRF table 4.1 and background CRF tables 4.A–4.F.	Yes. Transparency
L.10	Land representation	The Party reported in its NIR (table 6.3 and p.369) that 915 kha of the high mountain areas is considered to be forest land, but, since no field measurements were performed, CSC for these areas was not estimated. The ERT noted that	Yes. Transparency

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue/problem?[a]
		according to the NIR (section 6.2.1) all forest land is considered managed, but according to data in NIR table 6.3 forests in the high mountain areas are unmanaged. During the review, the Party confirmed that these forests are unmanaged. The ERT recommends that the Party improve the transparency of its reporting on forest land by including information on the management status of forests that are not included in the estimations of carbon removals and emissions.	
L.11	4.A Forest land – CO_2	The Party reported in its NIR (annex 3, table A3:2.4) that the reported and validated values of CSC in stump and root systems of the deadwood pool were derived from modelling and from harvest statistics, respectively. However, the ERT could not establish how the validated values were estimated and how they were used in the Party's reporting. During the review, the Party clarified that the validated values were estimated using harvest statistics; that is, the carbon added to the deadwood pool (stump and root systems part) is based on harvest statistics. A constant of 0.23 (23 per cent) was used to convert whole tree harvest to retained stump and root system biomass. The ERT recommends that the Party include information in its NIR on the methodology and factors used for estimating the validated values of CSC from stump and root systems of the deadwood pool; and the procedures (if any) for using validated values to calculate or adjust reported values of CSC in the deadwood pool, or clarify that these values are provided for information purposes only.	Yes. Transparency
L.12	4.A.2 Land converted to forest land	The Party reported that when an area previously converted to wetlands or other land as a result of land degradation meets the forest definition criteria again it is reallocated to the forest land category with corresponding estimations of CSC for all pools. The ERT noted that this conversion may have natural causes or be due to human activities. During the review, the Party clarified that this might occur for either reason. The Party also indicated that when such a conversion occurred the carbon in living biomass before conversion was taken into account in the calculation of CSC. The ERT recommends that the Party, when reporting in the NIR on CSC due to the conversion of wetlands and other land to forest land, distinguish between conversion due to natural causes and conversion due to human activities, and include the information provided during the review.	Yes. Transparency
L.13	4.B.1 Cropland remaining cropland – CO_2	The Party reported its NIR (annex 3, section 3.2.1.7) that there has been a change in the methodology used for calculating and reporting CSC in mineral soils of cropland since the previous submission. Specifically, in the 2020 submission Sweden reported CSC in the "old" carbon pool only rather than in both "old" and "young" carbon pools, where "old" carbon is the stable fraction of soil carbon and "young" carbon is carbon with a high turnover rate. The ERT noted that this change caused significant differences compared with the reporting in the previous submission. For example, for some years estimated emissions from SOM increased (for 2015, 902.66 kt C removals was changed to 98.71 kt C emissions), while for other years emissions decreased (for 2011, as a result of recalculation, estimated emissions were changed from 804.97 to 149.72 kt C). Moreover, the ERT could not identify information in the NIR on how the emissions previously reported from "young" carbon are currently considered in the Party's submission. The ERT noted that the NIR is lacking transparency in terms of the methodology used to calculate CSC in SOM with regard to distinguishing between "old" and "young" carbon pools. During the review, the Party clarified that the "young" carbon pool displays a high inter-annual variation with high annual input and turnover, and, in the long term, is more or less in balance and has little impact on the trend.	Yes. Transparency

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue/problem?*[a]
		The ERT recommends that the Party report on how the CSC that was previously reported for the "young" carbon pool of SOM is currently considered in the calculations of the reported CSC in the SOM pool of cropland remaining cropland.	
L.14	4.B.2 Land converted to cropland – CO_2	The Party reported in its NIR (annex 3, table A3:2.12) that the EFs for emissions from organic soils of forest land and grassland converted to cropland are equal to the EF for emissions from organic soils of cropland. According to the NIR (annex 3, section 3.2.1.8), the EF for emissions from organic soils of cropland is 6.1 t C-CO_2/ha, while the value reported in table A3:2.12 for forest land and grassland converted to cropland is 0.3 t C-CO_2/ha. During the review, the Party clarified that this is a misprint and the values in table A3:2.12 should refer to footnote 2; that is, that the EF is determined by the original land use (forest land or grassland).	Yes. Convention reporting adherence
		The ERT recommends that the Party correct the information reported in table A3:2.12 in annex 3 to its NIR.	
L.15	4.B.2 Land converted to cropland – CO_2	In its NIR (annex 3, section 3.2.1.10) Sweden reported that a single EF value for organic soils was used for the land-use conversion categories. For 2018, Sweden reported in CRF table 4.B emissions from organic soils on grassland converted to cropland with the IEF 0.3 t C/ha, which is consistent with the value reported in table A3:2.12 in annex 3 to the NIR. However, for the time series 1990–2017, the IEF for emissions from organic soils on grassland converted to cropland was 0.42 t C/ha, which differs from the values reported in section 3.2.1.10 of annex 3 to the NIR.	Yes. Accuracy
		During the review, the Party clarified that the emissions from drained organic soils should include DOC (0.12 t C/ha) and therefore the IEF should be 0.42 t C/ha. Thus, the value reported in CRF table 4.B for 2018 does not include DOC emissions.	
		The ERT recommends that the Party recalculate the estimated emissions from organic soils on land converted to cropland for 2018 by including DOC emissions.	
L.16	4(II) Emissions/ removals from drainage and rewetting and other management of organic/mineral soils – CO_2 and N_2O	The Party reported in its NIR (annex 3, table A3:2.9) 939 kha drained organic soils in forest land and 18 kha in grassland, but CRF table 4(II) contains somewhat different values – 1012.81 kha and 22.10 kha, respectively. The ERT concluded that the emissions from organic soils reported in CRF tables 4.A and 4.D were not estimated using the values reported in the NIR (annex 3, section 3.2.1.6).	Yes. Transparency
		During the review, the Party clarified that table A3:2.9 in annex 3 to its NIR contains data on areas of forest land remaining forest land and grassland remaining grassland. Since the Party has no information on the drainage status of land converted to these categories, the assumption was made that converted land on organic soils is drained. Thus, CRF table 4(II) reports the sum of the areas in table A3:2.9 and the corresponding areas of organic soils for the converted subcategories.	
		The ERT recommends that the Party include areas of drained organic soils of land converted to forest land and land converted to grassland in table A3:2.9, maintaining the stratification by natural zone and nutrient status. Alternatively, the Party may wish to provide information on how the areas of organic soils reported in table A3:2.9 were combined with the areas of land converted to forest land and grassland, taking into account the stratification by natural zone and nutrient status.	
L.17	4(V) Biomass burning – CO_2, CH_4 and N_2O	The Party reported in its NIR (annex 3, section 3.2.2.5) that the amount of carbon burned was assumed to be 5.78, 1.02 and 0.72 C Mg ha^{-1} for the categories forest, sparsely covered by trees and no tree cover, respectively (as used by the Swedish Civil Contingencies Agency during data collection). In addition, Sweden used default EFs for each of	Yes. Transparency

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue/problem?[a]
		three gases CO_2, CH_4 and N_2O (see ID# L.18 below). The ERT noted that the IEF for controlled burning and wildfires changed during the time series 1990–2018 for forest land and wildfires on grassland (e.g. 0.05–0.09 t CH_4/ha, 0.0003–0.0006 t N_2O/ha for forest wildfires).	
		During the review, the Party clarified that the IEF in CRF table 4(V) shows the total for all forest types and therefore represents the average value, while the proportion of each forest type included in the calculations changes from year to year.	
		The ERT recommends that the Party include information in the NIR on how values of burned biomass were estimated for different forest types, including the approach used to allocate these emissions from the categories used by the Swedish Civil Contingencies Agency to IPCC categories.	
L.18	4(V) Biomass burning – CO_2, CH_4 and N_2O	The Party reported in its NIR (section 6.4.2.12) that a tier 1 methodology and default EFs were used for calculating emissions from biomass burning. The ERT noted that, on the basis of the equations in section 3.2.2.5 in annex 3 to the NIR, the method and EFs were taken from the IPCC good practice guidance for LULUCF rather than the 2006 IPCC Guidelines, which was confirmed by the Party during the review. The ERT also noted that the NIR (section 6.4.2.12) contains an explanation of the selection of combustion factor from the IPCC good practice guidance for LULUCF rather than the 2006 IPCC Guidelines.	Yes. Accuracy
		According to decision 24/CP.19, the 2006 IPCC Guidelines are to be used for estimating emissions. The ERT recognizes that the IPCC good practice guidance for LULUCF may reflect national circumstances better than the 2006 IPCC Guidelines, but this should be appropriately documented and reported in the NIR.	
		The ERT recommends that the Party include in the NIR justification of the use of a methodology and EFs from the IPCC good practice guidance for LULUCF for burned biomass or apply a tier 1 methodology and EFs from the 2006 IPCC Guidelines. The Party may also wish to consider developing a country-specific methodology and/or EFs.	
L.19	4.G HWP – CO_2	The Party reported in the NIR (section 6.4.2.6) country-specific values for conversion factors for different types of HWP; namely, 0.42 t/m^3 for sawnwood and 0.62 t/m^3 for wood-based panels with carbon content for every category equal to 0.5. These values are different from the default values in the IPCC *2013 Revised Supplementary Methods and Good Practice Guidance Arising from the Kyoto Protocol* (table 2.8.1, section 2). The ERT could not identify information on the sources of these conversion factors and how they were derived.	Yes. Transparency
		During the review, the Party clarified that several sources were used, including data from the national forest inventory and the Swedish Forest Industries Association, oral information from different experts and default factors.	
		The ERT recommends that the Party include all sources of information used for calculating quantities of HWP, as well as information on how these data were combined to calculate country-specific conversion factors for the different types of HWP reported in the NIR (section 6.4.2.6).	
Waste			
W.10	5.A Solid waste disposal on land – CH_4	The Party reported in its NIR an overview of the statistical data used and estimated DOC content for 2010, 2012 and 2014 (table 7.16) and for 2016 (table 7.17). Waste statistics for 2011, 2013, 2015 and 2017 are interpolated or extrapolated. It is also stated in the NIR (pp.416–417) that some of the DOC content values for 2016 differ from those for 2010–2014. The ERT noted that DOC values decreased between 2014 and 2016, particularly for EWC-Stat code 10.1, "Household and similar wastes" (from 18 to 3.4), EWC-Stat code 03.2, "Industrial effluent sludges" (from 12.5	Yes. Consistency

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue/problem?*[a]
		to 0.17) and EWC-Stat code 02A, "Chemical wastes" (from 5 to 0.99). The ERT noted a constant DOC value for common sludge (EWC-Stat code 11A) over 28 years and a fivefold decrease in the trend for DOC of chemical waste (from 5 to 0.99), while the amount of waste has been increasing (from 126.0 to 158.0 kt) over the same period. Section 7.2.1 of the NIR broadly indicates the drivers for such changes, including technological improvements, promoting alternative chemicals and implementing new technologies for waste disposal. During the review, the Party clarified that the data for 2014 used in the 2020 submission reflect a DOC value from two studies on data published in 2008 and 2010. The Party also indicated that it performed a study in 2020 whereby the DOC values for 2012 and 2014 have been updated. The new study shows the following changes between 2014 and 2016: EWC-Stat code 10.1, a decrease from 18 to 3.4; EWC-Stat code 03.2, a decrease from 12.5 to 0.17; and EWC-Stat code 02A, a decrease from 5 to 0.99. The changes over time can be explained mainly by the implementation of policies (see NIR section 7.2.1), especially the national prohibition on landfilling burnable and organic wastes (sections 9–10 of Landfill Ordinance 2001:512). These new estimates will be reported in the next submission. The ERT recommends that Sweden provide more transparently in the NIR the reason for the reduction in the DOC content of industrial waste and update the entire time series on the basis of the new data set.	
W.11	5.A Solid waste disposal on land – CH_4	The Party reported "NE" in CRF table 5 for the long-term storage of carbon in waste disposal sites (memo item), annual change in total long-term carbon storage and annual change in long-term carbon storage in HWP waste. The ERT noted that the amount of carbon stored in solid waste disposal sites can be estimated using the first-order decay model in accordance with the 2006 IPCC Guidelines (vol. 5, chap. 3.4). During the review, the Party clarified that since the background information on carbon stored and annual change does not involve any emission estimates and does not relate to the IEFs, the reporting has a low priority in its inventory. The Party explained that the budget for the next inventory does not cover incorporating background information on carbon stored and annual change. In the past, there have been proposals to incorporate these values into the inventory, but the development work that has an impact on the emission estimates has always had a higher priority. The ERT encourages the Party to further explore the possibility of providing background information on carbon stored and annual change as an information item in the CRF waste sector tables in accordance with the 2006 IPCC Guidelines (vol. 5, chap. 3.4).	Not an issue/problem
KP-LULUCF			
KL.3	HWP – CO_2	The ERT could not identify information on how emissions from the HWP pool that have been accounted for during the first commitment period on the basis of instantaneous oxidation have been excluded from the accounting for the second commitment period as required by decision 2/CMP.8, annex II. During the review, the Party clarified that the contribution to the accounting from HWP during the first commitment period is cancelled out. The ERT recommends that the Party include in the NIR information on how emissions from the HWP pool that have been accounted for during the first commitment period have been excluded from the accounting for the second commitment period as required by decision 2/CMP.8, annex II.	Yes. Transparency

[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.

VI. Application of adjustments

11. 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

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

VIII. Questions of implementation

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

Annex I

Overview of greenhouse gas emissions and removals and data and information on activities under Article 3, paragraphs 3–4, of the Kyoto Protocol, as submitted by Sweden in its 2020 annual submission

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

Table I.1

Total greenhouse gas emissions for Sweden, base year[a]–2018

($kt CO_2 eq$)

	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 (Article 3.3 of the Kyoto Protocol)[d]*	*KP-LULUCF (Article 3.4 of the Kyoto Protocol)*	
	Total including LULUCF	*Total excluding LULUCF*	*Total including LULUCF*	*Total excluding LULUCF*			*CM, GM, RV, WDR*	*FM*
FMRL								–41 336.10
Base year	36 823.41	71 311.23	NA	NA	NA		NA	
1990	36 697.11	71 184.93	NA	NA				
1995	38 593.83	73 120.48	NA	NA				
2000	28 382.47	68 114.65	NA	NA				
2010	19 359.65	64 467.31	NA	NA				
2011	16 293.57	60 131.47	NA	NA				
2012	12 845.03	57 294.30	NA	NA				
2013	13 100.37	55 607.71	NA	NA		1 780.79	NA	–48 890.54
2014	12 827.01	53 846.36	NA	NA		2 065.41	NA	–47 420.46
2015	11 746.49	53 739.18	NA	NA		2 469.50	NA	–48 789.28
2016	8 497.46	53 285.94	NA	NA		1 147.32	NA	–50 386.22
2017	9 647.15	52 715.03	NA	NA		1 213.57	NA	–49 501.02
2018	9 785.28	51 779.24	NA	NA		1 299.65	NA	–47 956.37

Note: Emissions and 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 relates to GHG emissions from conversion of forests (deforestation) in 1990 as contained in the report on the review of the report to facilitate the calculation of the assigned amount for the second commitment period of the Kyoto Protocol of the Party.

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

Table I.2
Greenhouse gas emissions by gas for Sweden, excluding land use, land-use change and forestry, 1990–2018
(kt CO_2 eq)

	CO_2[a]	*CH_4*	*N_2O*	*HFCs*	*PFCs*	*Unspecified mix of HFCs and PFCs*	*SF_6*	*NF_3*
1990	57 348.82	7 418.85	5 740.26	6.49	568.78	–	101.73	–
1995	59 366.21	7 367.10	5 583.88	135.76	532.35	–	135.19	–
2000	54 684.43	6 833.16	5 332.71	769.64	375.93	–	118.78	–
2010	53 042.22	5 216.54	4 823.49	1 133.81	187.79	–	63.46	–
2011	49 166.90	5 066.00	4 522.11	1 105.94	215.08	–	55.44	–
2012	46 692.01	4 899.56	4 483.00	1 087.92	78.68	–	53.13	–
2013	45 086.34	4 828.16	4 523.21	1 076.73	51.22	–	42.06	–
2014	43 337.56	4 701.77	4 576.55	1 102.58	82.02	–	45.88	–
2015	43 336.76	4 595.54	4 597.77	1 120.85	35.13	–	53.14	–
2016	42 972.57	4 510.99	4 576.74	1 137.00	31.18	–	57.46	–
2017	42 306.82	4 470.49	4 757.28	1 098.05	36.58	–	45.81	–
2018	41 766.18	4 380.55	4 503.64	1 034.90	61.87	–	32.10	–
Percentage change 1990–2018	**–27.2**	**–41.0**	**–21.5**	**15 852.4**	**–89.1**	**NA**	**–68.5**	**NA**

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

Table I.3
Greenhouse gas emissions by sector for Sweden, 1990–2018
(kt CO_2 eq)

	Energy	*IPPU*	*Agriculture*	*LULUCF*	*Waste*	*Other*
1990	52 190.05	7 611.49	7 641.08	–34 487.81	3 742.30	–
1995	54 076.28	7 902.70	7 579.57	–34 526.66	3 561.93	–
2000	49 125.75	8 360.13	7 406.33	–39 732.17	3 222.44	–
2010	47 283.32	8 383.18	6 832.61	–45 107.66	1 968.19	–
2011	43 543.05	7 884.97	6 824.99	–43 837.90	1 878.46	–
2012	41 245.62	7 534.11	6 754.72	–44 449.28	1 759.85	–
2013	39 635.00	7 468.97	6 829.71	–42 507.34	1 674.03	–
2014	38 046.44	7 355.02	6 885.93	–41 019.36	1 558.97	–
2015	38 063.54	7 313.94	6 898.41	–41 992.70	1 463.29	–
2016	37 183.08	7 849.89	6 868.73	–44 788.48	1 384.24	–

	Energy	*IPPU*	*Agriculture*	*LULUCF*	*Waste*	*Other*
2017	36 770.08	7 592.98	7 029.45	–43 067.88	1 322.52	–
2018	36 401.63	7 341.82	6 790.17	–41 993.96	1 245.62	–
Percentage change 1990–2018	**–30.3**	**–3.5**	**–11.1**	**21.8**	**–66.7**	**NA**

Notes: (1) Sweden did not report emissions or removals in the sector other (sector 6); the corresponding cells in the CRF tables were left blank; (2) Sweden did not report indirect CO_2 emissions in CRF table 6.

Table I.4

Greenhouse gas emissions and removals from activities under Article 3, paragraphs 3–4, of the Kyoto Protocol by activity, base year[a]–2018, for Sweden

($kt\ CO_2\ eq$)

	Article 3.7 bis as contained in the Doha Amendment[b]	*Activities under Article 3.3 of the Kyoto Protocol*		*FM and elected activities under Article 3.4 of the Kyoto Protocol*				
	Land-use change	*AR*	*Deforestation*	*FM*	*CM*	*GM*	*RV*	*WDR*
FMRL				–41 336.10				
Technical correction				7 878.25				
Base year	NA				NA	NA	NA	NA
2013		–1 200.01	2 980.80	–48 890.54	NA	NA	NA	NA
2014		–1 152.28	3 217.69	–47 420.46	NA	NA	NA	NA
2015		–1 182.02	3 651.52	–48 789.28	NA	NA	NA	NA
2016		–1 242.00	2 389.32	–50 386.22	NA	NA	NA	NA
2017		–1 284.01	2 497.58	–49 501.02	NA	NA	NA	NA
2018		–1 284.44	2 584.09	–47 956.37	NA	NA	NA	NA
Percentage change base year–2018					**NA**	**NA**	**NA**	**NA**

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

[a] Sweden has elected not 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 relates to 1990.

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

Table I.5
Key relevant data for Sweden under Article 3, paragraphs 3–4, of the Kyoto Protocol from its 2020 annual submission

Parameter	*Data 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
Elected activities under Article 3, paragraph 4, of the Kyoto Protocol	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 t CO_2 eq (20 175 994 t 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

Annex II

Information to be included in the compilation and accounting database

Tables II.1–II.6 include the information to be included in the compilation and accounting database for Sweden. Data shown are from the Party's annual submission, including the latest revised estimates submitted, adjustments (if applicable) and the final data to be included in the compilation and accounting database.

Table II.1
Information to be included in the compilation and accounting database for 2018, including on the commitment period reserve, for Sweden
(t CO_2 eq)

	Original submission	*Revised submission*	*Adjustment*	*Final value*
CPR	**283 999 121**	**–**	**–**	**283 999 121**
Annex A emissions				
CO_2	41 766 183	–	–	41 766 183
CH_4	4 380 546	–	–	4 380 546
N_2O	4 503 639	–	–	4 503 639
HFCs	1 034 901	–	–	1 034 901
PFCs	61 870	–	–	61 870
Unspecified mix of HFCs and PFCs	–	–	–	–
SF_6	32 099	–	–	32 099
NF_3	–	–	–	–
Total Annex A sources	**51 779 237**	–	–	**51 779 237**
Activities under Article 3, paragraph 3, of the Kyoto Protocol				
AR	–1 284 437	–	–	–1 284 437
Deforestation	2 584 087	–	–	2 584 087
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol				
FM	–47 956 374	–	–	–47 956 374

Table II.2
Information to be included in the compilation and accounting database for 2017 for Sweden
(t CO_2 eq)

	Original submission	*Revised submission*	*Adjustment*	*Final value*
Annex A emissions				
CO_2	42 306 816	–	–	42 306 816
CH_4	4 470 490	–	–	4 470 490
N_2O	4 757 283	–	–	4 757 283
HFCs	1 098 052	–	–	1 098 052
PFCs	36 578	–	–	36 578
Unspecified mix of HFCs and PFCs	–	–	–	–
SF_6	45 811	–	–	45 811
NF_3	–	–	–	–
Total Annex A sources	**52 715 030**	–	–	**52 715 030**
Activities under Article 3, paragraph 3, of the Kyoto Protocol				
AR	–1 284 011	–	–	–1 284 011
Deforestation	2 497 577	–	–	2 497 577
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol				
FM	–49 501 025	–	–	–49 501 025

Table II.3
Information to be included in the compilation and accounting database for 2016 for Sweden
(t CO_2 eq)

	Original submission	*Revised submission*	*Adjustment*	*Final value*
Annex A emissions				
CO_2	42 972 565	–	–	42 972 565
CH_4	4 510 992	–	–	4 510 992
N_2O	4 576 737	–	–	4 576 737
HFCs	1 137 001	–	–	1 137 001
PFCs	31 177	–	–	31 177
Unspecified mix of HFCs and PFCs	–	–	–	–
SF_6	57 463	–	–	57 463
NF_3	–	–	–	–
Total Annex A sources	**53 285 936**	–	–	**53 285 936**
Activities under Article 3, paragraph 3, of the Kyoto Protocol				
AR	–1 241 995	–	–	–1 241 995
Deforestation	2 389 319	–	–	2 389 319
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol				
FM	–50 386 219	–	–	–50 386 219

Table II.4
Information to be included in the compilation and accounting database for 2015 for Sweden
(t CO_2 eq)

	Original submission	*Revised submission*	*Adjustment*	*Final value*
Annex A emissions				
CO_2	43 336 755	–	–	43 336 755
CH_4	4 595 544	–	–	4 595 544
N_2O	4 597 772	–	–	4 597 772
HFCs	1 120 845	–	–	1 120 845
PFCs	35 131	–	–	35 131
Unspecified mix of HFCs and PFCs	–	–	–	–
SF_6	53 136	–	–	53 136
NF_3	–	–	–	–
Total Annex A sources	**53 739 184**	–	–	**53 739 184**
Activities under Article 3, paragraph 3, of the Kyoto Protocol				
AR	–1 182 023	–	–	–1 182 023
Deforestation	3 651 524	–	–	3 651 524
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol				
FM	–48 789 278	–	–	–48 789 278

Table II.5
Information to be included in the compilation and accounting database for 2014 for Sweden
(t CO_2 eq)

	Original submission	*Revised submission*	*Adjustment*	*Final value*
Annex A emissions				
CO_2	43 337 555	–	–	43 337 555
CH_4	4 701 769	–	–	4 701 769
N_2O	4 576 554	–	–	4 576 554
HFCs	1 102 581	–	–	1 102 581
PFCs	82 024	–	–	82 024

	Original submission	*Revised submission*	*Adjustment*	*Final value*
Unspecified mix of HFCs and PFCs	–	–	–	–
SF_6	45 879	–	–	45 879
NF_3	–	–	–	–
Total Annex A sources	**53 846 362**	–	–	**53 846 362**
Activities under Article 3, paragraph 3, of the Kyoto Protocol				
AR	–1 152 276	–	–	–1 152 276
Deforestation	3 217 690	–	–	3 217 690
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol				
FM	–47 420 459	–	–	–47 420 459

Table II.6
Information to be included in the compilation and accounting database for 2013 for Sweden
(t CO_2 eq)

	Original submission	*Revised submission*	*Adjustment*	*Final value*
Annex A emissions				
CO_2	45 086 335	–	–	45 086 335
CH_4	4 828 160	–	–	4 828 160
N_2O	4 523 206	–	–	4 523 206
HFCs	1 076 727	–	–	1 076 727
PFCs	51 224	–	–	51 224
Unspecified mix of HFCs and PFCs	–	–	–	–
SF_6	42 058	–	–	42 058
NF_3	–	–	–	–
Total Annex A sources	**55 607 710**	–	–	**55 607 710**
Activities under Article 3, paragraph 3, of the Kyoto Protocol				
AR	–1 200 013	–	–	–1 200 013
Deforestation	2 980 799	–	–	2 980 799
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol				
FM	–48 890 543	–	–	–48 890 543

Annex III

Additional information to support findings in table 2

Missing categories that may affect completeness

The only category for which an estimation method is 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 land converted to other land (CO_2) (see ID# L.6 in table 3).

Annex IV

Reference documents

A. Reports of the Intergovernmental Panel on Climate Change

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

IPCC. 2014. *2013 Revised Supplementary Methods and Good Practice Guidance Arising from the Kyoto Protocol*. T Hiraishi, T Krug, K Tanabe, et al. (eds.). Hayama, Japan: Institute for Global Environmental Strategies. Available at https://www.ipcc.ch/publication/2013-revised-supplementary-methods-and-good-practice-guidance-arising-from-the-kyoto-protocol/.

IPCC. 2014. *2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands*. T Hiraishi, T Krug, K Tanabe, et al. (eds.). Geneva: IPCC. Available at https://www.ipcc.ch/publication/2013-supplement-to-the-2006-ipcc-guidelines-for-national-greenhouse-gas-inventories-wetlands/.

IPCC. 2019. *2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories.* E Calvo Buendia, K Tanabe, A Kranjc, J Baasansuren, et al. (eds.). Hayama, Japan: Institute for Global Environmental Strategies. Available at https://www.ipcc-nggip.iges.or.jp/public/2019rf/index.html.

B. UNFCCC documents

Annual review reports

Reports on the individual reviews of the 2014, 2015, 2016, 2017 and 2019 annual submissions of Sweden, contained in documents FCCC/ARR/2014/SWE, FCCC/ARR/2015/SWE, FCCC/ARR/2016/SWE, FCCC/ARR/2017/SWE and FCCC/ARR/2019/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%202020_final.pdf.

Annual status report for Sweden for 2020. Available at https://unfccc.int/sites/default/files/resource/asr2020_SWE.pdf.

C. Other documents used during the review

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

Bertilsson J. 2016. Updating Swedish emission factors for cattle to be used for calculations of greenhouse gases. Report 292. Department of Animal Nutrition and Management. Swedish University of Agricultural Sciences.

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

Hytteborn et al. 2015. Patterns and predictability in the intra-annual organic carbon variability across the boreal and hemiboreal landscape. Science of the Total Environment 520, 260-269.

Lindgren A. and Lundblad, M. 2014. Towards new reporting of drained organic soils under the UNFCCC – assessment of emission factors and areas in Sweden. SLU. Department of Soil and Environment, Rapport 14. Uppsala 2014.

Spörndly R. (ed). 2003. Fodertabeller för idisslare 2003 (Feed tables for ruminant animals). Swedish University of Agricultural Sciences. Department of Animal Nutrition and Management. Report 257.

IVL Svenska Miljöinstitutet AB, 2014 (Westling, Tjus & Ek). Memo “Comments on Table 4D1 Calculation of methane emissions from domestic wastewater treatment”. Unpublished.

IVL Svenska Miljöinstitutet AB, 2014 (Westling, Tjus & Ek). Memo “Comments on Table 4D1 Calculation of nitrous oxide emissions from domestic and industrial wastewater treatment”. Unpublished.

Minska skillnader mellan RA och SA. Uppdatering av ”Non Energy Use” samt flöden av stenkol och injektionskol. SMED Rapport Nr 7, 2020.