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Report on the individual review of the inventory submission of the United States of America 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). This report presents the results of the individual review of the 2020 inventory submission of the United States of America, conducted by an expert review team in accordance with 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". The review took place from 2 to 7 November 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

AD	activity data
Annex I Party	Party included in Annex I to the Convention
Btu	British thermal unit
C	carbon
CaO	calcium oxide
CCS	carbon dioxide capture and storage
CH_4	methane
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
CRF	common reporting format
DAYCENT	Daily Century (model)
DOC	degradable organic carbon
DOM	dead organic matter
EF	emission factor
EIA	United States Energy Information Administration of the Department of Energy
EOR	enhanced oil recovery
EPA	United States Environmental Protection Agency
ERT	expert review team
GE	gross energy intake
GHG	greenhouse gas
GHGRP	Greenhouse Gas Reporting Program of the United States Environmental Protection Agency
GREET	Greenhouse Gases, Regulated Emissions and Energy Use in Transportation
HFC	hydrofluorocarbon
HWP	harvested wood products
IE	included elsewhere
IEA	International Energy Agency
IEF	implied emission factor
IPCC	Intergovernmental Panel on Climate Change
IPPU	industrial processes and product use
LPG	liquefied petroleum gas
LULUCF	land use, land-use change and forestry
MMS	manure management system(s)
MOVES	Motor Vehicle Emission Simulator
MSW	municipal solid waste
N	nitrogen
NA	not applicable
NCV	net calorific value
NE	not estimated
NEU	non-energy use
Nex	nitrogen excretion
NF_3	nitrogen trifluoride
NGL	natural gas liquid

NIR	national inventory report
NLCD	National Land Cover Database
NO	not occurring
NRI	United States Department of Agriculture National Resources Inventory
N_2O	nitrous oxide
OECD	Organisation for Economic Co-operation and Development
PFC	perfluorocarbon
QA/QC	quality assurance/quality control
Revised 1996 IPCC Guidelines	*Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*
SF_6	sulfur hexafluoride
SiC	silicon carbide
SOC	soil organic carbon
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"
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*

I. Introduction

1. This report covers the review of the 2020 inventory submission of the United States of America, organized by the secretariat in accordance with 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 2 to 7 November 2020 remotely[1] and was coordinated by Tomoyuki Aizawa, Javier Hanna and Jongikhaya Witi (secretariat). Table 1 provides information on the composition of the ERT that conducted the review for the United States.

Table 1
Composition of the expert review team that conducted the review for the United States of America

Area of expertise	*Name*	*Party*
Generalist	Mikhail Gitarskiy	Russian Federation
Energy	Kendal Blanco-Salas	Costa Rica
	Audace Ndayizeye	Burundi
	Songli Zhu	China
IPPU	Roman Kazakov	Russian Federation
	Ils Moorkens	Belgium
Agriculture	Yu'e Li	China
	Batima Punsalmaa	Mongolia
	Juan José Rincón Cristóbal	Spain
LULUCF	Erik Karltun	Sweden
	Timothy Paul Liersch	Australia
	Yusuf Serengil	Turkey
Waste	Maryna Bereznytska	Ukraine
	Violeta Hristova	Bulgaria
	Hiroyuki Ueda	Japan
Lead reviewers	Mikhail Gitarskiy	
	Songli Zhu	

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

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

4. A draft version of this report was communicated to the Government of the United States, 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 the United States, including totals excluding and including LULUCF, indirect CO_2 emissions, and emissions by gas and by sector.

[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.

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

6. 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 the United States of America

Assessment			*Issue ID#(s) in table 3 or 5*[a]
Date of submission	Original submission: NIR, 14 April 2020; CRF tables (version 1), 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	G.4, E.4, E.5, I.12, I.26, I.33, A.30, L.11, L.18, L.35, W.11
	(c) Development and selection of EFs?	Yes	E.11, E.12, I.17, I.31, I.32, A.4, A.7
	(d) Collection and selection of AD?	Yes	E.9, E.10, E.21, E.22, E.26, I.25, I.30, A.8, A.9, A.11, A.12, L.1, L.2, L.3, L.6, L.7, L.27, W.10
	(e) Reporting of recalculations?	No	
	(f) Reporting of a consistent time series?	Yes	E.30, A.2, L.5, L.10, L.15
	(g) Reporting of uncertainties, including methodologies?	Yes	E.1, A.3, A.10
	(h) QA/QC?	Yes	A.20, A.26, A.27, A.29
	(i) Missing categories, or completeness?[b]	Yes	E.7, E.13, I.3, I.8, I.11, I.23, A.1, A.18, L.1, L.2, L.15, L.17, L.22, L.24, L.25, L.30, L.31, L.32, L.37, L.38, L.39, W.15, W.17
	(j) Application of corrections to the inventory?	No	
Significance threshold	For categories reported as insignificant, has the Party provided sufficient information showing that the likely level of emissions meets the criteria in paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines?	No	G.1, G.2
Description of trends	Did the ERT conclude that the description in the NIR of the trends for the different gases and sectors is reasonable?	No	
National inventory arrangements	Have any issues been identified with the effectiveness and reliability of the institutional, procedural and legal arrangements for estimating GHG emissions?	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	

[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 II.

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

7. Table 3 compiles the recommendations from previous review reports that were included in the most recent previous review report, published on 20 July 2020,[3] and had not been addressed by the time of publication of the review report of the Party's 2019 inventory submission. The ERT has specified whether it believes the Party had resolved, was addressing or had not resolved each issue 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 the United States of America

ID#	*Issue classification*[a]	*Recommendation made in previous review report*	*ERT assessment and rationale*
General			
G.1	Annual submission (G.1, 2019) (G.1, 2018) (G.1, 2016) (G.1, 2015) (9, 2013) (8, 2012) Completeness	Improve the completeness of the inventory, in particular for those categories for which there are methodologies in the 2006 IPCC Guidelines.	Addressing. The ERT acknowledged the efforts by the United States to enhance the completeness of its annual inventory submission, in particular the inclusion in annex 5 to the NIR of likely emission levels for subcategories not yet estimated (1.A.3, 1.A.5, 1.B.1, 3.B.1 and 3.B.2). In response to a question regarding the recommendation of the previous ERT, the Party clarified that its inventory improvement plan includes obtaining emission estimates for subcategories that are not yet estimated as soon as the necessary data become available, prioritizing with other improvements to make best use of available resources consistently with IPCC good practice. However, the ERT considers that the recommendation has not yet been fully addressed because the Party did not include estimates for several categories, and in most cases subcategories and some carbon pools, for which there are methodologies in the 2006 IPCC Guidelines (as listed in annex II).
G.2	Annual submission (G.2, 2019) Completeness	Provide a justification in the NIR, based on the likely level of emissions as per paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines, for all sources and sinks that occur but are considered insignificant and excluded from the inventory and for which there are methodologies provided in the 2006 IPCC Guidelines, and provide in the NIR evidence that the total national aggregate of estimated emissions for all mandatory gases and categories considered insignificant remains below 0.1 per cent of national total GHG emissions.	Addressing. The Party enhanced the completeness of its annual inventory by including in annex 5 to the NIR likely emission levels for subcategories 1.A.3, 1.A.5, 1.B.1, 3.B.1 and 3.B.2, which were considered to be below the significance threshold. It stated in annex 5 (p.A-499) that the total aggregate of all required gases and categories for which emissions occur but are considered insignificant is highly likely to remain below 0.1 per cent of national total GHG emissions, but the Party did not include a total quantified estimate for all categories considered insignificant to confirm this assumption. In response to a question regarding the recommendation of the previous ERT, the Party indicated that it continually reviews and updates information on likely significance levels not yet estimated as the necessary or approximated data become available, while prioritizing with other planned improvements to make best use of available resources consistently with IPCC good practice. However, the ERT noted that the level of significance was not provided for the majority of not estimated categories in CRF table 9 and NIR annex 5 (table A-251, pp.A-500–A-502). Consequently, the

[3] FCCC/ARR/2019/USA.

ID#	Issue classification[a]	Recommendation made in previous review report	ERT assessment and rationale
			sufficient evidence that the total national aggregate of estimated emissions for all mandatory gases and categories considered insignificant is below 0.1 per cent of national total GHG emissions has not yet been provided by the United States. Therefore, the ERT concludes that the recommendation has not yet been fully addressed by the Party.
G.3	Uncertainty analysis (G.3, 2019) Convention reporting adherence	Include the results of the uncertainty analysis for 1990 in the relevant tables of section 1 and annex 7.	Resolved. The United States reported on the results of the quantitative uncertainty analysis for 1990 in NIR section 1.7 (table 1-5, pp.1-25–1-26) and annex 7 (table A-267, p.A-535). The uncertainty assessment was performed following approaches 1 and 2, including and excluding LULUCF, as required by paragraph 15 of the UNFCCC Annex I inventory reporting guidelines.
Energy			
E.1	1. General (energy sector) – gaseous fuels – CO_2 and CH_4 (E.2, 2019) (E.18, 2018) Convention reporting adherence	Examine if the uncertainty analysis needs to be updated to reflect the findings of the research on natural gas combustion and document its findings in future submissions.	Addressing. The uncertainty analysis is provided in the NIR (pp.3-35–3-37) for CO_2 from fossil fuel combustion, with supporting information given in annexes 2.2 and 7. The Party explains in the NIR that the uncertainty estimates are not affected by the updates to the carbon content of natural gas in the 2019 submission, and that the general findings regarding the carbon content of fuels given in NIR annex 2.2 (pp.A-103–A-106) still apply for natural gas without updating. The uncertainty range reported in the 2020 submission for CO_2 emissions from natural gas combustion was in the 2019 inventory submission with the exception of United States territories, where the lower bound differs by 1 percentage point (from –13 per cent in the 2019 submission to –12 per cent in the 2020 submission). During the review, the Party clarified that this was attributable to statistical variations in the approach used (Monte Carlo analysis). The ERT considers that this issue has not been fully addressed because no specific information has been documented to demonstrate that the impact of updates to the carbon content of natural gas on the uncertainty analysis is negligible.
E.2	1. General (energy sector) – gaseous fuels – CO_2 and CH_4 (E.3, 2019) (E.18, 2018) Transparency	(a) Research CO_2 EF data for fuel gas used by upstream oil and gas producers, and natural gas that has been processed and injected into downstream distribution networks, in order to determine whether a different CO_2 EF for fuel gas used in offshore oil and gas production than the CO_2 EF for the processed gas that enters the transmission, storage and distribution networks used in power and industrial plants and by other users is warranted and whether it can be determined; and (b) document the findings of the research on the CO_2 EFs in the NIR.	Addressing. The Party explained in annex 2.2 to the NIR (p.A-106) that, as natural gas carbon content is based on the calorific value of the gas, and EIA reported that the calorific value (higher heating value or gross calorific value) of dry natural gas produced is the same as that of natural gas consumed in the country, on average 1,036 Btu/cubic foot (p.A-104), the same carbon factor was used for natural gas consumption by all users, including upstream operation. The Party provided a reference to an edition of Monthly Energy Review, published by EIA, on page A-106 but did not provide any information from that publication. The ERT considers that this issue has not been fully addressed as the Party did not include specific information in the NIR on consistent heating values for produced gas (used in upstream operations) and consumed gas (used in downstream operations).
E.3	Fuel combustion – reference approach –	Provide a more transparent clarification of how the difference in emissions between the reference	Addressing. For the reference approach, the values reported in CRF table 1.A(c) for apparent energy consumption and apparent energy consumption excluding NEU were

ID#	Issue classification[a]	Recommendation made in previous review report	ERT assessment and rationale
	all fuels – CO_2 (E.4, 2019) (E.3, 2018) (E.5, 2016) (E.5, 2015) (32, 2013) (41, 2012) Transparency	and the sectoral approach is determined and which fuels are subtracted as NEU and feedstocks.	the same for the entire time series. The Party explained in the NIR (p.3-38) that emissions from carbon that was not stored during NEU of fuels are subtracted under the sectoral approach and reported separately but are not subtracted under the reference approach. Thus, emission estimates under the reference approach are comparable to those under the sectoral approach, except that the emissions from NEU of fuels are included in the reference approach. The ERT noted that a similar explanation was included in annex 4 to the NIR (p.A-482). During the review, the Party confirmed that (1) the emission scope of the reference and the sectoral approaches is the same since carbon emissions from NEU (i.e. carbon not excluded) are included in both approaches, except for other fossil fuels (see ID# E.25 in table 5); (2) the energy consumption covered by the sectoral approach includes both fuel consumption and NEU, which is reported under category 1.A.5 other, hence the scope of energy consumption under the sectoral approach is comparable with that under the reference approach without excluding NEU; and (3) where it is indicated that NEU emissions are subtracted under the sectoral approach, it means that they are reported separately, not that they are not covered by the sectoral approach. The ERT considers that it would be useful to include this explanation in the NIR of future inventory submissions.
E.4	Feedstocks, reductants and other NEU of fuels – all fuels – CO_2 (E.5, 2019) (E.4, 2018) (E.7, 2016) (E.7, 2015) (38, 2013) (47, 2012) Comparability	Report only emissions from fuels combusted for the use of energy under fuel combustion, and reallocate the relevant emissions currently reported under the subcategory NEU (other) and part of the fuel used under the subcategory United States territories (other).	Not resolved. Emissions from NEU of lubricants and waxes and other (e.g. asphalt and road oil), which should be reported under CRF category 2.D, were still reported under fuel combustion under category 1.A.5 and combined with emissions from NEU of other fuels (see ID# E.3 above), and as "IE" under the IPPU sector. Like in the 2019 submission, the Party indicated in the NIR (p.3-54, box 3-5) that these emissions cannot be reallocated to IPPU owing to national circumstances, in particular where a carbon balance calculation was performed on the basis of the aggregated amount of fossil fuels used for NEU, and that artificial adjustments to reallocate emissions could lead to transparency issues. The ERT noted that a similar explanation was provided in the IPPU section of the NIR (p.4-6), where it is stated that artificial adjustments would result in the carbon emissions for lubricants, waxes, asphalt and road oil being reported under the IPPU sector, while carbon storage for those subcategories would be reported under the energy sector. The ERT noted that the carbon balance approaches for most petrochemical products were provided in NIR annex 2.3 (pp.A-141–A-157). Taking lubricants as an example, the ERT remarked that, according to the information provided in the NIR (pp.A-152–A-154), 92 per cent of lubricants are categorized as lubricant oils and the remaining 8 per cent as lubricant greases. Annex 2.3 to the NIR also provides information on the commercial and environmental fate of oil lubricant (table A-85) and grease lubricant (table A-86), with information on the percentage combusted during use and not combusted during use. The ERT is of the view that emissions relevant to lubricant use could be allocated consistently with the 2006 IPCC Guidelines by using the existing statistical information and assumptions mentioned above without raising transparency concerns. While reallocating the small portion of emissions associated with non-combustion use to the IPPU sector may not improve the

ID#	Issue classification[a]	Recommendation made in previous review report	ERT assessment and rationale
			overall accuracy of the inventory, it would improve its comparability with the inventories of other Annex I Parties (see ID# I.18 below).
E.5	Feedstocks, reductants and other NEU of fuels – all fuels – CO_2 (E.6, 2019) (E.19, 2018) Accuracy	Continue to research the data for the emissions from NEU of fuels reported under the energy and IPPU sectors mass-balance method used across petrochemical production to estimate CO_2 emissions from NEU of fuels and the method based on process emissions reported under facility-level reporting used to estimate emissions from feedstock consumption under IPPU, and further clarify the country-specific approach used in the NIR consistent with paragraph 10 of the UNFCCC Annex I inventory reporting guidelines.	Addressing. The Party reported in its NIR (p.4-58) that some degree of double counting may occur between CO_2 emissions from NEU of fuels in the energy sector and CO_2 process emissions from petrochemical production in the IPPU sector, but that data integration is not feasible as feedstock data from EIA used to estimate NEU of fuels were aggregated by fuel type, rather than disaggregated by both fuel type and individual IPPU industries. The Party noted in the NIR (footnote 65 on p.3-48) and further clarified during the review that this is not considered to be a significant issue since NEU industrial release data (e.g. the Toxics Release Inventory) include different categories of sources to those included under the IPPU sector, and the NEU estimates account for roughly 20 per cent of the emissions captured in the IPPU sector. During the review, the Party further clarified that, for 2018, carbon emissions from industrial releases from NEU of fuels, reported as 6,500 kt CO_2 in table A-67 of annex 2.3 to the NIR (p.A-136), represent 21.8 per cent of the emissions from petrochemical production (29,700 kt CO_2 eq) reported under the IPPU sector, as shown in NIR table 4-46 (p.4-59) and CRF table 2(I).A-H (sheet 1) for category 2.B.8. However, the ERT considers that the Party has not yet fully addressed the recommendation, in particular the potential issue related to possible double counting, which the Party considers not to be significant, by describing how the country-specific approach is better able to reflect the Party's national situation and how these methodologies are compatible with the 2006 IPCC Guidelines (see ID#s E.4 above and I.12 below).
E.6	International aviation – liquid fuels – CO_2, CH_4 and N_2O (E.7, 2019) (E.5, 2018) (E.6, 2016) (E.6, 2015) (35, 2013) Transparency	Harmonize and reconcile the data between the reference and the sectoral approach for the reporting of jet kerosene consumption between CRF tables 1.A(b) and 1.D or furnish an adequate explanation of inconsistencies, where appropriate.	Addressing. There are still inconsistencies in the reporting of jet kerosene consumption as international bunker fuel between CRF tables 1.A(b) and 1.D (e.g. 198.85 Mbbl (approx. 1,207,361.48 TJ) and 1,209,889.16 TJ for 2018, respectively). An explanation was provided in footnote 6 to table A-244 of NIR annex 4 (p.4-487), indicating that jet kerosene used in international aviation has a different NCV based on data specific to that source. The Party clarified during the review that physical values of jet kerosene consumption are converted on the basis of a combined calorific value across all sources of jet fuel (export, import and stock change, as shown in CRF table 1.A(b)), which may result in inconsistency with jet fuel data for international aviation (as shown in CRF table 1.D). The Party further clarified that the value in CRF table 1.D is based on bunkers only (198.85 Mbbl and heating content of 6,084.42 TJ/Mbbl) while the values in table 1.A(b) are based on apparent consumption, including imports, exports and so on, and average heating value (–227.08 Mbbl and 6071.71 TJ/Mbbl). The ERT is of the view that the amount of jet fuel used as international bunker fuel should be reported as a single value that is consistent across the approaches used in the inventory reporting. In this regard, the ERT considers that the footnote and the additional information provided do not fully explain the inconsistencies between CRF tables 1.A(b) and 1.D. The ERT believes it is necessary to provide in the NIR the reason why different heating values are applied to jet kerosene in CRF tables 1.A(b) and 1.D to resolve this issue.

ID#	*Issue classification*[a]	*Recommendation made in previous review report*	*ERT assessment and rationale*
E.7	1.A Fuel combustion – sectoral approach – biomass – CH_4 and N_2O (E.9, 2019) (E.20, 2018) Completeness	Advance the research on CH_4 and N_2O emissions from the combustion of landfill gas, sewage gas and other biogas in order to review data sources for biogas, review the reporting of non-CO_2 emissions in the waste sector and assess the need to add new estimates.	Not resolved. The NIR did not contain information on any such research. In addition, in the 2020 inventory submission, the amount of CH_4 recovered for energy use for subcategory 5.A.1.a anaerobic (managed waste disposal sites) was reported in CRF table 5.A as numerical values for 1990–2004 and as "NE" for 2005–2018, and in the 2018 inventory submission as "IE" for 2005–2016. During the review, the Party clarified that it is conducting research on the sources of data on biogas use and biogas combustion for energy purposes to confirm whether or not these emissions are reported elsewhere, and that updates to CH_4 and N_2O emissions from the combustion of landfill gas, sewage gas and other biogas will be made, as needed, and described in future inventory submissions (see ID# W.9 below).
E.8	1.A.2.g Other (manufacturing industries and construction) – liquid fuels – CO_2, CH_4 and N_2O (E.12, 2019) (E.22, 2018) Transparency	Document the impacts of the new model and the validity of the outputs and transparently document the recalculations in the NIR when the latest version of the model (MOVES2014b) is incorporated in the inventory.	Addressing. The MOVES2014b model has been incorporated in inventory development since the 2019 inventory submission, in which the impact of the recalculation on CH_4 and N_2O emissions was explained without any reference to CO_2 emissions. According to the information provided in the 2020 NIR (p.3-36), no particular recalculation was performed for non-road mobile machinery. In addition, no documentation on the validity of the outputs of the model was included in the NIR. During the review, the Party emphasized that (1) the use of the MOVES2014b model was limited primarily to the estimation of CH_4 and N_2O emissions from non-transportation mobile sources; (2) the model was also used to generate vehicle age distributions that were used to estimate CH_4 and N_2O emissions from transportation sources; (3) it plans to incrementally improve the discussion of the validity of the MOVES2014b model in future inventory submissions; and (4) the model was not used to derive CO_2 emissions from non-road mobile machinery, which were calculated using fuel consumption data from EIA and were included under the industrial and commercial categories of the inventory, so any recalculations performed using the MOVES2014b model will not impact the estimated CO_2 emissions from non-transportation mobile sources. The ERT considers that this issue has not yet been fully resolved as the NIR does not indicate that the recalculation using the MOVES2014b model had no impact on CO_2 emissions from non-road mobile machinery, and the NIR could provide more information on specific assumptions that were made and modifications to the MOVES2014b model (see ID# E.14 below).
E.9	1.A.2.g Other (manufacturing industries and construction) – liquid fuels – CO_2, CH_4 and N_2O (E.13, 2019) (E.23, 2018) Comparability	Research whether data are available to accurately reallocate emissions from fuel use by agricultural mobile machinery from subcategory 1.A.2.g to 1.A.4.c.ii and fuel use for fishing vessels to 1.A.4.c.iii in order to improve the comparability of the submission and ensure that emissions of all gases from a given source are reported under the same IPCC category. If data are not available to accurately reallocate emissions to the different categories, clarify, in the NIR, the country-specific approach taken consistently with	Not resolved. No relevant research or clarifications are reported in the 2020 submission. AD for subcategories 1.A.4.c.ii off-road vehicles and other machinery and 1.A.4.c.iii fishing were reported as "IE" and "NO" for the whole time series, as in the 2018 and 2019 inventory submissions. During the review, the Party indicated that it is currently researching and comparing various AD sources and updating the MOVES2014b model inputs, in addition to researching the availability of data for addressing the reallocation of emissions from fuel use by agricultural mobile machinery from subcategory 1.A.2.g other to subcategory 1.A.4.c.ii off-road vehicles and other machinery, and fuel use for fishing vessels to subcategory 1.A.4.c.iii fishing. The ERT noted that, according to the information provided in the NIR (p.2-28), the fuel used in the agriculture economic sector is disaggregated using supplementary data from

ID#	Issue classification[a]	Recommendation made in previous review report	ERT assessment and rationale
		paragraph 10 of the UNFCCC Annex I inventory reporting guidelines.	sources additional to EIA, and that CO_2 emissions from fuel combustion and CH_4 and N_2O emissions from stationary and mobile combustion are then apportioned to the corresponding subcategories of the agriculture economic sector consistent with the fuel use. It considers that the CH_4 and N_2O emissions from non-transportation mobile sources in agriculture could be reported under subcategory 1.A.4.c ii off-road vehicles and other machinery. The ERT also noted that NIR tables 3-14–3-15 (pp.3-28–3-29) provide CH_4 and N_2O emissions, respectively, from non-road machinery used in agriculture for certain years only (1990, 2005 and 2014–2018). The Party indicated that it will continue working towards reporting GHG emissions from the combustion of fuels in non-road machinery used in the agriculture economic sector under subcategory 1.A.4.c ii off-road vehicles and other machinery.
E.10	1.A.2.g Other (manufacturing industries and construction) – liquid fuels – CO_2, CH_4 and N_2O (E.14, 2019) (E.24, 2018) Accuracy	Research data by non-road mobile machinery vehicle type across the different data sets, including the Federal Highway Administration and MOVES model outputs, to determine the optimum AD estimate for each subsource under non-road mobile machinery, and improve inventory accuracy, as necessary, including for CO_2, CH_4 and N_2O emissions from industrial, commercial, agricultural machinery and fishing vessels.	Addressing. According to the NIR (p.3-40), EPA tested an alternative approach for disaggregating gasoline between road and non-road use. It used on-road fuel consumption output from the MOVES2014b model to determine the percentage of the Federal Highway Administration consumption data totals that are attributable to highway transportation sources, and then applied this to the EIA total data to determine gasoline consumption from highway transportation sources, such that the remainder could be defined as industrial and commercial consumption and allocated to non-road mobile machinery. However, as the results of the test revealed differences between fuel consumption data from the MOVES2014b model and those from the Federal Highway Administration, no changes were made to the methodology for estimating motor gasoline consumption for non-road mobile sources. The ERT considers that this issue has not been fully addressed as the optimum AD were not determined for each subsource under non-road mobile machinery.
E.11	1.A.3 Transport – liquid fuels – CO_2, CH_4 and N_2O (E.15, 2019) (E.25, 2018) Accuracy	Advance the research in order to implement as soon as practicable the following improvements indicated during the review: (a) Updating on-road diesel CH_4 and N_2O EFs; (b) Developing improved methodology and data sources to estimate emissions from class II and III (short-line and regional) rail locomotives; (c) Applying a consistent methodology over time to estimate vehicle miles travelled for on-road vehicles by vehicle type, defined by wheel base; (d) Including ongoing research and documentation of minor emissions sources currently not included in the inventory, such as urea use in trucks, bio jet fuel, and compressed natural gas or liquefied petroleum gas use in shipping.	Addressing. (a) Resolved. For the 2020 inventory submission, the Party updated the CH_4 and N_2O EFs for diesel oil for subcategory 1.A.3.b road transportation for years after 2006. For example, the CH_4 EF for diesel oil for 2017 was updated from 0.24 kg/TJ in the 2019 inventory submission to 0.53 kg/TJ in the 2020 inventory submission. The Party explained in the NIR (p.3-46) that CH_4 and N_2O EFs for on-road gasoline and diesel oil vehicles were developed on the basis of annual certification data compiled by EPA instead of regression analyses (for N_2O) or the ratio of non-methane organic gas emission standards (for CH_4). It remarked during the review that certification data containing CH_4 and N_2O emission information for the period preceding 2006 were not available; (b) Resolved. It also explained in the NIR (p.3-46) that the methodology for estimating fuel consumption and emissions from class II and III rail locomotives was updated to use surrogate carload data reported by the company Railinc for 2014 onward, as 2014 is the last year for which the Party was able to receive class II and III fuel consumption data from the American Short Line and Regional Railroad Association;

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			(c) Not resolved. During the review, the Party confirmed that it will apply a more consistent methodology over time to estimate vehicle miles travelled for on-road vehicles by vehicle type; (d) Not resolved. The ERT noted that the emissions from urea use for non-agricultural purposes presented on page 4-32 of the NIR did not contain any specific information on trucks. It also noted that, according to annex 5 to the NIR (p.A-493), N_2O emissions from biomass fuel use in domestic aviation were not estimated as they are considered insignificant. During the review, the Party confirmed that it will include research results and document minor emissions sources not currently included in the inventory in stages over the 2021 and 2022 inventory submissions, pending data availability.
E.12	1.A.3.b Road transportation – liquid fuels – CO_2 (E.16, 2019) (E.26, 2018) Accuracy	Review and update the time series of diesel and gasoline CO_2 EFs, including, where necessary, the data on fuel densities and carbon share by fuel grade, and report on progress, or document in the NIR that the EFs applied are accurate and representative of emissions across the time series, and update the uncertainty analysis as needed to reflect the findings of the research.	Not resolved. The ERT noted that the Party did not revise the CO_2 EFs for diesel oil and gasoline for subcategory 1.A.3.b road transportation in the 2020 inventory submission and continued to use constant values for the EFs for gasoline (67.62 t CO_2/TJ) for 2008–2017 (the EFs vary between 70.68 and 71.55 t CO_2/TJ for other years) and for diesel (70.10 t CO_2/TJ) for the entire time series, without justifying the accuracy of the EFs. During the review, the Party clarified that it is in the process of updating the time series of diesel oil and gasoline CO_2 EFs, and that additional considerations identified by expert input during the 2020 inventory compilation cycle had the update. The Party expected to address this issue in the 2021 inventory submission.
E.13	1.A.3.b Road transportation – liquid fuels – CO_2 (E.17, 2019) (E.27, 2018) Completeness	Either present information in the NIR to justify the omission of any fossil carbon component in the CO_2 EF for biofuel use (e.g. fatty acid methyl ester use) or update the inventory estimates to account for emissions from the fossil carbon component of biofuels and explain the estimations in the NIR.	Addressing. The inventory was not updated to account for possible emissions from the fossil carbon component of biofuels. The Party explained in footnote 97 to page 3-114 of the NIR that CO_2 emissions from biodiesel do not include emissions associated with the carbon contained in methanol used in the process of combustion, as emissions from methanol use in combustion are assumed to be accounted for under NEU. It also explained in a footnote to page A-134 of NIR annex 2.3 that natural gas used as a petrochemical feedstock includes use in production of methanol and that, as a result, the carbon storage factor developed for natural gas as petrochemical feedstocks (65 per cent stored and 35 per cent emitted for 2018) takes into consideration the emissions from the use of the resulting products, including methanol. However, the ERT noted that table A-67 of NIR annex 2.3 (p.A-136) shows the carbon stored and emitted by products obtained from petrochemical feedstock for 2018 but provides no specific information on methanol, which is one of the products obtained from natural gas. During the review, the Party clarified that it will examine ways to incorporate more information into table A-67 of NIR annex 2.3 to further clarify uses of petrochemical feedstocks. The ERT considers that the issue of possible underestimation has not been fully addressed, since emissions from methanol combustion, which is assumed to be included under NEU (CRF category 1.A.5 other), are not transparently estimated and reported.

ID#	*Issue classification*[a]	*Recommendation made in previous review report*	*ERT assessment and rationale*
E.14	1.A.3.b Road transportation – liquid fuels – CH_4 and N_2O (E.18, 2019) (E.28, 2018) Convention reporting adherence	Include descriptions of the MOVES model used to estimate CH_4 and N_2O emissions from road transportation and the 2016 GREET model used to generate EF inputs for alternative fuel vehicles, and information to verify that the models have been tested and calibrated to be representative of the United States fleet, fuels, driving conditions, road types and vehicle types.	Addressing. The Party reported in the NIR (p.3-44) that CH_4 and N_2O EFs for alternatively fuelled vehicles were developed on the basis of the 2018 GREET model and provided a related reference in annex 3.2 (p.A-219) (Argonne National Laboratory, 2018). It also provided a reference for the MOVES model in annex 3.2 (p.A-220). During the review, the Party reiterated its plans to incrementally improve discussion of the validity of the MOVES and GREET models in future inventory submissions. In relation to the list of provisional main findings, the Party provided an additional document (EPA, 2020) showing that the CH_4 and N_2O EFs for on-highway gasoline and diesel vehicles generated by MOVES2014b were reviewed by experts in October 2019. The ERT considers that this issue has not been fully addressed as no reference to the expert review of EFs was included in NIR.
E.15	1.A.5.b Mobile – solid and gaseous fuels, and biomass use – CO_2, CH_4 and N_2O (E.21, 2019) (E.31, 2018) Transparency	Report AD and emissions of activities not occurring as "NO" instead of "NA".	Addressing. The Party reported in CRF table 1.A(a) (sheet 4) "NO" for consumption of solid and gaseous fuels and biomass for CO_2, CH_4 and N_2O emissions for subcategory 1.A.5.b other – mobile (military) for the whole time series, but "NA" for other fossil fuels.
E.16	1.B.2 Oil, natural gas and other emissions from energy production – all fuels – CO_2, CH_4 and N_2O (E.22, 2019) (E.32, 2018) Accuracy	Implement the planned improvements for this category discussed during the review, including the following: (a) Estimating emissions from natural gas gathering systems using component-level annual data instead of whole-facility study data; (b) Estimating emissions from hydraulically fractured oil well completions using annually reported facility emission data instead of production-based estimates; (c) Estimating fugitive emission releases from liquefied natural gas storage and transfer using GHGRP data rather than data from an older reference; (d) Estimating emissions from natural gas transmission pipeline blowdowns using GHGRP data rather than data from an older reference, ensuring that the recalculations are described transparently and that a consistent time series of estimates is maintained.	Resolved. The Party estimated emissions from hydraulically fractured oil well completions using annually reported facility emission data; fugitive emission releases from liquefied natural gas storage and transfer using GHGRP data; and emissions from natural gas transmission pipeline blowdowns using GHGRP data. It also transparently described recalculations and maintained a consistent time series of estimates in the 2019 inventory submission. CH_4 and CO_2 emissions for natural gas gathering and boosting stations, which are key sources of emissions under subcategory 1.B.2.b.2 production (natural gas), were recalculated for the whole time series. The Party explained in the NIR (pp.3-93 and 3-95) that the methodology used in the emission estimates was updated to allow the use of data from a study (Zimmerle et al., 2019) in which CH_4 measurements were taken at gathering and boosting stations and CH_4 EFs were calculated for certain equipment (compressors, tanks, dehydrators, acid gas removal units, separators and yard piping). During the review, the Party provided an additional document (EPA, 2020) showing updated CH_4 EFs. For example, the CH_4 EF for compressors (including both leakage and venting) of 230.4 and for dehydrators of 15.9 t/year/dehydrator. For CO_2 emissions, the Party explained in the NIR (p.3-92) that for previous inventory submissions it was unable to estimate the largest CO_2 sources in gathering and boosting stations because of data unavailability, but for the 2020 inventory submission, the incorporation of recent data on CO_2 emissions from flaring and acid gas removal units enabled the estimation of such emissions. As a result, in comparison with the 2019 inventory submission, CO_2 emissions from natural gas

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			production increased by 150–250 per cent for 1990–2017, whereas CH_4 emissions decreased by 10–15 per cent.
E.17	1.B.2.c Venting and flaring – liquid and gaseous fuels – CO_2 and CH_4 (E.23, 2019) (E.16, 2018) (E.20, 2016) (E.20, 2015) Transparency	Enhance transparency in reporting CH_4 emissions from petroleum systems from venting and flaring, in accordance with the UNFCCC Annex I inventory reporting guidelines.	Addressing. The Party still reported "IE" for CO_2 and CH_4 emissions from venting and flaring in CRF table 1.B.2 and did not provide any specific information on venting and flaring in the NIR. During the review, the Party reiterated the clarification and response provided during previous reviews, namely that providing an estimate of disaggregated flaring and venting emissions would involve the application of many assumptions, which would result in inconsistent reporting and, potentially, decreased transparency. The Party also clarified during the review that there were inconsistencies in data availability across segments (such as gathering) within oil and gas activities systems and noted that EF data available for activities that cover flaring (such as heavy fuel oil well completions with flaring) include emissions from multiple sources (flaring, venting and leaks).
E.18	1.C CO_2 transport and storage – CO_2 (E.25, 2019) Transparency	Report on the progress on the research to enable estimation of emissions for category 1.C.2, and provide a description of emission pathways associated with EOR and CCS processes for all relevant categories, including how leakage from CO_2 geological storage formations is assessed for both EOR and CCS projects.	Not resolved. No progress was reported in the NIR, and CO_2 emissions for subcategories 1.C.2.a injection and 1.C.2.b storage were reported as "IE" for all years of the time series in the 2019 and 2020 inventory submissions. During the review, the Party clarified that it will continue to review new data available from the GHGRP and other sources of information for consideration in updating emission estimates and allocations from category 1.C.1 transport of CO_2 and subcategories 1.C.2.a injection and 1.C.2.b storage. The Party indicated that it will provide an update, as appropriate, in future inventory submissions on recalculations and planned improvements, where feasible.
E.19	1.C CO_2 transport and storage – CO_2 (E.26, 2019) Comparability	Change the total amount of CO_2 captured for storage to "IE" in line with the Party's existing approach of reporting EOR and CCS emissions in the sectors where the emissions are captured for use in EOR.	Not resolved. The total amount of CO_2 captured for storage was reported as "NA" for all years of the time series in the 2019 and 2020 inventory submissions. During the review, the Party clarified that it will review and correct notation key use as appropriate in a future inventory submission.
E.20	1.C CO_2 transport and storage – CO_2 (E.26, 2019) Comparability	Report the total amounts of CO_2 injected at storage sites and the total leakage from transport, injection and storage as "IE".	Not resolved. CO_2 emissions for the total amounts of CO_2 injected at storage sites and total leakage from transport, injection and storage were reported as "NA" for all years of the time series in the 2019 and 2020 inventory submissions. During the review, the Party clarified that it will review and correct notation key use as appropriate in a future inventory submission.
IPPU			
I.1	2. General (IPPU) – CO_2 (I.1, 2019) (I.26, 2018) Accuracy	Review the basis of EFs applied and, where appropriate, apply consistent carbon content factors to ensure consistency across the energy and IPPU sectors, reflecting any annual variations in the factors.	Resolved. The Party used country-specific CO_2 EFs for natural gas and petroleum coke to estimate the amounts of fuel consumed for ammonia production and subtracted these amounts from the energy sector to avoid double counting of CO_2 emissions. The EF values applied are provided in NIR annex 2 (tables A-42, p.A-91; and A-43, p.A-92). The carbon content values for coking coal revised in accordance with those reported under the energy sector are provided in NIR table 4-66 (p.4-80). The recalculations

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			performed for the revised EFs and carbon content of fuels used as feedstock are discussed in the NIR (pp.4-31 and 4-85).
I.2	2.A.1 Cement production – CO_2 (I.2, 2019) (I.28, 2018) Transparency	Justify the applicability of the 2 per cent value of the cement kiln dust factor to national circumstances or investigate further the availability of the data required to derive a country-specific cement kiln dust factor for cement production and report on the outcome of this investigation.	Resolved. The Party reported in the NIR (p.4-10) that data are not currently available to derive a country-specific cement kiln dust correction factor. A default correction factor of 1.02 (2 per cent) was used to account for cement kiln dust CO_2 emissions in accordance with the 2006 IPCC Guidelines. The ERT considers that, given that plant-level data are not available, the default correction factor of 1.02 is appropriate for the chosen tier 2 method and can be considered good practice in line with the 2006 IPCC Guidelines (vol. 3, chap. 2, pp.2.12–2.13).
I.3	2.A.4 Other process uses of carbonates – CO_2 (I.3, 2019) (I.5, 2018) (I.17, 2016) (I.17, 2015) Completeness	Conduct further research and consultation with industry, state-level regulators and/or statistical agencies to access additional AD and EFs and/or to seek verification of the current method and assumptions for estimating emissions from ceramics, non-metallurgical magnesium production and from other limestone and dolomite use; and report on progress in the NIR.	Addressing. The Party reported CO_2 emissions from other limestone and dolomite use under category 2.A.4.d (other) in NIR section 4.4 and CRF table2(I).A-Hs1, but "NE" for categories 2.A.4.a (ceramics) and 2.A.4.c (non-metallurgical magnesium production) in CRF table 2(I).A-Hs1. The Party reported its progress and the status of this issue in the NIR (p.4-27). During the review, the Party clarified that there is no reportable progress in identifying data for the estimation of emissions based on further outreach and that efforts continue under the current cycle (see NIR annex 5, p.A-495).
I.4	2.B.1 Ammonia production – CO_2 (I.4, 2019) (I.7, 2018) (I.19, 2016) (I.19, 2015) Comparability	Allocate emissions from all fossil fuel uses (i.e. fuel and feedstock use) for ammonia production under subcategory 2.B.1 of the IPPU sector in accordance with the 2006 IPCC Guidelines.	Not resolved. The Party reported CO_2 emissions from fossil fuel use as fuel for energy use for ammonia production under the energy sector (NIR p.4-27). During the review, the Party clarified that its planned improvements (NIR p.4-31) include assessing anticipated new data for updating EFs to include both fuel and feedstock CO_2 emissions and to improve consistency with the 2006 IPCC Guidelines (vol. 3, chap. 3.2). The Party indicated that this is a long-term improvement to be included in the 2024 or 2025 submission at the earliest. Until these additional data are available and have been assessed as indicated in the NIR, consistently with the UNFCCC Annex I inventory reporting guidelines, the United States has provided an explanation on the use of a country-specific or national method as noted in the NIR (p.4-29).
I.5	2.B.1 Ammonia production – CO_2 (I.24, 2019) Transparency	Investigate the reasons behind the trends in the CO_2 IEF and underlying AD and emission and removal trends and report on the matter.	Resolved. The Party clarified in the NIR (p.4-29) that increases in the amount of ammonia produced from petroleum coke between 2000 and 2001 and 2015 and 2016 caused increases in the CO_2 IEF across those years. During the review, the Party provided data on ammonia production from natural gas and petroleum coke to support the description of the CO_2 IEF in the NIR. The ERT agreed with the estimates provided.
I.6	2.B.2 Nitric acid production – N_2O (I.25, 2019) Transparency	Include in the NIR an explanation of the trends observed for N_2O emissions and AD for nitric acid production.	Not resolved. The observed trends in N_2O emissions and AD for nitric acid production for 2014–2016 were not explained in the NIR. During the review, the Party clarified that work is ongoing to update trend explanations in the 2021 submission.
I.7	2.B.3 Adipic acid production – N_2O	Include a trend analysis of the IEF in order to explain observed inter-annual changes and	Resolved. The Party provided in the NIR (p.4-40) an analysis of trends in N_2O emissions from adipic acid production, including information on inter-annual changes.

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	(I.6, 2019) (I.30, 2018) Transparency	irregularities in these trends for adipic acid production (2.B.3).	The emission values depend on the volume of adipic acid produced and the efficiency of the abatement system used. During the review, the Party explained that the analysis of N_2O IEFs was not presented in the NIR for commercial confidentiality reasons. The IEFs in the CRF tables that are based on GHGRP data (i.e. for 2010–2018) were reported as confidential accordingly.
I.8	2.B.4 Caprolactam, glyoxal and glyoxylic acid production – N_2O (I.7, 2019) (I.31, 2018) Completeness	Gather the necessary data and report N_2O emissions from glyoxal and glyoxylic acid production.	Not resolved. The Party reported AD and N_2O emissions from glyoxal and glyoxylic acid production as "NE" in CRF table 2(I).A-Hs1. During the review, the Party clarified that potential data sources for glyoxal and glyoxylic acid were being investigated on the basis of ongoing research. It stated that progress on AD gathering and N_2O estimates will be included in the 2022 or 2023 submission. If production of glyoxal and/or glyoxylic acid is found to not occur in the United States, then the notation key will be revised from "NE" to "NO".
I.9	2.B.5 Carbide production – CO_2 (I.8, 2019) (I.32, 2018) Comparability	Allocate CO_2 emissions from production of calcium carbide to the IPPU sector in line with the 2006 IPCC Guidelines or provide clarity in the NIR as to the country-specific approach taken.	Addressing. The Party reported CO_2 emissions from coke use for calcium carbide production under the energy sector, with an appropriate explanation in the NIR and the correct notation key ("IE") in CRF table (I).A-H. During the review, the Party clarified that there are no AD for calculating CO_2 emissions from calcium carbide production under the IPPU sector. The ERT noted that, according to annex 5 to the NIR (pp.A-495–A-496), EPA has initiated research to obtain data from the limited production facilities in the United States (fewer than five). During the expert review of the inventory compilation, EPA sought input on production data for CO_2 emissions from calcium carbide production but was unable to identify data sources for applying tier 1 methods.
I.10	2.B.5 Carbide production – CO_2 (I.27, 2019) Comparability	Report the correct notation key "IE" for AD and CO_2 emissions in CRF table 2(I).A-Hs1 and provide the necessary explanation in CRF table 9.	Resolved. The Party reported CO_2 emissions for subcategory 2.B.5.b calcium carbide as "IE" in CRF table 2(I).A-Hs1 for the whole inventory period (1990–2018). The allocation of CO_2 emissions under the energy sector was provided in CRF table 9.
I.11	2.B.8 Petrochemical and carbon black production – CH_4 and N_2O (I.9, 2019) (I.10, 2018) (I.22, 2016) (I.22, 2015) Completeness	Progress with plans to analyse new data reported by facilities (i.e. GHGRP data) and include emissions from combustion and flaring from installations not currently included in the inventory.	Not resolved. The Party stated in the NIR (p.4-63) that CH_4 emissions from ethylene production reported under the GHGRP have not been included as this would result in double counting of carbon (i.e. all carbon in the CH_4 emissions would also be included in the CO_2 emissions from ethylene processing units, which are subset of facilities reporting under the GHGRP use alternative methods to the carbon balance approach). During the review, the Party clarified that EPA continues to assess the GHGRP data to determine how best to disaggregate and incorporate them into the inventory.
I.12	2.B.8 Petrochemical and carbon black production – CO_2 and CH_4 (I.10, 2019) (I.12, 2018) (I.25, 2016) (I.25, 2015) Accuracy	Develop a methodology that is consistent with the 2006 IPCC Guidelines as soon as is practicable, allocating relevant fuel and feedstock emissions within the IPPU sector.	Addressing. The ERT considers that the recommendation has not been addressed because the CO_2 emissions for category 2.B.8 were not fully allocated to the IPPU sector. As with ID# E.5 above, the Party will resolve this issue by describing how the country-specific approach is better able to reflect its national situation and providing a description of how these methodologies are compatible with the 2006 IPCC Guidelines.

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I.13	2.B.8 Petrochemical and carbon black production – CO_2 (I.11, 2019) (I.33, 2018) Accuracy	Review the backcasting methods to estimate the CO_2 EF for the period 1990–2009 for subcategories 2.B.8.b (ethylene), 2.B.8.c (ethylene dichloride and vinyl chloride monomer), 2.B.8.d (ethylene oxide) and 2.B.8.f (carbon black) with improved accuracy; and report transparently on the backcasting methodology for the CO_2 EF that it chooses to apply.	Resolved. The Party reported in the NIR (pp.4-60–4-61) that it used the revised backcasting method to estimate CO_2 emissions for 1990–2009 for subcategories 2.B.8.b (ethylene), 2.B.8.c (ethylene dichloride and vinyl chloride monomer), 2.B.8.d (ethylene oxide) and 2.B.8.f (carbon black), applying data for 2010–2012 only. The revision of the methodology resulted in an average increase in total petrochemical emissions of about 1 per cent compared with the previous submission. The recalculations are discussed transparently in the NIR (pp.4-63–4-64).
I.14	2.B.8.b Ethylene – CO_2 (I.12, 2019) (I.13, 2018) (I.26, 2016) (I.26, 2015) Transparency	Provide an explanation for the country-specific approaches using the EFs for ethylene production derived from GHGRP data, including the outcome of consultation with industry experts, and the results of the quality checks between GHGRP production estimates and data from trade association membership surveys.	Resolved. The NIR contained information on the use of a country-specific approach for estimating CO_2 emissions for category 2.B.8.b ethylene (pp.4-59–4.60) and the results of the quality checks (p.4-63). The ERT considers this information sufficient and is of the view that the recommendation has been fully addressed.
I.15	2.C.1 Iron and steel production – CO_2 (I.13, 2019) (I.16, 2018) (I.27, 2016) (I.27, 2015) Completeness	Conduct further research and consultation with industry, regulators and statistical agencies as necessary in order to access complete AD on natural gas consumption and coke oven gas production at merchant coke plants, and obtain EFs and/or emission estimates.	Resolved. The Party reported in NIR table 4-68 AD on natural gas consumption at integrated plants and coke oven gas production for both integrated and merchant coke plants. The AD were used to estimate CO_2 emissions from coke production under the IPPU sector for coke oven gas production and natural gas consumption (integrated plants) and under the energy sector for natural gas consumption at merchant coke plants.
I.16	2.C.1 Iron and steel production – CO_2 (I.14, 2019) (I.17, 2018) (I.28, 2016) (I.28, 2015) Transparency	Explain the allocation of the emissions from coke production and iron and steel production across both the energy and IPPU sectors, including the amount of carbon stored in the products of iron and steel production (this could be done, for example, through the provision of a quantitative summary of the carbon balance that the Party uses to compile and quality check the inventory estimates).	Addressing. The Party explained in NIR section 4.16 and annex 2 the allocation of the CO_2 emissions from iron and steel production across both the IPPU and energy sectors. In its clarifications on the list of provisional main findings, the Party indicated that factors are reported transparently in the NIR (p.4-80), including the material carbon contents for metallurgical coke production (NIR table 4-66) and the production and consumption data for the calculation of CO_2 emissions from metallurgical coke production (NIR tables 4-67 and 4-68). However, the ERT noted that the United States did not confirm its allocation of CO_2 emissions from coke production through a fully transparent tracking of carbon flows as per the previous recommendation. The ERT considers that the recommendation has not yet been fully addressed because the Party did not confirm the allocation of CO_2 emissions from coke production by providing a fully transparent tracking of carbon flows.
I.17	2.C.4 Magnesium production – SF_6 (I.15, 2019) (I.35, 2018) Consistency	Investigate the reasons for the SF_6 IEF increase between 2009 and 2011 and report in the NIR on the outcome of the investigation and on any recalculations of AD, IEF or emissions resulting from those investigations.	Addressing. The Party did not report in the NIR the outcomes of any such investigation or the reasons for the increase in the SF_6 IEF between 2009 and 2011. During the review, the Party clarified that the increase in SF_6 emissions between 2010 and 2011 was attributable partially to one facility anomalously reporting high emissions for 2011 and partially to increased production. It also stated that the 2021 NIR will include a discussion on the trends in the SF_6 IEF. The ERT noted that the SF_6 emissions for 2009–2011 were revised in the previous submission and approved by the ERT, and that

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			there have been no new recalculations since the previous submission. The ERT considers that the recommendation has not yet been fully addressed because the Party did not include in the NIR an explanation of the outstanding trends on the IEF for magnesium production.
I.18	2.D Non-energy products from fuels and solvent use – CO_2 (I.16, 2019) (I.36, 2018) Comparability	Estimate separately CO_2 emissions from lubricants and paraffin wax use and report them under category 2.D.	Not resolved. The Party reported CO_2 emissions from paraffin wax as "IE" under category 2.D (non-energy products from fuels and solvent use). The ERT noted that AD on the use of waxes are available for the Party, for example, in NIR table 3-22 (pp.3-49 and 3-50). The ERT is of the view that emissions from wax use could be determined on the basis of the statistical information and assumptions provided in the NIR and reported under category 2.D.
I.19	2.F Product uses as substitutes for ozone-depleting substances – HFCs and PFCs (I.17, 2019) (I.19, 2018) (I.29, 2016) (I.29, 2015) Transparency	Improve the documentation of the refrigeration and air-conditioning model by including the clarifications on model assumptions, data sources and calculation methodologies provided to the ERT during the 2016 review, including: (a) The assumed linear substitution trend between "start" and "full penetration" dates for substitution gases; (b) Additional information on the annual growth rates cited in the NIR; (c) The model calculation approach for overlapping equipment technology substitutions; (d) Details of country-specific circumstances and key references for the annual emission rates for servicing and leaks applied; (e) Information on assumed recovery, reuse and recycling of fluids at end of life (e.g. for fire extinguishers).	Resolved. The Party provided the recommended information to improve the transparency of the model applied for estimating HFCs and PFCs under category 2.F, specifically: (a) The assumed linear substitution trend between "start" and "full penetration" dates for substitution gases for each ozone-depleting substance application (NIR table A-147, pp.A-271–A-280); (b) Annual growth rates for each market segment (NIR table A-147, pp.A-271–A-280); (c) The calculation approach relevant to overlapping equipment (NIR, p.268); (d) Details of applied emission rates for servicing and leaks (NIR table A-148, p.A-281); (e) Assumptions for recovery, reuse and recycling by subcategory, including fire protection (NIR p.268).
I.20	2.F.5 Solvents – HFCs and PFCs (I.19, 2019) (I.22, 2018) (I.32, 2016) (I.32, 2015) Transparency	Either review and update the assumptions regarding solvent emissions, or provide country-specific information to justify the assumption that only 90 per cent of solvents are emitted.	Resolved. The Party included in NIR annex 3 (p.A-284) the methodology and assumptions for leakages of solvents used (90 per cent), as well as references to the assumptions applied, which are supported by an industry study. The leakage rate was identified on the basis of the opinions of experts in the United States solvent industry and was published in *The U.S. Solvent Cleaning Industry and the Transition to Non Ozone Depleting Substances*. During the review, the Party clarified that no other up-to-date sources of relevant leakage rates were identified and that updates will be made over time as data become available.
I.21	2.F.5 Solvents – HFCs and PFCs	Revise the reporting of emissions from solvents in the CRF tables (reported as "NA").	Resolved. The Party reported emissions of an unspecified mix of HFCs and PFCs under category 2.F.5 solvents as "IE" instead of "NA". In CRF table 9 the Party clarified that

ID#	Issue classification[a]	Recommendation made in previous review report	ERT assessment and rationale
	(I.20, 2019) (I.23, 2018) (I.32, 2016) (I.32, 2015) Comparability		some HFCs and PFCs are grouped together and reported collectively as an unspecified mix of HFCs and PFCs to ensure that its reporting of emissions protects confidential business information. These gases are included in category 2.F.6 other applications.
I.22	2.F.6 Other applications (product uses as substitutes for ozone-depleting substances) – HFCs and PFCs (I.21, 2019) (I.24, 2018) (I.33, 2016) (I.33, 2015) Transparency	Provide in the NIR detailed information including the quality checks for all gases and sources included in the unspecified mix of HFCs and PFCs in the subcategory other applications under the category product uses as substitutes for ozone-depleting substances.	Resolved. The Party included in the NIR detailed information on quality checks for all gases and sources included in the unspecified mix of HFCs and PFCs under category 2.F.6. In particular, the Party explained in the NIR (pp.4-129–4-130) that the gases and sources included in the unspecified mix of HFCs and PFCs are modelled and verified individually using the same process as for all other gases and sources under the EPA Vintaging Model. The QA/QC and verification process for individual gases and sources under the Vintaging Model include regular checks against up-to-date market information, including equipment stock estimates, leak rates and sector transitions. In addition, comparisons are made against published emission and consumption sources by gas and by source, including atmospheric measurements of HFC emissions under the GHGRP. Independent peer reviews of the Vintaging Model are periodically performed, including one in 2017 to confirm Vintaging Model estimates and identify updates (NIR p.4-130).
I.23	2.G.2 SF_6 and PFCs from other product use – SF_6 (I.22, 2019) (I.37, 2018) Completeness	Investigate possible SF_6 emissions from airborne warning and control systems, particle accelerators and radars and include them in the next submission, providing a description of the identified sources, the SF_6 emissions from them for the entire time series, a methodology description and an uncertainty analysis, in accordance with the 2006 IPCC Guidelines (vol. 2, chap. 8, pp.8.23–8.25 and 8.26–8.30).	Addressing. The Party reported SF_6 emissions for category 2.G.2 as "NE" and PFC emissions as "NA" in CRF table 2(II). It clarified in NIR annex 5 (p.A-496) that emissions from some particle accelerators and from military applications are reported by the Government to the Federal Energy Management Program. The updated analysis of the underlying data for 2018 identified fugitive SF_6 emissions of approximately 600 kt CO_2 eq. The Party noted that the sources of the identified emissions are probably particle accelerators and compounds commonly used as fluorinated heat transfer fluid (NIR p.A-496). According to NIR annex 5 (p. A-496), EPA plans to contact reporting agencies to better understand the sources of the emissions and the estimation methods used by reporters. The ERT considers that the recommendation has not yet been resolved because the identified emissions of SF_6 and PFCs for category 2.G.2 were not reported in the CRF tables.
I.24	2.H Other (IPPU) – N_2O (I.23, 2019) (I.38, 2018) Transparency	Increase the transparency of the reporting of N_2O emissions from semiconductor manufacturing by including in both the NIR and the CRF tables a clear indication of where the emissions are reported and explaining that this is because CRF table 2(I).A-H does not allow for reporting N_2O emissions under category 2.E.1.	Resolved. The Party explained why N_2O emissions from semiconductors were allocated to category 2.H in a footnote to CRF table 2(I).A-H, noting that it reported N_2O emissions from semiconductor manufacturing under category 2.H.3 because CRF table 2(I).A-H does not allow for the reporting of N_2O emissions under category 2.E.1. It also included a clarification in the NIR (p.4-113).
Agriculture			
A.1	3. General (agriculture) – CH_4 and N_2O	Include in the NIR (e.g. in annex 5) an indication of the sources and categories not estimated for Hawaii and Alaska, otherwise if the emissions are	Not resolved. The Party reported in its NIR (pp.5-44 and 5-54) that the current inventory includes N_2O emissions from mineral fertilizer and Nex on pasture, range and paddock in Alaska and Hawaii and drained organic soils in Hawaii, but excludes CH_4

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	(A.25, 2019) Completeness	insignificant, justify their exclusion on the basis of the likely level of emissions in accordance with paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines.	and N_2O emissions from field burning of agricultural residues in those States. During the review, the Party clarified that work is under way to assemble these data for Alaska and Hawaii for inclusion in either the 2021 or 2022 NIR.
A.2	3. General (agriculture) – CH_4 and N_2O (A.26, 2019) Consistency	Explore the use of alternative data sources to derive AD for the years of the time series where no DAYCENT data are available (2013–2017), and if alternative data sets are not available, use proxy data or extrapolation methods to derive AD.	Not resolved. The Party reported in its NIR that surrogate data, trend analysis and statistical approaches were used to estimate CH_4 emissions from rice cultivation for 2016–2018 (p.5-24), N_2O emissions from managed soils for 2016–2018 (p.5-36) and CO_2 emissions from field biomass burning for 2015–2018 (p.5-36). However, the ERT noted that the AD reported in CRF tables 3.C for 2015–2018 and 3.F for 2014–2018 are simply the same figures. During the review, the Party clarified that it will continue to seek out alternative data sources to derive the inventory estimates for the portion of the time series not covered by the National Resources Inventory. It noted that this is a medium- to long-term update.
A.3	3.A Enteric fermentation – CH_4 (A.2, 2019) (A.16, 2018) Convention reporting adherence	Undertake a quantitative uncertainty assessment in conjunction with future planned methodological updates.	Not resolved. The Party reported the same uncertainty range in its NIR (p.5-8) as in previous submissions (i.e. a range of 11 per cent below to 18 per cent above the 2018 emission estimates). The ERT noted that the last quantitative uncertainty analysis for CH_4 emissions from enteric fermentation was undertaken for the 2003 GHG inventory submission. During the review, the Party reiterated its previous response, namely that updates will be accounted for in methodological refinements planned for future submissions.
A.4	3.A.1 Cattle – CH_4 (A.6, 2019) (A.20, 2018) Accuracy	Update regional diet characterization data used in the estimation of CH_4 emissions from cattle in order to more accurately reflect the differences in diets across farms and states.	Not resolved. The Party reported regional digestible energy intake, which is expressed in percentage of GE, and average CH_4 conversion rate data in NIR tables A-172 and A-173 and GE by animal type and state in table A-174 of NIR annex 3.10. These data are the same as those reported in the previous submission. In the footnotes to these tables it is indicated that they will be updated for the entire time series in the next inventory submission. During the review, the Party informed the ERT that work is under way to address this issue by the 2022 submission at the earliest and that, since the 2021 NIR will focus on the improvement, rather than the running, of the Cattle Enteric Fermentation Model, updated values will not be available until the 2022 NIR, when the model is next run.
A.5	3.A.1 Cattle – CH_4 (A.27, 2019) Convention reporting adherence	Correct the value of the GE reported in CRF table 3.As1 for 2000 for heifer feedlot cattle.	Resolved. The Party reported the correct GE value (0.16 MJ/head/day) in CRF table 3.As1 for 2000 for heifer feedlot cattle. The ERT considers that the recommendation has been fully addressed.
A.6	3.A.1 Cattle – CH_4 (A.28, 2019) Convention reporting adherence	Correct the values reported in table A-160 of the NIR to reflect the correct values of the monthly average calf population by including losses due to mortality and slaughter.	Resolved. The Party reported in the NIR (annex 3.10, p.A-301, table A-160) that it had updated the monthly average population in the calf transition matrix, accounting for losses due to slaughter and death, and the values reported in NIR table A-160 now reflect the variation in population numbers over the course of a year. The ERT considers that the recommendation has been fully addressed.

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A.7	3.A.1 Cattle – CH_4 (A.4, 2019) (A.18, 2018) Accuracy	Improve the accuracy of the milk fat percentage, for example, by investigating the possibility of using additional data sources for information on milk fat percentage values, such as creameries and agricultural extension services.	Not resolved. The Party reported in its NIR (p.5-9) that, according to information obtained through recent improvements, the 4 per cent value is still representative of milk fat for 2018. During the review, the Party informed the ERT that it had obtained a source for milk fat percentages and expected to include these new values in the 2022 submission. The ERT commends the efforts made by the Party but considers that the issue remains unresolved as the milk fat value has not been updated as recommended.
A.8	3.A.1 Cattle – CH_4 (A.5, 2019) (A.19, 2018) Accuracy	Investigate the possibility of using additional data sources (e.g. farm extension services) to derive country-specific information on calf births from dairy cows throughout the year and report on the results of this investigation in the NIR.	Addressing. The Party reported in NIR annex 3.10 (p.A-301) that the number of births is assumed to be distributed equally throughout the year for calf births from dairy cows but noted in the planned improvements section (p.5-9) that it is seeking data for births by month. During the review, the Party informed the ERT that work is under way to identify sources of data. It noted that this is a long-term improvement and will be included in the 2023 submission at the earliest.
A.9	3.A.2 Sheep – CH_4 (A.7, 2019) (A.21, 2018) Accuracy	Update the sheep population distribution as data availability allows, focusing resources as appropriate, in line with the 2006 IPCC Guidelines.	Not resolved. The Party reported in NIR annex 3.11 (p.A-326) that population distribution data for lamb and sheep on feed are not available for after 1993. During the review, the Party informed the ERT that it expects to include updated sheep EFs and populations in the 2021 and 2022 submissions, respectively.
A.10	3.B Manure management – CH_4 (A.11, 2019) (A.25, 2018) Convention reporting adherence	Update the quantitative uncertainty assessment.	Not resolved. The Party reported in its NIR (p.5-16) that the quantitative uncertainty analysis for CH_4 and N_2O emissions from manure management was performed in 2002 using approach 2 from the 2006 IPCC Guidelines, and that the uncertainty estimates were applied directly to the values for 2018. During the review, the Party reiterated its previous response, namely that the updates will be accounted for in the methodological refinements planned for future submissions.
A.11	3.B Manure management – CH_4 and N_2O (A.12, 2019) (A.5, 2018) (A.14, 2016) (A.14, 2015) Accuracy	Obtain updated MMS data and estimate emissions using the updated MMS usage data; if this is not possible, report on progress in the effort to update the MMS data.	Addressing. The Party reported in NIR annex 3.11 updated MMS data for dairy cows (p.A-330), swine (p.A-331) and poultry (p.A-332); however, data for other livestock types, such as sheep, have not been updated since 2001. During the review, the Party informed the ERT that it will report on further progress in the 2021 submission.
A.12	3.B Manure management – N_2O (A.14, 2019) (A.26, 2018) Accuracy	Investigate other potential data sources of animal MMS data, such as extension services (i.e. agricultural advisory services).	Addressing. The Party reported in its NIR (p.5-18) that waste management system distribution data for dairy cows were updated using data from the 2016 Agricultural Resource Management Survey of dairy producers, and anaerobic digestion data were updated for swine, dairy cows and poultry using data from the EPA AgSTAR Program. The Party also reported that it is continuing to investigate new sources of MMS data. During the review, the Party informed the ERT that further progress on animal MMS data will be reported in the 2021 submission. The ERT commends the Party's progress but considers that the recommendation has not yet been fully addressed; for example, the MMS distribution data for sheep have not been updated since 2001 (NIR annex 3.11, p.A-332) (see ID# A.11 above).

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A.13	3.B.1 Cattle – CH_4 (A.16, 2019) (A.7, 2018) (A.15, 2016) (A.15, 2015) Transparency	If not using a more disaggregated livestock categorization in estimating emissions, use option A in reporting data and emissions for cattle in the CRF tables; if applying option C, report the values for population size, allocation by climate region to cool and temperate regions, typical animal mass, volatile solid daily excretion and CH_4 producing potential for all other cattle subcategories of option C in CRF tables 3.B(a)s1 and 3.B(a)s2.	Addressing. The Party applied option C and disaggregated data on cattle characterization reported in CRF table 3.B(a)s1, such as livestock population, typical animal mass, volatile solid daily excretion and CH_4 producing potential. Data on population size in CRF table 3.B(a)s1 and MMS in CRF table 3.B(a)s2 are still reported according to dairy and non-dairy cattle, rather than according to disaggregated information on population allocations to climate regions and usage of MMS. During the review, the Party reiterated its previous response, namely that updates will be accounted for in methodological refinements planned for future submissions. The Party is still investigating the possibility of reporting disaggregated climate parameters in the CRF tables.
A.14	3.B.1 Cattle – CH_4 (A.17, 2019) (A.27, 2018) Comparability	Report MMS that are not used as "NO" instead of "NE" in CRF table 3.B(a)s2 or, if they occur but are not estimated, replace "NE" with the appropriate estimate.	Resolved. The Party reported "NE" in CRF table 3.B(a)s2 for certain MMS, including composting and digesters for swine, anaerobic lagoons, liquid systems and daily spread for sheep. During the review, the Party explained that while it was possible that such waste management systems existed for sheep and swine, there were currently no data to support the reporting of "NO", "NE" or an estimate. The current use of the "NO" and "NE" notation keys is based on the Party's assessment of current industry practices and continuously assesses available data. The Party clarified that notation keys will be updated in the future to reflect the latest available data and any changes in industry practices.
A.15	3.B.1 Cattle – N_2O (A.29, 2019) Transparency	Report the correct Nex values for beef calves, dairy calves and beef replacements in CRF table 3.B(b) so that they reflect the true average Nex rate.	Not resolved. Discrepancies persist in the reported total N excreted and the results calculated by multiplying population by Nex rate for dairy cows, beef calves and dairy calves in CRF table 3.B(b). During the review, the Party indicated that it is currently investigating the possibility of providing disaggregated Nex rates for these cattle types in its 2022 submission.
A.16	3.B.1 Cattle – N_2O (A.30, 2019) Transparency	Replace "IE" for the Nex rate for heifer stockers and beef replacements with the actual Nex rates applied for those individual animals in CRF table 3.B(b); and replace the Nex rates for dairy cattle and non-dairy cattle with "IE" and explain in the documentation box of CRF table 3.B(b) that the Nex rates are reported against individual livestock classes.	Not resolved. The Party continued to report "IE" for the Nex rate for heifer stockers and beef replacements in CRF table 3.B(b) in its 2020 submission. During the review, the Party indicated that it is currently investigating the possibility of updating disaggregated Nex rates for these cattle types in its 2022 submission. The ERT considers that the recommendation has not yet been addressed.
A.17	3.B.2 Sheep – CH_4 and N_2O (A.31, 2019) Transparency	Include information on MMS distribution for sheep in NIR table A-189.	Not resolved. The Party did not report MMS distribution for sheep in NIR table A-189 (annex 3.11, pp.A-346–A-347). During the review, the Party informed the ERT that it is currently working on including these values in the 2022 submission.
A.18	3.D Direct and indirect N_2O emissions from agricultural soils – N_2O	Include all N_2O emissions from the States of Alaska and Hawaii in the emissions reported under this category or clearly outline in the improvement	Not resolved. The Party reported that N_2O emissions from the States of Alaska and Hawaii are not included in the current inventory for agricultural soil management, with the exception of N_2O emissions from drained organic soils in cropland and grassland for

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	(A.19, 2019) (A.30, 2018) Completeness	plan steps for including those emissions in the inventory.	Hawaii and synthetic fertilizer and pasture, range and paddock N amendments for grassland in Alaska and Hawaii. This issue is identified in the Party's planned improvements in its NIR (p.5-45). During the review, the Party informed the ERT that work is under way to assemble these data for inclusion in the agricultural soil N_2O estimates by either the 2021 or 2022 submission.
A.19	3.D Direct and indirect N_2O emissions from agricultural soils – N_2O (A.20, 2019) (A.32, 2018) Transparency	Provide additional information in the NIR on the quantities and N content of commercial organic amendments (e.g. biosolids, dried blood and compost) applied to agricultural soils.	Not resolved. The Party did not report additional information on the N content of commercial organic amendments included in the NIR (section 5.4). During the review, the Party informed the ERT that it will include this information in a future inventory if the unique N content of each of the non-commercial organic amendments can be found.
A.20	3.D Direct and indirect N_2O emissions from agricultural soils – N_2O (A.32, 2019) Convention reporting adherence	Correct the text in the NIR to reflect the actual method applied, namely that N_2O emissions from tobacco crops are estimated using the DAYCENT model (tier 3 method).	Not resolved. The Party reported in its NIR (p.5-36) both that DAYCENT is used and that it is not used to estimate N_2O emissions from tobacco. During the review, the Party indicated that this issue will be addressed in the 2021 submission.
A.21	3.D.a Direct N_2O emissions from managed soils – N_2O (A.33, 2019) Transparency	Include in the NIR an explanation of the AD, methods and EFs used to estimate emissions under categories 3.D.a.1, 3.D.a.5 and 3.D.a.6 and explain why the new N_2O emission values are more accurate than the previous ones.	Resolved. The NIR (p.5-45) includes the recalculations and a justification for N_2O emissions for categories 3.D.a.1 (inorganic fertilizers), 3.D.a.4 (crop residues), 3.D.a.5 (mineralization/immobilization associated with loss/gain of soil organic matter) and 3.D.a.6 (cultivation of organic soils). Changes in methods, EFs and AD are reported in the NIR (p.5-45). During the review, the Party explained that discussions on the improved AD, methods and EFs used to estimate these emissions are provided in the NIR. The ERT considers that the information provided in the NIR demonstrates that the updated methods are more accurate than the previous method.
A.22	3.D.a Direct N_2O emissions from managed soils – N_2O (A.33, 2019) Convention reporting adherence	Report on the recalculations in accordance with paragraphs 43–45 of the UNFCCC Annex I inventory reporting guidelines if the Party performs recalculations for those categories in the next submission.	Resolved. The Party reported the recalculations in the NIR (p.5-45). It also reported changes in methods, EF and AD in the NIR (p.5-45) and CRF table 3.D for the whole time series. The ERT considers that the recommendation has been addressed because the recalculations are reported in accordance with paragraphs 43–45 of the UNFCCC Annex I inventory reporting guidelines.
A.23	3.D.a.3 Urine and dung deposited by grazing animals – N_2O (A.34, 2019) Transparency	Include in the NIR the information provided to the ERT explaining the approach used to allocate N deposited in urine and dung to each county and how the DAYCENT model uses these data in the estimation of N_2O emissions.	Not resolved. The Party did not include in its NIR information on the approach used to allocate N deposited in urine and dung to each county and how the DAYCENT model uses these data in the estimation of N_2O emissions. During the review, the Party informed the ERT that it planned to include an additional explanation on the approach used to allocate N deposited in the 2021 submission.
A.24	3.D.b Indirect N_2O emissions from managed soils – N_2O	Provide an explanation of how the methodology and the DAYCENT model used to estimate N	Addressing. The ERT was unable to identify any additional explanation in the NIR on how the methodology and the DAYCENT model used to estimate N volatilized and N loss are both compatible with the 2006 IPCC Guidelines and based on science in its

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	(A.24, 2019) (A.12, 2018) (A.18, 2016) (A.18, 2015) Transparency	volatilized and N loss are both compatible with the 2006 IPCC Guidelines and based on science.	NIR. During the review, the Party informed the ERT that additional information will be added to the NIR for either the 2021 or 2022 submission.
LULUCF			
L.1	4. General (LULUCF) – CO_2, CH_4 and N_2O (L.1, 2019) (L.2, 2018) (L.2, 2016) (L.2, 2015) (81, 2013) Completeness	Conclude the technical work under way to be able to provide estimates for the carbon stock changes in the living biomass and DOM pools for each conversion category from forest land to any other land use for each year based on a reliable land-use change matrix, and report on the achievements made.	Addressing. The United States reported carbon losses in the living biomass and DOM pools for categories 4.B.2.1 (forest land converted to cropland), 4.C.2.1 (forest land converted to grassland) and 4.E.2.1 (forest land converted to settlements) and in the living biomass pool only for category 4.D.2.3.1 (forest land converted to other wetlands) for the first time for 2018. Categories 4.D.2.2.1 (forest land converted to flooded land) and 4.F.2.1 (forest land converted to other land) are still reported as "NE" or "NA" in its CRF table 4.F. During the review, the Party clarified that it does not currently include estimates for the categories forest land converted to other land or flooded land, or land converted to flooded land. These categories will be included in a future inventory submission and will contain the estimates of carbon stock loss as a result of converting forest land to these lands mentioned above. With respect to flooded lands, the United States plans to include the flooded land categories when it applies the updated guidance on flooded lands from the *2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories*. The ERT considers that the recommendation has not yet been fully addressed because the Party did not include carbon stock change estimates for living biomass and DOM for all managed lands in the inventory.
L.2	4. General (LULUCF) – CO_2, CH_4 and N_2O (L.2, 2019) (L.3, 2018) (L.3, 2016) (L.3, 2015) (82, 2013) (97, 2012) Completeness	Include all managed United States lands in the inventory; improve the consistency of the time series of national areas; and report on the achievements made.	Addressing. The land-use matrix of CRF table 4.1 and the land representation tables in the NIR (tables 6-6 and 6-7, pp.6-10–6-11) include all areas of managed and unmanaged land in the United States except for United States territories. During previous reviews, the Party clarified that it plans to include these territories in future submissions, including preliminary land-use information for the United States territories in NIR table 6-9. In addition, the "total area" columns of CRF background tables 4.A, 4.B, 4.C, 4.D, 4.E and 4.F do not include managed land areas where emissions or removals do not occur. Instead, the different coverage of the reported area is highlighted in a documentation box for some of the CRF background tables. During the review, the Party explained that it has included further information in the NIR to explain the deviations. NIR tables 6-33 and 6-37 demonstrate that the area of managed land left out for categories 4.B.1 and 4.B.2 is greater than 1 kha, while NIR tables 6-41 and 6-49 show the deviations for categories 4.C.1 and 4.C.2, respectively, resulting from not including managed grassland in Alaska. Similarly, deviations between the areas given in CRF tables 4.1 and 4.A are documented in NIR annex 3.13 tables A-231 and A-233. The ERT considers that the recommendation has not yet been fully addressed because the Party did not include all managed lands in the inventory.

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L.3	4. General (LULUCF) – CO_2, CH_4 and N_2O (L.3, 2019) (L.36, 2018) Convention reporting adherence	Until the Party is able to report anthropogenic emissions and removals from the entire national managed land area, report non-estimated managed land as a subdivision in the relevant CRF tables (i.e. tables 4.A, 4.B, 4.C, 4.D and 4.E), so that the managed land area for each land category reported in CRF table 4.1 corresponds with that reported for the same category in CRF tables 4.A, 4.B, 4.C, 4.D and 4.E.	Addressing. In CRF table 4.1 the United States reported for the first time areas for forest land (unmanaged), grassland (unmanaged) and wetlands (unmanaged) for the whole time series. The Party did not report non-estimated managed land as a subdivision in CRF tables 4.A, 4.B, 4.C, 4.D and 4.E (see ID# L.2 above). During the review, the Party clarified that it is considering reporting insignificant emissions as "NE" and justifying their exclusion in accordance with paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines. In its clarifications on the list of provisional main findings, the Party indicated that it reports areas for managed lands that are not included in the estimates of: (a) CRF table 4.A in NIR annex 3.13, page 442, table A-231; and NIR table A-233, page 447; (b) CRF table 4.B in NIR chapter 6.4, page 65, table 6-33; and NIR chapter 6.5, page 71, table 6-37; (c) CRF table 4.C in NIR chapter 6.6, page 79, table 6-41; and NIR chapter 6.7, page 90, table 6-49; (d) CRF table 4.D – work is under way to include information on additional wetlands such as flooded lands. The coastal wetlands estimates are assumed to include all managed coastal wetlands, but the area data are not linked to the land representation (see pp.6-98–6-99 of the NIR for more information); (e) CRF table 4.E for drained organic soils in NIR chapter 6.10, page 118, table 6-78; and NIR chapter 6.11, page 142, table 6-93. Explanations were also included in the documentation boxes of the CRF tables. The ERT considers that the recommendation has not yet been fully addressed because the Party did not report managed lands that have not been estimated as a subdivision in CRF tables 4.A, 4.B, 4.C, 4.D and 4.E.
L.4	4. General (LULUCF) – CO_2, CH_4 and N_2O (L.41, 2019) Transparency	Report in the NIR preliminary emission or removal estimates for the land areas of the United States territories reported as a preliminary result of the planned improvement carried out in the Party's inventory.	Not resolved. The Party reported preliminary land-use data for United States territories but did not report any preliminary emission or removal estimates for these land areas. During the review, the Party clarified that work to improve the land representation and tracking of managed and unmanaged land will be initiated in 2021 with a view to updating NIR chapter 6 for the 2022 or 2023 submission. The improvement is expected to have been fully implemented by the 2024 submission.
L.5	Land representation – CO_2, CH_4 and N_2O (L.4, 2019) (L.7, 2018) (L.21, 2016) Consistency	Resolve the inconsistencies in land-use areas in the time series reported in the CRF tables.	Not resolved. The discrepancy between land-use areas in the time series reported in CRF table 4.1, where the final area at the end of a given year is not the same as the initial area of the subsequent year, remains unresolved. For example, the final area reported for category 4.1.1 forest land remaining forest land (unmanaged) for 2017 is 281,651.72 kha, while the total initial area reported for 2018 is 281,563.37 kha. During previous reviews, the Party explained that the land-use areas in CRF table 4.1 were entered in accordance with the IPCC definitions of remaining land (land that remains subject to the same use for 20 years) and converted land (cumulative area of conversion

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			over the past 20 years) and also stated that the heading of CRF table 4.1 can be understood to allow it to be compiled in accordance with the IPCC definition (namely, using the 20-year conversion). The ERT considers that the Party should bear in mind that the CRF tables are designed to be presented as an inventory of emissions for individual years, with a separate set of tables for each year. The land transition matrix in CRF table 4.1, once published, is designed to show the changes that have occurred that year between land uses, not between land conversion categories. This approach helps to ensure transparency, as it prevents the duplication of information on land areas within an accounting category provided in CRF tables 4.A–4.F. For example, where a Party converts 100 kha from grassland to settlements each year under a default IPCC method, CRF table 4.1 would show for any given year the movement of 100 kha from grassland under initial use and to settlements under final use. By contrast, CRF table 4.E would show 2,000 kha under land converted to settlements to represent 20 years of cumulative conversions for which emissions are calculated in relation to land-use changes over time. CRF tables 4.1 and 4.E would be deemed consistent where the total area of settlements is the same. This is in accordance with the 2006 IPCC Guidelines (vol. 4), which state that Parties should retain land in a conversion category for the conversion period (CRF tables 4.A–F) while transparently reporting on the new transitions for each year (CRF table 4.1). Further information on the compilation of land transition matrices can be found in the 2006 IPCC Guidelines (vol. 4, chap. 3.3), along with examples of final matrices (vol. 4, chap. 3.3, tables 3.5 and 3.6).
L.6	Land representation – CO_2, CH_4 and N_2O (L.42, 2019) Accuracy	Include the land-use changes that occurred during the periods 1971–1978 for land converted to cropland, grassland and settlements, and 1971–1981 for land converted to forest land, in order to ensure that the areas of land converted categories for all inventory years since 1990 contain the accumulated total of the land-use changes over the past 20 years.	Not resolved. The Party did not report the complete time series for the land-use transition categories mentioned in the recommendation. During the review, the Party explained that it will improve the transparency of the reporting in the 2021 submission and that it plans to report in the 2023 and 2024 submissions improvements to land representation that will allow for tracking additional land-use conversions.
L.7	Land representation – CO_2, CH_4 and N_2O (L.43, 2019) Accuracy	Revise the area of unmanaged grassland for Alaska and report on the changes in the NIR.	Addressing. During the previous review, the United States informed the ERT that the area of unmanaged grassland in Alaska had been overestimated and would be revised. The current ERT noted that no land-use transitions were reported between managed and unmanaged grassland (CRF table 4.1). During the review, the Party clarified that areas of managed and unmanaged grassland were recalculated on the basis of updated underlying data sources and that the recalculation resulted in decreased areas of unmanaged grassland. However, the Party reported in NIR table 6-41 that 50,040 kha of managed grassland in Alaska is not yet included in the inventory. As a result, the ERT considers that the recommendation has not yet been fully addressed.

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L.8	Land representation – CO_2, CH_4 and N_2O (L.43, 2019) Transparency	Increase the transparency regarding the approach to classifying managed and unmanaged land and include a specific example of the change from managed land to unmanaged land in the NIR because this type of land-use change is not common in the inventory reporting of other Parties.	Not resolved. The NIR does not include an explanation of the Party's approach to classifying managed and unmanaged land or include an example of the change from managed to unmanaged land.
L.9	Land representation – CO_2, CH_4 and N_2O (L.6, 2019) (L.9, 2018) (L.23, 2016) (L.22, 2015) Transparency	When providing detailed information in the NIR on how the different data sources were harmonized, provide explicit information on how the model ensures consistent integration of the three data sources, for example, by including a visual flow chart of data processing during the harmonization process.	Addressing. Three sets of land-use data are used: NRI, Forestry Inventory and Analysis and NLCD (see also ID# L.10 below). The Party explains in the NIR (pp.6-20–6-24) how different land data sources are used and harmonized to classify national land data into IPCC land-use categories. During the review, it also explained that it will modify its approach to developing land representation over the next few years and will update its NIR accordingly. The ERT considers that the recommendation has not yet been fully addressed because explicit information on how the three data sources are consistently integrated was not provided.
L.10	Land representation – CO_2, CH_4 and N_2O (L.8, 2019) (L.37, 2018) Accuracy	Update the land representation with the latest available data from NRI, and proceed with plans to improve the coordination and timing of sharing data between federal agencies if necessary.	Resolved. The land-use data from NRI and NLCD were updated in the 2020 submission. The Party updated land representation by including (1) updated Forestry Inventory and Analysis data for 1990–2018 for the conterminous United States and Alaska, (2) updated NRI data for 1990–2015 for the conterminous United States and Hawaii and (3) updated NLCD data for the conterminous United States for 2001–2016. It also recalculated land-use areas for cropland, grassland and settlements for the entire time series. During the review, the Party stated that it will continue to update these data sets as new versions are released. There is currently no annual source other than NRI and NLCD for obtaining land-use, conversion and management data for cropland, grassland and settlements, so the Party must continue to rely on these data for the time being. The United States clarified that it will modify its approach to developing land representation over the next few years and will update its NIR accordingly.
L.11	4.A Forest land – CO_2 (L.10, 2019) (L.39, 2018) Convention reporting adherence	Report up-to-date information on the verification of the outputs of the model used to estimate SOC changes in mineral soils, for example, at the level of annual fluxes in single specific sites representative of the variability of the population or, as done for the DAYCENT model for agricultural soils (NIR figure A-12), at the level of the total cumulated (across the time series and the entire territory modelled) net flux.	Addressing. No information is provided in the NIR on verification of forest soil estimation by model, despite a background research paper on the soil estimation approach being cited in annex 3 to the NIR (p.A-361). During the review, the Party explained that it expects to report this information in the 2022 or 2023 submission.
L.12	4.A Forest land – CO_2 (L.11, 2019) (L.40,	Apply as the carbon conversion factor for forest biomass either a country-specific value or the default value provided in the 2006 IPCC Guidelines (vol. 4, chap. 4, table 4.3), and, for	Resolved. In the estimation of living biomass for forest land, the Party applies the same carbon conversion factor (0.50 t C/t dead matter) as was used in the previous submission for all forest types. During the previous review, the Party explained that the carbon conversion factor of 0.50 was used as a country-specific value for living

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	2018) Accuracy	mangrove forests, either a country-specific value or the default value provided in the Wetlands Supplement.	biomass, although this was not clearly explained in the NIR. The ERT noted that the Party has included proper references in footnote 31 on NIR page 6-26 supporting the use of 0.50 t C/t dead matter as a country-specific value.
L.13	4.A Forest land – CO_2 and N_2O (L.13, 2019) (L.42, 2018) Transparency	Calculate the carbon stock change in each carbon pool at the level of each single plot and then aggregate the results at the state and national level, and explain any recalculations in the NIR.	Addressing. During the previous review, the Party provided additional information on the methodology in response to a question raised by the ERT about double counting of carbon. The previous ERT considered that the methodology for calculating carbon stock change on forest land was appropriately applied taking into account the information provided by the Party. However, it noted that the information provided in the NIR did not demonstrate that the stock-difference method for forest land was applied at each land-use category level. During the most recent review, the Party explained that it will provide the requisite information in the NIR of its next submission. The ERT considers that the recommendation has not yet been fully addressed because the Party did not update the NIR information demonstrating that the stock-difference method for forest land was applied at each land-use category level.
L.14	4.A.1 Forest land remaining forest land – CO_2 (L.14, 2019) (L.13, 2018) (L.26, 2016) Transparency	Provide in an annex to the NIR detailed tables on average carbon fluxes by region and type (e.g. the region and forest type classifications described in Smith et al. (2006) and used for estimating downed deadwood and understory, which might better reflect the diversity of forest types and age classes).	Not resolved. The United States did not provide tables with average carbon fluxes disaggregated by region, state or forest type. During the review, the Party explained that this information will be included in the 2021 or 2022 submission.
L.15	4.B Cropland – CO_2 (L.16, 2019) (L.18, 2018) (L.14, 2016) (L.14, 2015) (93, 2013) (107, 2012) Completeness	Estimate the carbon stock changes in living biomass in perennial crops for all years in the time series.	Not resolved. The United States did not report biomass stock changes in perennial cropland (for either cropland remaining cropland or land converted to cropland). The ERT considers that, if no information is available other than the time series of areas covered by perennial crops reported in the national statistics on agriculture, the Party should consider using this information and the tier 1 methodology from the 2006 IPCC Guidelines (vol. 4, chap. 5) to prepare a time series of estimates of biomass changes in perennial crops. The carbon stock dynamic of the perennial cropland area in 1989 can be assumed to be at equilibrium and can be modelled for 1990 onward on the basis of the ageing of trees and changes in the area planted. The issue applies to both cropland remaining cropland and land converted to cropland. During the review, the Party explained that this information will be included in the 2022 submission.
L.16	4.B Cropland – CO_2 (L.17, 2019) (L.45, 2018) Accuracy	Check the quality of the data from which the land representation is derived, investigate the reasons for the sudden and temporary decrease in the area of organic soils by about 80 kha between 1999 and 2000 for cropland remaining cropland reported in CRF table 4.B, explain the result of this investigation in the NIR, correct any identified inconsistencies and explain any recalculations in the NIR.	Resolved. The area of organic soils under cropland remaining cropland was recalculated between the 2019 and 2020 submissions and the trend for the area reported no longer shows a sudden and temporary decrease, as pointed out in the 2018 review (the 2018 and 2020 submissions report interannual changes for 1998–1999 of 85.26 and 5.15 kha, respectively). During the review, the Party clarified that the area of organic soils for cropland remaining cropland was recalculated for the 2020 submission and that the error in the 1999–2000 decrease was corrected.

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L.17	4.B.2.2 Grassland converted to cropland – CO_2 (L.18, 2019) (L.46, 2018) Completeness	Estimate biomass carbon stock changes using the IPCC default method and factors or, where available, country-specific methods and factors, and report the estimations in the NIR.	Not resolved. The Party did not provide estimates and reported "NE" for carbon stock changes in biomass on grassland converted to cropland in CRF table 4.B. During the review, the Party explained that the requisite information will be included in the 2022 submission.
L.18	4.B Cropland 4.C Grassland – CO_2 and N_2O (L.19, 2019) (L.47, 2018) Convention reporting adherence	Verify the model's output for the entire time series from 1990 onward and for all applicable land categories (e.g. by verifying the model's output for each land-use category, or for the total of the land-use categories, or for any subaggregation, as long as the total estimate of all land-use categories modelled is verified) and report on the verification and the results in the NIR.	Not resolved. The Party reported the same verification in the NIR as in the previous submission; that is, comparing SOC changes with lower tiers (figure A-13). Therefore, the concern of previous ERTs regarding coverage of land categories (i.e. that the output of the DAYCENT model was verified for carbon stock change in cropland remaining cropland, but not for other land-use categories and gases) has not been addressed. During the review, the Party explained that it still plans to improve the documentation on the model and refine the calibration used for the model, and to implement an additional verification, alongside ongoing methodological refinements for estimating soil carbon, soil N_2O and soil CH_4. It noted that this issue will be addressed in the 2021 and 2022 submissions. In its clarifications on the list of provisional main findings, the Party indicated that it has provided documentation on the model's prediction capability for SOC on grassland and cropland (see NIR annex 3.12, p.A-405, figure A-12); the output of the model is also shown for N_2O and CH_4 (figures A-14–A-15); and these comparisons lend credibility to the ability of DAYCENT to predict emissions and removals for these gases. The Party indicated that it has allocated available resources to other improvements instead of conducting a tier 1 analysis, which would effectively entail compiling the inventory twice, and that it will work towards making this addition to the 1990–2020 inventory for reporting in 2022. The ERT considers that the recommendation has not yet been addressed because the Party has not verified the model's output for the entire time series from 1990 onward.
L.19	4.B Cropland 4.C Grassland – CO_2 and N_2O (L.20, 2019) (L.48, 2018) Comparability	Report SOC changes and associated CO_2 and N_2O emissions from cropland and grassland mineral soils using a depth increment of at least 30 cm in line with the 2006 IPCC Guidelines (vol. 4, chap. 2).	Resolved. The United States provided SOC changes for the first time using a depth increment of 30 cm in line with the 2006 IPCC Guidelines (vol. 4, chap. 2), recalculated the resulting CO_2 and N_2O emissions for the entire time series and provided an explanation of the recalculation in the NIR (pp.6-64, 6-71, 6-79 and 6-89).
L.20	4.C Grassland – CO_2 (L.21, 2019) (L.49, 2018) Transparency	Report woody grassland as a subdivision of the grassland category, estimate accordingly the area and carbon stock change for all carbon pools of woody grassland within the category grassland remaining grassland and within all land-use categories of conversion from and to grassland, and report the estimations in the NIR.	Not resolved. The Party did not estimate carbon stock changes on woody grassland. Further, the Party has removed from the NIR (box 6-6, p.6-71, of the 2019 NIR) an explanation on grassland woody biomass analysis and a reference to its plans to include the woody grassland subcategory in its reporting. The Party explained during the review that while it intends to include this subcategory in the 2021 submission, owing to administrative delays it may have to include it in the 2022 submission instead. In its clarifications on the list of provisional main findings, the Party indicated that it reports all carbon stock pools for woodland that occur on grassland (i.e. land that does not

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			meet the definition of forest land). It acknowledges that there may be some woody grassland which is not included and is reviewing the data with a view to making the relevant refinements in the future. The ERT considers that the recommendation has not yet been addressed because the Party did not report emissions and uptake under the woody grassland subcategory in CRF table 4.C.
L.21	4.C.2 Land converted to grassland – CO_2 (L.23, 2019) (L.23, 2018) (L.33, 2016) (L.26, 2015) Accuracy	Revise the estimates of carbon stock change in mineral soils under forest land converted to grassland using the updated data for mineral soils and report the results in the NIR.	Resolved. Recalculations have been made in the estimation of carbon stock changes in mineral soils under forest land converted to grassland for the entire time series since the previous submission. The United States explained in the NIR (p.6-89) that the recalculations are associated with several improvements to both the tier 2 and 3 approaches that are discussed in the cropland remaining cropland section.
L.22	4.C.2.2 Cropland converted to grassland – CO_2 (L.24, 2019) (L.51, 2018) Completeness	Estimate biomass carbon stock change using the IPCC default method and factors or, where available, country-specific methods or factors, and explain the estimations in the NIR.	Not resolved. The Party did not provide estimates and reported "NE" for carbon stock changes in biomass on cropland converted to grassland. The Party explained during the review that while it intends to include carbon stock changes in biomass on cropland converted to grassland in the 2021 submission, owing to administrative delays it may have to include it in the 2022 submission instead.
L.23	4.D.1 Wetlands remaining wetlands – CO_2, CH_4 and N_2O (L.25, 2019) (L.25, 2018) (L.34, 2016) (L.27, 2015) Comparability	Noting the need to determine the quantity of peat harvested per ha and the total area undergoing peat extraction, provide the respective AD and IEFs for the on-site CH_4 and N_2O emission estimates in CRF table 4(II) for organic soils under peat extraction.	Addressing. The Party explained in the NIR (p.6-91) that it used the total peat extraction area as AD for on-site CH_4 emissions and the nutrient-rich peat production area as AD for on-site N_2O emissions. However, these AD were not included in CRF table 4(II). In a documentation box to CRF table 4(II), the Party explains that, since different areas are used to estimate CH_4 and N_2O emissions, it is not possible to provide the AD and IEF for both gases on the same row. The ERT suggests that the Party report the area for CH_4 emissions and the values for CH_4 and N_2O emissions and explain the resulting N_2O IEF value.
L.24	4.D.2.2 Land converted to flooded land – CO_2 (L.26, 2019) (L.53, 2018) Completeness	Estimate carbon stock change in flooded land using the 2006 IPCC Guidelines (vol. 4, chap. 7) default method and factors or, where available, country-specific methods or factors, and explain the estimations in the NIR.	Not resolved. Carbon stock changes in all carbon pools for land converted to flooded land are reported as "NE" for the whole time series. During the review, the Party explained that improvements in this regard are planned for the 2022 submission. (See also ID# L.1 above for the case of forest land converted to flooded land.)
L.25	4.D.2.3 Land converted to wetlands – CO_2 (L.27, 2019) (L.54, 2018) Completeness	Estimate biomass and DOM carbon stock changes for forest land converted to other wetlands as planned for the 2020 submission, and explain the estimations in the NIR.	Addressing. The Party has reported carbon stock changes in living biomass for land converted to other wetlands (category 4.D.2.3) as numerical values since the 2019 submission, as opposed to "NE" in the 2018 submission. However, it reported carbon stock changes in DOM for category 4.D.2.3 as "NE" in the 2018, 2019 and 2020 submissions. During the review, the Party explained that it plans to make improvements in this regard for future inventory submissions.
L.26	4.D.2.3 Land converted to wetlands – CO_2 (L.28, 2019) (L.54,	Estimate carbon stock changes in biomass for the conversion of cropland and grassland to other wetlands using IPCC default methods and factors (2006 IPCC Guidelines, vol. 4, chap. 7) or, where	Resolved. The Party has reported carbon stock changes in living biomass for cropland converted to other wetlands (category 4.D.2.3.2) and grassland converted to other

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	2018) Completeness	available, country-specific methods or factors, and explain the estimations in the NIR.	wetlands (category 4.D.2.3.3) as numerical values since the 2019 submission, as opposed to "NE" in the 2018 submission.
L.27	4.E Settlements – CO_2 (L.29, 2019) (L.27, 2018) (L.15, 2016) (L.15, 2015) (94, 2013) Accuracy	Eliminate the overlap between the urban forest inventory and the forest inventory.	Addressing. The Party updated the tree cover area in settlements (urban forest area) in the 2020 submission and indicated in the NIR that it plans to address the overlap between the forest and urban forest inventories (under planned improvements in settlements, p.6-126). The Party explained in the NIR that there may be a minor overlap between the forest and urban forest inventories and that this will be addressed when new NLCD data become available. It added during the review that it plans to take steps over the next few years to develop spatially explicit and spatially continuous representations of land to eliminate such overlaps and to enable the production of better settlement area estimates.
L.28	4.E.1 Settlements remaining settlements – CO_2 (L.30, 2019) (L.55, 2018) Comparability	Remove the reporting of the carbon stock change associated with yard trimmings and food scraps from under the settlements category and allocate it to the category other under the relevant sector.	Not resolved. The Party continues to report carbon stock changes associated with yard trimmings and food scraps under the settlements category instead of category 4.H (other). During the review, the Party indicated that this reallocation will be addressed in the 2022 submission. The Party could see the issue will be resolved by reporting emissions from landfilled yard trimmings and food scraps under category 4.H (other), applying a country-specific method or under category 4.G (HWP) as an additional "other" HWP pool in solid waste disposal sites while continuing to ensure that the methods used are consistent with the waste sector reporting as per the 2006 IPCC Guidelines (vol. 4, chap. 12.2.1, and vol. 5, chap. 3.4).
L.29	4.E.1 Settlements remaining settlements – CO_2 (L.31, 2019) (L.55, 2018) Comparability	Report information on the long-term stored carbon stock of yard trimmings and food scraps, as well as on its annual changes, in the memo item in CRF table 5.	Not resolved. The Party did not report in the memo item in CRF table 5 on the long-term storage of carbon in waste disposal sites or on the annual change in total long-term carbon storage. During the review, the Party indicated that this will be addressed in the 2021 or 2022 submission. The ERT considers that the recommendation has not yet been addressed because the Party did not report on the long-term storage of carbon in waste disposal sites in the memo item in CRF table 5.
L.30	4.E.2.2 Cropland converted to settlements 4.E.2.3 Grassland converted to settlements – CO_2 (L.32, 2019) (L.56, 2018) Completeness	Estimate biomass carbon stock change for cropland converted to settlements (category 4.E.2.2) and grassland converted to settlements (category 4.E.2.3) using the IPCC default method and factors (2006 IPCC Guidelines, vol. 4, chap. 8) or, where available, country-specific methods or factors, and explain the estimations in the NIR.	Not resolved. The Party did not estimate carbon stock changes in biomass for cropland converted to settlements and grassland converted to settlements. During the review, the Party explained that it plans to report this information in the 2022 submission.
L.31	4.F.2 Land converted to other land – CO_2 (L.33, 2019) (L.57, 2018) Completeness	Report estimates of carbon stock change for land converted to other land using the IPCC default method and factors (2006 IPCC Guidelines, vol. 4, chap. 9) or, where available, country-specific	Not resolved. The Party reported all carbon stock changes in all carbon pools under category 4.F.2 as "NA" (previously "NE"). During the review, the Party explained that it was unable to report the required information under this category but plans to do so in a future submission. It also explained that the notation key was mistakenly changed

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		methods or factors, and explain the estimations in the NIR.	to "NA" and will be changed back to "NE" in the next submission. (See also ID# L.1 above for the issue of forest land converted to other land.)
L.32	4.G HWP – CO_2 (L.34, 2019) (L.58, 2018) Transparency	Complete CRF table 4.Gs2 with aggregated values in t C for each of the three HWP subcategories (solid wood, paper and paperboard, and other) and report in the NIR a table with all subcategories used by the model to calculate the HWP contribution as well as the conversion factors to carbon weight applied for each subcategory.	Not resolved. The United States did not complete CRF table 4.Gs2 and reported only the values of paper and paperboard for 1990–2018. It reported "IE" for sawnwood and wood panels. During the review, the Party explained that it is working towards improving the reporting of HWP in its 2021 submission.
L.33	4.H Other (LULUCF) – CO_2 (L.35, 2019) (L.31, 2018) (L.17, 2016) (L.17, 2015) (96, 2013) (112, 2012) Accuracy	Reflect the intersectoral linkages and document the differences in the decay values for yard trimmings and food scraps to ensure the consistent use of decay values across the whole inventory.	Resolved. The Party revised the NIR chapter on the methodology for the decay calculations (pp.6-131–6-134) to make them more transparent and made further recalculations (p.6-131 (tables 6-85 and 6-86) and p.6-135 of the NIR) to correct an error in previous submissions that slightly changed the time series. The ERT considers that the recommendation has been fully addressed because the Party provided an improved description of the calculation of decay rates, while the intersectoral aspect of the issue is considered in ID# L.34 below.
L.34	4.H Other (LULUCF) – CH_4 (L.36, 2019) (L.60, 2018) Accuracy	Report the complete calculation of the decay rates applied to yard trimmings and food scraps as well as information on the impact that the calculation has on the CH_4 emission rates applied to other MSW.	Addressing. While the decay rates are properly explained (see ID# L.33 above), there is still a transparency issue between the LULUCF and waste sectors. The CH_4 emissions from yard trimmings and food scraps are reported in the waste sector as part of total CH_4 emissions from MSW. As disaggregated CH_4 emissions from yard trimmings and food scraps are not reported in the waste sector (NIR p.6-135), it is not possible to check the relationship or consistency between carbon storage and the CH_4 emissions from yard trimmings and food scraps. In the NIR, the Party explains that there are no plans to disaggregate these waste components in the data in the waste sector, which will hamper the separate reporting of CH_4 emission from yard trimmings and food scraps. During the review, the Party stated that it considers this issue to have been resolved. However, the ERT is of the opinion that, while it may be difficult to provide evidence of consistency between sectoral methods, the Party should at least demonstrate that the methods used are not inconsistent. This could be done by showing that carbon losses resulting from the decay of yard trimmings and food scraps as calculated under LULUCF are in keeping with the waste sector estimates of CH_4 emitted from landfills. Alternatively, the Party could perform a model calculation of CH_4 emissions from the yard trimming and food scraps carbon pool in landfills (see also ID# L.29 above) and compare the results with the waste sector CH_4 estimates. The ERT considers that the recommendation has not yet been fully addressed because the Party did not explain in the NIR how the decay of yard trimmings and food scraps reported in CRF table 4.E (recommended to be moved to category 4.H, see ID# L.28 above) is consistent with the emissions of CH_4 from landfills reported in the waste sector.

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L.35	4(II) Emissions/removals from drainage and rewetting and other management of organic/mineral soils (4.A Forest land) – CO_2, CH_4 and N_2O (L.44, 2019) Transparency	Provide information regarding which emissions or removals are estimated under carbon stock change in forest organic soils (category 4.A) and drained forest organic soils (category 4(II)) and how it avoids double counting of emissions between the two sources in the NIR and in the relevant documentation boxes of CRF tables 4.A and 4(II).	Not resolved. No information is provided either in the NIR or in the documentation boxes of CRF tables 4.A or 4(II) on the avoidance of double counting. During the review, the Party clarified that it plans to report this information in a future submission.
L.36	4(II) Emissions/removals from drainage and rewetting and other management of organic/mineral soils – N_2O (L.45, 2019) Convention reporting adherence	Correct the area of nutrient-rich peat production in NIR table 6-50.	Resolved. NIR table 6-54 (corresponding to table 6-50 of the previous NIR) has been corrected.
L.37	4(III) Direct N_2O emissions from N mineralization/ immobilization – N_2O (L.37, 2019) (L.61, 2018) Completeness	Estimate N_2O emissions associated with the mineralization of the N content of SOC losses in mineral soils for forest land, wetlands, settlements and other land, as well as for their conversion to and from cropland and grassland, using the IPCC default method and factors (2006 IPCC Guidelines, vol. 4, chap. 11) or, where available, country-specific methods or factors, and report the estimations in CRF table 4(III) and the NIR.	Not resolved. Direct N_2O emissions associated with the mineralization of the N content of SOC losses in mineral soils are not estimated. During the review, the Party informed the ERT that work is under way to enable all land categories to be reported in future submissions. The ERT considers that the recommendation has not yet been addressed because the Party did not provide data on N_2O emissions associated with mineralization of N as a result of SOC losses in mineral soils.
L.38	4(IV) Indirect N_2O emissions from managed soils – N_2O (L.38, 2019) (L.62, 2018) Completeness	Estimate indirect N_2O emissions associated with the mineralization of the N content of SOC losses in mineral soils for forest land, wetlands, settlements and other land and report them in CRF table 4(IV), and explain the estimations in the NIR.	Not resolved. No indirect N_2O emissions associated with organic matter are reported. During the review, the Party clarified that work is under way to report these emissions for all land categories in future submissions.
L.39	4(V) Biomass burning – CH_4 and N_2O (L.39, 2019) (L.35, 2018) (L.42, 2016) (L.33, 2015) Completeness	Noting that CH_4 and N_2O emissions from forest fires are key categories, estimate CH_4 and N_2O emissions from biomass burning for land converted to forest land, land converted to wetlands, cropland, grassland and settlements; and populate CRF table 4(V).	Addressing. While CH_4 and N_2O emissions from biomass burning for forest land and grassland are estimated, all burning is reported under forest land remaining forest land and grassland remaining grassland. The Party explained that it is currently unable to separately report the emissions from land converted to forest land and land converted to grassland but will continue to explore ways of doing so. Biomass burning from

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			wildfires on cropland and biomass burning on wetlands and settlements were not estimated owing to a lack of data.
Waste			
W.1	5. General (waste) – CO_2, CH_4 and N_2O (W.1, 2019) (W.1, 2018) (W.9, 2016) (W.9, 2015) Transparency	Provide background information that is consistent with the data actually used for the emission estimates, including the waste management practices.	Not resolved. The United States reported in the NIR (annex 3.14, table A-236) the total amount of MSW generated and landfilled based on research by EPA, BioCycle and the Environmental Research and Education Foundation. However, the trend in the amount of MSW landfilled differs with the decreasing trend of CH_4 emissions from landfilled MSW for 1990–2018 (NIR tables 7-3–7-4). In addition, the ratio of landfilled MSW to total MSW generated for 2017 is reported as 65 per cent in NIR table A-236 but as 52.1 per cent in NIR box 7-4 (p.7-16). In its clarifications on the list of provisional main findings, the Party indicated that an explanation for these differences is provided in the NIR (annex 3.14, page A-463). However, the ERT considers that this explanation is narrative rather than quantitative, and that the Party should provide an analysis of the discrepancies and the data used for the emission estimates, such as waste composition data, DOC in MSW and background information on MSW streams, like the waste stream analysis by waste type provided in the 2006 IPCC Guidelines (vol. 5, chap. 2, box 2.1) (see also ID# W.3 below).
W.2	5.A Solid waste disposal on land – CH_4 (W.2, 2019) (W.3, 2018) (W.3, 2016) (W.3, 2015) (101 and 104, 2013) Accuracy	Revise the estimates of emissions from solid waste disposal on land by incorporating the revised DOC values into the emission estimation.	Resolved. The ERT observed small recalculations (in the order of 0.1–1.1 per cent) of CH_4 emissions for category 5.A for 2005–2016 in the 2020 submission as compared with the 2018 submission. In response to the previous recommendation, the Party stated that the constant DOC value of 0.2 is applied only for 1990–2004 and is considered as representative of waste disposed of for this period, and that since 2005, CH_4 emissions have been directly reported under the GHGRP. The Party explains in the NIR (annex 3.14, p.A-464) that the DOC value for 1990–2004 is 0.2028 and is calculated on the basis of national CH_4 generation potential, which in turn is based on analysed data from a set of 52 representative landfills across the United States in different precipitation ranges, and that, for this period, waste composition data were not regularly collected for all landfills nationwide. The DOC values for the other years in the time series were revised for the 2017 submission.
W.3	5.A Solid waste disposal on land – CH_4 (W.3, 2019) (W.4, 2018) (W.4, 2016) (W.4, 2015) (104, 2013) (125, 2012) Transparency	Report the composition of waste landfilled, with the amounts/shares and corresponding coefficients, including DOC.	Resolved. During the review, the United States provided the same explanation as in the previous review, namely that the composition of MSW sent to landfill is generally not available for many of the 1,500 active MSW landfills in the United States, and emphasized that emissions after 2010 were estimated using a tier 3 methodology (see NIR figure 7-2). Further, the Party explained that good-quality landfill-specific AD are reported under the GHGRP (see annex 9 to the NIR), and the GHGRP requires each landfill to report data on individual landfill characteristics, annual waste acceptance amounts, and measured landfill gas collection rates and CH_4 percentage; however, the GHGRP does not require the reporting of the composition of waste accepted. The ERT noted that the Party has improved the estimation method since this issue was identified in the 2012 review and applied a higher-tier method for this category. Considering

ID#	Issue classification[a]	Recommendation made in previous review report	ERT assessment and rationale
			difficulties in collecting past data in more detail, the ERT recognizes that the original recommendation is no longer applicable, although time-series consistency (connectivity of data and method) should be considered by the Party as this is a key category.
W.4	5.A Solid waste disposal on land – CH_4 (W.14, 2019) Transparency	Include in the NIR the explanation provided to the ERT on how the collection efficiency default value of 0.75 was derived to justify its confidence in the collection efficiency value used.	Resolved. The United States explained in the NIR (annex 3.14, p.A-472) how the collection efficiency default value of 0.75 was developed and applied.
W.5	5.A.1 Managed waste disposal sites – CH_4 (W.4, 2019) (W.15, 2018) Transparency	Include detailed information on the methods and parameters used by the facilities to estimate net CH_4 emissions and how the estimates are chosen for the national inventory when alternative estimates of net CH_4 emissions (e.g. from facilities that recover CH_4) are also produced.	Resolved. The United States provided a detailed explanation in the NIR (annex 3.14, pp.A-459–A-476) of the methods used to estimate net CH_4 emissions under the GHGRP, including those for facilities that recover CH_4, for the entire time series.
W.6	5.A.1 Managed waste disposal sites – CH_4 (W.5, 2019) (W.15, 2018) Transparency	Include in the NIR a summary of the process to select the year to start using the new bottom-up method.	Resolved. The United States provided information in the NIR (annex 3.14, pp.A-459–A-460) about historical changes to the data collection system and the selection of 2005 as the year to start using the bottom-up method. It explained that CH_4 emission estimates have consisted of directly reported bottom-up data from the GHGRP since 2010, using the first order decay method with AD and parameters taken from various studies, to estimate emissions for 1990–2004, and performing a backcast estimation to merge the first order decay methodology with the GHGRP data for 2005–2009 (see also ID# W.5 above).
W.7	5.A.1 Managed waste disposal sites – CH_4 (W.6, 2019) (W.15, 2018) Transparency	Include in the NIR a summary of the methodologies used and analysis conducted in order to produce a scale-up factor for non-reporting facilities.	Resolved. The United States provided an explanation in the NIR (annex 3.14, p.A-469, "Step 4a: Developing and Applying the Scale-up Factor for MSW Landfills for 2005 to 2009") of how it estimates the scale-up factor for non-reporting landfill facilities under the GHGRP.
W.8	5.A.1 Managed waste disposal sites – CH_4 (W.15, 2019) Transparency	Include information to justify the oxidation factor used, including references and supporting data relevant to national circumstances as well as an uncertainty analysis for the oxidation factor applied in the estimation.	Addressing. The United States provided information in the NIR (pp.A-473–474) to justify the use of a country-specific oxidation factor greater than the default value of 0.1. During the review, the Party explained that it is planning to include additional detail in the discussion of the uncertainty analysis. This reporting is planned for the 2021 submission.
W.9	5.A.1.a Anaerobic – CH_4 (W.7, 2019) (W.16, 2018) Comparability	Estimate and report the amounts of CH_4 flared and CH_4 for energy recovery for anaerobic waste disposal sites, but, until that is possible, report them as "NE" instead of "IE" in CRF table 5.A.	Addressing. The United States reported the amount of CH_4 flared and used for energy recovery as "NE" in CRF table 5.A. During the previous review, the Party explained its use of directly reported GHGRP net emissions and noted that facilities were not required to report separately the total amounts of CH_4 recovered for energy and CH_4 flared. However, the ERT notes that the EPA Landfill Methane Outreach Program provides information on the amount of landfill gas collected and flared. It also notes that the 2006 IPCC Guidelines (vol. 5, chap. 3, p.3.18) state that if recovered gas is used for energy, then the resulting GHG emissions should be reported under the energy

ID#	Issue classification[a]	Recommendation made in previous review report	ERT assessment and rationale
			sector. Therefore, the Party should report the amount of CH_4 for energy recovery in CRF table 5.A and include a corresponding explanation in the NIR, taking into account the good practice outlined in the 2006 IPCC Guidelines.
W.10	5.A.1.a Anaerobic – CH_4 (W.8, 2019) (W.7, 2018) (W.12, 2016) (W.11, 2015) Accuracy	Obtain up-to-date data on the type and fractions of organic waste placed in industrial waste landfills; and revise the CH_4 estimates for all major industrial waste landfills.	Addressing. The United States provided information in the NIR (p.7-10) on an EPA analysis to validate the assumption that most of the organic waste which would result in CH_4 emissions is disposed of at pulp-, paper- and food-processing facilities (54 per cent) and food manufacturing facilities (7 per cent). However, the ERT believes that the Party should consider including other industries (e.g. metal foundries, petroleum refineries and chemical manufacturing facilities) as recommended in the 2016 review report (FCCC/ARR/2016/USA, ID# W.12). According to the NIR (p.7-15), EPA plans to investigate the prevalence of food-related waste deposited in industrial waste landfills and will record the findings from this exercise in a memorandum and implement during the following inventory cycle any warranted changes to the methodology or assumptions for industrial waste landfills. The ERT welcomes the Party's provision of this information on the estimation of CH_4 emissions from industrial waste landfill.
W.11	5.B.2 Anaerobic digestion at biogas facilities – CH_4 (W.9, 2019) (W.8, 2018) (W.14, 2016) (W.13, 2015) Accuracy	Estimate and report CH_4 emissions from unintentional leakages using the default value of 5 per cent provided in the 2006 IPCC Guidelines.	Not resolved. During the review, the Party explained that unintentional leakages of CH_4 emissions from anaerobic digestion of organic waste, as described in the 2006 IPCC Guidelines (vol. 5, chap. 4.1), will be reported in the 2021 submission, as indicated in the NIR (p.7-39).
W.12	5.B.2 Anaerobic digestion at biogas facilities – CH_4 and N_2O (W.10, 2019) (W.17, 2018) Transparency	Review and complete the explanation in CRF table 9 for category 5.B.2.b for CH_4 and N_2O.	Resolved. The United States included in CRF table 9 the reason for reporting "NE". It explained in the NIR (p.7-39) that, while activities under this category occur in the country, EPA needs to conduct further research on available AD to estimate emissions. Depending on the availability of additional resources, EPA will continue its research on AD and feasibility with a view to reporting these emissions and related progress in future inventory submissions (see also ID# W.11 above).
W.13	5.C.1 Waste incineration – CO_2, CH_4 and N_2O (W.13, 2019) (W.10, 2018) (W.15, 2016) (W.14, 2015) Transparency	Provide in the NIR consistent information on the data that are used for the estimation of emissions from waste incineration (e.g. on the percentage of waste incinerated in 2013 reported in figure 7-2 and tables 3-26 and A-272 of the 2016 NIR).	Not resolved. Inconsistencies still exist in the combustion ratio of MSW between NIR figure 7-3 (12.7 per cent) and NIR table 3-27 (7.6 per cent). During the review, the United States explained that the percentage of waste incineration shown in figure 7-3 comes from a different source than that used for table 3-27 and does not represent the data used in the analysis for estimating emissions from waste incineration. However, the ERT considers that this inconsistency should be clearly explained in the NIR or NIR figure 7-3 should be removed.
W.14	5.C.1 Waste incineration – CO_2, CH_4 and N_2O (W.12, 2019) (W.18,	Ensure that the 2019 NIR indicates that the emissions from the incineration of non-hazardous industrial waste referred to in the 2018 NIR are in	Resolved. (a) The description in the NIR (annex 3.14, p.A-494) has been corrected to only mention medical waste;

ID#	*Issue classification*[a]	*Recommendation made in previous review report*	*ERT assessment and rationale*
	2018) Transparency	fact emissions from the incineration of hazardous industrial waste and already included in the inventory by: (a) Correcting the entry in annex 5 to the NIR, p.A-427, section on category 1.A.5.a (CO_2 emissions from non-hazardous industrial waste incineration and medical waste incineration); (b) Correcting the entry in annex 5 to the NIR, table A-266, row on category 1.A.5.a; (c) Changing the notation key reported for CO_2, CH_4 and N_2O emissions for category 5.C.1 (non-biogenic (other)) from "NA" to "IE" in CRF table 5.C and explaining in CRF table 9 where the emissions are included.	(b) In table A-251, the row on category 1.A.5.a has been corrected to "medical waste incineration" instead of "non-hazardous industrial waste incineration and medical waste incineration"; (c) The United States reported "IE" for CO_2, CH_4 and N_2O emissions from incineration of MSW for category 5.C.1 (waste incineration) of "biogenic – MSW", of "non-biogenic – MSW" and of "non-biogenic – other".
W.15	5.D.2 Industrial wastewater – CH_4 (W.13, 2019) (W.14, 2018) (W.5, 2016) (W.5, 2015) (105, 2013) Completeness	Include information on the non-estimation of CH_4 emissions from sludge under industrial wastewater.	Not resolved. In the previous review, the United States explained that sludge removed from industrial wastewater is not estimated owing to insufficient data. During the 2020 review, the Party explained that this issue will be addressed in the 2021 submission, and that the likely level of emissions associated with anaerobic digestion of industrial wastewater sludge could be far less than 500 kt CO_2 eq.

[a] References in parentheses are to the paragraph(s) and the year(s) of the previous review report(s) in which the issue 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.

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

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

Table 4
Issues identified in three or more successive reviews and not addressed by the United States of America

ID#	*Previous recommendation for the issue*	*Number of successive reviews issue not addressed*[a]
General		
G.1	Improve the completeness of the inventory, in particular for those categories for which there are methodologies in the 2006 IPCC Guidelines.	6 (2012–2020)

ID#	*Previous recommendation for the issue*	*Number of successive reviews issue not addressed*[a]
Energy		
E.1	Examine if the uncertainty analysis needs to be updated to reflect the findings of the research on natural gas combustion and document its findings in future submissions.	3 (2018–2020)
E.2	Research CO_2 EF data for fuel gas used by upstream oil and gas producers, and natural gas that has been processed and injected into downstream distribution networks, in order to determine whether a different CO_2 EF for fuel gas used in offshore oil and gas production than the CO_2 EF for the processed gas that enters the transmission, storage and distribution networks used in power and industrial plants and by other users is warranted and whether it can be determined; and document the findings of the research on the CO_2 EFs in the NIR.	3 (2018–2020)
E.3	Provide a more transparent clarification of how the difference in emissions between the reference and the sectoral approach is determined and which fuels are subtracted as NEU and feedstocks.	6 (2012–2020)
E.4	Report only emissions from fuels combusted for the use of energy under fuel combustion, and reallocate the relevant emissions currently reported under the subcategory NEU (other) and part of the fuel used under the subcategory United States territories (other).	6 (2012–2020)
E.5	Continue to research the data for the emissions from NEU of fuels reported under the energy and IPPU sectors mass-balance method used across petrochemical production to estimate CO_2 emissions from NEU of fuels and the method based on process emissions reported under facility-level reporting used to estimate emissions from feedstock consumption under IPPU, and further clarify the country-specific approach used in the NIR consistent with paragraph 10 of the UNFCCC Annex I inventory reporting guidelines.	3 (2018–2020)
E.6	Harmonize and reconcile the data between the reference and the sectoral approach for the reporting of jet kerosene consumption between CRF tables 1.A(b) and 1.D or furnish an adequate explanation of inconsistencies, where appropriate.	5 (2013–2020)
E.7	Advance the research on CH_4 and N_2O emissions from the combustion of landfill gas, sewage gas and other biogas in order to review data sources for biogas, review the reporting of non-CO_2 emissions in the waste sector and assess the need to add new estimates.	3 (2018–2020)
E.8	Document the impacts of the new model and the validity of the outputs and transparently document the recalculations in the NIR when the latest version of the model (MOVES2014b) is incorporated in the inventory.	3 (2018–2020)
E.9	Research whether data are available to accurately reallocate emissions from fuel use by agricultural mobile machinery from subcategory 1.A.2.g to 1.A.4.c.ii and fuel use for fishing vessels to 1.A.4.c.iii in order to improve the comparability of the submission and ensure that emissions of all gases from a given source are reported under the same IPCC category. If data are not available to accurately reallocate emissions to the different categories, clarify, in the NIR, the country-specific approach taken consistently with paragraph 10 of the UNFCCC Annex I inventory reporting guidelines.	3 (2018–2020)
E.10	Research data by non-road mobile machinery vehicle type across the different data sets, including the Federal Highway Administration and MOVES model outputs, to determine the optimum AD estimate for each subsource under non-road mobile machinery, and improve inventory accuracy, as necessary, including for CO_2, CH_4 and N_2O emissions from industrial, commercial, agricultural machinery and fishing vessels.	3 (2018–2020)

ID#	*Previous recommendation for the issue*	*Number of successive reviews issue not addressed*[a]
E.11	Advance the research in order to implement as soon as practicable the following improvements indicated during the review: (a) Updating on-road diesel CH_4 and N_2O EFs; (b) Developing improved methodology and data sources to estimate emissions from class II and III (short-line and regional) rail locomotives; (c) Applying a consistent methodology over time to estimate vehicle miles travelled for on-road vehicles by vehicle type, defined by wheel base; (d) Including ongoing research and documentation of minor emissions sources currently not included in the inventory, such as urea use in trucks, bio jet fuel, and compressed natural gas or liquefied petroleum gas use in shipping.	3 (2018–2020)
E.12	Review and update the time series of diesel and gasoline CO_2 EFs, including, where necessary, the data on fuel densities and carbon share by fuel grade, and report on progress, or document in the NIR that the EFs applied are accurate and representative of emissions across the time series, and update the uncertainty analysis as needed to reflect the findings of the research.	3 (2018–2020)
E.13	Either present information in the NIR to justify the omission of any fossil carbon component in the CO_2 EF for biofuel use (e.g. fatty acid methyl ester use) or update the inventory estimates to account for emissions from the fossil carbon component of biofuels and explain the estimations in the NIR.	3 (2018–2020)
E.14	Include descriptions of the MOVES model used to estimate CH_4 and N_2O emissions from road transportation and the 2016 GREET model used to generate EF inputs for alternative fuel vehicles, and information to verify that the models have been tested and calibrated to be representative of the United States fleet, fuels, driving conditions, road types and vehicle types.	3 (2018–2020)
E.15	Report AD and emissions of activities not occurring as “NO” instead of “NA”.	3 (2018–2020)
E.17	Enhance transparency in reporting CH_4 emissions from petroleum systems from venting and flaring, in accordance with the UNFCCC Annex I inventory reporting guidelines.	4 (2015/2016–2020)
IPPU		
I.3	Conduct further research and consultation with industry, state-level regulators and/or statistical agencies to access additional AD and EFs and/or to seek verification of the current method and assumptions for estimating emissions from ceramics, non-metallurgical magnesium production and from other limestone and dolomite use; and report on progress in the NIR.	4 (2015/2016–2020)
I.4	Allocate emissions from all fossil fuel uses (i.e. fuel and feedstock use) for ammonia production under subcategory 2.B.1 of the IPPU sector in accordance with the 2006 IPCC Guidelines.	4 (2015/2016–2020)
I.8	Gather the necessary data and report N_2O emissions from glyoxal and glyoxylic acid production.	3 (2018–2020)
I.9	Allocate CO_2 emissions from production of calcium carbide to the IPPU sector in line with the 2006 IPCC Guidelines or provide clarity in the NIR as to the country-specific approach taken.	3 (2018–2020)
I.11	Progress with plans to analyse new data reported by facilities (i.e. GHGRP data) and include emissions from combustion and flaring from installations not currently included in the inventory.	4 (2015/2016–2020)
I.12	Develop a methodology that is consistent with the 2006 IPCC Guidelines as soon as is practicable, allocating relevant fuel and feedstock emissions within the IPPU sector.	4 (2015/2016–2020)

ID#	*Previous recommendation for the issue*	*Number of successive reviews issue not addressed*[a]
I.16	Explain the allocation of the emissions from coke production and iron and steel production across both the energy and IPPU sectors, including the amount of carbon stored in the products of iron and steel production (this could be done, for example, through the provision of a quantitative summary of the carbon balance that the Party uses to compile and quality check the inventory estimates).	4 (2015/2016–2020)
I.17	Investigate the reasons for the SF_6 IEF increase between 2009 and 2011 and report in the NIR on the outcome of the investigation and on any recalculations of AD, IEF or emissions resulting from those investigations.	3 (2018–2020)
I.18	Estimate separately CO_2 emissions from lubricants and paraffin wax use and report them under category 2.D.	3 (2018–2020)
I.23	Investigate possible SF_6 emissions from airborne warning and control systems, particle accelerators and radars and include them in the next submission, providing a description of the identified sources, the SF_6 emissions from them for the entire time series, a methodology description and an uncertainty analysis, in accordance with the 2006 IPCC Guidelines (vol. 2, chap. 8, pp.8.23–8.25 and 8.26–8.30).	3 (2018–2020)
Agriculture		
A.3	Undertake a quantitative uncertainty assessment in conjunction with future planned methodological updates.	3 (2018–2020)
A.4	Update regional diet characterization data used in the estimation of CH_4 emissions from cattle in order to more accurately reflect the differences in diets across farms and states.	3 (2018–2020)
A.7	Improve the accuracy of the milk fat percentage, for example, by investigating the possibility of using additional data sources for information on milk fat percentage values, such as creameries and agricultural extension services.	3 (2018–2020)
A.8	Investigate the possibility of using additional data sources (e.g. farm extension services) to derive country-specific information on calf births from dairy cows throughout the year and report on the results of this investigation in the NIR.	3 (2018–2020)
A.9	Update the sheep population distribution as data availability allows, focusing resources as appropriate, in line with the 2006 IPCC Guidelines.	3 (2018–2020)
A.10	Update the quantitative uncertainty assessment.	3 (2018–2020)
A.11	Obtain updated MMS data and estimate emissions using the updated MMS usage data; if this is not possible, report on progress in the effort to update the MMS data.	4 (2015/2016–2020)
A.12	Investigate other potential data sources of animal MMS data, such as extension services (i.e. agricultural advisory services).	3 (2018–2020)
A.13	If not using a more disaggregated livestock categorization in estimating emissions, use option A in reporting data and emissions for cattle in the CRF tables; if applying option C, report the values for population size, allocation by climate region to cool and temperate regions, typical animal mass, volatile solid daily excretion and CH_4 producing potential for all other cattle subcategories of option C in CRF tables 3.B(a)s1 and 3.B(a)s2.	4 (2015/2016–2020)
A.18	Include all N_2O emissions from the States of Alaska and Hawaii in the emissions reported under this category or clearly outline in the improvement plan steps for including those emissions in the inventory.	3 (2018–2020)
A.19	Provide additional information in the NIR on the quantities and N content of commercial organic amendments (e.g. biosolids, dried blood and compost) applied to agricultural soils.	3 (2018–2020)

ID#	*Previous recommendation for the issue*	*Number of successive reviews issue not addressed*[a]
A.24	Provide an explanation of how the methodology and the DAYCENT model used to estimate N volatilized and N loss are both compatible with the 2006 IPCC Guidelines and based on science.	4 (2015/2016–2020)
LULUCF		
L.1	Conclude the technical work under way to be able to provide estimates for the carbon stock changes in the living biomass and DOM pools for each conversion category from forest land to any other land use for each year based on a reliable land-use change matrix, and report on the achievements made.	5 (2013–2020)
L.2	Include all managed United States lands in the inventory; improve the consistency of the time series of national areas; and report on the achievements made.	6 (2012–2020)
L.3	Until the Party is able to report anthropogenic emissions and removals from the entire national managed land area, report non-estimated managed land as a subdivision in the relevant CRF tables (i.e. tables 4.A, 4.B, 4.C, 4.D and 4.E), so that the managed land area for each land category reported in CRF table 4.1 corresponds with that reported for the same category in CRF tables 4.A, 4.B, 4.C, 4.D and 4.E.	3 (2018–2020)
L.5	Resolve the inconsistencies in land-use areas in the time series reported in the CRF tables.	4 (2015/2016–2020)
L.9	When providing detailed information in the NIR on how the different data sources were harmonized, provide explicit information on how the model ensures consistent integration of the three data sources, for example, by including a visual flow chart of data processing during the harmonization process.	4 (2015/2016–2020)
L.11	Report up-to-date information on the verification of the outputs of the model used to estimate SOC changes in mineral soils, for example, at the level of annual fluxes in single specific sites representative of the variability of the population or, as done for the DAYCENT model for agricultural soils (NIR figure A-12), at the level of the total cumulated (across the time series and the entire territory modelled) net flux.	3 (2018–2020)
L.13	Calculate the carbon stock change in each carbon pool at the level of each single plot and then aggregate the results at the state and national level, and explain any recalculations in the NIR.	3 (2018–2020)
L.14	Provide in an annex to the NIR detailed tables on average carbon fluxes by region and type (e.g. the region and forest type classifications described in Smith et al. (2006) and used for estimating downed deadwood and understory, which might better reflect the diversity of forest types and age classes).	4 (2015/2016–2020)
L.15	Estimate the carbon stock changes in living biomass in perennial crops for all years in the time series.	6 (2012–2020)
L.17	Estimate biomass carbon stock changes using the IPCC default method and factors or, where available, country-specific methods and factors, and report the estimations in the NIR.	3 (2018–2020)
L.18	Verify the model's output for the entire time series from 1990 onward and for all applicable land categories (e.g. by verifying the model's output for each land-use category, or for the total of the land-use categories, or for any subaggregation, as long as the total estimate of all land-use categories modelled is verified) and report on the verification and the results in the NIR.	3 (2018–2020)
L.20	Report woody grassland as a subdivision of the grassland category, estimate accordingly the area and carbon stock change for all carbon pools of woody grassland within the category grassland remaining grassland and within all land-use categories of conversion from and to grassland, and report the estimations in the NIR.	3 (2018–2020)

ID#	*Previous recommendation for the issue*	*Number of successive reviews issue not addressed*[a]
L.22	Estimate biomass carbon stock change using the IPCC default method and factors or, where available, country-specific methods or factors, and explain the estimations in the NIR.	3 (2018–2020)
L.23	Noting the need to determine the quantity of peat harvested per ha and the total area undergoing peat extraction, provide the respective AD and IEFs for the on-site CH_4 and N_2O emission estimates in CRF table 4(II) for organic soils under peat extraction.	4 (2015/2016–2020)
L.24	Estimate carbon stock change in flooded land using the 2006 IPCC Guidelines (vol. 4, chap. 7) default method and factors or, where available, country-specific methods or factors, and explain the estimations in the NIR.	3 (2018–2020)
L.25	Estimate biomass and DOM carbon stock changes for forest land converted to other wetlands as planned for the 2020 submission, and explain the estimations in the NIR.	3 (2018–2020)
L.27	Eliminate the overlap between the urban forest inventory and the forest inventory.	5 (2013–2020)
L.28	Remove the reporting of the carbon stock change associated with yard trimmings and food scraps from under the settlements category and allocate it to the category other under the relevant sector.	3 (2018–2020)
L.29	Report information on the long-term stored carbon stock of yard trimmings and food scraps, as well as on its annual changes, in the memo item in CRF table 5.	3 (2018–2020)
L.30	Estimate biomass carbon stock change for cropland converted to settlements (category 4.E.2.2) and grassland converted to settlements (category 4.E.2.3) using the IPCC default method and factors (2006 IPCC Guidelines, vol. 4, chap. 8) or, where available, country-specific methods or factors, and explain the estimations in the NIR.	3 (2018–2020)
L.31	Report estimates of carbon stock change for land converted to other land using the IPCC default method and factors (2006 IPCC Guidelines, vol. 4, chap. 9) or, where available, country-specific methods or factors, and explain the estimations in the NIR.	3 (2018–2020)
L.32	Complete CRF table 4.Gs2 with aggregated values in t C for each of the three HWP subcategories (solid wood, paper and paperboard, and other) and report in the NIR a table with all subcategories used by the model to calculate the HWP contribution as well as the conversion factors to carbon weight applied for each subcategory.	3 (2018–2020)
L.34	Report the complete calculation of the decay rates applied to yard trimmings and food scraps as well as information on the impact that the calculation has on the CH_4 emission rates applied to other MSW.	3 (2018–2020)
L.37	Estimate N_2O emissions associated with the mineralization of the N content of SOC losses in mineral soils for forest land, wetlands, settlements and other land, as well as for their conversion to and from cropland and grassland, using the IPCC default method and factors (2006 IPCC Guidelines, vol. 4, chap. 11) or, where available, country-specific methods or factors, and report the estimations in CRF table 4(III) and the NIR.	3 (2018–2020)
L.38	Estimate indirect N_2O emissions associated with the mineralization of the N content of SOC losses in mineral soils for forest land, wetlands, settlements and other land and report them in CRF table 4(IV), and explain the estimations in the NIR.	3 (2018–2020)
L.39	Noting that CH_4 and N_2O emissions from forest fires are key categories, estimate CH_4 and N_2O emissions from biomass burning for land converted to forest land, land converted to wetlands, cropland, grassland and settlements; and populate CRF table 4(V).	4 (2015/2016–2020)
Waste		

ID#	*Previous recommendation for the issue*	*Number of successive reviews issue not addressed*[a]
W.1	Provide background information that is consistent with the data actually used for the emission estimates, including the waste management practices.	4 (2015/2016–2020)
W.9	Estimate and report the amounts of CH_4 flared and CH_4 for energy recovery for anaerobic waste disposal sites, but, until that is possible, report them as "NE" instead of "IE" in CRF table 5.A.	3 (2018–2020)
W.10	Obtain up-to-date data on the type and fractions of organic waste placed in industrial waste landfills; and revise the CH_4 estimates for all major industrial waste landfills.	4 (2015/2016–2020)
W.11	Estimate and report CH_4 emissions from unintentional leakages using the default value of 5 per cent provided in the 2006 IPCC Guidelines.	4 (2015/2016–2020)
W.13	Provide in the NIR consistent information on the data that are used for the estimation of emissions from waste incineration (e.g. on the percentage of waste incinerated in 2013 reported in figure 7-2 and tables 3-26 and A-272 of the 2016 NIR).	4 (2015/2016–2020)
W.15	Include information on the non-estimation of CH_4 emissions from sludge under industrial wastewater.	5 (2013–2020)

[a] Reports on the reviews of the 2014 and 2017 inventory submissions of the United States have not yet been published. Therefore, 2014 and 2017 were not included when counting the number of successive years for this table. In addition, as the reviews of the Party's 2015 and 2016 inventory 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 inventory submission

9. Table 5 presents findings made by the ERT during the individual review of the 2020 inventory submission of the United States that are additional to those identified in table 3.

Table 5
Additional findings made during the individual review of the 2020 annual submission of the United States of America

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue?*[a]
General			
G.4	Uncertainty analysis	The Party reported in the NIR (chap. 1.7, p.1-24; annex 7, p.A-531) the results of the quantitative uncertainty assessment conducted in accordance with approaches 1 and 2 from the 2006 IPCC Guidelines. However, the results reported in NIR tables A-266–A-269 (annex 7, pp.A-533–A-539) followed a different structure to that provided in the 2006 IPCC Guidelines (vol. 1, table 3.3). The ERT noted that this is not in accordance with paragraph 42 of the UNFCCC Annex I inventory reporting guidelines, which states that information on uncertainties should be presented using table 3.3 in volume 1 of the 2006 IPCC Guidelines. During the review, the Party noted that presenting the information on uncertainties on the basis of table 3.3 would considerably expand the annex tables, given that IPCC approach 2 was largely used to perform the uncertainty assessment, but that it plans to report this information in a format more consistent with table 3.3.	Not an issue

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue?*[a]
		To enhance comparability of reporting among Annex I Parties, the ERT encourages the United States to explore ways of presenting the results of the uncertainty assessment using table 3.3 from volume 1 of the 2006 IPCC Guidelines in accordance with paragraph 42 of the UNFCCC Annex I inventory reporting guidelines.	
Energy			
E.21	Fuel combustion – reference approach – gaseous and liquid fuels – CO_2	The Party provided an explanation in annex 4 to the NIR of the comparison between the reference approach and the sectoral approach. The energy data presented in NIR table A-249 (pp.A-490–A-491) for fuel consumption under the reference approach match the data presented in CRF table 1.A(c); however, the energy data reported under the sectoral approach do not match those presented in CRF table 1.A(c) for natural gas, petroleum and total values (excluding other fossil fuels). For example, NIR table A-249 shows natural gas consumption of 30,788 TBtu for 2018 under the sectoral approach, equal to 34,483.2 PJ, whereas a value of 32,630.1 PJ is given in CRF table 1.A(c). During the review, the Party clarified that the natural gas data presented in NIR table A-249 include natural gas for combustion and NEU, and that the gaseous fuels data in CRF table 1.A(c) are derived from CRF table 1.A(a) and include natural gas for combustion and NEU as well as still gas for NEU, which is included as a gaseous fuel as opposed to a liquid fuel. The ERT recommends that the Party consistently treat still gas as liquid fuel under the sectoral and reference approaches to improve consistency between CRF tables 1.A(a), 1.A(b), 1.A(c) and the NIR table that compares fuel consumption under the two approaches (see also ID# E.22 below).	Yes. Convention reporting adherence
E.22	Fuel combustion – reference approach – all fuels – CO_2	The Party reported the quantity of carbon stored (carbon excluded) in CRF table 1.A(b) and the quantity of carbon excluded from the reference approach in CRF table 1.A(d). The ERT notes that the total carbon stored in liquid, solid and gaseous fuels for 2018 (60,469.88 kt C) is exactly the same in both tables, but that the disaggregated values are drastically different. For example, carbon stored in liquid, solid and gaseous fuels are reported as 57,034.45, 562.68 and 2,872.72 kt C, respectively, in CRF table 1.A(b) but as 38,903.00, 16,784.93 and 4,781.96 kt C, respectively, in CRF table 1.A(d). During the review, the Party clarified that the data in CRF table 1.A(d) were taken from the reference approach but recharacterized to reflect the Party's fuel categories, as explained in NIR annex 4 (p.A-483). It also clarified that asphalt and road oil are treated as a solid fuel, and still gas is treated as a gaseous fuel (see ID# E.21 above, under both the reference and the sectoral approach. The ERT is of the view that treating asphalt and road oil as a solid fuel is not in accordance with the 2006 IPCC Guidelines (vol. 2, table 1.1). To improve consistency between CRF tables 1.A(b) and 1.A(d) and compliance with the 2006 IPCC Guidelines, the ERT recommends that the Party consistently categorize asphalt and road oil as liquid fuels under both the reference and sectoral approaches.	Yes. Comparability
E.23	Feedstocks, reductants and other NEU of fuels – all fuels – CO_2	The ERT noted that the Party reported CO_2 emissions from NEU of fuels under category 1.A.5.a in CRF table 1.A(a)s4 and only reported them for certain years (1990, 2005 and 2014–2018) in NIR table 3-20 (p.3-48). The data from the two sources are different; for example, the NIR and CRF table 1.A(a)s4 report 129.5 and 136.4 Mt CO_2, respectively, for 2018. During the review, the Party clarified that, in CRF table 1.A(a)s4, category 1.A.5.a covers incineration of waste, United States territories and NEU. Emissions from NEU listed in CRF table 1.A(a)s4 do not include NEU of lubricants and other petroleum in United States territories (i.e. American Samoa, Guam, Puerto Rico, the United States Virgin Islands, Wake Island and other United States Pacific islands); these emissions are allocated to territories together with other emissions in United States territories. For example, for	Yes. Convention reporting adherence

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue?*[a]
		2018, the total emissions from NEU of lubricants and other petroleum in United States territories stood at 136.4 Mt CO_2 (i.e. 5.1 Mt CO_2 (NIR table 3-22, p.3-20) plus 129.5 Mt CO_2 (CRF table 1.A(a)s4)), as reported in NIR table 3-20. The ERT concluded that the NIR and CRF tables do not transparently explain what is included under category 1.A.5.a. The ERT recommends that the Party reconcile the emission data on NEU of fuel reported in the NIR and CRF table 1.A(a)s4 by either reallocating NEU of lubricants and other petroleum in United States territories to NEU in CRF table 1.A(a)s4 or adding a footnote to NIR table 3-20 to explain how the data reported in that table differ from those presented in CRF table1.A(a)s4.	
E.24	Feedstocks, reductants and other NEU of fuels – solid fuels – CO_2	Whereas the Party reports in the NIR (p.3-50; annex 2.3, pp.A-133 and A-156) that storage factors, including those for industrial coking coal and distillate fuel oil (0.1 and 0.5, respectively), were taken from the 2006 IPCC Guidelines, which in turn draw on data from Marland and Rotty (1984), the ERT understands that the 2006 IPCC Guidelines do not provide storage factors for NEU of fuels. During the review, the Party clarified that the storage factors for industrial coking coal and distillate fuel oil were taken from the Revised 1996 IPCC Guidelines but primarily from Marland and Rotty (1984). The ERT recommends that in future submissions the Party include the correct reference, that is to the Revised 1996 IPCC Guidelines rather than the 2006 IPCC Guidelines, for storage factors for industrial coking coal and distillate fuel oil, together with a justification of their applicability.	Yes. Transparency
E.25	Fuel combustion – reference approach – other fossil fuels – CO_2, CH_4 and N_2O	Data on the non-biomass portion of waste, reported to IEA for all years, are missing from CRF table 1.A(b). In the 2020 submission, the ERT notes that the AD and emissions for other fossil fuels are reported under CRF categories 1.A.1.a (public electricity and heat production) and 1.A.5.a (incineration of waste) under the sectoral approach, but as "NA" in CRF tables 1A(b) and 1A(c) under the reference approach, for the whole time series. During the review, the Party clarified that comparisons of energy use and CO_2 values between the sectoral and reference approaches concern only fossil fuel sources (coal, natural gas and petroleum) and exclude waste fuels for reasons of consistency, as shown in table A-250 (NIR annex 4, p.A-491). The ERT recommends that the Party either take into account other fossil fuels under the reference approach when completing CRF table 1.A(b) or document that waste fuels are not used in the comparison between the sectoral and reference approaches in order to improve consistency between the reference and sectoral approaches in terms of estimation coverage, and amend the reference approach column in CRF table 1.A(c) as needed.	Yes. Consistency
E.26	Fuel combustion – reference approach – LPG – CO_2	The ERT noted that data on LPG production, trade and stock changes reported under NGL in CRF table 1.A(b) seem to be different to those reported to IEA. For example, apparent consumption of NGL for 2017 is reported in the CRF table as 3,634,913 TJ (gross calorific value), equivalent to 3,453,168 TJ (NCV), but to IEA as 4,669,988 TJ (NCV), while LPG is reported as "NA" in the CRF table and as –1,238,360 TJ (NCV) to IEA. All headings for LPG are reported as "NA" except for "C stored" for the whole time series in CRF table 1.A(b). During the review, the Party clarified that LPG is a fuel category under the sectoral approach while NGL is not. LPG statistics reported under the sectoral approach consist of both NGL and LPG (as explained briefly in NIR annex 4, p.A-483), while under the reference approach, LPG falls under NGL and liquefied refinery gases, whose carbon content is based on the EF for LPG reported under the sectoral approach. The Party believes that this is the most accurate approach for calculating emissions under both the sectoral and reference approaches.	Yes. Comparability

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue?*[a]
		The ERT recommends that the Party either estimate NGL and LPG consistently between the reference and sectoral approaches or explain in the NIR why covering different fuels under the reference approach applying a different list of fuels than that used for the sectoral approach is the most accurate way to estimate emissions under both approaches, and change the notation key reported for LPG in CRF table 1.A(b) from "NA" to "IE".	
E.27	1.A.2.g Other (manufacturing industries and construction) – all fuels – CO_2, CH_4 and N_2O	The ERT noted that, in the recalculation performed for subcategory 1.A.2.g (other) in the 2020 submission, the values reported for fuel consumption and CO_2 emissions were reduced by more than 20 per cent for the whole time series, whereas those reported for CH_4 and N_2O emissions were reduced by only 5–6 and 2–3 per cent, respectively. It also noted that fuel distribution among categories changed significantly in the 2020 submission compared with the 2019 submission. For example, for 2017, fuel consumption increased by 2,838,783.55 TJ under category 1.A.1 and decreased by 2,930,213.62 TJ under category 1.A.2 and by 293,474,205 TJ under subcategory 1.A.2.g. According to the explanation provided in the NIR (pp.3-38–3-39), EIA updated the data for LPG consumption in economic sectors and revised sector allocations for propane and total LPG for 2010–2017, and for natural gas, distillate fuel oil and kerosene for 2017, without providing any explanation for the significant changes noted by the ERT. The discussion in the NIR (pp.3-38–3-39) of the impact of the recalculation on overall emissions similarly fails to broach these changes. During the review, the Party noted that, in addition to the reallocation of liquid fuels, as reported in the NIR (box 3-4, p.3-34), the values reported in the CRF tables for petroleum refining (subcategory 1.A.1.b) and manufacture of solid fuels (subcategory 1.A.1.c) were corrected to include part of the total fuel consumption when calculating energy use under subcategory 1.A.2.g. That correction accounted for most of the revisions in energy use between categories 1.A.1 and 1.A.2 for 2017. The Party explained that biomass energy use under category 1.A.2 and related non-CO_2 emissions are not disaggregated to subcategories (i.e. 1.A.2.a–f) and are reported only under subcategory 1.A.2.g, whereas biomass consumption remains unchanged in the 2020 submission. It noted that since the majority of non-CO_2 emissions are driven by biomass combustion, the adjustment made to fossil energy use and CO_2 emissions did not have as significant an impact on non-CO_2 emissions. The ERT recommends that the Party provide information in the NIR on the recalculation of emission estimates and clearly indicate the reason for any changes and corrections compared with previous submissions.	Yes. Transparency
E.28	1.A.2.g Other (manufacturing industries and construction) – all fuels – CO_2, CH_4 and N_2O	The ERT noted that the terminology used in the NIR for non-road (off-road) transportation is inconsistent, for example "non-transportation mobile sources" (footnotes to table 3-13, p.3-26), "non-road mobile sources" (p.3-43) and "off-road sources" (annex 3.2, table A-106, p.A-188). During the review, the Party clarified that these terms are interchangeable and generally refer to mobile sources that are not used in the transportation of goods and people (e.g. farm and construction equipment). The Party stated that much of the category breakdown is based on domestic data collection and reporting terminology. For example, energy data are collected on the basis of economic sectors, including transportation, which includes certain source types. Therefore, the expression "non-transportation mobile sources" refers to sources that are categorized as mobile sources under the Party's regulations but are not captured in the transportation sector as part of energy data. The ERT encourages the Party to clarify in the NIR the terms "non-transportation mobile sources" (footnotes to NIR table 3-13, p.3-26), "non-road mobile sources" (NIR p.3-43) and "off-road sources" (NIR annex 3.2, table A-106, p.A-188) and to use consistent terminology in future submissions. It also encourages the Party to refer to "off-road" or "non-road" transportation in line with the terminology used in the 2006 IPCC Guidelines.	Not an issue

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue?*[a]
E.29	1.A.3 Transport – all fuels – CO_2, CH_4 and N_2O	In CRF summary table 3, the United States reported on its use of a combination of default and higher-tier methods and a mix of default and country-specific EFs for estimating GHG emissions for subcategory 1.A.3, which was identified as a key category in NIR annex 1 (p.A-3). However, the NIR did not contain an explanation for every instance of the default method and parameters being used to estimate emissions for key categories. The ERT noted that this is not in accordance with paragraphs 11 and 50(c) of the UNFCCC Annex I inventory reporting guidelines, which state that the Party should make every effort to use a method recommended in the 2006 IPCC Guidelines or otherwise shall explain in its annual GHG inventory submission why it was unable to implement a recommended method in accordance with the decision trees in the 2006 IPCC Guidelines. During the review, the Party clarified that the use of default methods for gases for subcategories within the key categories (1.A.3) estimating CH_4 and N_2O emissions from off-road transport (category 1.A.3) could be enhanced. The ERT noted that the reasons for the Party's inability to implement higher-tier methods for this category were not transparently described in the NIR. In response, the Party explained why it had been unable to implement higher-tier methods for estimating CH_4 and N_2O emissions from off-road transport (category 1.A.3). The ERT recommends that the United States include the explanation shared with the ERT during the review in its NIR describing why it was unable to implement a recommended method in accordance with the decision trees in the 2006 IPCC Guidelines, as outlined in paragraphs 11 and 50(c) of the UNFCCC Annex I inventory reporting guidelines, where default methods and emission parameters were used for estimating GHG emissions and removals for categories identified as key, particularly for category 1.A.3 (CH_4 and N_2O for off-road sources), which includes ships and boats, aircraft, locomotives and off-road sources (i.e. construction or agricultural equipment).	Yes. Transparency
E.30	1.A.5.a Stationary – other fossil fuels – CO_2, CH_4 and N_2O	According to the NIR (p.3-56; table 3-27, p.3-57), the amount of waste incinerated for 2012–2018 is assumed to be equal to the amount for 2011, and waste discarded for 2014–2018 is constant. This results in a constant ratio of incinerated waste to total waste for 2014–2018 (7.6 per cent). The ERT notes that according to historical data on MSW generation in the United States for 2000–2018 published on the OECD website (https://data.oecd.org/waste/municipal-waste.htm), 265.2 Mt waste was generated in 2018, whereas according to the NIR (table 3-27) this figure is 273.1 Mt. It also notes that the OECD data are comparable to those used for estimating emissions from waste incineration, as reported in the NIR, and do not show how much of the waste is incinerated. During the review, the Party acknowledged that the reporting of constant values for waste incineration for years after 2011 is an issue and stated that it has drawn up an improvement plan to investigate additional sources of MSW data (NIR p.3-58), including data on how much waste is incinerated, and will include the results in a future submission. The ERT recommends that the Party use updated data to estimate GHG emissions from waste incineration, including by updating the amount of waste generated and the ratio of incineration for the latest year of the time series, and examine the applicability of data from the OECD website and other sources.	Yes. Accuracy
E.31	1.A.5. Other (not specified elsewhere) – liquid and other fuels – CO_2	The Party reported in the NIR (p.3-47; annex 2.3, p.A-134) that, on average for the whole time series, approximately 62 per cent of total carbon in fuels consumed for non-energy purposes was stored in products for the long term and will not be released into the atmosphere, and the remaining 38 per cent has been released into the atmosphere as CO_2. For 2018, 65 per cent of the total carbon in fuels consumed for non-energy purposes was stored in products, including those to be incinerated as waste at end of life. For 2018, 36.7 Mt C was stored in products (NIR annex 2.3, p.A-136, table A-67). The ERT understands that some of the plastics will be incinerated	Not an issue

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue?*[a]
		in the future and most of the carbon contained in them will be emitted into the atmosphere, except for carbon remaining in soot or ash generated during incineration. According to NIR table 3-25 (p.3-55), CO_2 emitted from incineration of plastic waste for 2018 was approximately 6.4 Mt, which equates to 4.75 per cent of the carbon stored in plastics for the same year. The ERT notes that 7.6 per cent of total waste is assumed to be incinerated for 2018 (NIR table 3-27; see also ID# E.29 above). The ERT also understands that plastics incinerated for 2018 do not necessarily equate to plastics manufactured that year; however, as the amount of waste disposed of in the United States has not changed significantly over the time series (NIR table 3-27, p.3-57) and CO_2 emissions from plastic waste incineration have also not changed significantly for certain years (NIR table 3-25, p.3-55), the ERT considers that overall, 4–5 per cent of carbon stored in plastics will be incinerated and emitted into the atmosphere in the future, which is lower than the average rate of waste incineration. The ERT further understands that plastic waste tends to be incinerated, rather than landfilled as in most Annex I Parties, to reduce waste volume and recover energy. In response to a question raised by the ERT about the lower incineration rate of plastic waste and the possible underestimation of related emissions, the Party clarified that (1) the low emission rate associated with CO_2 emissions from plastic waste incineration compared with carbon stored in products in a given year is not necessarily a direct comparison; (2) a portion of waste plastic is recycled rather than incinerated or landfilled; and (3) landfill, and not incineration, is the primary way to manage MSW in the United States. In addition, in response to the provisional main findings of the ERT, the Party indicated that NIR box 7-4 (p.7-16) includes an explanation of the recycling and composition of MSW for 1990–2017, in particular for 2017. The ERT encourages the Party to provide a reference to NIR box 7-4 (p.7-16) for the discussion of waste incineration emissions to improve the understanding of carbon emissions associated with plastic waste incineration.	
IPPU			
I.25	2. General (IPPU)	AD and emissions for several IPPU categories for the latest year of the inventory (2018 in the 2020 submission) were approximated to be equal to the values for the previous year (2017). During the review, the Party explained that AD and emission data for several categories of the IPPU sector could not be obtained from the GHGRP when the inventory was compiled. The ERT considers that emission estimates for some IPPU categories (e.g. 2.A.1, 2.B.1, 2.B.2) were not accurate because the AD and emission values were assessed to be equal to the previous year without any justification. The ERT encourages the Party to gather actual AD for emission estimates for the latest year of reporting for IPPU categories (e.g. 2.A.1, 2.B.1, 2.B.2) from the GHGRP or alternative sources instead of applying the data from the previous inventory year or otherwise to adhere to paragraph 18 of the UNFCCC Annex I inventory reporting guidelines and apply the techniques provided in the 2006 IPCC Guidelines (vol. 1, section 5.3) to estimate the missing values.	Not an issue
I.26	2.A.1 Cement production – CO_2	The United States reported in the NIR (p.4-10) that it used the tier 2 method from the 2006 IPCC Guidelines for estimating CO_2 emissions for the key category 2.A.1 cement production. The ERT noted that non-carbonate sources of CaO in clinker production were not taken into consideration, as stated in the NIR (p.4-11), whereas it is good practice under the chosen tier 2 method to identify non-carbonate sources, for example slag, fly ash and so on, and exclude them from CaO content in clinker (2006 IPCC Guidelines, vol. 3, chap. 2, pp.2.12 and 2.14). During the review, the Party confirmed that non-carbonate sources of CaO were not included in the estimates and	Yes. Accuracy

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue?[a]
		informed the ERT about a planned improvement involving the identification of non-carbonate raw materials used in clinker production. The ERT noted that the estimates of CO_2 emissions for category 2.A.1 cement production may be not accurate because non-carbonate sources of CaO were not included in the estimates, which is not in compliance with the Party's chosen tier 2 method from the 2006 IPCC Guidelines. The ERT recommends that the Party identify the amount of non-carbonate sources of CaO used in cement production (category 2.A.1) by fully implementing the planned improvement related to the use of non-carbonate raw materials in clinker production, and revise estimates of CO_2 emissions in accordance with the tier 2 method from the 2006 IPCC Guidelines by correcting the amount of CaO from non-carbonate sources if data of non-carbonate CaO sources are available.	
I.27	2.A.3 Glass production – CO_2	The Party used the tier 3 method from the 2006 IPCC Guidelines (vol. 2, chap. 2.4, p.2.28) for estimating CO_2 emissions from glass production on the basis of carbonates used, including limestone, dolomite and soda ash (NIR p.4-20). According to the NIR (section 4.3), AD on carbonate use can be obtained directly from national statistics and are not consistent across the time series. For example, dolomite consumption is reported as 541 kt for 2005 but as 0 kt for 2014–2018 (NIR table 4-12, pp.4-20–4-21). During the review, the Party clarified that updating the AD for glass production is a priority among its planned improvements. In its clarifications to the ERT, the Party reiterated information in the NIR that may impact data consistency, such as withheld data. The ERT recommends that the Party explain transparently in the NIR the reasons for the dramatic reduction in reported dolomite use for glass production, from 541 kt for 2005 to 0 kt for 2014–2018, and ensure that all major carbonates (limestone, dolomite and soda ash) are estimated for the whole inventory period.	Yes. Transparency
I.28	2.B.7 Soda ash production – CO_2	The Party reported in NIR table 4-44 (p.4-56) the soda ash production AD used for estimating CO_2 emissions. However, the ERT noted that according to the NIR (p.4-55), the EF for CO_2 emissions was applied for trona consumption (0.0974 t CO_2/t trona) but not for soda ash production. During the review, the Party clarified that the data provided in NIR table 4-44 correspond not to soda ash production but to trona consumption. The ERT also noted that the AD description provided in CRF table 2(I).A-Hs1 was also not clearly related to trona consumption and still described AD as "soda ash production". The ERT recommends that the Party correct the table heading for the AD from "soda ash production" to "trona consumption" in the NIR and clarify the AD description in CRF table 2(I).A-Hs1.	Yes. Transparency
I.29	2.B.10 Other (chemical industry) – CO_2	The Party reported CO_2 emissions from SiC consumption under category 2.B.10 in CRF table 2(I).A-Hs1 (e.g. some 97.41 kt CO_2 in 2018). During the review, the Party clarified that these emissions stem from the use of SiC in non-abrasive applications, which include steel smelting and other end-uses, where SiC is heated to a sufficiently high temperature that carbon is oxidized and released as CO_2. The ERT agreed with the provided explanation but noted that emissive sources of SiC are not transparently described in the NIR. It also noted that emissions from SiC use were reported in the NIR (section 4.10) as a sum total that also included emissions from SiC production. The ERT recommends that the Party clarify the emissive non-abrasive applications of SiC, document why these emissions are not reported elsewhere (e.g. category 2.C.1) and separately report in the NIR CO_2 emissions from SiC production and SiC use.	Yes. Comparability
I.30	2.C.1 Iron and steel production – CO_2	The Party included coke breeze production in the estimates of CO_2 emissions from coke production (NIR pp.4-79–4-80). The amount of coke breeze produced was approximated using a production factor of 0.075 t coke breeze/t	Yes. Accuracy

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue?[a]
		coking coal consumed (NIR p.4-79) because actual data were not available. However, the ERT noted that actual data on coke breeze production in the United States can be obtained from EIA quarterly coal reports. The ERT compared the estimated data on coke breeze production used in the GHG inventory (1,248 kt coke breeze for 2018) with the EIA statistics (636 kt coke breeze for 2018) and concluded that coke breeze production was potentially overestimated in the inventory. The overestimation of coke breeze production could lead to an underestimation of emissions because the emissions are estimated using the carbon balance method, where the carbon content of products (coke and coke breeze) is subtracted from the carbon inputs (coking coal). During the review, the Party acknowledged the difference between the EIA statistics and the data used for estimating CO_2 emissions. In its clarifications on the list of provisional main findings, the Party indicated that: (a) Industry data more accurately represent coke output data in relation to the other industry data used (data on coke production output are linked to other sources of iron and steel production emissions, including sinter production, where coke breeze is often used, and non-energy use of energy where coal tar is utilized); (b) Use of industry data allows for a consistent approach across the different emission categories; (c) Overall, there is no underestimation or overestimation of CO_2 emissions because all carbon associated with the coal used to make the coke is eventually accounted for, either in the coke production process or where the coke is eventually used, and a consistent approach is used to track the carbon throughout (see ID# I.31 below). The ERT recommends that the Party revise estimates of CO_2 emissions from coke production taking into account national statistics on coke breeze production, for example from EIA quarterly coal reports, or demonstrate in the NIR that CO_2 emissions from coke production were not underestimated by using industry data on coke breeze production instead of EIA statistics, and explain how there is a consistent approach used to track carbon throughout the calculations.	
I.31	2.C.1 Iron and steel production – CO_2	The Party reported coke consumption for pig iron production in NIR table 4-72 (p.4-83) (e.g. 7,618 kt for 2018) and carbon content in the coke used in estimates in NIR table 4-69 (p.4-81) (0.83 t C/t coke). During the review, the Party clarified that data on coke consumption are reported in t dry coke according to the data source (American Iron and Steel Institute annual statistical report). The ERT noted that the chosen carbon content of coke does not correspond to the coke consumption units because the expected value of carbon content for dry coke is significantly higher (e.g. according to the CO_2 Emissions Data Collection User Guide (version 7) of the World Steel Association, the carbon content of dry coke is approximately 0.89 t C/t dry coke or 3.257 t CO_2/t dry coke). The ERT concluded that CO_2 emissions for category 2.C.1 iron production were probably underestimated because the carbon content of coke chosen for estimates was incorrect. In the estimation of the ERT, the missing emissions might account for 1,675.96 kt CO_2 for 2018 for iron production, but emissions would be overestimated by the same amount for coke production. During the review, the Party explained that underestimated emissions from coke consumption were included in other parts of the inventory. However, the ERT was unable to confirm this because the Party did not provide the initial sources of data used in estimates. The ERT recommends that the Party specify in the NIR the units of coke consumption and coke production (t coke or t dry coke) and provide supporting data sources, and revise estimates of CO_2 emissions as needed from pig iron production and coke production by applying a carbon content value for coke that corresponds to the AD for coke production or consumption.	Yes. Accuracy

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue?*[a]
I.32	2.C.1 Iron and steel production – CO_2	The Party estimated that the carbon content of pellets, sinter and natural ore used in pig iron production is equal to the carbon content of direct reduced iron (2 per cent) (NIR p.4-84). During the review, the Party did not provide any relevant sources to justify the chosen carbon content value for pellets, sinter and natural ore. In its clarifications on the list of provisional main findings, the Party indicated that, given the lack of default carbon content values for pellets, sinter and natural ore, it adopted a country-specific approach to determine these values, as documented in the NIR (table 4-69, p.4-81). It added that, although iron and steel is a key category, any updates to estimates for subcategories resulting from updates to the carbon content of pellets, sinter and natural ore are unlikely to lead to a significant recalculation of total emissions for iron and steel. Noting that the carbon content of pellets, sinter and natural ore is likely to be significantly lower than 2 per cent, the ERT concluded that the related CO_2 emissions might not be accurate. Moreover, the failure of the Party to provide any justification for its chosen carbon content value for pellets, sinter and natural ore is not in compliance with paragraph 50(a) of the UNFCCC Annex I inventory reporting guidelines. The ERT recommends that the Party justify its chosen carbon content value of 2 per cent for pellets, sinter and natural ore by indicating that it used a country-specific approach of assuming the same carbon content as direct reduced iron (2 per cent), with confirmation by the references to the relevant data sources in the NIR, or otherwise revise the emission estimates for iron and steel production (category 2.C.1) by updating the carbon content value for pellets, sinter and natural ore used in pig iron production on the basis of relevant data sources.	Yes. Accuracy
I.33	2.C.1 Iron and steel production – CO_2	The Party included in its estimates of CO_2 emissions from iron and steel production (category 2.C.1) flux consumption for electric arc furnace steel and basic oxygen furnace steel production (NIR table 4-72, p.483). According to the NIR (p.4-81), the amount of flux used in pig iron production was deducted from other process uses of carbonates (CRF source category 2.A.4) to avoid double counting. During the review, the Party explained that data for flux consumption in both basic oxygen furnace and electric arc furnace steel production were obtained from American Iron and Steel Institute annual statistical reports. In its clarifications on the list of provisional main findings, the Party indicated that the flux consumption data provided by the American Iron and Steel Institute include all flux types, including limestone, lime and fluorspar, and that it only accounts for the use of fluxes containing carbon (limestone and dolomite) in iron and steel sector emissions, since the emissions associated with other fluxes are reported for their individual sectors (e.g. lime production). The ERT recommends that the Party transparently describe in the NIR the type of fluxes used in iron and steel production and ensure that only CO_2 emissions from the emissive source of fluxes are reported under category 2.C.1 and consumption of carbonates under category 2.A.4 is adjusted to subtract emissive sources accounted for elsewhere but not by subtracting non-carbonate fluxes.	Yes. Accuracy
Agriculture			
A.25	3. General (agriculture) – CH_4 and N_2O	The GE values reported in NIR table A-174 (pp.A-313–A-314) for each subcategory differ significantly among States. For example, the annual GE for dairy cows is reported as 29 MJ/1,000 head in Alaska and 262,323 MJ/1,000 head in California. During the review, the Party clarified that the values reported in NIR table A-174 represent total GE for each animal type in each State rather than on a per-head basis. The ERT recommends that the Party correct the unit in the title of NIR table A-174 from “MJ/1,000 head” to “MJ/head”.	Yes. Transparency

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue?*[a]
A.26	3. General (agriculture) – N_2O	The ERT noted that Nex on pasture, range and paddock for 2018 was reported in CRF table 3.D as 3,569,237,661.43 kg N/year, while total Nex on pasture, range and paddock for cattle, sheep, swine and other livestock for 2018 was reported in CRF table 3.B(b) as 4,036,707,495.09 kg N/year. It also noted that N data reported by the Party for pasture, range and paddock manure used in agricultural soil management and manure management are inconsistent between these CRF tables for 1997−2018. The ERT acknowledges that the Party noted this discrepancy in the NIR (annex 3.11, p.A-326, footnote 93). The ERT recommends that the Party report the same values for Nex on pasture, range and paddock in CRF tables 3.B(b) and 3.D.	Yes. Convention reporting adherence
A.27	3.D.a.2 Organic N fertilizers – N_2O	The ERT considers that the average N content of biosolids of 69 per cent reported by the Party in the NIR (annex 3.12, p.A-377) is too high according to common scientific knowledge on the N content ratio of organic material. During the review, the Party clarified that the reported percentage was a typographical error and that the N content of biosolids used in estimating the total applied N from biosolids is assumed to be 3.9 per cent. The error has no impact on the estimated emissions. The ERT recommends that the Party correct the reported percentage for the average N content of biosolids.	Yes. Convention reporting adherence
A.28	3.D Direct and indirect N_2O emissions from agricultural soils – N_2O	The Party reported in the NIR (p.5-45) that the recalculations of N_2O emissions from managed soil resulted in an average increase in those emissions of 22 per cent for 1990–2017 relative to the previous inventory for this category. The Party did not include a discussion on the impact of the recalculation on the emission trend at the category, sector and national total levels. During the review, the Party clarified that it will make structural improvements to the trends and recalculations chapter in future reports. The ERT encourages the Party to report in its next submission the impact of N_2O emission recalculations on the emission trend at the category, sector and national total level.	Not an issue
A.29	3.F Field burning of agricultural residues – CH_4 and N_2O	The ERT noted that the equation in the NIR (p.5-53) applied to calculate carbon or N released from biomass burning is incorrect. During the review, the Party stated that this typographical error in the equation would be corrected in the next inventory report and noted that carbon or N released from biomass burning was calculated using a country-specific approach based on the equation from the Revised 1996 IPCC Guidelines (vol. 3, p.4.82), as the Party clearly described in box 5-6 of the NIR. The Party noted that the calculation was performed according to the correct equation so will not require any recalculations. The ERT recommends that the Party correctly report the equation used to calculate carbon or N released from biomass burning.	Yes. Transparency
A.30	3.H Urea application – CO_2	The Party reported in its NIR (chap. 4.6, pp.4-32–4-35) that CO_2 emissions from the application of urea to agricultural soils were estimated using the Monte Carlo analysis, with an EF uncertainty range of 50 to 100 per cent of emissions and a triangular distribution. During the review, the Party explained that it applied a probabilistic Monte Carlo analysis based on the methods described in the 2006 IPCC Guidelines (vol. 1, chap. 3). It added that the result was based on the posterior distribution of the analysis, with the mode as the estimated highest probability value, and the confidence interval provided by distribution percentiles of 2.5 and 97.5. The ERT noted that the 2006 IPCC Guidelines (vol. 1, chap. 3) provide guidance on how to use the Monte Carlo analysis for combining uncertainties, not for reporting emission estimates. Moreover, the country-specific EFs were not justified in the light of specific national circumstances or well documented in the NIR.	Yes. Accuracy

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue?*[a]
		The ERT recommends that the Party demonstrate that the country-specific EFs are appropriate for its specific national circumstances and are more accurate than the default data provided in the 2006 IPCC Guidelines, or otherwise apply the IPCC default value (0.2 t CO_2-C/t urea) for this category.	
LULUCF			
L.40	4.F Other land – CO_2, CH_4 and N_2O	The Party reported "NA" for all entries in CRF table 4.F (other land) owing to a lack of data. It explained in the NIR (chaps. 6.12–6.13, pp.6-142–6-143) that, while it is conducting research to track carbon pools for other land, it is unable to estimate CO_2, CH_4 and N_2O emissions for other land or land converted to other land. The ERT notes that, according to the UNFCCC Annex I inventory reporting guidelines, categories that are not estimated should be reported as "NE" where emissions or uptake can be expected. During the review, the Party stated that it will report the correct notation key in its next submission. It added that, while it is not currently developing estimates for other lands, it will aim to complete CRF table 4.F with the information available.	Yes. Comparability
		The ERT recommends that the Party report numerical values in CRF table 4.F for managed areas of other land and "NE" for carbon pools for which numerical values cannot be reported, or otherwise develop an assumption for carbon pools being in equilibrium.	
L.41	4.G HWP – CO_2	According to the NIR (p.6-35), the Party reports HWP using the production approach. Data for HWP are reported in CRF table 4.G (a separate issue regarding this reporting is detailed under ID# L.32 in table 3). The ERT noted that the value for carbon stock change in forest land remaining forest land presented in NIR tables 6-1, 6-3, 6-4 and 6-5 (–663.2 Mt CO_2 eq) differs from the value reported in CRF table 4.1 (−565.2 Mt CO_2 eq). In a footnote to NIR tables 6-1 and 6-3 (but not to NIR tables 6-4 and 6-5), the Party explains that this figure also includes the uptake of carbon in HWP. This is contrary to reporting conventions, according to which HWP should be reported under category 4.G (including HWP in solid waste disposal sites) and not under forest land remaining forest land (category 4.A.1). The ERT considers that reporting HWP as a separate concept rather than as a subcategory of forest land is important, as HWP can sometimes fall under other land uses, such as forest converted to grassland, or former perennial horticulture on cropland. The same rationale is behind the recommendation to report the carbon balance of yard trimmings and food scraps under other (category 4.H) rather than as a sub-component of settlements (category 4.E) (see ID# L.28 in table 3).	Yes. Transparency
		The ERT recommends that the Party clearly differentiate between HWP and forest carbon stock changes in the NIR and ensure consistent reporting between the CRF and NIR tables.	
Waste			
W.16	5.C.1 Waste incineration – CO_2	The Party reported in the CRF tables CO_2 emissions from waste incineration (category 5.C) as "IE" and stated in the NIR (pp.3-55 and 7-39) that CO_2 emissions from incineration of plastics, synthetic rubber, synthetic fibres and carbon black in scrap tyres are accounted for under category 1.A.5 (fuel combustion – other) instead of category 5.C (waste incineration). During the review, the Party explained that CO_2 emissions from waste nappies and waste fossil oil are included under the NEU emission estimates. The Party also explained that CO_2 emissions from paper and cardboard waste are not estimated because paper waste was assumed to have 0 per cent fossil carbon content. The default range of fossil carbon fraction in the 2006 IPCC Guidelines is 0–5 per cent, and the default value is 1 per cent (vol. 5, chap. 2, table 2.4, p.2.14). The Party informed the ERT that it applies a country-specific parameter	Yes. Accuracy

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue?*[a]
		of 0 per cent fossil carbon content in paper waste based on the approach from the EPA Reduction Model (WARM). The Party noted that it could refer to the Waste Reduction Model in a future submission. The ERT recommends that the United States provide an explanation for reporting 0 per cent fossil carbon content in paper waste as a country-specific parameter as well as the reference on which the parameter is based.	
W.17	5.C.1 Waste incineration – CH_4 and N_2O	The ERT noted there were approximately 170 sewage sludge incineration plants in operation in the United States in the early 1990s according to the EPA website (https://www.epa.gov/sites/production/files/2020-10/documents/c02s02.pdf) and that CH_4 and N_2O emissions from incineration of sewage sludge may not be reported in the national inventory, as the emissions reported under category 5.C.1 (waste incineration – biogenic – MSW) are reported as "IE". During the review, the Party explained that CH_4 and N_2O emissions from incineration of wastewater treatment plant sludge are likely estimated as emissions from MSW even though wastewater treatment plant sludge is not officially categorized as MSW, or that emissions could be considered insignificant given the increasing regulatory pressure on sludge incineration. However, the ERT cannot be assured that CH_4 and N_2O emissions are accurately estimated in line with the 2006 IPCC Guidelines because AD or emission estimates are not clearly shown in the NIR. It notes that the 2006 IPCC Guidelines (vol. 5, chap. 5, table 5.6) provide a default N_2O EF for sewage sludge of 900 g N_2O/t waste (wet weight) and the default N_2O EF for MSW of 50–60 g N_2O/t waste (wet weight), but could not assess whether these emissions are included in the inventory on the basis of the information provided in the NIR and during the review week. The ERT recommends that the United States estimate CH_4 and N_2O emissions from incineration of sewage sludge at wastewater treatment plants in the country and either include estimates or otherwise provide an explanation in the NIR demonstrating that these emissions are already included in the inventory estimation.	Yes. Completeness

[a] Recommendations made by the ERT during the review are related to issues as defined in para. 81 of the UNFCCC review guidelines.

Annex I

Overview of greenhouse gas emissions and removals as submitted by the United States of America in its 2020 inventory submission

1. Tables I.1–I.3 provide an overview of the total GHG emissions and removals as submitted by the United States. Table I.1 shows total GHG emissions, including and excluding LULUCF and, for Parties that have decided to report indirect CO_2 emissions, with and without indirect CO_2. Tables I.2–I.3 show GHG emissions reported under the Convention by the United States by gas and by sector, respectively.

Table I.1
Total greenhouse gas emissions for the United States of America, 1990–2018
(kt CO_2 eq)

	Total GHG emissions excluding indirect CO_2 emissions		*Total GHG emissions including indirect CO_2 emissions*[a]	
	Total including LULUCF	*Total excluding LULUCF*	*Total including LULUCF*	*Total excluding LULUCF*
1990	5 583 629.72	6 437 000.13	NA	NA
1995	5 957 608.57	6 771 015.64	NA	NA
2000	6 463 810.39	7 275 396.97	NA	NA
2010	6 241 086.07	6 981 613.04	NA	NA
2011	6 027 571.69	6 820 533.47	NA	NA
2012	5 799 209.48	6 580 674.82	NA	NA
2013	5 992 026.49	6 769 551.03	NA	NA
2014	6 106 006.37	6 829 016.66	NA	NA
2015	5 900 827.78	6 676 371.43	NA	NA
2016	5 735 133.84	6 524 080.44	NA	NA
2017	5 724 290.81	6 488 234.64	NA	NA
2018	5 903 153.26	6 676 649.62	NA	NA

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

Table I.2
Greenhouse gas emissions by gas for the United States of America, 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	5 128 300.62	774 409.53	434 624.27	46 289.01	24 255.67	227.38	28 845.73	47.92
1995	5 438 905.70	764 998.07	449 257.54	72 513.85	18 640.47	1 750.82	24 865.94	83.24

	CO_2[a]	CH_4	N_2O	HFCs	PFCs	Unspecified mix of HFCs and PFCs	SF_6	NF_3
2000	5 998 070.43	703 010.92	423 309.70	113 573.21	15 920.48	4 733.79	16 574.30	204.13
2010	5 698 055.78	682 336.33	431 423.77	147 374.33	4 560.87	10 037.46	7 279.48	545.02
2011	5 565 294.40	656 270.45	421 855.67	150 500.07	7 171.62	10 664.65	8 207.69	568.92
2012	5 367 568.56	646 830.14	392 262.99	148 996.59	6 250.03	11 272.03	6 921.75	572.73
2013	5 514 029.29	642 457.54	439 175.24	149 034.04	5 976.09	11 868.78	6 512.43	497.61
2014	5 561 719.22	639 011.11	449 265.17	153 850.35	5 637.04	12 523.04	6 495.25	515.48
2015	5 412 432.19	638 482.83	443 821.30	156 539.44	5 072.60	13 960.65	5 483.48	578.93
2016	5 292 267.56	624 244.79	426 067.40	155 559.61	4 318.82	14 984.93	6 052.51	584.82
2017	5 253 606.13	630 304.47	421 258.93	156 637.03	4 032.73	15 874.20	5 913.45	607.70
2018	5 424 881.50	634 457.13	434 528.56	155 375.64	4 631.32	16 210.62	5 936.18	628.67
Percentage change 1990–2018	**5.8**	**–18.1**	**0.0**	**235.7**	**–80.9**	**7 029.2**	**–79.4**	**1 211.9**

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

Table I.3
Greenhouse gas emissions by sector for the United States of America, 1990–2018
(kt CO_2 eq)

	Energy	IPPU	Agriculture	LULUCF	Waste	Other
1990	5 338 091.04	345 554.23	554 354.51	–853 370.41	199 000.35	NA
1995	5 626 904.26	374 731.71	573 798.36	–813 407.07	195 581.30	NA
2000	6 160 356.26	394 654.93	555 959.97	–811 586.58	164 425.81	NA
2010	5 875 464.25	364 114.26	594 998.26	–740 526.98	147 036.27	NA
2011	5 725 246.29	381 159.09	575 955.53	–792 961.78	138 172.56	NA
2012	5 513 556.36	369 387.35	558 343.92	–781 465.33	139 387.19	NA
2013	5 664 906.05	369 903.35	598 930.25	–777 524.54	135 811.37	NA
2014	5 704 031.22	380 799.46	608 551.85	–723 010.29	135 634.12	NA
2015	5 550 063.88	377 086.58	614 566.93	–775 543.64	134 654.04	NA
2016	5 421 565.49	370 386.03	600 533.37	–788 946.60	131 595.55	NA
2017	5 383 842.27	370 692.29	602 271.28	–763 943.83	131 428.80	NA
2018	5 547 207.94	376 501.56	618 501.74	–773 496.36	134 438.38	NA
Percentage change 1990–2018	**3.9**	**9.0**	**11.6**	**–9.4**	**–32.4**	**NA**

Note: The United States did not report indirect CO_2 emissions in CRF table 6.

Annex II

Additional information to support findings in table 2

Missing categories that may affect completeness

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

(a) 1.A fuel combustion (CH_4 and N_2O emissions from biomass) (see ID# E.7 in table 3);

(b) 1.A.3.b road transportation (CO_2 emissions from the fossil carbon component of biofuels) (see ID# E.13 in table 3);

(c) 2.A.4 other process uses of carbonate (CO_2 emissions for categories 2.A.4.a (ceramics) and 2.A.4.c (non-metallurgical magnesium production)) (see ID# I.3 in table 3);

(d) 2.B.4 caprolactam, glyoxal and glyoxylic acid production (N_2O emissions from glyoxal and glyoxylic acid production) (see ID# I.8 in table 3);

(e) 2.B.8 petrochemical and carbon black production (CH_4 and N_2O emissions from combustion and flaring) (see ID# I.11 in table 3);

(f) 2.G.2 SF_6 and PFCs from other product use (SF_6 emissions from airborne warning and control systems, particle accelerators and radars) (see ID# I.23 in table 3);

(g) 3 general (agriculture) (CH_4 and N_2O emissions for the States of Alaska and Hawaii) (see ID# A.1 in table 3);

(h) 3.D direct and indirect N_2O emissions from agricultural soils for the States of Alaska and Hawaii (see ID# A.18 in table 3);

(i) 4 general (LULUCF) (carbon stock changes in the living biomass and DOM pools for categories 4.D.2.2.1 (forest land converted to flooded land) and 4.F.2.1 (forest land converted to other land) (see ID# L.1 in table 3);

(j) 4 general (LULUCF) (CO_2, CH_4 and N_2O emissions from the LULUCF sector for some land uses in United States territories, Hawaii and a large portion Alaska) (see ID# L.2 in table 3);

(k) 4.B cropland (carbon stock changes in living biomass in perennial crops for all years) (see ID# L.15 in table 3);

(l) 4.B.2.2 grassland converted to cropland (carbon stock changes in biomass) (see ID# L.17 in table 3);

(m) 4.C.2.2 cropland converted to grassland (carbon stock changes in biomass) (see ID# L.22 in table 3);

(n) 4.D.2.2 land converted to flooded land (carbon stock changes in biomass) (see ID# L.24 in table 3);

(o) 4.D.2.3 land (forest land) converted to wetlands (carbon stock changes in biomass) (see ID# L.25 in table 3);

(p) 4.D.2.3 land (cropland and grassland) converted to wetlands (carbon stock changes in biomass) (see ID# L.26 in table 3);

(q) 4.E.2.2 cropland converted to settlements and 4.E.2.3 grassland converted to settlements (carbon stock changes) (see ID# L.30 in table 3);

(r) 4.F.2 land converted to other land (carbon stock changes) (see ID# L.31 in table 3);

(s) 4.G HWP (CO_2) (see ID# L.32 in table 3);

(t) 4(III) direct N_2O emissions from N mineralization/immobilization (N_2O emissions associated with the mineralization of the N content of SOC losses in mineral soils for forest land, wetlands, settlements and other land, as well as for their conversion to and from cropland and grassland) (see ID# L.37 in table 3);

(u) 4(IV) indirect N_2O emissions from managed soils (indirect N_2O emissions associated with the mineralization of the N content of SOC losses in mineral soils for forest land, wetlands, settlements and other land) (see ID# L.38 in table 3);

(v) 4(V) biomass burning (CH_4 and N_2O emissions from biomass burning for land converted to forest land and land converted to wetlands, cropland, grassland and settlements) (see ID# L.39 in table 3);

(w) 5.C.1 waste incineration (CH_4 and N_2O emissions from sewage sludge) (see ID# W.17 in table 5);

(x) 5.D.2 industrial wastewater (CH_4 emissions from sludge) (see ID# W.15 in table 3).

Annex III

Reference documents

A. Reports of the Intergovernmental Panel on Climate Change

IPCC. *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*. Edited by J. L. Houghton, L. G. Meira Filho, B. Lim, K. Treanton, I. Mamaty, Y. Bonduki, D. J. Griggs, and B. A. Callander. Paris: IPCC/Organisation for Economic Co-operation and Development/International Energy Agency, 1997. https://www.ipcc-nggip.iges.or.jp/public/gl/invs1.html.

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

IPCC. 2014. *2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands*. T Hiraishi, T Krug, K Tanabe, et al. (eds.). Geneva: IPCC. Available at 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, et al. (eds.). Geneva: IPCC. Available at https://www.ipcc.ch/report/2019-refinement-to-the-2006-ipcc-guidelines-for-national-greenhouse-gas-inventories/.

B. UNFCCC documents

Annual review reports

Reports on the individual reviews of the 2012, 2013, 2015, 2016, 2018 and 2019 inventory submissions of the United States, contained in documents FCCC/ARR/2012/USA, FCCC/ARR/2013/USA, FCCC/ARR/2015/USA, FCCC/ARR/2016/USA, FCCC/ARR/2018/USA and FCCC/ARR/2019/USA, 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 the United States for 2020. Available at https://unfccc.int/sites/default/files/resource/asr2020_USA.pdf.

C. Other documents used during the review

Responses to questions during the review were received from Mausami Desai (EPA), including additional material on the methodology and assumptions used. The following references have been reproduced as received:

AISI (2004 through 2018) Annual Statistical Report, American Iron and Steel Institute, Washington, D.C.

Argonne National Laboratory. 2018. The Greenhouse Gases, Regulated Emissions, and Energy Use in Transportation Model (GREET 2018). Argonne National Laboratory. October 2017. Available at https://greet.es.anl.gov.

EPA. April 2020. Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990-2018: Updates to Natural Gas Gathering & Boosting Station Emissions. Available at https://www.epa.gov/sites/production/files/2020-04/documents/2020_ghgi_update_-_gb_stations_final.pdf.

EPA. September 2004. The U.S. Solvent Cleaning Industry and the Transition to Non Ozone Depleting Substances. Available at https://www.epa.gov/sites/production/files/2014-11/documents/epasolventmarketreport.pdf.

EPA. 2020. Summary of Expert Review Comments and Responses: Draft Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2018. Available at https://www.epa.gov/sites/production/files/2020-05/documents/2020_expert_review_comment_response.pdf.

Marland, G., R.M. Rotty. 1984. Carbon dioxide emissions from fossil fuels: A procedure for estimation and results for 1950-1982. Tellus 36b:232-261.

Smith, J.E. et al. 2006. Methods for calculating forest ecosystem and harvested carbon with standard estimates for forest types of the United States. Gen. Tech. Rep. NE-343. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northeastern Research Station. 216 p.

Zimmerle, et al. 2019. "Characterization of Methane Emissions from Gathering Compressor Stations." Available at https://www.osti.gov/servlets/purl/1506681.

World Steel Association. *CO_2 EMISSIONS DATA COLLECTION. User Guide, Version 7.* Available at https://www.worldsteel.org/en/dam/jcr:0e4a13c7-1cf7-4b9b-9577-17b752441249/Data+collection+user+guide.pdf.