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Report on the individual review of the annual submission of Japan submitted in 2022*

Note by the expert review team

Summary

Each Party included in Annex I to the Convention must submit an annual inventory of emissions and removals of greenhouse gases for all years from the base year (or period) to two years before the inventory due date (decision 24/CP.19). Parties included in Annex I to the Convention that are Parties to the Kyoto Protocol are also required to report supplementary information under Article 7, paragraph 1, of the Kyoto Protocol with the inventory submission due under the Convention. This report presents the results of the individual review of the 2022 annual submission of Japan, conducted by an expert review team in accordance with the "Guidelines for review under Article 8 of the Kyoto Protocol". The review took place from 29 August to 3 September 2022 in Tokyo, Japan.

* In the symbol for this document, 2022 refers to the year in which the inventory was submitted, not to the year of publication.

Contents

Abbreviations and acronyms

2006 IPCC Guidelines	*2006 IPCC Guidelines for National Greenhouse Gas Inventories*
2019 Refinement to the 2006 IPCC Guidelines	*2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories*
AAU	assigned amount unit
AD	activity data
Annex I Party	Party included in Annex I to the Convention
AR	afforestation and reforestation
Article 8 review guidelines	"Guidelines for review under Article 8 of the Kyoto Protocol"
BEF	biomass expansion factor
BOD	biochemical oxygen demand
CER	certified emission reduction
CH_4	methane
CM	cropland management
CO_2	carbon dioxide
CO_2 eq	carbon dioxide equivalent
COD	chemical oxygen demand
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"
CPR	commitment period reserve
CRF	common reporting format
CSC	carbon stock change
DE	digestible energy
d.m.	dry matter
EF	emission factor
ERT	expert review team
ERU	emission reduction unit
FM	forest management
FMRL	forest management reference level
FOD	first-order decay
$Frac_{GASM}$	fraction of applied organic nitrogen fertilizer materials and of urine and dung nitrogen deposited by grazing animals that volatilizes as ammonia and nitrogen oxides
$Frac_{LEACH}$	fraction of nitrogen input to managed soils that is lost through leaching and run-off
GCV	gross calorific value
GE	gross energy intake
GHG	greenhouse gas
GM	grazing land management
HFC	hydrofluorocarbon
HWP	harvested wood products
IE	included elsewhere
IEF	implied emission factor
IPCC	Intergovernmental Panel on Climate Change
IPPU	industrial processes and product use
KP-LULUCF	activities under Article 3, paragraphs 3–4, of the Kyoto Protocol
KP reporting adherence	adherence to the reporting guidelines under Article 7, paragraph 1, of the Kyoto Protocol

LULUCF	land use, land-use change and forestry
MMS	manure management system(s)
MSW	municipal solid waste
N	nitrogen
N_2O	nitrous oxide
NA	not applicable
NCV	net calorific value
NE	not estimated
Nex	nitrogen excretion
NF_3	nitrogen trifluoride
NIR	national inventory report
NO	not occurring
PFC	perfluorocarbon
QA/QC	quality assurance/quality control
Revised 1996 IPCC Guidelines	*Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*
RMU	removal unit
RothC	Rothamsted carbon (model)
RV	revegetation
SEF	standard electronic format
SF_6	sulfur hexafluoride
SIAR	standard independent assessment report
TDN	total digestible nutrients
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"
US EPA	United States Environmental Protection Agency
WDR	wetland drainage and rewetting
Wetlands Supplement	*2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands*

I. Introduction

1. This report covers the review of the 2022 annual submission of Japan, organized by the secretariat in accordance with the Article 8 review guidelines (adopted by decision 22/CMP.1 and revised by decision 4/CMP.11). In accordance with the Article 8 review guidelines, this review process also encompasses the review under the Convention as described in the UNFCCC review guidelines, particularly in part III thereof, namely the "UNFCCC guidelines for the technical review of greenhouse gas inventories from Parties included in Annex I to the Convention" (annex to decision 13/CP.20). The review took place from 29 August to 3 September 2022 in Tokyo, Japan, and was coordinated by Nashib Kafle and Roman Payo (secretariat). Table 1 provides information on the composition of the ERT that conducted the review for Japan.

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

Area of expertise	*Name*	*Party*
Generalist	Mausami Desai	United States
Energy	Brooke Perkins	Australia
IPPU	Kendal Blanco-Salas	Costa Rica
Agriculture	Andrea Pickering	New Zealand
LULUCF and KP-LULUCF	Valentyna Slivinska	Ukraine
Waste	Excellent Hachileka	Zambia
Lead reviewers	Kendal Blanco-Salas	
	Mausami Desai	

2. The basis of the findings in this report is the assessment by the ERT of the Party's 2022 annual submission in accordance with the UNFCCC review guidelines and the Article 8 review guidelines.

3. The ERT has made recommendations that Japan resolve identified findings, including issues[1] designated as problems.[2] Other findings, and, if applicable, the encouragements of the ERT to Japan to resolve related issues, are also included in this report. The assessment by the ERT takes into account that Japan does not have a quantified emission limitation or reduction commitment for the second commitment period of the Kyoto Protocol inscribed in the third column of Annex B in the Doha Amendment.

4. A draft version of this report was communicated to the Government of Japan, 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 Japan, including totals excluding and including LULUCF, indirect CO_2 emissions, and emissions by gas and by sector, and contains background data on emissions and removals from KP-LULUCF, if elected by the Party, by gas, sector and activity.

II. Summary and general assessment of the Party's 2022 annual submission

6. Table 2 provides the assessment by the ERT of the Party's 2022 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.

[1] Issues are defined in decision 13/CP.20, annex, para. 81.
[2] Problems are defined in decision 22/CMP.1, annex, paras. 68–69, as revised by decision 4/CMP.11.

Table 2
Summary of review results and general assessment of the 2022 annual submission of Japan

Assessment			*Issue/problem ID#(s) in table 3 or 5*[a]
Date of submission	Original submission: NIR, 15 April 2022; CRF tables (version 1), 15 April 2022; SEF tables, 15 April 2022		
Review format	In country		
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	I.14, L.16
	(c) Development and selection of EFs?	Yes	I.4
	(d) Collection and selection of AD?	Yes	E.5, A.8, L.15, L.17,
	(e) Reporting of recalculations?	Yes	E.4, E.6, E.7, L.14, **Error! Reference source not found.**, W.5
	(f) Reporting of a consistent time series?	No	
	(g) Reporting of uncertainties, including methodologies?	Yes	A.9
	(h) QA/QC?	QA/QC procedures were assessed in the context of the national system (see supplementary information under the Kyoto Protocol below)	
	(i) Missing categories, or completeness?[b]	No	
	(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.3, E.11
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	E.6, I.13, A.7, L.8, L.9
Supplementary information under the Kyoto Protocol	Have any issues been identified related to the following aspects of the national system:		
	(a) Overall organization of the national system, including the effectiveness and reliability of the institutional, procedural and legal arrangements?	No	
	(b) Performance of the national system functions?	No	
	Have any issues been identified related to the national registry:		
	(a) Overall functioning of the national registry?	NA	
	(b) Performance of the functions of the national registry and the adherence to technical standards for data exchange?	NA	
	Have any issues been identified related to the reporting of information on AAUs, CERs, ERUs and RMUs and on discrepancies in accordance with decision 15/CMP.1, annex, chapter I.E, in conjunction with decision 3/CMP.11, taking into consideration any findings or recommendations contained in the SIAR?	NA	
	Have any issues been identified in matters related to Article 3, paragraph 14, of the Kyoto Protocol, specifically problems related to the transparency, completeness or timeliness of the reporting on the Party's activities related to the priority actions listed in decision 15/CMP.1, annex,	No	

Assessment			*Issue/problem ID#(s) in table 3 or 5[a]*
	paragraph 24, in conjunction with decision 3/CMP.11, including any changes since the previous annual submission?		
	Have any issues been identified related to the following reporting requirements for KP-LULUCF:		
	(a) Reporting requirements of decision 2/CMP.8, annex II, paragraphs 1–5?	No	
	(b) Demonstration of methodological consistency between the reference level and reporting on FM in accordance with decision 2/CMP.7, annex, paragraph 14?	Yes	KL.1
	(c) Reporting requirements of decision 6/CMP.9?	No	
	(d) Country-specific information to support provisions for natural disturbances in accordance with decision 2/CMP.7, annex, paragraphs 33–34?	NA	
CPR	Was the CPR reported in accordance with decision 18/CP.7, annex; decision 11/CMP.1, annex; and decision 1/CMP.8, paragraph 18?	NA	
Adjustments	Has the ERT applied any adjustments under Article 5, paragraph 2, of the Kyoto Protocol?	NA	
	Has the Party submitted a revised estimate to replace a previously applied adjustment?	NA	Japan does not have a previously applied adjustment as it does not have a quantified emission limitation or reduction commitment for the second commitment period of the Kyoto Protocol
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	
Questions of implementation	Did the ERT list any questions of implementation?	No	

[a] Further information on the issues identified, as well as additional findings, may be found in tables 3 and 5.
[b] Missing categories for which methods are provided in the 2006 IPCC Guidelines may affect completeness and are listed in annex III.

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

7. Table 3 compiles the recommendations from previous review reports that were included in the most recent previous review report, published on 17 March 2021,[3] and had not been resolved by the time of publication of the report on the review of the Party's 2020 annual submission. The ERT has specified whether it believes the Party had resolved, was addressing or had not resolved each issue or problem by the time of publication of this review report and has provided the rationale for its determination, which takes into consideration the publication date of the most recent previous review report and national circumstances.

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

ID#	*Issue/problem classification*[a, b]	*Recommendation from previous review report*	*ERT assessment and rationale*
General			
G.1	QA/QC and verification (G.1, 2020) (G.2, 2018) Convention reporting adherence	Ensure that documentation is available during the review to justify the country-specific EFs, including descriptions of the used methodologies, measurements and interpretation of results, to ensure the transparency and accuracy of the inventory.	Resolved. The Party reported in its NIR (pp.3-79, 3-120, 4-34, 4-58 and 4-59) information to justify the suitability of the country-specific EFs (see also ID#s E.3, I.5 and I.9 below). Although the Party is yet to provide such information for category 2.B.8 in the NIR, sufficient documentation was made available to the ERT during the review (see ID# I.4 below).
Energy			
E.1	Fuel combustion – reference approach – all fuels – CO_2 (E.1, 2020) (E.1, 2018) (E.1, 2016) (25, 2014) Transparency	Include in the NIR detailed information on the conversion factors used to convert GCV to NCV for all fuels.	Addressing. The Party expanded the list of GCV to NCV conversion factors in NIR table A4-26. The ERT noted that Orimulsion and coal tar are included as minor imports in CRF table 1.A(b), however, they are listed in NIR table A4-26 without conversion factors. During the review, the Party clarified that the NCVs for Orimulsion and coal tar were not measured when the country-specific EFs were developed as the consumption of these fuels is low. Therefore, GCV to NCV ratios for Orimulsion and coal tar were not reported and the default factor of 0.95 from the 2006 IPCC Guidelines (vol. 2, chap. 6, p.6.7) for coal and oil was used. The ERT considers that the recommendation has not yet been fully addressed because the Party has not yet provided in the NIR conversion factors for all fuels. The ERT considers that including the IPCC default factor of 0.95 for Orimulsion and coal tar in NIR table A4-26 would resolve this issue.
E.2	1.A.1.b Petroleum refining – liquid fuels – CO_2	Include in the NIR the explanation provided during the review regarding the revision of the GCVs and regarding the use of crude oil for refinery.	Addressing. The Party reported in its NIR (p.3-15) detailed information on the decrease in the CH_4 EF for residual and straight-run fuel oil for refinery use under category 1.A.1.b.

[3] FCCC/ARR/2020/JPN. The ERT notes that the report on the review of Japan's 2021 annual submission has not been published yet owing to insufficient funding for the review process. As a result, the latest previously published annual review report reflects the findings of the review of the Party's 2020 annual submission.

ID#	*Issue/problem classification*[a, b]	*Recommendation from previous review report*	*ERT assessment and rationale*
	(E.8, 2020) Transparency		During the review, the Party clarified that the 2013 survey referenced as the source of the GCV revisions was conducted by the Ministry of Economy, Trade and Industry and the Ministry of the Environment, and that an outline of the survey is provided on NIR page 3-21. The ERT considers that the recommendation has not yet been fully addressed because the source of the revisions to GCVs reported by the Party in the NIR (i.e. "the 2013 survey") is not clear. The ERT considers that including the information provided during the review, namely, which ministries conducted the survey and that the survey outline is available in the NIR, would resolve this issue.
E.3	1.B.1.a Coal mining and handling – CH_4 (E.6, 2020) (E.13, 2018) Transparency	Describe in the NIR verification information consistent with the 2006 IPCC Guidelines (vol. 2, chaps. 4.1.7.1–4.1.7.2) and ensure that documentation is available during the review to justify the decrease in the CH_4 EF for category 1.B.1.a.i.	Resolved. The Party reported in its NIR (pp.3-79 and 3-120) references to the two studies provided to the ERT during the 2020 review (Matsumoto (2006) and Matsumoto et al. (2018)). These studies provide information on the decline in the CH_4 EF since 2005 for category 1.B.1.a.i (underground mines). These studies also provide evidence that coal is now mined in shallower areas, resulting in lower emissions from 2005 onward and thus verifying the Party's use of a lower CH_4 EF for more recent years.
IPPU			
I.1	2. General (IPPU) – CO_2, CH_4 and N_2O (I.1, 2020) (I.1, 2018) (I.6, 2016) Comparability	Reallocate emissions from the consumption of reducing agents for the production of soda ash, iron and steel, ferroalloys, lead and zinc to categories 2.B.7, 2.C.1, 2.C.2, 2.C.5 and 2.C.6 respectively, in line with the UNFCCC Annex I inventory reporting guidelines and the 2006 IPCC Guidelines.	Resolved. The Party clearly indicated in its NIR (pp.4-51–4-52) that all the emissions from the consumption of reducing agents used as AD for categories 2.C.1 (iron and steel production), 2.C.2 (ferroalloys production), 2.C.5 (lead production) and 2.C.6 (zinc production) are accounted for and reported under categories 1.A (fuel combustion) and 1.A.2 (manufacturing industries and construction) of the energy sector and are reported as "IE" under the IPPU sector. For category 2.B.7 (soda ash production), the Party indicated in the NIR (p.4-31) that the thinking on where to account for CO_2 emissions from coke is the same as that for 2.C.1 (iron and steel production). The Party noted in the NIR that it is difficult for it to differentiate and between energy use and reducing agents use completely and allocate emissions accordingly, but, taking into consideration the conclusions and recommendations from the 17th meeting of GHG inventory lead reviewers (para. 8(b) (available at https://unfccc.int/sites/default/files/resource/conclusions-GHG_LRs-2020.pdf)), the Party confirmed that all emissions from reducing agent consumption have been allocated without double counting or omission.
I.2	2.A.2 Lime production – CO_2 (I.24, 2020) Transparency	Include in the NIR the reference calculation provided during the 2020 review: 0.428 (t CO_2/t material)/(1 – 0.428) (t lime/t material) = 0.748 (t CO_2/t lime).	Resolved. The Party reported in its NIR (p.4-7) the reference calculation 0.428 (t CO_2/t material)/(1 – 0.428) (t lime/t material) = 0.748 (t CO_2/t lime).

ID#	*Issue/problem classification*[a, b]	*Recommendation from previous review report*	*ERT assessment and rationale*
I.3	2.B.4 Caprolactam, glyoxal and glyoxylic acid production – N_2O (I.25, 2020) Transparency	Include in the NIR the explanation provided during the 2020 review for the use of "C" for reporting category 2.B.4.b (glyoxal).	Resolved. The Party provided in its NIR (p.4-24) an explanation for its use of the notation key "C" for reporting category 2.B.4.b (glyoxal). Japan stated that no glyoxal production occurred in the country from 2010 onward, but emissions for 1990 to 2011 are reported as "C" to ensure confidentiality of reporting under category 2.B.4.c (glyoxylic acid) for 2010 and 2011.
I.4	2.B.8 Petrochemical and carbon black production – CO_2 (I.7, 2020) (I.8, 2018) (I.12, 2016) Transparency	Justify that the country-specific CO_2 EF has been developed in a manner consistent with the 2006 IPCC Guidelines, covers the total CO_2 emissions from the steam cracking process and is considered to be more accurate than the IPCC default EF; or recalculate the CO_2 emissions from ethylene production by applying the default EF provided in the 2006 IPCC Guidelines (vol. 3, chap. 3.9.2.2).	Addressing. The Party did not provide information in the NIR (section 2.B.8.b) that justifies the use of the country-specific CO_2 EF for this category. During the review, the Party clarified that CO_2 emissions from the energy use of industrial process off gases obtained from the feedstocks in ethylene production (steam cracking process) in Japan are included with emissions from refinery gas under petrochemical – energy use in the General Energy Statistics. These emissions are already accounted for in the inventory under category 1.A.2.c (chemicals) in accordance with the 2006 IPCC Guidelines (vol. 3, chap. 3, section 3.9.1). Also, the Party explained that the Japan Petrochemical Industry Association gathered data on the measured CO_2 emissions and ethylene production amounts from all ethylene manufacturers. The country-specific CO_2 EF for ethylene production was established on the basis of those data. Japan confirmed, as part of its inventory data compilation, the coverage of this country-specific EF with the Japan Petrochemical Industry Association. According to information from the Association, the emission processes investigated for establishing the country-specific EF include decoking; therefore, processes that emit CO_2 from non-energy use are also covered in this survey and these emissions are accounted for under category 2.B.8.b (ethylene) in accordance with the 2006 IPCC Guidelines (vol. 3, chap. 3.9.1). The Party considers that there is a substantive difference between the IPCC default EF, which includes CO_2 emissions from the energy use of by-product gases obtained from feedstocks, and the country-specific EF, which does not. Japan confirmed that the scale of and trend in CO_2 emissions accounted for under category 1.A.2.c are roughly consistent with those of estimations obtained using the IPCC default value. The ERT considers that the recommendation has not yet been fully addressed but that including in the NIR the above-mentioned explanation provided during the review justifying the use of the country-specific CO_2 EF would resolve the issue.
I.5	2.B.8 Petrochemical and carbon black production – CH_4 (I.9, 2020) (I.26, 2018) Transparency	Describe in the NIR how fugitive emissions from the steam cracking of naphtha from flanges, valves and other process equipment are considered in the calculation of the country-specific CH_4 EF or recalculate emissions by considering these sources (fugitive emissions from the steam cracking of naphtha from flanges, valves and other process equipment) in the country-specific CH_4 EF.	Resolved. The Party clarified in its NIR (section 4.3.8.2, p.4-34) that according to the Japan Petrochemical Industry Association, fugitive emissions in plants are controlled under the High Pressure Gas Safety Act and are thus below detectable levels (nearly zero). It is considered that there are almost no fugitive CH_4 emissions from flanges, valves and other process equipment used in the steam cracking of naphtha.

ID#	*Issue/problem classification*[a, b]	*Recommendation from previous review report*	*ERT assessment and rationale*
I.6	2.C.1 Iron and steel production – CO_2 (I.12, 2020) (I.29, 2018) Transparency	Include in the NIR a description (or table) indicating all reducing agents used in iron and steel production and cross references to the NIR sections where information about the reducing agents can be found.	Resolved. Japan included in the NIR (section 4.4.1, p.4-52) a description of all the reducing agents used in iron and steel production and cross references to NIR tables 3-10 and 3-61 under the energy sector.
I.7	2.C.2 Ferroalloys production – CO_2 and CH_4 (I.26, 2020) Accuracy	Apply the methodology from the 2006 IPCC Guidelines in order to enhance the comparability of reporting on ferroalloys production, or justify in the NIR that the country-specific methodology used better reflects the national situation and is both compatible with the 2006 IPCC Guidelines and scientifically based (see FCCC/ARR/2020/JPN, ID#s I.14–I.15).	Resolved. The Party justified the use of the country-specific methodology in its NIR (section 4.4.2, pp.4-58–4-59). The country-specific EF was established using measured CH_4 concentration, measured dry gas emissions per hour, calories per hour and calories per unit of electricity and therefore needs to be expressed in units of electricity (TJ). In addition, electricity consumption is determined by the operation of furnaces and the type of ferroalloy produced; therefore, Japan has used electricity consumption, not production, as more accurate, and more readily available, AD. The country-specific EF reflects the average operation of furnaces and type of ferroalloy at the time of measurement in Japan. To ensure the scientific basis of the EF, the above-mentioned parameters were established using measurements that were conducted in line with the 2006 IPCC Guidelines, for example by making an effort to cover a representative sample.
I.8	2.C.2 Ferroalloys production – CO_2 (I.14, 2020) (I.31, 2018) Accuracy	Estimate CO_2 emissions related to the other carbon-containing materials (such as ore and slag forming).	Resolved. The Party reported in its NIR (section 4.4.2, p.4-58) that public sources of information on ferroalloys production, such as the Mineral Resources Material Flow (Japan Oil, Gas and Metals National Corporation), do not provide data on distribution amounts that can be used for emission estimation, and therefore these emissions are not estimated. The Party also reported in the NIR (section 4.4.2, p.4-58) that the primary raw materials for ferroalloys in Japan (currently imported manganese ores, nickel ores and chromium ores) are rarely imported as carbonate ores. Most of the manganese ore distributed in Japan is high-grade manganese oxide ore, and low-grade manganese carbonates are rarely distributed.
I.9	2.C.2 Ferroalloys production – CH_4 (I.15, 2020) (I.32, 2018) Transparency	Provide a more detailed explanation of how CH_4 emissions and the country-specific CH_4 EF are calculated and explain the reasons for not producing a country-specific EF on the basis of t CH_4/t ferroalloy produced (as in CRF table 2(I).A-Hs2 and in the 2006 IPCC Guidelines), considering that the quantity of CH_4 emissions from ferroalloys depends on the operation of furnaces and the type of ferroalloy produced and is based on the amount of coke consumed in the furnaces. If the Party measures the CH_4 emissions directly, provide information in the NIR in accordance with the 2006 IPCC Guidelines (vol. 1, chap. 2.2.2, p.2.8, and chap. 6.7.1, pp.6.12–6.14).	Resolved. The Party reported in its NIR (section 4.4.2, pp.4-58–4-59) on how the country-specific EF was established (see ID# I.7 above) and provided the equation used to calculate it.

ID#	*Issue/problem classification*[a, b]	*Recommendation from previous review report*	*ERT assessment and rationale*
I.10	2.F Product uses as substitutes for ozone-depleting substances – PFCs (I.19, 2020) (I.34, 2018) Transparency	Provide documentation in the NIR to support the claim that PFC emissions from the manufacturing, stocks and disposal of commercial refrigeration are not occurring at any time during the time series. If this is not possible, make efforts to collect data on PFCs imported in products under commercial refrigeration and report the emissions in CRF table 2(II)B-Hs2.	Resolved. The Party reported in its NIR (section 4.7.1.2.a, p.4-76) that the Japan Refrigeration and Air Conditioning Industry Association was consulted on this matter and confirmed with its member companies that no use of PFCs was found in imported commercial refrigeration equipment for all the years of the time series.
I.11	2.F.1 Refrigeration and air conditioning – HFCs (I.27, 2020) Transparency	Include in the NIR the explanation for the outlying inter-annual fluctuations provided during the 2020 review for the fluctuation in the IEF (disposal loss factor) for HFC-125 for 2009–2010 and 2014–2015.	Resolved. The Party clarified in its NIR (section 4.7.1.5.b, p.4-83) that the IEF (disposal loss factor) for HFC-125 is affected by the change in amounts of HFCs collected at disposal and was therefore observed to fluctuate between 2009 and 2010 (decrease of 9.9 per cent) and between 2014 and 2015 (increase of 5.6 per cent).
I.12	2.G.1 Electrical equipment – SF_6 (I.28, 2020) Convention reporting adherence	Correct the AD in CRF table 2(II)B-Hs2 for category 2.G.1 (electrical equipment) and enhance the QA/QC procedure for checking these data.	Resolved. The Party corrected the AD in CRF table 2(II)B-Hs2 for category 2.G.1 and included in the NIR (section 1.2.3.1, pp.1-7–1-9) information on the QA/QC procedures performed.
Agriculture			
A.1	3.B.3 Swine – N_2O (A.5, 2020) Transparency	Explain in the NIR why the Nex rates for swine have declined since 1990.	Resolved. The Party reported in its NIR (p.5-11) that Nex rates for swine have declined since 1990 owing to the amount of crude protein in feed decreasing as a result of the decreasing proportion of soybean meal in feed each year. A description, including references, of how Nex rates are estimated for swine is also reported in the NIR (p.5-18).
A.2	3.C Rice cultivation – CH_4 (A.1, 2020) (A.4, 2018) Transparency	Include in the NIR verification information in line with the 2006 IPCC Guidelines (in accordance with para. 41 of the UNFCCC Annex I inventory reporting guidelines), including a comparison of new and previous estimates with a discussion of the results to explain why the new data for rice cultivation are more accurate and suitable for inclusion in the national inventory.	Resolved. The ERT noted that the recommendation refers to changes made between the 2016 and 2017 submissions. The ERT also noted that Japan has made other changes since then, including, as explained during the review, that a new data source, the Statistics on Farm Management, was used for the 2021 submission. This data source has more sampling data of the whole time series with higher transparency than the survey results of the original sources (Basis Survey of Soil Environment (1990) by the Ministry of Agriculture, Forestry and Fisheries and Survey of Greenhouse Gas Emissions from Soils and Soil Carbon Sequestration (2013) (conducted from 2008 to 2012) by the Research Council on Soil Function for Global Warming Countermeasures). The ERT further noted that Japan explained in its 2021 NIR figure 5-7 (p.5-43) the impact of the recalculation made between the 2020 and 2021 submissions regarding the amount of organic matter applied in rice cultivation. The ERT considers the description of the current estimation methodology included in the 2022 NIR (section 5.4) adequate and notes that the Party is using for its estimations of CH_4

ID#	Issue/problem classification[a, b]	Recommendation from previous review report	ERT assessment and rationale
			emissions from rice cultivation a country-specific EF (developed using the DNDC-Rice model (the 'DeNitrification-DeComposition' model applied to rice)) with a tier 2 method that has been modified to better fit the national circumstances of Japan. The ERT concludes that the current estimation methodology, including detailed AD, a country-specific EF and an adapted tier 2 method, is appropriate and more accurate than the default methodology and that the several improvements (i.e. recalculations) made since 2017 make verification of the different methods applied in the 2016 and 2017 submissions irrelevant in 2022.
A.3	3.D.a Direct N_2O emissions from managed soils– N_2O (A.2, 2020) (A.5, 2018) Transparency	Include information in the NIR on the reasons behind the decreasing trend in the total N for fertilizers (organic and inorganic) under categories 3.D.a.1 and 3.D.a.2.	Resolved. The Party reported total area by crop type in NIR table 5-56 (p.5-49) for planted area and cross-referenced these values with an explanation for the decreasing trend in total N for fertilizers (inorganic (category 3.D.a.1) and organic (category 3.D.a.2)), namely, a decreasing area of crops.
A.4	3.D.a.1 Inorganic N fertilizers – N_2O (A.6, 2020) Transparency	Provide more clarity on the use of nitrification inhibitors, while maintaining appropriate data confidentiality, either by providing rounded annual figures or by clarifying in the NIR that the use of nitrification inhibitors started in 1996 (e.g. stating in the NIR "the use of synthetic fertilizer with nitrification inhibitor in Japan started in 1996").	Addressing. The Party reported in NIR table 5-53 (p.5-48) the amount of synthetic fertilizer with nitrification inhibitor and noted that "shipping amount of synthetic fertilizer with nitrification inhibitor which is included in 'N amount of synthetic N fertilizer applied (agricultural soil)' is from surveyed data by Statistics on Farm Management since 1996". The Party reported "NE" for N amount in synthetic fertilizer with nitrification inhibitor for 1990 and 1995 in NIR table 5-53 but it is unclear whether the survey started in 1996 or if nitrification inhibitors began to be used from 1996. During the review, the Party clarified that the survey started in 1996. The Party explained that it assumes little nitrification inhibitor was used prior to 1996 but it does not have any evidence of this as no data are available. The ERT considers that the recommendation has not yet been fully addressed because the Party has not yet included in the NIR a transparent clarification of the use of nitrification inhibitors. The ERT considers that including in the annual submission (1) the information provided during the review, that is, that the survey of relevant data started in 1996, and (2) an estimate based on expert judgment of nitrification inhibitor use prior to 1996 would resolve this issue.
A.5	3.D.a.6 Cultivation of organic soils (i.e. histosols) – N_2O (A.7, 2020) Transparency	Provide further details on the area included under cultivated organic soils, clarifying that organic soils from the land-use categories grazed meadow and pastureland are not considered in this category (3.D.a.6) and providing evidence that these areas are undrained or uncultivated.	Resolved. The Party reported in its NIR (p.5-61) that ploughed area of organic soils includes all areas of organic soils for rice field and upland field and renewed pastureland, while organic soils for orchard, grazed meadow and wild land are not included. The Party explained in the NIR (section 6.7.1) that orchard, grazed meadow and wild land are not ploughed.

ID#	*Issue/problem classification*[a, b]	*Recommendation from previous review report*	*ERT assessment and rationale*
LULUCF			
L.1	4. General (LULUCF) – CO_2 (L.11, 2020) Transparency	Include in the NIR the information that CO_2 emissions do not occur from organic soils that are currently not included in the estimates, noting equation 2.26 from the 2006 IPCC Guidelines (vol. 4, chap. 2), which applies to drained organic soils, in particular the required AD.	Addressing. The Party reported the following information: (a) Forest land remaining forest land: CO_2 emissions from organic soils for semi-natural forests (a subdivision of forest land remaining forest land) were reported as "NO" in CRF table 4.A; however, the Party reported an area of organic soils for semi-natural forest in this table (e.g. 66.74 kha for 2020). CO_2 emissions from organic soils for forest land remaining forest land were reported as "NO" in NIR table 6-14. The Party reported in its NIR (p.6-16) that forest land on organic soils is not drained in Japan on the basis of discussion with experts and regulations regarding land practices in protected areas where some organic soils exist. However, the Party did not specify whether semi-natural forest is considered a protected area; (b) Cropland remaining cropland: CO_2 emissions from organic soils in orchards were reported as "NO" in the NIR (p.6-30) owing to the absence of drainage activity on such land because of the management practices applied thereon, namely clean cultivation or sod culture, both of which do not involve drainage. The Party did not provide evidence for the absence of drainage; (c) Grassland remaining grassland: CRF table 4.C includes areas of organic soils for wild land, grazed meadow and pastureland. However, CO_2 emissions from organic soils are estimated only for pastureland (emissions for wild land are reported as "NA" and for grazed meadow as "NO"). The NIR (p.6-43) indicates that drainage resulting from renewal of grazed meadows is not implemented. The Party did not provide evidence for the absence of drainage. During the review, the Party clarified that all the decisions for these categories related to organic soils (forest land, cropland and grassland) were made by experts on the Committee for Greenhouse Gas Emission Estimation Methods. This information will be included in future NIRs. The ERT considers that the recommendation has not yet been fully addressed because the Party has not yet included in the NIR information that clarifies by whom and how the assumption was formed that no drainage activities occur on organic soils for forest land remaining forest land, cropland remaining cropland and grassland remaining grassland.
L.2	4.A.1 Forest land remaining forest land – CO_2, CH_4 and N_2O (L.2, 2020) (L.15, 2018) Transparency	Verify the value for the carbon stock of deadwood and include in the NIR an explanation of the reasons why this value is high.	Addressing. The Party reported in NIR table 6-10 (p.6-7) a value for the carbon stock of deadwood for forest land before conversion of 14.5 t carbon per ha. The Party provided in its NIR (p.6-17) an explanation as to why this value is high and does not significantly deviate from the actual situation, comparing, among other things, the ratio of the amount of deadwood to the amount of living biomass reported, which is slightly higher than the ratio of below-ground to above-ground biomass. Regarding verification of the value, the Party reported in its NIR (p.6-

ID#	Issue/problem classification[a, b]	Recommendation from previous review report	ERT assessment and rationale
			18) that it intends to update values for the amount of deadwood in a future submission by using the results of a recent monitoring survey as part of the input data and parameters of the CENTURY-jfos model update. During the review, the Party provided information that demonstrates how the deadwood stock in the model will be updated using monitoring data (i.e. mortality rate). The ERT considers that the recommendation has not yet been fully addressed because the Party has not yet verified the value for the carbon stock of deadwood and provided corresponding information in the NIR.
L.3	4.A.1 Forest land remaining forest land – CO_2 (L.3, 2020) (L.16, 2018) Transparency	Include in the NIR explanations of the major drivers for the changes in carbon stock, as well as information on the FM practices that have been applied to intensively managed forests and semi-natural forests that caused the increase in carbon stock.	Resolved. The Party reported in its NIR (pp.6-9–6-11) information on the major drivers of the CSC, such as the maturation of planted forests established primarily in the 1960s and the associated decrease in the annual growth rate (annual increment in growing stocks). In addition, the Party provided an analysis of changes in the supply of domestic wood (except logging residue) for 1990–2020 (shown in NIR figure 6-2 (p.6-11)), based on data from the Forestry Agency, which considers the increasing trend of woody biomass use in power generation facilities in recent years. The Party also reported in its NIR (section 6.5, p.6-9) information on forest subcategories, including intensively managed forests and semi-natural forests with a focus on FM practices, particularly the division of forests into *Ikusei-rin* and *Tennensei-rin*. Regeneration, tending, thinning and harvesting are applied in *Ikusei-rin* forests and practices for protection or conservation, including control of logging, are applied in *Tennensei-rin* forests.
L.4	4.A.1 Forest land remaining forest land – CO_2 (L.12, 2020) Transparency	Improve the description of the methodology used to calculate CSCs, including by adding specific information in the NIR on the parameters used to calculate CSCs in living biomass for cutover forests and lesser stocked forests on the basis of expert judgment.	Addressing. The Party reported in its NIR (p.6-11) an improved description of the methodology for calculating CSCs and of the considerations for management of the forest type, including for forest with less standing trees, and provided in NIR table 6-16 the parameters used for calculating CSCs in living biomass by tree species, for private and national forests with less standing trees. (The ERT noted that the category used in CRF table 4.A was “cutover forests and lesser stocked forests”, which is similar to the category “less standing trees” used in the NIR.) However, the Party did not provide in its NIR an explanation as to how these parameters were obtained. During the review, the Party clarified that values for forest with less standing trees reported in NIR table 6-16 were derived by averaging each parameter using the areas in the National Forest Resources Database as weights for the average. The ERT considers that the recommendation has not yet been fully addressed because the Party has not yet fully described in the NIR the parameters for cutover forests and lesser stocked forests, specifically how they were derived.

ID#	*Issue/problem classification*[a, b]	*Recommendation from previous review report*	*ERT assessment and rationale*
L.5	4.A.1 Forest land remaining forest land – CO_2 (L.13, 2020) Transparency	Explain in the NIR how observed changes in FM are taken into account in the CENTURY-jfos model on an ongoing basis.	Resolved. The Party reported in its NIR (p.6-17) information on how changes in FM were considered in the CENTURY-jfos model. The yield tables used for biomass growth were adjusted according to levels of thinning activity, including where no thinning has taken place, since the model also runs simulations for intensively managed forests. Thus, forest biomass stock data were used for the model if the relative yield index was 0.85 or over, assuming that these data were unaffected by thinning.
L.6	4.A.2 Land converted to forest land – CO_2 (L.14, 2020) Transparency	Include in the NIR information on how the areas of wetlands, settlements and other land converted to forest land were estimated across the time series.	Resolved. The Party provided in its NIR (p.6-24) a revised description of how the areas of wetlands, settlements and other land converted to forest land were obtained for 1971–2004 and from 2005 onward. The Party reported that the ratio of wetlands, settlements and other land converted to forest land from 1971 to 2004 was calculated on the basis of the AR identified for 2007 and was fixed at 0:1:1 in all cases.
L.7	4.A.2 Land converted to forest land – CO_2 (L.15, 2020) Transparency	Improve the transparency of the reporting on carbon stocks before and after conversion by providing additional information in the NIR on the sources of data on biomass stocks for cropland (NIR table 6-8a); increments for forest land (NIR table 6-8b); and deadwood, litter and soil on forest land (NIR tables 6-9, 6-10 and 6-12).	Resolved. The Party reported in NIR table 6-8 (p.6-6) additional information on the source of data on biomass stocks before and after conversion to forest land for cropland, specifying that the amount of d.m. of crop residues ploughed into rice fields and upland fields is based on AD used for the agriculture sector inventory (category 3.D.a.4 (crop residues)). The increment for forest land reported in NIR table 6-9 (p.6-7) is the average annual growth increment per unit area derived from the estimated carbon gain from AR activity over a three-year period (fiscal year 2008 to fiscal year 2010). This information is used to obtain CSCs in forest land. The deadwood, litter and soil on forest land values reported in NIR tables 6-10–6-12 (pp.6-7–6-8) are average carbon stocks in deadwood, litter and soils in all forests with standing trees in the previous inventory year calculated using the CENTURY-jfos model.
L.8	4.B.1 Cropland remaining cropland – CO_2 (L.5, 2020) (L.6, 2018) (L.12, 2016) Transparency	Clearly explain in the NIR the resulting estimates from the RothC model and their trends, considering that the background data and information provided in the CRF tables, the NIR and the interactions during the 2016 review were not sufficient for the ERT to assess the accuracy and time-series consistency of the estimates of CSCs in cropland mineral soils.	Addressing. The Party reported in its NIR (section 6.6.1) information on the parameters used for the RothC model. However, owing to a lack of quantitative data, the Party reported only limited information in its 2021 NIR (sections 6.6.1.a and 6.6.1.e) on the estimates produced by the model and their trends. The ERT considers that this information does not constitute verification of the estimates of CSCs in cropland mineral soils. During the review, the Party clarified the estimates resulting from use of the RothC model and their trends and how time-series consistency is ensured using the model. The ERT considers that the recommendation has not yet been fully addressed because the Party has not yet fully explained in the NIR the estimates resulting from use of the RothC model and their trends. The ERT considers that this issue will be resolved when the Party includes in the NIR the quantitative information

ID#	Issue/problem classification[a, b]	Recommendation from previous review report	ERT assessment and rationale
			on the AD or parameters used in the model to explain the trends of the estimates, including changes resulting from minor updates or corrections.
L.9	4.C.1 Grassland remaining grassland – CO_2 (L.7, 2020) (L.8, 2018) (L.14, 2016) Transparency	Clearly explain in the NIR the resulting estimates from the RothC model and their trends, considering that the background data and information provided in the CRF tables and the NIR and in the responses of the Party to the questions of the ERT were not sufficient for the ERT to assess the accuracy and time-series consistency of the estimates for grassland mineral soils.	Addressing. The Party reported in its NIR (section 6.7.1.b) that the assumptions and parameters used for the RothC model for estimating CSCs in mineral soils for grassland remaining grassland are the same as those used for mineral soils for cropland remaining cropland. However, the NIR includes only limited information on the verification of the estimates (see also ID# L.8 above). During the review, the Party clarified the estimates resulting from use of the RothC model and their trends and how time-series consistency is ensured using the model. The ERT considers that the recommendation has not yet been fully addressed because the Party has not yet fully explained in the NIR the estimates resulting from use of the RothC model and their trends. The ERT considers that this issue will be resolved when the Party includes in the NIR the quantitative information on the AD or parameters used in the model to explain the trends of the estimates, including changes resulting from minor updates or corrections.
L.10	4.E.2 Land converted to settlements – CO_2 and N_2O (L.17, 2020) Completeness	Correct the estimates of N_2O emissions for land converted to settlements in CRF table 4(II) and include CO_2 emissions from the drainage of organic soils under cropland converted to settlements in CRF table 4.E or provide transparent information in the NIR to justify not reporting those emissions in CRF table 4.E.	Resolved. The Party reported in CRF table 4(II) corrected estimates of N_2O emissions for land converted to settlements for the whole time series using a country-specific EF (0.297 kg N_2O-N/ha/year, reported in NIR table 6-59) and a methodology from the Wetlands Supplement (equation 2.7). The Party also reported CO_2 emissions from the drainage of organic soils for rice fields converted to settlements in its NIR (p.6-67) and CRF table 4.E. Those estimates were calculated using the country-specific EF provided in NIR section 6.6.1.
L.11	4(II) Emissions/removals from drainage and rewetting and other management of organic/mineral soils – N_2O (L.18, 2020) Transparency	Include in the NIR the assumption that no N_2O emissions occur from organic soils in forest land currently not included in the estimates, noting that CRF table 4(II) requires that emissions from drained or rewetted soils be reported and noting the methods available in the 2006 IPCC Guidelines and the Wetlands Supplement.	Addressing. The Party did not report CH_4 or N_2O emissions from organic soils in forest land in CRF table 4(II) (the three subcategories are reported as "NA" or "NO"). The Party reported in its NIR (p.6-86) that soil drainage is generally not carried out in Japan, which is why N_2O emissions from organic soils in forest land are reported as "NO". The Party did not include information in its NIR on how it arrived at the assumption that no drainage occurs for organic soils. During the review, the Party clarified that all the decisions for these categories related to organic soils were made by experts on the Committee for Greenhouse Gas Emission Estimation Methods and were documented. This information will be included in future NIRs. The ERT considers that the recommendation has not yet been fully addressed because the Party has not yet included in the NIR information on how organic soil drainage occurrence was documented to justify the assumption that no N_2O emissions occur from organic soils in forest land.

ID#	*Issue/problem classification*[a, b]	*Recommendation from previous review report*	*ERT assessment and rationale*
L.12	4(II) Emissions/removals from drainage and rewetting and other management of organic/mineral soils – CH_4 (L.19, 2020) Transparency	Explain in the NIR which areas are included in the estimate of CH_4 emissions from grassland and correct the actual area used to calculate these emissions in CRF table 4(II).	Resolved. The Party reported in its NIR (p.6-44) that CH_4 emissions from grassland were calculated only for pastureland, for which cultivation and drainage occur. The area of pastureland was obtained from the area of organic soils in pastureland multiplied by the renewal ratio for pastureland. The Party also corrected the actual area used for the calculation of CH_4 emissions from grassland in CRF table 4(II) using the renewal ratio for pastureland for the whole time series (e.g. the Party reported 1.18 kha for 2020).
L.13	4(III) Direct N_2O emissions from N mineralization/immobilization – N_2O (L.20, 2020) Convention reporting adherence	Correct the area reported in CRF table 4(III) to bring it into line with the area of mineral soils included in the estimate of direct N_2O emissions from N mineralization/immobilization associated with losses or gains in soil organic matter resulting from a change of land use or management of mineral soils.	Resolved. The Party reported in CRF table 4(III) the same area of mineral soils for forest land remaining forest land as in CRF table 4.A (e.g. 24,866.85 kha for 2020 in both tables).
Waste			
W.1	5.A Solid waste disposal on land – CH_4 (W.5, 2020) Transparency	Provide in the NIR the description provided during the 2020 review explaining the difference between the FOD methodology in the 2006 IPCC Guidelines and Japan's FOD method, thus confirming that the country-specific FOD method is in accordance with the 2006 IPCC Guidelines (vol. 5, chap. 3, equation 3.1).	Addressing. The Party explained in its NIR (p.7-7) that there are no substantial differences between Japan's country-specific FOD method and the FOD methodology in the 2006 IPCC Guidelines, which it considers is confirmation that the country-specific FOD method is in accordance with the 2006 IPCC Guidelines (vol. 5, chap. 3, equation 3.1). During the review, the Party clarified that the only difference between the two methodologies is that Japan employs country-specific parameters in line with the domestic estimation methodology under its Mandatory Greenhouse Gas Accounting and Reporting System. The ERT considers that the recommendation has not yet been fully addressed because the Party has not yet included in the NIR information demonstrating that its country-specific FOD method is in accordance with the FOD methodology in the 2006 IPCC Guidelines (vol. 5, chap. 3, equation 3.1).
W.2	5.B.1 Composting – CH_4 and N_2O (W.7, 2020) Transparency	Report enhanced and comparable information on the AD for category 5.B.1 (composting), including information on subcategories and AD on MSW and industrial waste in both the NIR and CRF table 5.B.	Resolved. The Party reported in NIR table 7-22 (p.7-22) and CRF table 5.B enhanced, comparable information on the AD for category 5.B.1 (composting), including information on subcategories and AD on MSW and industrial waste.
W.3	5.B.1 Composting – N_2O (W.6, 2020) Accuracy	Justify in the NIR how the N_2O EF for wood can be deemed as a representative country-specific value when it was derived from only one facility or revise the calculation using the IPCC default value.	Resolved. The Party provided in its NIR (pp.7-21–7-22) an additional justification for the use of the country-specific N_2O EF. Although only one facility solely composts garden and park waste among the facilities considered in a study conducted by the Ministry of the Environment, expert judgment is that

ID#	*Issue/problem classification*[a, b]	*Recommendation from previous review report*	*ERT assessment and rationale*
			the CH_4 and N_2O emissions from the composting of garden and park waste are significantly lower than those from the composting of other waste types because garden and park waste is less degradable than sludge and food waste. The Party reported that, on the basis of measurements taken on a half-yearly basis at nine facilities, the N_2O EFs for composting are classified by waste type.
W.4	5.D Wastewater treatment and discharge – CH_4 and N_2O (W.8, 2020) Transparency	Provide additional information in the NIR describing the procedures for choosing EFs and clarify whether the BOD-based AD are suitable for industrial wastewater treatment and in accordance with the 2006 IPCC Guidelines (vol. 5, chap. 6.2.3).	Resolved. The Party reported in its NIR (p.7-90) that suitable methodologies and default EFs are not available in the 2006 IPCC Guidelines for estimating N_2O emissions from industrial wastewater. The N_2O emissions are estimated using Japan's country-specific methodology, namely, by multiplying the amount of N in industrial wastewater by a country-specific N_2O EF per unit BOD. The EF is based on Japan's wastewater handling process. Because N_2O is emitted in wastewater biological treatment processes, BOD-based AD (amount of organic matter in wastewater degraded through biological treatment) are considered to be preferable to COD-based AD, which is in accordance with the 2006 IPCC Guidelines (vol. 5, chap. 6.2.3).
KP-LULUCF			
KL.1	FM – CO_2 (KL.2, 2020) KP reporting adherence	Reassess the technical correction to the FMRL with regard to the inclusion of HWP for all reported years for the second commitment period, ensuring that all pools included in the FMRL use the same approach in accordance with decision 2/CMP.7.	Not resolved. The Party reported in its NIR (section 11.7.5) and CRF table 4(KP-I)B.1.1 a technical correction to the FMRL with regard to the inclusion of the HWP pool using projections (1,555.73 kt CO_2 eq/year). The current ERT, as did the previous ERT, considers that including HWP in the technical correction is not consistent with the accounting approach Japan has chosen for its FMRL, that is, "Zero at the 1 January 2013". This approach is not based on a methodology (the other two accounting approaches are based on methodologies to estimate base-year emissions or to project emissions and removals) and as a result, there is no methodology to be corrected with a technical correction. Making a technical correction for HWP would also mean that not all pools follow the same approach (i.e. all pools would follow the zero approach except the HWP pool, which would follow the estimation approach). According to page 4 of the document "Japan's submission on information on the forest management reference level" for the second commitment period (available at https://unfccc.int/files/meetings/ad_hoc_working_groups/kp/application/pdf/awgkp_japan_2011.pdf), regarding the identification of pools and gases that have been included in constructing the FMRL and explanation of the reasons for omitting a pool, "Japan's reference level is set as 0 so that it is equivalent to Gross-net…At the time of accounting based on Japan's proposed reference level, the emission/removal will be accounted for on the assumption that all pools and gases are 0". Also, on page 6 of the same document, Japan reported that for projections of removals from FM where the HWP pool is not included, it was shown for transparency. The current ERT, as did the previous ERT, concludes

ID#	Issue/problem classification[a, b]	Recommendation from previous review report	ERT assessment and rationale
			that there is no need to perform a technical correction to the FMRL with regard to the inclusion of the HWP pool. During the review, the Party clarified that at the time of FMRL construction, a discussion of the rules and modalities for HWP accounting was still under way and the treatment of the HWP pool had not been decided yet. Thus, the HWP pool was not included in the FMRL submission proposing the zero reference level, which is equivalent to gross-net accounting, using the instantaneous oxidation approach for the HWP pool. The Party also provided the following information: (a) The Party is of the view that, according to the *2013 Revised Supplementary Methods and Good Practice Guidance Arising from the Kyoto Protocol*, the methodological consistency to be demonstrated when accounting for FM in line with the annex to decision 2/CMP.7 refers to the consistency between the methodological elements used in the construction of the FMRL and those used in the reporting of FM, which does not mean that the same accounting approach needs to be used to set the FMRL of the different forest carbon pools (e.g. when countries using a projection approach include a new soil pool, they are not requested to make a new projection for the new pool in the context of applying the methodological consistency). As there are no decisions or guidelines that require the same accounting approach to be used for the accounting of newly added carbon pools as for existing pools, the Party does not see any problem in applying the projection only to the HWP pool; (b) The Party considers that the projection approach based on the past trend was applied to the HWP pool reference level construction, because estimation of CSCs in the HWP pool needs to take into consideration not only the inflow added every year, but also the outflow that necessarily reflects the past trend of inflow, including that before the second commitment period; (c) The Party noted that, as indicated in the CRF accounting table, applying a technical correction to the FMRL (1,555.73 kt CO_2 eq) does not affect the accounting quantity for 2013–2020 because the total net removals from FM (370,362.56 kt CO_2 eq) exceed the FM cap (355,669.19 kt CO_2 eq). The ERT considers that the recommendation has not yet been addressed because the Party has not yet reassessed the technical correction to the FMRL regarding the inclusion of HWP in a manner consistent with the accounting approach selected for the FMRL. The ERT acknowledges that this issue for FM does not have any impact on the fulfilment of commitments under the Kyoto Protocol, as Japan does not have a quantified emission limitation or reduction commitment for the second commitment period.

ID#	*Issue/problem classification*[a, b]	*Recommendation from previous review report*	*ERT assessment and rationale*
KL.2	FM – CO_2 (KL.4, 2020) Transparency	Correct the text in the NIR to reflect the correct status of FM in the second commitment period of the Kyoto Protocol in accordance with decision 2/CMP.7.	Resolved. The Party revised the description in the NIR (p.11-4) of the activities under Article 3, paragraph 4, of the Kyoto Protocol. The NIR indicates that reporting on FM is mandatory in the second commitment period, in accordance with decision 2/CMP.7, annex, paragraph 7.

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

[b] The report on the review of the 2021 annual submission of Japan was not available at the time of this review. Therefore, the recommendations reflected in this table are taken from the 2020 annual review report. For the same reason, 2021, 2019, 2017 and 2015 are excluded from the list of review years in which issues could have been identified.

IV. Issues and problems 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 and/or problems included in table 4 have been identified in three or more successive reviews, including the review of the 2022 annual submission of Japan, and had not been addressed by the Party by the time of publication of this review report.

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

ID#	*Previous recommendation for issue*	*Number of successive reviews issue not addressed*[a]
General	No issues identified.	
Energy		
E.1	Include in the NIR detailed information on the conversion factors used to convert GCV to NCV for all fuels.	5 (2014–2022)
IPPU		
I.4	Justify that the country-specific CO_2 EF has been developed in a manner consistent with the 2006 IPCC Guidelines, covers the total CO_2 emissions from the steam cracking process and is considered to be more accurate than the IPCC default EF; or recalculate the CO_2 emissions from ethylene production by applying the default EF provided in the 2006 IPCC Guidelines (vol. 3, chap. 3.9.2.2).	4 (2016–2022)
Agriculture	No issues identified.	
LULUCF		
L.2	Verify the value for the carbon stock of deadwood and include in the NIR an explanation of the reasons why this value is high.	3 (2018–2022)
L.8	Clearly explain in the NIR the resulting estimates from the RothC model and their trends, considering that the background data and information provided in the CRF tables, the NIR and the interactions during the 2016 review were not sufficient for the ERT to assess the accuracy and time-series consistency of the estimates of CSCs in cropland mineral soils.	4 (2016–2022)

ID#	*Previous recommendation for issue*	*Number of successive reviews issue not addressed*[a]
L.9	Clearly explain in the NIR the resulting estimates from the RothC model and their trends, considering that the background data and information provided in the CRF tables and the NIR and in the responses of the Party to the questions of the ERT were not sufficient for the ERT to assess the accuracy and time-series consistency of the estimates for grassland mineral soils.	4 (2016–2022)
Waste	No issues identified.	
KP-LULUCF	No issues identified.	

[a] Reports on the reviews of the 2015, 2017, 2019 and 2021 annual submissions of Japan have not yet been published. Therefore, 2015, 2017, 2019 and 2021 were not included when counting the number of successive years for this table.

V. Additional findings made during the individual review of the Party's 2022 annual submission

9. Table 5 presents findings made by the ERT during the individual review of the 2022 annual submission of Japan that are additional to those identified in table 3.

Table 5
Additional findings made during the individual review of the 2022 annual submission of Japan

ID#	*Finding classification*	*Description of finding with recommendation or encouragement*	*Is finding an issue/problem?*[a]
General			
G.2	Other	The Party reported in its NIR (section 1.7, p.1-21) an assessment of the completeness of its inventory. The ERT noted that the NIR does not include information on geographical scope to indicate whether emissions and removals have been estimated for Japan's entire national territory. During the review, the Party clarified that Japan's inventory is prepared by using AD from national statistics, which cover all geographical areas of the country. Therefore, it can be said that geographical coverage is complete. The ERT recommends that the Party include in the NIR information on geographical scope when reporting the assessment of the completeness of its inventory.	Yes. Transparency
G.3	Other	The Party reported in NIR tables A-5-2 and A-5-3 and CRF table 9 categories for which emissions were not estimated. Japan quantitatively assessed the likely level of significance of emissions for most categories in NIR table A-5-2 and provided an assessment of the aggregate impact of those categories, demonstrating that the emissions not estimated remain below 0.1 per cent of the total emissions (excluding LULUCF). However, NIR table A-5-3 contains additional categories for which emissions were not estimated and for which the likely level of significance was not quantitatively assessed. The ERT noted that this is not in accordance with the UNFCCC Annex I inventory reporting guidelines because neither the NIR tables nor CRF table 9 include justifications, consistent with paragraph 37(b) of the guidelines, for the assumption that the likely level of emissions for some categories reported as "NE" remain below the threshold of significance. The ERT also noted that for several categories, the Party indicated that AD are	Yes. Transparency

ID#	Finding classification	Description of finding with recommendation or encouragement	Is finding an issue/problem?[a]
		not available and included explanations within the sectoral chapters of the NIR as to why estimation was not possible (see, e.g., ID# E.9 below). The ERT acknowledges that the total aggregate impact of estimated emissions for all categories and associated gases that were not estimated for which methods are available will likely be well below 0.1 per cent of total national GHG emissions. During the review, the Party clarified that the additional categories in NIR table A-5-3 are categories for which the 2006 IPCC Guidelines do not provide methods for estimating emissions and for which AD are not available to quantify the likely level of significance; these categories were thus considered insignificant. Japan indicated that it intends to clarify this in the next annual submission. The Party also indicated that explanations as to why emissions were not estimated are included in CRF table 9. The ERT recommends that the Party provide in the NIR justifications for its assumption that emissions for the categories for which emissions are not estimated and for which AD are not available to quantitatively assess the likely level of significance are insignificant, clarifying whether these are categories for which methods are not available in the 2006 IPCC Guidelines, and improve the transparency of its reporting and the completeness of its inventory by ensuring consistency within the NIR and between NIR tables A-5-2 and A-5-3 and CRF table 9.	
G.4	Time series	The Party reported in its NIR (pp.2-1–2-20) information on observed GHG trends at the national, sectoral and category level. The ERT noted that the NIR does not include information on the reasons behind the observed trends over the time series for all categories (see ID#s E.6, I.13, I.15 and A.7 below). During the review, the Party indicated that it will consider this finding of the ERT for future annual submissions. The ERT encourages the Party to provide information on the reasons for the observed trends in emissions across the time series at the category and sectoral level, in particular for significant categories.	Not an issue/problem
Energy			
E.4	1.A Fuel combustion – sectoral approach – all fuels – all gases	The ERT identified a number of recalculations made in the energy sector since the review of the 2020 annual submission (the last inventory subject to individual review). Specifically, recalculations were made for the following categories: 1.A.1.b (petroleum refining), liquid fuels, 2008 and 2011–2019; 1.A.2.c (chemicals), liquid fuels, 1990–2019; 1.A.2.e (food processing, beverages and tobacco), liquid fuels, 1990–2019; 1.A.2.g (other (manufacturing industries and construction)), liquid fuels, 1990–2019, and other fossil fuels, 1990–2019; 1.A.4.a (commercial/institutional), liquid fuels, 1990–2019, and other fossil fuels, 1990–2019; 1.A.4.c.i (stationary), liquid fuels, 1990–2019; and 1.A.4.c.iii (fishing), residual fuel oil, 2014–2019. The ERT noted that while in the NIR (sections 3.2.4.e, 3.2.6.e and 3.2.10.e) recalculations are reported as being triggered by an update of the General Energy Statistics, no details as to what necessitated the update of the General Energy Statistics are provided. This is not in accordance with the UNFCCC Annex I inventory reporting guidelines (para. 44), which state that recalculations shall be reported in the NIR with explanatory information and justification. During the review, the Party clarified that the General Energy Statistics (the primary statistics used in compiling the 2021 and 2022 submissions) had been revised as follows: (a) The 2015 Input-Output Tables published in 2019 were updated to reflect the estimation of liquid fuel consumption by agriculture, forestry and fisheries;	Yes. Transparency

ID#	Finding classification	Description of finding with recommendation or encouragement	Is finding an issue/problem?[a]
		(b) Data from the Statistical Survey on Farm Management (Management Statistics by Farming Type) have not been available since 2017, so data from the Report of the Statistical Survey on Farm Management (Production Cost of Crops) were used; (c) Data from the Annual Report on National Accounts were used for estimating fuel consumption, such as use of lubricants in construction. The report, published in December 2020, contained a change in the benchmark year (from 2011 to 2015), leading to the recalculation of fuel consumption in construction; (d) Data on the consumption of bitumen in construction were changed from estimates to values from the Outlook for Demand of Major Construction Materials report; (e) The amount of non-energy use of liquefied petroleum gas by chemical industry was revised; (f) The latest update of the Census of Fisheries, which is used for estimating fuel consumption of fisheries and which is updated every five years, was reflected in the estimations. The Party also clarified that the above-mentioned revisions changed the balance of supply and demand, resulting in revisions to the fuel consumption of other categories needing to be made in order to maintain the energy balance. Further, Japan noted that it is time-consuming to provide in the NIR information on every revision made to the General Energy Statistics and that many explanations thereof are repetitious or interconnected. The ERT recommends that the Party explain and justify in the NIR all recalculations made for energy sector categories, including the cause of the recalculations, namely, revisions to the key data source (i.e. the General Energy Statistics). The ERT encourages the Party to provide information about changes to the General Energy Statistics in a single section of the NIR that could be referenced in the recalculation section for each affected category of the energy sector.	
E.5	Feedstocks, reductants and other non-energy use of fuels – liquid fuels – CO_2	The Party reported in CRF table 1.A(d) CO_2 emissions from the non-energy use of liquid fuels that were two to four times higher than those reported in the 2021 submission. The ERT noted increases of 6,408.61 kt (368.9 per cent) for 1990, 6,261.60 kt (366.6 per cent) for 1991, 5,914.51 kt (352.1 per cent) for 1992, 4,281.32 kt (239.2 per cent) for 2017, 4,417.28 kt (286.7 per cent) for 2018 and 3,993.48 kt (224.3 per cent) for 2019. The ERT also noted that the emissions reported for 2020 (5,464.4 kt) were significantly higher than the annual emissions reported for 1993–2016. During the review, the Party clarified that the values reported in CRF table 1.A(d) were unintentional overestimations, potentially caused by problems with using CRF Reporter. The Party indicated that the total CO_2 emissions for liquid fuels in CRF table 1.A(d) should be 1,737.27 kt for 1990, 1,708.19 kt for 1991, 1,679.57 kt for 1992, 1,789.88 kt for 2017, 1,540.62 kt for 2018, 1,780.81 kt for 2019 and 1,431.72 kt for 2020. The ERT noted that this is not in accordance with the 2006 IPCC Guidelines (vol. 2, chap. 3.2.3) and the UNFCCC Annex I inventory reporting guidelines because accurate data, consistent across the time series, for liquid fuel consumption and CO_2 emissions were not reported. The ERT recommends that the Party report accurate values of CO_2 emissions from liquid fuel consumption for non-energy uses in CRF table 1.A(d) that are neither overestimated nor underestimated and that maintain time-series consistency.	Yes. Accuracy
E.6	1.A.1.a Public electricity and heat	The ERT identified a number of recalculations made in the energy sector between the 2021 and 2022 submissions. The ERT calculated the average recalculation per year between these submissions to be 0.01 per cent for 1990–2015,	Yes. Transparency

ID#	Finding classification	Description of finding with recommendation or encouragement	Is finding an issue/problem?[a]
	production – liquid fuels – CO_2	however, the recalculations resulted in a decrease in CO_2 emissions of 4.1 per cent (1,759.00 kt) for 2016, 4.8 per cent (1,619.70 kt) for 2017 and 6.3 per cent (1,471.83 kt) for 2018, and an increase of 1.3 per cent (215.55 kt) in 2019. The ERT observed that the trend in CO_2 emissions from liquid fuels used for public electricity and heat production (category 1.A.1.a) showed a strong decrease from 2012 to 2020, and this decrease was intensified following the recalculations. The cause of this trend was not explained in the NIR. The ERT noted that this is not in accordance with the UNFCCC Annex I inventory reporting guidelines (para. 44), which state that recalculations shall be reported in the NIR with explanatory information and justification. Further, a discussion of the impact of the recalculations on the trend in emissions should be provided in the NIR at the category, sector and total national level, as appropriate. During the review, the Party clarified that the recalculations for 2016–2018 were necessitated by a revision to the General Energy Statistics, in which an overestimation by a power generator was corrected. The Party also clarified that CO_2 emissions were declining owing to the long-term decreasing trend of oil consumption for electricity, driven by the 1970s oil crisis and the increasing diversification of fuels for electricity generation, and that the temporary increase in oil consumption in 2011 and 2012 occurred as the operation of nuclear power plants was suspended following the 2011 Great East Japan Earthquake. The ERT recommends that the Party, if it continues to use the same method for the next annual submission, include in the NIR a description of the revised method and data used for estimating CO_2 emissions from public electricity and heat production for 2016–2019 (see also ID# E.4 above) and a description of the reasons for the long-term declining trend in CO_2 emissions under this category (provided during the review as being the long-term decreasing trend of oil consumption for electricity, driven by the 1970s oil crisis and the increasing diversification of fuels for electricity generation, with the temporary increase in oil consumption in 2011 and 2012 occurring as the operation of nuclear power plants was suspended following the 2011 Great East Japan Earthquake).	
E.7	1.A.1.c Manufacture of solid fuels and other energy industries – gaseous fuels – CO_2	The Party reported in CRF table 1.A(a)s1 that CO_2 emissions from gaseous fuels for 2019 decreased by 376.17 kt (22.4 per cent), or from 1,682.26 to 1,306.09 kt, between the 2021 and 2022 submissions. The ERT noted that 2019 is the only year for which data were recalculated for this category and the emissions decreased by 36.1 per cent in 2019 when compared with the 2018 level and increased by 5.7 per cent in 2020 when compared with the 2019 level. The ERT also noted that emissions for 2019 and 2020 were much lower than emissions reported for 2007–2018. The ERT did not find an explanation for this trend in the 2022 NIR. The ERT noted that this is not in accordance with the UNFCCC Annex I inventory reporting guidelines (para. 44), which state that recalculations shall be reported in the NIR with explanatory information and justification. Further, a discussion of the impact of the recalculations on the trend in emissions should be provided in the NIR at the category, sector and total national level, as appropriate. During the review, the Party clarified that the amount of own use gas reported for 2019 significantly decreased because of two factors. First, the 2019 values from the current survey of production by the gas industry were updated. Second, a duplication was found between the city gas consumption for power generation reported under the electric power statistics and the amount of own use gas reported under the current survey of production by the gas industry. The amount of the duplication was subtracted from own use of city gas conversion and production. The duplication arose because electricity companies can sell city gas and city gas companies can sell electricity owing to the liberalization of retail electricity since 2016 and retail city gas since 2017. The duplication led, in turn, to the duplication of consumption between the electricity statistics and the gas statistics. The amount of the duplication was checked during the compilation of data on 2020 gas consumption for the 2022 submission. It was found that the	Yes. Transparency

ID#	Finding classification	Description of finding with recommendation or encouragement	Is finding an issue/problem?[a]
		duplication only occurred from 2019; therefore, consumption for 2019 was recalculated and consumption for 2020 was corrected prior to submission. The ERT recommends that the Party include in the NIR a detailed explanation for any recalculations made for this category in its next submission. The ERT further recommends that the Party include a description of the trend in CO_2 emissions under this category, including an explanation as to why CO_2 emissions from gaseous fuels are considerably lower for 2019 and 2020 than those reported for 2007–2018.	
E.8	1.B.1.b Solid fuel transformation – all fuels – CH_4	The Party reported in its NIR (p.3-86) that flaring of coke oven gas occurs in the country, suggesting that AD exist for category 1.B.1.b. The NIR also states that flaring of coke oven gas is not conducted during normal operations and occurs rarely during the suspension and construction of the consumption process. The ERT noted that in CRF table 1.B.1, CH_4 recovery/flaring is reported as "NE". While CRF table 9 contains an explanation for CH_4 recovery/flaring under category 1.B.1.b being reported as "NE" (i.e. lack of available data), the ERT could not find a justification for the use of "NE" in the NIR. The ERT noted that this is not in accordance with the UNFCCC Annex I inventory reporting guidelines (para. 37) because the use of "NE" is not adequately justified. During the review, the Party clarified that the flaring of coke oven gas is included under category 1.A (fuel combustion). The Party's rationale for using "NE" for CH_4 recovery/flaring under category 1.B.1.b was that recovery/flaring of the fugitive CH_4 emissions from charcoal production, which are reported in CRF table 1.B.1, is not estimated. The Party stated that it will include this explanation in the next annual submission. The ERT recommends that the Party (1) clarify in the NIR that the flaring of coke oven gas is included under category 1.A (fuel combustion) and that recovery/flaring of the fugitive CH_4 emissions from charcoal production, reported in CRF table 1.B.1, is not estimated and (2) justify in the NIR the use of "NE" for CH_4 recovery/flaring under category 1.B.1.b in the NIR and CRF table 9, and either explain that no IPCC method is available or provide an estimate of the likely level of emissions in NIR table A5-2.	Yes. Transparency
E.9	1.B.2.a Oil – liquid fuels – CO_2 and CH_4	In CRF table 9, the Party reported as "NE" CO_2 emissions for category 1.B.2.a.4 (refining/storage) and CO_2 and CH_4 emissions for category 1.B.2.a.5 (distribution of oil products). According to CRF table 9, the justification for doing so was the lack of AD for these categories. However, the NIR (pp.3-92 and 3-94) states that there are no default EFs available in the 2006 IPCC Guidelines for estimating these emissions. During the review, the Party clarified that default EFs for estimating CO_2 emissions for 1.B.2.a.4 and CO_2 and CH_4 emissions for 1.B.2.a.5 are not available in the 2006 IPCC Guidelines (vol. 2, chap. 4, table 4.2.4). The ERT recommends that the Party enhance the justification for reporting CO_2 emissions for category 1.B.2.a.4 (refining/storage) and CH_4 and CO_2 emissions for category 1.B.2.a.5 (distribution of oil products) as "NE" in CRF table 9 by stating that no default EFs are provided in the 2006 IPCC Guidelines (vol. 2, chap. 4, table 4.2.4) for these categories.	Yes. Transparency
E.10	1.B.2.a Oil – liquid fuels – CH_4	The Party reported in its NIR (p.3-92) that the amount of CH_4 emitted during the crude oil refining process for category 1.B.2.a.4 (refining/storage) is considered to be negligible because no fugitive CH_4 emissions are likely to occur in Japan during normal operations of crude oil refining. During the review, the Party clarified that the default EF for oil refining in the Revised 1996 IPCC Guidelines is 90–1,400 kg/PJ and that for oil storage is 20–250 kg/PJ. In the 1999 annual submission, Japan used the median of the	Yes. Transparency

ID#	Finding classification	Description of finding with recommendation or encouragement	Is finding an issue/problem?[a]
		default EFs in the Revised 1996 IPCC Guidelines (745 kg/PJ for oil refining and 135 kg/PJ for oil storage). The breakout group on Energy and Industrial Processes of the Committee for Greenhouse Gas Emission Estimation Methods, during a meeting held on 21 April 1999, discussed the application of a country-specific EF for oil storage (0.7 kg/PJ). The EF previously used for oil refining (745 kg/PJ) was about 1,000 times higher than the new country-specific EF for oil storage (0.7 kg/PJ). The group suggested that the large difference in two EFs between refining and storage might be a problem and that the lowest value of the default EF for oil refining would be more appropriate than the median. The delegate from the Petroleum Association of Japan supported the use of the lowest value of the default EF. The breakout group is currently considering applying the default EF in the 2019 Refinement to the 2006 IPCC Guidelines for category 1.B.2.a.4. However, a representative of the Petroleum Association of Japan stated "it is unlikely to occur the fugitive CO_2, CH_4 and N_2O emissions from oil refining in Japan as described in the 2019 Refinement to the 2006 IPCC Guidelines. For reflecting the domestic situation and estimating emissions correctly, sufficient discussion is needed for the application of the default EF in the 2019 Refinements". The ERT considers that the justification for choosing the Revised 1996 IPCC Guidelines default EF for CH_4 emissions from oil refining is not sufficient as it does not include the rationale or data that informed the expert judgment referred to below. The ERT welcomes the Party's ongoing work on identifying the EF most applicable for representing Japan's national circumstances. The ERT recommends that the Party, if it continues using for its annual submission the current EF for estimating CH_4 emissions for category 1.B.2.a.4 (refining/storage) (which is the lowest value of the Revised 1996 IPCC Guidelines factor), provide in the NIR the following rationale provided during the review for its selection: (a) Expert judgment was provided by the breakout group on Energy and Industrial Processes of the Committee for Greenhouse Gas Emission Estimation Methods (21 April 1999); (b) The lowest value of the Revised 1996 IPCC Guidelines EF was chosen to replace the previous EF, which was the median of the IPCC default EF, as documented expert judgment determined that it was more appropriate for Japan's national circumstances; (c) The data or other evidence that informed the selection of the lowest EF from the Revised 1996 IPCC Guidelines as more appropriate to the Party's national circumstances and why it is more appropriate than the value in the 2006 IPCC Guidelines (range of $2.6x10^{-6}$ to $41.0x10^{-6}$ Gg per 10^3 m^3 oil refined). If a different EF is used, the ERT recommends that the Party fully explain in the NIR the rationale for its choice. The ERT encourages the Party to include in the planned improvements section of the NIR an explanation that the EFs for CO_2, CH_4 and N_2O emissions from oil refining and storage are under review, with experts investigating whether EFs from the 2019 Refinement to the 2006 IPCC Guidelines are more appropriate in reflecting Japan's national circumstances. The ERT also encourages the Party to provide in the NIR the results of the review once it has been completed.	
E.11	1.B.2.b Natural gas – gaseous fuels – CO_2	In CRF table 1.B, the Party reported as "NA" CO_2 emissions for categories 1.B.2.b.4 (natural gas transmission) and 1.B.2.b.5 (natural gas distribution). In the NIR (p.3-100), Japan justified the use of "NA" by stating that "nearly all of this CO_2 is removed" and that "almost no CO_2 in natural gas is emitted". The ERT noted that this is not in accordance	Yes. Transparency

ID#	*Finding classification*	*Description of finding with recommendation or encouragement*	*Is finding an issue/problem?*[a]
		with the 2006 IPCC Guidelines (vol. 2, chap. 4) and the UNFCCC Annex I inventory reporting guidelines (para. 37) because sufficient evidence was not provided to demonstrate that CO_2 was not emitted for these sources. During the review, the Party clarified that the majority of gas distributed and consumed domestically is sourced from liquefied natural gas imports, which contain negligible traces of CO_2. The ERT agreed with the Party's rationale as the liquefaction process requires the removal of all CO_2 prior to the cooling process to prevent CO_2 ice from forming within the liquefaction equipment. The ERT further noted that there are no default CO_2 EFs for liquefied natural gas in the 2006 IPCC Guidelines. The Party explained that the four major gas providers (Tokyo Gas, Osaka Gas, Toho Gas and Saibu Gas), which represent 67 per cent of gas in Japan by energy content, have demonstrated through composition analysis that their gas contains no CO_2. The Party also explained that in 2020, domestic natural gas comprised about 4 per cent of city gas in the national average (as shown in NIR table 3-16). The Committee for Greenhouse Gas Emission Estimation Methods estimated the likely level of the amount of carbonated gas dissolved in domestic natural gas in the past as 187 kg-CO_2/PJ. By multiplying the amount of domestic natural gas used for producing city gas, the likely level of emissions is less than 0.5 kt CO_2/year, which is below the threshold for reporting "NE" (574 kt CO_2-eq for Japan in 2020). The ERT recommends that the Party change in CRF table 1.B the notation key for reporting CO_2 emissions under categories 1.B.2.b.4 (natural gas transmission) and 1.B.2.b.5 (natural gas distribution) from "NA" to "NE" and include in the NIR the following rationale provided during the review: (a) The majority of natural gas transmitted and distributed in Japan is sourced from imported liquefied natural gas, which contains negligible traces of CO_2 owing to the requirements for the liquefaction process; (b) The four major gas providers in Japan, representing 67 per cent of gas supply by energy content, provided analyses of their natural gas composition demonstrating that the gas they transmit or distribute contains no CO_2; (c) Domestic gas comprises about 4 per cent of city gas supply in Japan (as shown in NIR table 3-16); (d) The Committee for Greenhouse Gas Emission Estimation Methods estimated the likely level of the amount of CO_2 present in the historical domestic natural gas supply to be 187 kg-CO_2/PJ. By multiplying the amount of domestic natural gas used for producing city gas, the likely level of emissions is less than 0.5 kt CO_2/year, which is below the threshold for reporting "NE". The ERT also recommends that the Party update CRF table 9 to reflect the rationale for using "NE" to report CO_2 emissions for these categories and include in NIR table A5-2 the level analysis showing emissions are lower than 0.5 kt CO_2/year.	
E.12	1.B.2.b Natural gas – gaseous fuels – CH_4	The Party reported in CRF table Summary3s1 that it used a country-specific or tier 1 method for estimating CH_4 emissions for category 1.B.2.b (natural gas). The ERT noted that the reported CH_4 EF for category 1.B.2.b.v (distribution) is more than 115 times lower than the lowest value of the IPCC default EF ($1.1x10^{-3}$ Gg CH_4 per 10^6 m^3 of utility sales). The ERT was unable to find the justification for selecting and using this low country-specific EF in the NIR. The ERT noted that this is not in accordance with the UNFCCC Annex I inventory reporting guidelines (para. 50), which state that Annex I Parties shall transparently explain in their annual GHG inventory submissions what data and/or parameters have been used. During the review, the Party clarified that:	Yes. Transparency

ID#	Finding classification	Description of finding with recommendation or encouragement	Is finding an issue/problem?[a]
		(a) The 2006 IPCC Guidelines (vol. 2, chap. 4, p.4.54) states that the default CH_4 EF for natural gas distribution is sourced from the Canadian Association of Petroleum Producers (1999, 2004), the American Petroleum Institute (2004), GRI/US EPA (1996) and US EPA (1999); however, the Party was unable to understand how the default EF was derived from these references (e.g. which pages of the aforementioned reports the authors of the 2006 IPCC Guidelines refer to); (b) The Japan Gas Association provided emission estimates for this category of 292 t CH_4/year, which include emissions from new pipeline installations, pipeline relocation and inspection of governor and others from (1) high-pressure pipelines, (2) medium- and low-pressure pipelines and holders and (3) service pipes are estimated by CH_4 content in city gas, pipeline length of construction and number of inspections; (c) It recognizes that the country-specific EF is lower than the IPCC default values, but it has determined that this EF, based on country-specific data, better reflects its national circumstances than does the IPCC default (whose source is unclear). The ERT considers that the method used by the Party to calculate CH_4 emissions for this category is in fact a tier 2 method (AD multiplied by country-specific EF), not a tier 1 or country-specific method as reported in CRF table summary3s1. During the review, the Party agreed with this assessment and indicated that it will correct the description of the method to tier 2 in its next annual submission. The ERT recommends that the Party, if it continues using for its annual submission the country-specific EF for calculating CH_4 emissions for category 1.B.2.b.v (distribution), justify in the NIR its use by including the following information provided during the review: (a) The default CH_4 EF is sourced from the Canadian Association of Petroleum Producers (1999, 2004), the American Petroleum Institute (2004), GRI/US EPA (1996) and US EPA (1999), but the Party is unable to understand how the default EF was derived from these references; (b) The Japan Gas Association provided emission estimates for this category of 292 t CH_4/year, which include emissions from new pipeline installations, pipeline relocation and inspection of governor and others from (1) high-pressure pipelines, (2) medium- and low-pressure pipelines and holders and (3) service pipes are estimated by CH_4 content in city gas, pipeline length of construction and number of inspections. The ERT further recommends that the Party describe its national circumstances relating to natural gas distribution in its NIR, and explain the logical basis for using a CH_4 EF that is significantly lower than the IPCC default values. The ERT also recommends that the Party update CRF table summary3s1 to include the correct tier (i.e. tier 2 if the method does not change) of the method used for estimating CH_4 emissions for this category.	
IPPU			
I.13	2. General (IPPU) – CO_2 and NF_3	The Party reported in its NIR trends in emissions for all categories of the IPPU sector. The ERT noted significant decreases in CO_2 emissions for some categories for some years that did not have an explanation in the NIR; namely, from 2019 to 2020 decreases were observed for categories 2.A.4.a (ceramics), 41.2 per cent; 2.A.4.b (other uses of soda ash), 54.1 per cent; 2.A.4.d (other), 17.2 per cent; 2.B.1 (ammonia production), 17.3 per cent; 2.B.2 (nitric acid production), 33.3 per cent; 2.B.8.f (carbon black), 16.8 per cent; and 2.C.1.a (use of electric arc furnaces), 34.5 per	Yes. Transparency

ID#	*Finding classification*	*Description of finding with recommendation or encouragement*	*Is finding an issue/problem?*[a]
		cent. The ERT also noted a decrease of 58.1 per cent in NF_3 emissions under category 2.B.9.b (fugitive emissions) from 2014 to 2015. During the review, the Party clarified that the reductions in CO_2 emissions (and AD) were due to circumstances arising from the coronavirus disease 2019 pandemic. The decrease in fugitive NF_3 emissions was caused by the expansion of destruction unit installation. The ERT recommends that the Party include in the NIR a clear explanation of the reasons behind the decreases in (1) CO_2 emissions observed from 2019 to 2020 for categories 2.A.4.a (ceramics), 2.A.4.b (other uses of soda ash), 2.A.4.d (other), 2.B.1 (ammonia production), 2.B.2 (nitric acid production), 2.B.8.f (carbon black) and 2.C.1.a (use of electric arc furnaces), including that the coronavirus disease 2019 pandemic had an impact on the AD and emissions, and (2) fugitive NF_3 emissions observed from 2014 to 2015 for category 2.B.9, which was driven by the expansion of destruction unit installation.	
I.14	2.A.1 Cement production – CO_2	The Party reported in its NIR (p.4-4–4-6) that the cement industry takes in large amounts of waste and by-products from other industries and reuses them as a substitute for raw materials. The ERT noted that some of the waste types reported in NIR table 4-4, that is, coal ash from incineration, sewage sludge incineration ash and coal ash from dust collection, could contain carbon that may constitute additional combustion under the clinker production process. During the review, the Party explained that in the case of coal ash from incineration, the CO_2 emissions are accounted for under the energy sector as an oxidation factor of 1 is used for that sector, and in the case of sewage sludge incineration ash, because sewage sludge is of biogenic origin, the CO_2 emissions from its incineration are not included in the total national GHG emissions. For the other waste types, Japan indicated that confirmation is required. Japan also clarified that calcium oxide and magnesium oxide contained in the waste and by-products were subtracted from the clinker EF because they do not emit CO_2. The ERT recommends that the Party (1) determine whether the waste types used in cement production included in NIR table 4-4 have carbon available for combustion and if so, assess whether the CO_2 emissions are estimated and accounted for under the appropriate categories of the energy, IPPU or waste sectors; and (2) if not accounted for, to estimate the emissions and report the findings from this assessment in the NIR.	Yes. Accuracy
I.15	2.B.3 Adipic acid production – N_2O	The Party reported in its NIR (section 4.3.3.b, p.4-22) that N_2O decomposition units were installed in adipic acid production plants in March 1999, and that this has resulted in decreasing N_2O emissions for category 2.B.3 (adipic acid production) over the time series. However, the ERT noted an increase in the emissions from 2019 to 2020 of 267.7 per cent, which was not explained in the NIR. During the review, the Party clarified that the increase in N_2O emissions from 2019 to 2020 is due to the decrease in the operation rate of the N_2O decomposition units for adipic acid production. The ERT recommends that, while ensuring the confidentiality of the information, the Party include in the NIR an explanation for the increase in N_2O emissions from adipic acid production from 2019 to 2020, noting that the explanation provided during the review was a decrease in the operation rate of N_2O decomposition units for adipic acid production.	Yes. Transparency

ID#	*Finding classification*	*Description of finding with recommendation or encouragement*	*Is finding an issue/problem?*[a]
I.16	2.F.1 Refrigeration and air conditioning – HFCs	The Party reported in its NIR (section 4.7.1.2.b, pp.4-79–4-80) and CRF table 2(II)B-Hs2 emissions of HFC-134a for automatic vending machines under category 2.F.1.a (commercial refrigeration). The ERT noted that only emissions from manufacturing are reported, whereas emissions from stocks and disposal are reported as "NO". The ERT also noted that including these emissions in the manufacturing step has increased the IEF for manufacturing from 0.5 per cent for 1999 to 805.7 per cent for 2020. During the review, the Party explained that HFC-134a emissions are estimated separately for manufacturing, stocks and disposal, however, emissions from stocks and disposal are included in emissions from manufacturing for automatic vending machines. The ERT recommends that the Party report in the NIR and CRF table 2(II)B-Hs2 the HFC-134a emissions from manufacturing, stocks and disposal separately for automatic vending machines in category 2.F.1.a (commercial refrigeration).	Yes. Comparability
I.17	2.F.1 Refrigeration and air conditioning – HFCs	The Party reported in CRF table 2(II)B-Hs2 emissions of an unspecified mix of HFCs under category 2.F.1.c (industrial refrigeration) as "IE" and explained in CRF table 9 that those emissions are included under category 2.F.1.a (commercial refrigeration). Also, Japan reported in the NIR (section 4.7.1.4, p.4-83) that emissions of an unspecified mix of HFCs under category 2.F.1.c were reported as "IE" as they are included under category 2.F.1.a. The ERT noted that an explanation for the use of "IE" was not provided in CRF table 9 or the NIR. During the review, the Party clarified that it is not possible to separate emissions from commercial refrigeration and industrial refrigeration because the industrial association that provides the data does not differentiate between the two in its data-collection process. Furthermore, it is difficult to differentiate between commercial and industrial devices. Japan indicated it has no future plan to split emissions between categories 2.F.1.a and 2.F.1.c. The ERT recommends that the Party include in the NIR or CRF table 9 the reasons for using "IE" to report emissions of an unspecified mix of HFCs for category 2.F.1.c (industrial refrigeration), that is, that it is not possible to separate emissions of commercial refrigeration and industrial refrigeration because the industrial association that provides the data does not differentiate between the two in its data-collection process.	Yes. Transparency
I.18	2.F.1 Refrigeration and air conditioning – HFCs	The Party reported in CRF table 2(II)B-Hs2 emissions of an unspecified mix of HFCs under category 2.F.1.c (industrial refrigeration) as "IE" whereas the AD are reported as "NE". During the review, Japan explained that "NE" was used for the AD because no AD exist for this subcategory. However, the Party indicated that the AD are already accounted for together with commercial devices under category 2.F.1.a (commercial refrigeration) so the use of "NE" for these AD is not correct. The ERT recommends that the Party use the correct notation key, that is, change "NE" to "IE", for the AD for category 2.F.1.c (industrial refrigeration) in CRF table 2(II)B-Hs2.	Yes. Comparability
Agriculture			
A.6	3. General (agriculture) – CH_4 and N_2O	The Party reported in NIR table 5-4 (p.5-5) the equations used to estimate d.m. intake by cattle. These equations are from the Japanese Feeding Standards. While having the details of each equation in the NIR is commendable, there are no details of how these equations were developed, for example, what conditions the research behind them investigated.	Not an issue/problem

ID#	*Finding classification*	*Description of finding with recommendation or encouragement*	*Is finding an issue/problem?*[a]
		During the review, the Party provided a translated copy of the Japanese Feeding Standards (which are currently only printed in Japanese). These standards provide background information on the equations. The ERT encourages the Party to develop an English version of the Japanese Feeding Standards to improve the transparency of the country-specific methodology used for estimating emissions from livestock and to provide a copy of this version as supplementary documentation for future annual submissions.	
A.7	3.A.1 Cattle – CH_4	The Party reported in NIR table 5-10 (p.5-7) a decline in the population of dairy cattle since 1990, but no explanation for the decline. During the review, the Party clarified that the main reason for the decreasing dairy cow population is the decreasing number of livestock farmers, which, in turn, is caused by the aging population of dairy farm owners and the lack of people wanting to carry on with dairy farming when they inherit the farms. In recent years, however, owing to the implementation of production infrastructure measures, the trend of decreasing numbers of livestock farmers is reversing. The ERT recommends that the Party include in the NIR the explanation provided during the review for the declining dairy cattle population since 1990, including any recent factors affecting this trend.	Yes. Transparency
A.8	3.A.1 Cattle – CH_4	The Party reported in NIR table 5-6 (p.5-6) AD for cattle weight. The values in the table indicate that the weight of heifers between three and six months and between six months and two years has not changed since 2010 and that of all types of non-dairy cattle has not changed since 2000. The ERT considered it unusual that the average weight of cattle had not changed in such a long time, as breeding programmes to improve animal productivity often result in weight changes. During the review, the Party clarified that the Japanese Feeding Standards are used to estimate cattle weight each year. For dairy cattle, the growth models in the standards are based on actual measurements carried out by experts at universities. The coefficients in the models are updated every time the standards are updated. For non-dairy cattle, the actual measurement-based data in the standards are used for the estimation of weight. For dairy cattle, the most recent publication of the standards was in 2017 but the weight values were the same as in the 2006 standards. However, the weight of lactating cattle and non-lactating cattle decreased owing to a change in average age in months for primipara cows. For non-dairy cattle, the most recent publication of the standards was in 2008; however, the standards for non-dairy cattle had some issues with consistency between the 2008 version and the 1995 and 2000 versions, so the 2008 standards have not been used. The Party also clarified that an update to the Japanese Feeding Standards is under way and should be finished in the next few years. The ERT recommends that the Party use the updated values for cattle weight from the Japanese Feeding Standards, which are under revision, as soon as they are available. The ERT encourages the Party to regularly update the Japanese Feeding Standards.	Yes. Accuracy
A.9	3.B Manure management – CH_4 and N_2O	The Party reported in its NIR (p.5-31) that for cattle, swine and poultry manure management, CH_4 EF uncertainties given in the 2006 IPCC Guidelines (tier 2 values, 20 per cent) were applied. N_2O EF uncertainties were calculated by synthesizing default uncertainties for each parameter described in the uncertainty guidance of the 2006 IPCC Guidelines. However, the Party uses a country-specific methodology and data when estimating emissions from this	Yes. Convention reporting adherence

ID#	Finding classification	Description of finding with recommendation or encouragement	Is finding an issue/problem?[a]
		source. The ERT noted that default uncertainties are no longer appropriate because of the Party's use of country-specific methodologies and data and the uncertainties for this source should be reviewed. During the review, the Party clarified that it will review the uncertainties for this source in the future. The ERT recommends that the Party review the uncertainties of its CH_4 and N_2O EFs for cattle, swine and poultry manure management, taking into account it uses a country-specific methodology and data for estimating emissions for this category, and either update its uncertainty assessment to better reflect the uncertainty of the data used or include in the NIR an explanation as to why default uncertainties are appropriate.	
A.10	3.B.1 Cattle – CH_4 and N_2O	The Party reported in its NIR (p.5-17) that for non-dairy cattle, the amounts of excretion per head per day of faeces and urine are separately calculated by using d.m. intake and percentage of TDN as variables instead of GE and percentage of DE, based on the 2006 IPCC Guidelines (vol. 4, equation 10.24, p.10.42), which is for the dry organic matter in excretion. The ERT noted that there are no details in the NIR on why the variables were substituted and how the substitution was implemented, that is, if it was a straight swap of the variables or if they needed further manipulation to be used in the calculation. During the review, the Party clarified that while the equation in the 2006 IPCC Guidelines estimates undigested matter by multiplying GE by percentage of DE, Japan estimates undigested d.m. content by multiplying d.m. intake by percentage of TDN. The units for both GE and percentage of DE indicate the heat quantity, while the units for d.m. intake and percentage of TDN describe the weight. As Japan uses d.m. intake in its calculations and not GE, percentage of TDN is therefore used as it shares a unit with d.m. intake. The Party noted that to convert percentage of TDN to DE the following equation can be used: DE (Mcal/kg) = 4.41 × percentage of TDN/100. The Party also provided the following reference for TDN used in cattle feed ingredients: https://rp.rakuno.ac.jp/archives/qalist/3058.html (in Japanese). The ERT recommends that the Party provide in the NIR (1) a detailed explanation of how the variables d.m. intake and percentage of TDN (as substitutes for GE and percentage of DE) are applied when estimating the amount of excretion per head per day for non-dairy cattle, including the equation used, and (2) a justification for substituting these variables, including the references supporting the substitution.	Yes. Transparency
A.11	3.B.4 Other livestock – CH_4 and N_2O	The Party reported in its NIR (pp.5-13–5-15) that for the CH_4 and N_2O EF for composting (faeces) for hens and broilers, the country-specific swine EFs for CH_4 (0.08 per cent) and N_2O (0.16 per cent) were applied on the basis of expert judgment. However, no details of or supporting references for that expert judgment were provided in the NIR and therefore it is not possible for the ERT to determine whether or not these values are accurate. During the review, the Party explained that the characteristics of faeces are similar among swine, hens and broilers (e.g. water content: swine, 70 per cent; hens, 70 per cent; and broilers, 80 per cent) and therefore it considers the swine EF appropriate for application as the hen and broiler EF. The Party acknowledged some differences between swine and poultry manure, including organic matter content, which may lead to differences in the EF. The ERT noted that the IPCC default values for maximum CH_4-producing capacity, which are used to determine the CH_4 EF for manure management (swine 0.45, chicken layer 0.39 and chicken broiler 0.36), and default EF for direct N_2O emissions from manure management (swine deep bedding 0.01, poultry manure with litter (similar to deep bedding) 0.001) for swine and poultry are not the same, with the different manure composition of the two species likely contributing to their differences.	Yes. Transparency

ID#	*Finding classification*	*Description of finding with recommendation or encouragement*	*Is finding an issue/problem?*[a]
		The ERT recommends that the Party provide in the NIR information, addressing more than the water content of manure, and including references, to support its rationale for using swine EFs for estimating CH_4 and N_2O emissions from hens and broilers manure management.	
A.12	3.B.5 Indirect N_2O emissions – N_2O	The Party reported in NIR table 5-41 (p.5-36) $Frac_{GASM}$ values for estimating indirect N_2O emissions from manure management. These country-specific values are lower than the default values for MMS in the 2006 IPCC Guidelines (vol. 4, table 10.22, p.10.65). For example, for dairy cattle, the country-specific $Frac_{GASM}$ range is 4.5–10.3 per cent while the IPCC default range is 25–48 per cent. While the aggregated $Frac_{GASM}$ values of 10–20 per cent do lie at the bottom of the default range of dairy cattle (7–40 per cent), there is no explanation in the NIR as to why these values are so low.	Yes. Transparency
		During the review, the Party clarified that the low $Frac_{GASM}$ values reflect the humid conditions in the country and the manure treatment methods used by Japan.	
		The ERT recommends that the Party provide in the NIR clarification regarding the country's high humidity and the impact that this has on the country-specific $Frac_{GASM}$ values used for estimating indirect N_2O emissions from manure management.	
A.13	3.D.a Direct N_2O emissions from managed soils – N_2O	The Party reported in its NIR (pp.5-48–5-49 and 5-53) and NIR tables 5-54–5-55 and 5-61–5-62 the amount of synthetic and organic N fertilizers applied to the various land uses of agricultural land. However, managed pastureland is not included.	Yes. Transparency
		During the review, the Party clarified that pastureland is under the crop type "feed crops" and, therefore, N_2O emissions from synthetic and organic N fertilizers applied to pastureland were calculated together with the emissions from crop residues and reported under category 3.D.a (direct N_2O emissions from managed soils). The Party also clarified that fodder crops include perennial pasture grass, annual pasture grass, rice for feed, maize for feed and others crops for feed. Therefore, the planted area for feed crops is larger than the pastureland area for the LULUCF sector.	
		The ERT recommends that the Party (1) clarify in the NIR that N_2O emissions from the application of synthetic and organic N fertilizers applied to pastureland are included in the estimates of direct N_2O emissions from managed soils, (2) include pastureland as a separate row in the relevant tables in the NIR (e.g. table 5-56) and (3) report the area of pastureland.	
A.14	3.D.a.5 Mineralization/ immobilization associated with loss/gain of soil organic matter – N_2O	The Party reported in its NIR (section 5.5.1.5, p.5-59) that the AD used for estimating N_2O emissions from mineralization are the area of cropland remaining cropland in mineral soils and that the only land-use types covered by the equation used for calculating the emissions are paddy fields, upland fields, orchards and tea plantations. There is no mention of pastureland. The ERT was unclear on whether N_2O emissions from the mineralization of mineral soils under pastureland were estimated by the Party.	Yes. Transparency
		During the review, the Party clarified these emissions are covered under the LULUCF sector (NIR section 6.14).	
		The ERT recommends that the Party provide in the agriculture section of the NIR a statement that N_2O emissions from the mineralization of mineral soils under pastureland are estimated and reported on under the LULUCF sector.	

ID#	*Finding classification*	*Description of finding with recommendation or encouragement*	*Is finding an issue/problem?*[a]
A.15	3.D.b Indirect N_2O emissions from managed soils – N_2O	The Party reported in its NIR (section 5.5.2.1, p.5-64, and section 5.5.2.2, pp.5-65–5-66) that the EFs for atmospheric deposition and leaching and run-off have been changed to default EFs from the 2019 Refinement to the 2006 IPCC Guidelines. However, the Party did not explain in the NIR why the EFs from the 2019 Refinement to the 2006 IPCC Guidelines better represent Japan's national circumstances. During the review, the Party clarified that fractions of N volatilized from each type of fertilizer are provided in the 2019 Refinement to the 2006 IPCC Guidelines, but they are not disaggregated in the 2006 IPCC Guidelines. For $Frac_{LEACH}$, the Party considered the 2019 Refinement to the 2006 IPCC Guidelines values to be more accurate as they were estimated using a larger research data set. The Party considers that using the default EFs from the 2019 Refinement to the 2006 IPCC Guidelines leads to estimates that better reflect the circumstances of Japan because they reflect the types of fertilizer used. The ERT recommends that the Party include in the NIR a justification for using the default values for EFs from the 2019 Refinement to the 2006 IPCC Guidelines values for estimating indirect N_2O emissions from managed soils.	Yes. Transparency
A.16	3.F.5 Other (field burning of agricultural residues) – CH_4 and N_2O	The Party reported in NIR table 5-77 (p.5-69) the amount of rice straw and rice chaff burned on crop fields, which is used to estimate CH_4 and N_2O emissions from the burning of rice residues instead of area burned and mass of fuel available for combustion. The values in this table do not match the values reported in CRF table 3.F. During the review, the Party clarified that NIR table 5-77 contains values for the wet weight of the material while CRF table 3.F contains values for the dry biomass. The ERT recommends that the Party explain in the NIR, regarding the amount of rice straw and rice chaff burned on crop fields, that NIR table 5-77 contains values for the wet weight of the material while CRF table 3.F contains values for the dry biomass and report in the NIR the coefficient and equation used to convert the wet weight values to the dry biomass values. The ERT further recommends that the Party indicate in the documentation box of CRF table 3.C that the dry weight values are reported for organic amendments for rice and include information in the additional information section of CRF table 3.F where appropriate.	Yes. Transparency
LULUCF			
L.14	4. General (LULUCF)	The Party reported in its NIR (section 10, pp.10-11–10-12) a list of the recalculations conducted as a result of improvements to AD (use of more recent available data), methodologies and parameters (use of country-specific parameters) applied to the calculation of emissions and removals for different carbon pools, and the categories affected by the recalculations, particularly all the subcategories of land uses under the LULUCF sector except for wetlands remaining wetlands and other land remaining other land. The Party reported the results of the recalculations (i.e. a comparison of the estimates in the 2021 and 2022 submissions) in NIR table 10-5 but at the level of main category only (e.g. forest land, cropland), not at the disaggregated level of pool (e.g. living biomass, litter, soil), for which the recalculations were made. The ERT commends the Party for improving its estimations and recalculating emissions and removals. However, the ERT noted that reporting the results of the recalculations at the aggregated level of category, where the impact of the recalculations on a particular pool may be masked, makes the review complicated owing to the reduced transparency.	Yes. Transparency

ID#	*Finding classification*	*Description of finding with recommendation or encouragement*	*Is finding an issue/problem?*[a]
		During the review, the Party clarified that the approach chosen for reporting the recalculations in the NIR is based on the reporting requirements related to the level of disaggregation provided in paragraph 43 of the UNFCCC Annex I inventory reporting guidelines. The ERT recommends that the Party report in the NIR recalculations of emissions and removals, if any, at the level to which the recalculations apply (e.g. subcategory of land-use type, specifying carbon pool when recalculations are made for a particular carbon pool) in order to improve the transparency of the information reported.	
L.15	Land representation	The Party reported in NIR table 6-6 (p.6-5) and CRF table 4.1 the total land area for 2020 (37,797.53 kha) as the sum of all land-use categories and in NIR table 6-5 (p.6-5) the total land area for 1990 (37,773.71 kha). The Party also reported that changes in total area were caused by the reclamation of land. The ERT noted that this is not in accordance with the 2006 IPCC Guidelines (vol. 4, chap. 3, p.3.10) because the total land base that is reported each year for all land-use categories should remain constant. If not kept constant, stock changes will reflect false carbon increases or decreases due to a change in total land area accounted for when using a stock change emission estimation method. The ERT also noted that the Party uses the stock difference method from the 2006 IPCC Guidelines to calculate CSCs in carbon pools and considering that the added area after the reclamation can be potentially greened, for instance as a subdivision of settlements, may lead to inaccurate estimates when applying this methodology in the future. The ERT further noted that the Party did not provide in its NIR information on why the approach of reporting of constant total area as a sum of all land-use categories was not applied. During the review, the Party clarified that because the change in national land area is an actual change, reporting the same total national land for all years would result in inaccurate values in the GHG inventory. The ERT recommends that the Party demonstrate, in the NIR, that the approach to the identification of total land area across the time series does not lead to an overestimate or underestimate of GHG emissions and removals, as far as can be judged.	Yes. Accuracy
L.16	4.A Forest land – CO_2	The Party reported in NIR table 6-16 (section 6.5.2.b.1) BEFs for private and national forests with less standing trees not differentiated by age (i.e. the same BEF for trees above 21 and below 20 years) or species (i.e. the only categories in the table are private and national forests), comparing them with BEFs for forests with standing trees (differentiated by age and by coniferous and broadleaf species). The Party applied the former BEFs for calculating CSCs in living biomass for forest land remaining forest land using the tier 2 stock difference method. The ERT noted that the Party did not provide a rationale for not differentiating BEFs for forests with less standing trees by age and species. During the review, the Party clarified that a partial breakdown of species and ages for these forests is available in the Forest Register. Therefore, BEFs for this subdivision of forest land, that is, private and national forests, have been derived, as of 2007, by averaging the BEF values for two age classes (20 years and below and 21 years and above) for each tree species weighted by area ratio of each tree species (for the above-mentioned two age classes) in the respective forest classification (private and national). The merchantable volume (growing stock) in this subcategory has been very small over the time series, for example representing merely 0.02 per cent of total forest land in fiscal year 2020. The ERT recommends that the Party report BEFs of private and national forests with less standing trees by age class and species or provide information on how age and species were considered in the calculation of CSCs in living biomass for this subdivision of forest land.	Yes. Accuracy

ID#	*Finding classification*	*Description of finding with recommendation or encouragement*	*Is finding an issue/problem?*[a]
L.17	4.B Cropland – CO_2	The Party reported in NIR table 6-25 (p.6-32) EFs for the calculation of CO_2 emissions from the cultivation of organic soils in cropland remaining cropland for cold and warm temperate climate zones. However, EFs for the cultivation of organic soils in the subtropical climate zone were not reported or used in the calculation of emissions despite a small part of Japan (Okinawa) being classified as tropical according to the climate zone map of the 2006 IPCC Guidelines (vol. 4, chap. 3, figure 3A.5.1). The ERT noted that a part of Kagoshima Prefecture could probably be classified as subtropical/tropical. The ERT noted that this is not in accordance with the 2006 IPCC Guidelines (vol. 4, chap. 3) because the Party did not apply at least the default EF for calculating CO_2 emissions from cultivated organic soils in the tropical/subtropical climate zone (the default EF is provided in the 2006 IPCC Guidelines (vol. 4, chap. 5, table 5.6)) in order to ensure the accuracy of the inventory in terms of recognizing biophysical stratification. During the review, the Party clarified that the AD of area of organic soils in the subtropical climate zone were considered under the warm temperate climate zone. The ERT recommends that the Party collect AD on area of organic soils in the tropical/subtropical climate zone and apply the default EF from the 2006 IPCC Guidelines (vol. 4, table 5.6) or provide a justification for organic soils in the tropical/subtropical climate zone not occurring in Japan.	Yes. Accuracy
L.18	4(III) Direct N_2O emissions from N mineralization/immobilization – CO_2	The area of mineral soils reported by the Party for other land in CRF table 4(III) (e.g. 111.53 kha for 2020) does not match the area of mineral soils reported for land converted to other land in CRF table 4.F (e.g. 109.44 kha for 2020) but matches the total area of land converted to other land, which includes the area of organic soils for land converted to other land. During the review, the Party clarified that emissions for other land are estimated only for forest land converted to other land, for which the actual area of mineral soils subject to the estimation is 91.55 kha. The ERT recommends that the Party review the area of mineral soils reported for other land in CRF table 4.F and the area of mineral soils for land converted to other land reported in CRF table 4(III), ensure that the same values are reported across the time series and explain this recalculation in the NIR.	Yes. Convention reporting adherence
Waste			
W.5	5. General (waste) – CH_4 and N_2O	The Party reported in its NIR (p.7-4) that recalculations of emissions for the waste sector are undertaken every year (Japan's fiscal year starts on 1 April and ends on 31 March), while the AD should cover the full year (1 January to 31 December). Emissions for the waste sector are estimated with preliminary AD for the latest fiscal year. Consequently, every year, these preliminary data are updated with final data when they become available by the end of the next fiscal year and the emissions are recalculated for the next annual submission. The ERT noted that the Party did not report a summary of recalculations undertaken for each category of the waste sector resulting from an update of statistical data such as AD or EFs. During the review, the Party acknowledged its omission of a summary of recalculations in the NIR (section 7) and indicated that it will include a summary of all recalculations undertaken for each category of the waste sector in its next annual submission. The ERT encourages the Party to include in the NIR (section 7) a summary of recalculations, with the underlying reasons for their need, undertaken for each category of the waste sector.	Not an issue/problem

ID#	*Finding classification*	*Description of finding with recommendation or encouragement*	*Is finding an issue/problem?*[a]
W.6	5.A.3 Uncategorized waste disposal sites – CH_4	The Party reported in its NIR (p.7-20) that for this category, AD prior to 2002 were estimated because data on uncategorized waste disposal sites are available only from 2002. It was not clear to the ERT how the AD were estimated for the period prior to 2002. During the review, the Party provided a spreadsheet used for the estimation of disposal/residual amount data for 1980–2001 and explained that data on the amount of uncategorized waste disposal result from investigations undertaken thereon and that residual amount data are available for each year since 2002. The Party explained that for the CH_4 emission estimations, the waste disposal amount for each year prior to 1980 was substituted with the amount for 1980 as this is representative of prevailing conditions before 1980. The Party indicated that it will consider adding an explanation of the estimation methodology for the data prior to 2002 in the next annual submission. The ERT recommends that Japan provide in the NIR detailed information on the investigation into and methodology used for estimating the amount of uncategorized waste disposal used as AD for 1980–2001.	Yes. Transparency
W.7	5.D Wastewater treatment and discharge – CH_4 and N_2O	The Party explained in its NIR (p.7-75) that "NA" is reported in CRF table 5.D for AD instead of reporting the amount of organic carbon based on BOD values because the AD for this category are estimated using a country-specific method for each gas and each wastewater treatment process. The ERT noted that the Party provided different reasons (use of different AD and country-specific methods) in CRF table 5.D for reporting AD for each emissions source category as "NA". During the review, the Party provided the calculation worksheet used for the estimation of emissions from the country-specific subcategories under domestic and industrial wastewater, which shows the use of different AD and country-specific methods for each gas and each emissions source category. The ERT did not identify any problems with the accuracy of the methods applied by the Party for estimation of emissions from the country-specific subcategories under domestic and industrial wastewater. The ERT recommends that the Party include the same explanation in the NIR and CRF table 5.D for reporting as "NA" the AD for the subcategories of category 5.D (wastewater treatment and discharge).	Yes. Transparency
KP-LULUCF		No findings for KP-LULUCF additional to those included in table 3 were made by the ERT during the review.	

[a] Recommendations made by the ERT during the review are related to issues as defined in para. 81 of the UNFCCC review guidelines or problems as defined in para. 69 of the Article 8 review guidelines.

VI. Application of adjustments

10. Japan does not have a quantified emission limitation or reduction commitment for the second commitment period of the Kyoto Protocol and therefore the application of adjustments does not apply.

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

11. Japan does not have a quantified emission limitation or reduction commitment for the second commitment period of the Kyoto Protocol and does not account for KP-LULUCF.

VIII. Questions of implementation

12. No questions of implementation were identified by the ERT during the individual review of the Party's 2022 annual submission.

Annex I

Overview of greenhouse gas emissions and removals and data and information on activities under Article 3, paragraphs 3–4, of the Kyoto Protocol, as submitted by Japan in its 2022 annual submission

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

Table I.1
Total greenhouse gas emissions and removals for Japan, 1990–2020
(kt CO_2 eq)

	Total GHG emissions excluding indirect CO_2 emissions		*Total GHG emissions and removals including indirect CO_2 emissions*[a]		*Land-use change (Article 3.7 bis as contained in the Doha Amendment)*[b]	*KP-LULUCF (Article 3.3 of the Kyoto Protocol)*[c]	*KP-LULUCF (Article 3.4 of the Kyoto Protocol)*	
	Total including LULUCF	*Total excluding LULUCF*	*Total including LULUCF*	*Total excluding LULUCF*			*CM, GM, RV, WDR*[d]	*FM*
FMRL								0.00
1990	1 204 584.25	1 269 901.03	1 210 132.67	1 275 449.45	NA		7 923.87	
1995	1 295 511.11	1 374 714.90	1 300 278.62	1 379 482.41				
2000	1 289 944.83	1 374 626.42	1 294 250.62	1 378 932.21				
2010	1 231 518.83	1 301 405.90	1 233 983.69	1 303 870.77				
2011	1 284 163.72	1 352 174.89	1 286 539.85	1 354 551.03				
2012	1 324 844.48	1 394 952.48	1 327 142.73	1 397 250.73				
2013	1 343 854.48	1 406 811.18	1 346 159.76	1 409 116.45		527.30	5 225.28	–51 173.74
2014	1 297 015.89	1 357 949.77	1 299 248.01	1 360 181.89		523.51	6 563.32	–51 512.15
2015	1 262 968.32	1 319 410.64	1 265 181.70	1 321 624.02		831.47	5 769.81	–49 255.20
2016	1 250 438.30	1 302 713.83	1 252 611.08	1 304 886.61		827.57	5 245.26	–46 642.40
2017	1 233 097.96	1 289 434.12	1 235 243.89	1 291 580.05		362.22	4 256.80	–46 352.62
2018	1 189 852.73	1 245 542.08	1 191 962.64	1 247 652.00		443.98	3 427.40	–45 228.61
2019	1 159 204.58	1 210 159.62	1 161 266.44	1 212 221.48		366.93	4 147.20	–41 259.00
2020	1 096 111.66	1 148 122.08	1 098 075.10	1 150 085.52		450.36	4 016.28	–38 938.83

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

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

[b] The value reported in this column relates to GHG emissions from conversion of forests (deforestation) in 1990 as contained in the report on the review of the Party's report to facilitate the calculation of the assigned amount for the second commitment period of the Kyoto Protocol.

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

[d] In accordance with decision 3/CMP.11, para. 8, the Party previously reported that it would report emissions from CM, GM and RV. The base year for those activities is 1990.

Table I.2
Greenhouse gas emissions and removals by gas for Japan, excluding land use, land-use change and forestry, 1990–2020
(kt CO_2 eq)

	CO_2[a]	*CH_4*	*N_2O*	*HFCs*	*PFCs*	*Unspecified mix of HFCs and PFCs*	*SF_6*	*NF_3*
1990	1 163 677.86	44 058.76	32 358.55	15 932.31	6 539.30	NO, NA	12 850.07	32.61
1995	1 244 676.91	41 668.85	33 598.22	25 212.86	17 676.95	NO, NA	16 447.52	201.09
2000	1 268 900.44	37 627.97	30 345.83	22 850.63	11 890.21	NO, NA	7 031.36	285.77
2010	1 217 522.97	31 982.73	22 841.25	23 326.51	4 259.43	NO, NA	2 398.14	1 539.74
2011	1 267 410.99	30 782.92	22 450.60	26 118.68	3 765.32	NO, NA	2 222.14	1 800.38
2012	1 308 480.76	30 140.56	22 088.70	29 376.67	3 444.92	NO, NA	2 207.27	1 511.85
2013	1 317 873.97	30 093.95	22 049.05	32 120.72	3 286.27	NO, NA	2 075.25	1 617.24
2014	1 266 645.38	29 598.39	21 612.58	35 801.15	3 362.66	NO, NA	2 038.86	1 122.87
2015	1 225 818.54	29 255.59	21 315.09	39 280.55	3 308.10	NO, NA	2 075.11	571.03
2016	1 206 060.98	29 211.69	20 803.94	42 641.97	3 375.33	NO, NA	2 158.27	634.44
2017	1 190 504.88	29 021.96	21 062.87	44 954.22	3 515.59	NO, NA	2 070.75	449.78
2018	1 145 521.82	28 654.80	20 607.07	47 043.41	3 487.45	NO, NA	2 054.94	282.50
2019	1 108 077.35	28 474.35	20 252.09	49 732.59	3 422.60	NO, NA	2 001.03	261.47
2020	1 044 187.46	28 394.07	19 986.94	51 725.38	3 474.54	NO, NA	2 028.31	288.83
Percentage change 1990–2020	**–10.3**	**–35.6**	**–38.2**	**224.7**	**–46.9**	**NA**	**–84.2**	**785.7**

Note: Emissions and removals reported for the sector other (sector 6) are not included in this table.

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

Table I.3
Greenhouse gas emissions and removals by sector for Japan, 1990–2020
(kt CO_2 eq)

	Energy	*IPPU*	*Agriculture*	*LULUCF*	*Waste*	*Other*
1990	1 092 934.05	115 476.63	37 479.41	–65 316.79	29 559.36	NA
1995	1 168 290.93	141 142.49	37 076.48	–79 203.79	32 972.51	NA
2000	1 198 623.22	112 652.67	35 299.54	–84 681.59	32 356.78	NA
2010	1 163 725.04	82 880.48	33 719.24	–69 887.07	23 546.00	NA
2011	1 214 350.87	84 689.69	32 980.28	–68 011.18	22 530.18	NA
2012	1 254 710.62	87 130.71	32 611.57	–70 108.00	22 797.83	NA
2013	1 262 239.60	91 501.33	32 846.68	–62 956.69	22 528.85	NA
2014	1 212 042.17	94 047.87	32 433.40	–60 933.88	21 658.44	NA

	Energy	*IPPU*	*Agriculture*	*LULUCF*	*Waste*	*Other*
2015	1 172 779.42	95 190.02	32 198.32	–56 442.32	21 456.26	NA
2016	1 154 006.31	98 206.36	32 209.31	–52 275.53	20 464.62	NA
2017	1 138 347.59	100 902.31	32 316.44	–56 336.16	20 013.71	NA
2018	1 092 951.91	101 897.26	32 103.02	–55 689.36	20 699.80	NA
2019	1 056 731.22	103 140.58	32 074.97	–50 955.04	20 274.71	NA
2020	994 763.18	102 950.81	32 185.76	–52 010.42	20 185.77	NA
Percentage change 1990–2020	**–9.0**	**–10.8**	**–14.1**	**–20.4**	**–31.7**	**NA**

Notes: (1) Japan did not report emissions or removals for the sector other (sector 6); (2) totals include indirect CO_2 emissions reported in CRF table 6.

Table I.4

Greenhouse gas emissions and removals from activities under Article 3, paragraphs 3–4, of the Kyoto Protocol by activity, base year–2020, for Japan

(kt CO_2 eq)

	Article 3.7 bis as contained in the Doha Amendment[a]	*Activities under Article 3.3 of the Kyoto Protocol*		*FM and elected activities under Article 3.4 of the Kyoto Protocol*				
	Land-use change	*AR*	*Deforestation*	*FM*	*CM*	*GM*	*RV*	*WDR*
FMRL				0.00				
Technical correction				1 555.73				
1990	NA				7 561.05	442.58	–79.76	NA
2013		–1 477.60	2 004.91	–51 173.74	5 489.54	965.72	–1 229.97	NA
2014		–1 483.34	2 006.85	–51 512.15	6 230.07	1 582.39	–1 249.14	NA
2015		–1 485.66	2 317.13	–49 255.20	5 748.61	1 291.21	–1 270.02	NA
2016		–1 488.04	2 315.61	–46 642.40	5 524.92	1 007.76	–1 287.42	NA
2017		–1 464.61	1 826.83	–46 352.62	4 712.38	854.62	–1 310.19	NA
2018		–1 375.40	1 819.38	–45 228.61	4 130.08	621.85	–1 324.54	NA
2019		–1 316.24	1 683.16	–41 259.00	4 746.50	751.17	–1 350.48	NA
2020		–1 245.26	1 695.62	–38 938.83	4 758.93	617.02	–1 359.67	NA
Percentage change 1990–2020					**–37.1**	**39.4**	**1 604.6**	**NA**

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

[a] The value reported in this column relates to 1990.

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

Table I.5
Key data for Japan under Article 3, paragraphs 3–4, of the Kyoto Protocol from its 2022 annual submission

Parameter	*Data*
Periodicity of accounting	NA
Elected activities under Article 3, paragraph 4, of the Kyoto Protocol	CM, GM and RV
Election of application of provisions for natural disturbances	No
3.5% of total base-year GHG emissions, excluding LULUCF and including indirect CO_2 emissions	NA
Cancellation of AAUs, CERs and ERUs and/or issuance of RMUs in the national registry for:	
1. AR	NA
2. Deforestation	NA
3. FM	NA
4. CM	NA
5. GM	NA
6. RV	NA

Annex II

Additional information to support findings in table 2

Missing categories that may affect completeness

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

Annex III

Reference documents

A. Reports of the Intergovernmental Panel on Climate Change

IPCC. 1997. *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories.* JL Houghton, LG Meira Filho, B Lim, et al. (eds.). Paris: IPCC/Organisation for Economic Co-operation and Development/International Energy Agency. Available at https://www.ipcc-nggip.iges.or.jp/public/gl/invs1.html.

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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-nggip.iges.or.jp/public/2019rf/index.html.

B. UNFCCC documents

Annual review reports

Reports on the individual reviews of the 2014, 2016, 2018 and 2020 annual submissions of Japan, contained in documents FCCC/ARR/2014/JPN, FCCC/ARR/2016/JPN, FCCC/ARR/2018/JPN and FCCC/ARR/2020/JPN 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/documents/510888.

Annual status report for Japan for 2022. Available at https://unfccc.int/sites/default/files/resource/asr2022_JPN.pdf.

C. Other documents used during the review

Responses to questions during the review were received from Takefumi Oda (National Institute for Environmental Studies of Japan), including additional material on the methodology and assumptions used.