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## **Report on the individual review of the annual submission of Japan submitted in 2018\***

**Note by the expert review team**

### *Summary*

Each Party included in Annex I to the Convention must submit an annual greenhouse gas inventory covering emissions and removals of greenhouse gas emissions for all years from the base year (or period) to two years before the inventory due date (decision 24/CP.19). Parties included in Annex I to the Convention that are Parties to the Kyoto Protocol are also required to report supplementary information under Article 7, paragraph 1, of the Kyoto Protocol with the inventory submission due under the Convention. This report presents the results of the individual inventory review of the 2018 annual submission of 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 8 to 13 October 2018 in Bonn.

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

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## Abbreviations and acronyms

2006 IPCC Guidelines	<i>2006 IPCC Guidelines for National Greenhouse Gas Inventories</i>
AAU	assigned amount unit
AD	activity data
AR	afforestation and reforestation
Article 8 review guidelines	“Guidelines for review under Article 8 of the Kyoto Protocol”
BOD	biochemical oxygen demand
C	carbon
CaC <sub>2</sub>	calcium carbide
CaO	calcium oxide
CER	certified emission reduction
CF <sub>4</sub>	tetrafluoromethane
C <sub>2</sub> F <sub>6</sub>	hexafluoroethane
CH <sub>4</sub>	methane
CHF <sub>3</sub>	fluoroform
CM	cropland management
CO	carbon monoxide
CO <sub>2</sub>	carbon dioxide
CO <sub>2</sub> eq	carbon dioxide equivalent
CPR	commitment period reserve
CRF	common reporting format
EF	emission factor
ERT	expert review team
ERU	emission reduction unit
F-gases	fluorinated gases
FM	forest management
FMRL	forest management reference level
GCV	gross calorific value
GHG	greenhouse gas
GM	grazing land management
GWP	global warming potential
HFC	hydrofluorocarbon
HWP	harvested wood products
IEA	International Energy Agency
IEF	implied emission factor
IPCC	Intergovernmental Panel on Climate Change
IPPU	industrial processes and product use
k	methane generation rate constant
KP-LULUCF activities	activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol
LULUCF	land use, land-use change and forestry
N	nitrogen
NA	not applicable
NCV	net calorific value
NE	not estimated
NF <sub>3</sub>	nitrogen trifluoride
NIR	national inventory report
NO	not occurring
N <sub>2</sub> O	nitrous oxide

PFC	perfluorocarbon
QA/QC	quality assurance/quality control
RMU	removal unit
RV	revegetation
SEF	standard electronic format
SF <sub>6</sub>	sulfur hexafluoride
SIAR	standard independent assessment report
TiO <sub>2</sub>	titanium dioxide
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”
VOC	volatile organic compound
WDR	wetland drainage and rewetting
Wetlands Supplement	2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands

## I. Introduction<sup>1</sup>

1. This report covers the review of the 2018 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” (decision 13/CP.20). The review took place from 8 to 13 October 2018 in Bonn and was coordinated by Ms. Claudia do Valle and Mr. Sohel Pasha (secretariat). Table 1 provides information on the composition of the ERT that conducted the review of Japan.

Table 1

### Composition of the expert review team that conducted the review of Japan

<i>Area of expertise</i>	<i>Name</i>	<i>Party</i>
Generalist	Ms. Agita Gancone	Latvia
	Ms. Emma Salisbury	United Kingdom of Great Britain and Northern Ireland
Energy	Mr. Sangay Dorji	Bhutan
	Mr. Erick Masafu	Kenya
	Mr. Dingane Sithole	Zimbabwe
IPPU	Ms. Ingrid Person Rocha e Pinho	Brazil
	Ms. Ann Marie Ryan	Ireland
	Ms. Kristina Saarinen	Finland
Agriculture	Mr. Paulo Cornejo	Chile
	Mr. Steen Gyldenkaerne	Denmark
	Ms. Janka Szemesova	Slovakia
LULUCF	Mr. Nagmeldin Elhassan	Sudan
	Ms. Inge G.C. Jonckheere	Belgium
	Mr. Dinh Hung Nguyen	Viet Nam
Waste	Mr. Gustavo Mozzer	Brazil
	Mr. Hans Oonk	Netherlands
Lead reviewers	Ms. Person Rocha e Pinho	
	Ms. Salisbury	

2. The basis of the findings in this report is the assessment by the ERT of the Party’s 2018 annual submission in accordance with the Article 8 review guidelines. The ERT notes that the individual inventory review of Japan’s 2017 annual submission did not take place in 2017 owing to insufficient funding for the review process.

<sup>1</sup> At the time of publication of this report, Japan had not yet submitted its instrument of ratification of the Doha Amendment, and the Amendment had not yet entered into force. The implementation of the provisions of the Doha Amendment is therefore considered in this report in the context of decision 1/CMP.8, paragraph 6, pending the entry into force of the Amendment.

3. The ERT has made recommendations that Japan resolve the findings related to issues,<sup>2</sup> including issues designated as problems.<sup>3</sup> Other findings, and, if applicable, the encouragements of the ERT to Japan to resolve them, are also included. 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 to the Kyoto Protocol.

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 shows annual GHG emissions for Japan, including totals excluding and including the LULUCF sector, indirect CO<sub>2</sub> emissions and emissions by gas and by sector. Annex I also contains background data related to emissions and removals from KP-LULUCF activities, if elected, by gas, sector and activity for Japan.

## II. Summary and general assessment of the 2018 annual submission

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

Table 2

### Summary of review results and general assessment of the inventory of Japan

<i>Assessment</i>	<i>Issue or problem ID#(s) in table 3 and/or 5<sup>a</sup></i>		
Dates of submission	Original submission: 24 April 2018 (NIR), 24 April 2018, Version 1 (CRF tables), 13 April 2018 (SEF tables) Revised submission: 24 April 2018 (SEF tables)		
Review format	Centralized		
Application of the requirements of the UNFCCC Annex I inventory reporting guidelines and Wetlands Supplement (if applicable)	1. Have any issues been identified in the following areas:		
	(a) Identification of key categories	No	
	(b) Selection and use of methodologies and assumptions	Yes	I.1, L.17, W.7
	(c) Development and selection of EFs	Yes	I.8, I.26, I.32, I.33, A.7, W.5
	(d) Collection and selection of AD	Yes	I.19, I.21, I.35, L.11
	(e) Reporting of recalculations	No	
	(f) Reporting of a consistent time series	No	
	(g) Reporting of uncertainties, including methodologies	No	
	(h) QA/QC	QA/QC procedures were assessed in the context of the national system (see para. 2 in this table)	
	(i) Missing categories/completeness <sup>b</sup>	Yes	I.3, I.4, I.5, I.31, I.34

<sup>2</sup> Issues are defined in decision 13/CP.20, annex, paragraph 81.

<sup>3</sup> Problems are defined in decision 22/CMP.1, annex, paragraphs 68 and 69, as revised by decision 4/CMP.11.

<i>Assessment</i>			<i>Issue or problem ID#(s) in table 3 and/or 5<sup>a</sup></i>
	(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	W.6
Description of trends	Did the ERT conclude that the description in the NIR of the trends for the different gases and sectors is reasonable?	No	E.12, A.5, L.6, L.8, L.16
Supplementary information under the Kyoto Protocol	2. Have any issues been identified related to the national system:		
	(a) The overall organization of the national system, including the effectiveness and reliability of the institutional, procedural and legal arrangements	No	
	(b) Performance of the national system functions	No	
	3. Have any issues been identified related to the national registry:		
	(a) Overall functioning of the national registry	NA	
	(b) Performance of the functions of the national registry and the technical standards for data exchange	NA	
	4. Have any issues been identified related to reporting of information on ERUs, CERs, AAUs and RMUs and on discrepancies reported in accordance with decision 15/CMP.1, annex, chapter I.E, in conjunction with decision 3/CMP.11, taking into consideration any findings or recommendations contained in the SIAR?	NA	
	5. Have any issues been identified in matters related to Article 3, paragraph 14, of the Kyoto Protocol, specifically problems related to the transparency, completeness or timeliness of reporting on the Party's activities related to the priority actions listed in decision 15/CMP.1, annex, paragraph 24, in conjunction with decision 3/CMP.11, including any changes since the previous annual submission?	No	
	6. Have any issues been identified related to the reporting of LULUCF activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, as follows:		
	(a) Reporting requirements in decision 2/CMP.8, annex II, paragraphs 1–5	No	
	(b) Demonstration of methodological consistency between the reference level and reporting on FM in accordance with decision 2/CMP.7, annex, paragraph 14	No	
	(c) Reporting requirements of decision 6/CMP.9	No	
	(d) Country-specific information to support provisions for natural disturbances, in accordance with decision 2/CMP.7, annex, paragraphs 33 and 34	NA	

<i>Assessment</i>			<i>Issue or problem ID#(s) in table 3 and/or 5<sup>a</sup></i>
CPR	Was the CPR reported in accordance with the annex to decision 18/CP.7, the annex to decision 11/CMP.1 and decision 1/CMP.8, paragraph 18?	NA	
Adjustments	Has the ERT applied an adjustment under Article 5, paragraph 2, of the Kyoto Protocol?	NA	
	Did the Party submit a revised estimate to replace a previously applied adjustment?	NA	
Response from the Party during the review	Has the Party provided the ERT with responses to the questions raised, including the data and information necessary for the assessment of conformity with the UNFCCC Annex I inventory reporting guidelines and any further guidance adopted by the Conference of the Parties?	No	G.2
Recommendation for an exceptional in-country review	On the basis of the issues identified, does the ERT recommend that the next review be conducted as an in-country review?	No	
Question of implementation	Did the ERT list a question of implementation?	No	

<sup>a</sup> The ERT identified additional issues and/or problems in all sectors and for KP-LULUCF activities that are not listed in this table but are included in table 3 and/or 5.

<sup>b</sup> Missing categories for which methods are provided in the 2006 IPCC Guidelines may affect completeness and are listed in annex.

### III. Status of implementation of issues and/or problems raised in the previous review report

7. Table 3 compiles all the recommendations made in previous review reports that were included in the previous review report, published on 4 April 2017.<sup>4</sup> For each issue and/or problem, the ERT specified whether it believes the issue and/or problem has been resolved by the conclusion of the review of the 2018 annual submission and provided the rationale for its determination, which takes into consideration the publication date of the previous review report and national circumstances.

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

<i>ID#</i>	<i>Issue and/or problem classification<sup>a, b</sup></i>	<i>Recommendation made in previous review report<sup>c</sup></i>	<i>ERT assessment and rationale</i>
<b>General</b>			
		No issues were identified in the previous annual review report.	
<b>Energy</b>			
E.1	Fuel combustion – reference approach – all fuels – CO <sub>2</sub> (E.1, 2016) (25,	Include in the NIR detailed information on the conversion factors used to convert GCV to NCV for all fuels.	Not resolved. In response to this recommendation, Japan explained that detailed information on the conversion factors used to convert NCV to GCV is provided in the NIR where they are used (e.g. section 3.2.5.b (p.3-29) for CH <sub>4</sub> and N <sub>2</sub> O emissions for

<sup>4</sup> FCCC/ARR/2016/JPN. The ERT notes that the individual inventory review of Japan’s 2017 annual submission did not take place during 2017. As a result, the latest published annual review report reflects the findings of the review of the Party’s 2016 annual submission.



ID#	Issue and/or problem classification <sup>a, b</sup>	Recommendation made in previous review report <sup>c</sup>	ERT assessment and rationale
2014)	Transparency		category 1.A.1, section 3.2.7.b (p.3-43) for CH <sub>4</sub> and N <sub>2</sub> O emissions for category 1.A.2, and section 3.2.11 (p.3-67) for CH <sub>4</sub> and N <sub>2</sub> O emissions for categories 1.A.4.a and 1.A.4.c). However, the ERT noted that the recommendation in the previous review report is related to the conversion factors used to convert GCV to NCV for CO <sub>2</sub> emissions for all fuels in the reference approach. The ERT also noted that NIR table 3-11 (p.3-16) shows the carbon EFs in GCVs, and NIR table 3-12 (p.3-17) shows whether values are country specific or IPCC default. NIR table 3-18 shows the GCVs used in the inventory; however, no equivalents numbers in NCVs or conversion factors (GCV to NCV) are presented in the inventory. Japan uses the same EFs for both the sectoral and the reference approaches. During the 2014 review the Party informed the ERT that, for the IPCC default EF, NCVs are 5 per cent lower than GCVs for solid and liquid fuels and 10 per cent lower than GCVs for natural gas, as provided in the 2006 IPCC Guidelines (volume 2, section 6.4.2, footnote). However, in addition to not including this information in the NIR (for explaining the conversion factors related to the IPCC default EFs used), the Party did not clarify whether these default conversion factors also apply to the country-specific EF.
E.2	Fuel combustion – reference approach – solid fuels – CO <sub>2</sub> (E.2, 2016) (26, 2014) (24, 2013) (39, 2012) Transparency	Address the inconsistencies between the figures reported in the CRF tables and the international statistics from IEA in annex 2 to the NIR (which might lead to differences between the reference and sectoral approaches) by providing coal production data in CRF table 1.A(b) and by including relevant explanations of the discrepancies with international statistics in annex 2 to the NIR.	Resolved. Domestic production data on sub-bituminous coal are provided in CRF table 1.A(b). The ERT checked the data, and inconsistencies in the figures reported by IEA and in the CRF table no longer exist.
E.3	Feedstocks, reductants and other non-energy use of fuels – gaseous and solid fuels – CO <sub>2</sub> (E.14, 2016) Comparability	Adhere to the requirement for the reporting of non-energy use of solid fuels under the IPPU sector by transparently reporting the allocation of fuels and emissions between the two sectors in the NIR and ensure consistency of reporting across the CRF tables.	Resolved. Japan updated the CRF tables as follows: (1) the amount of other bituminous coal is now reported in CRF table 1.A(d); (2) the value for solid fuels for apparent energy consumption in CRF table 1.A(c) cell C10 has been revised so that the difference of the values between cells B10 and C10 (18.66 PJ) equals the value in cell D38 of CRF table 1.A(d); and (3) according to the Party response provided in table 10-11 of the 2017 NIR, CRF table 1.A(d) column J has been changed to blank if column I indicates “NO” for other oil and coke oven/gas. However, regarding the latter change, the ERT noted that “NE” (and not “NO”) is reported in column I for other oil and coke oven/gas coke for the years in which these fuels are not consumed for ammonia production (in line with ID# E.4 below). In addition, the Party explained that

ID#	Issue and/or problem classification <sup>a, b</sup>	Recommendation made in previous review report <sup>c</sup>	ERT assessment and rationale
E.4	Feedstocks, reductants and other non-energy use of fuels – gaseous and solid fuels – CO <sub>2</sub> (E.15, 2016) Transparency	Provide greater transparency in the NIR and CRF tables (e.g. documentation boxes) and justification for the application of the “NE” notation key when fuels are used for non-energy purposes to demonstrate that there are no omissions of any potential emissions.	<p>in CRF table 1.A(d) column J (reported under “Select categories from the category tree”) new sectors were added for petroleum coke (titanium dioxide production), coal tar (carbon black) and natural gas (petrochemical production – other).</p> <p>Not resolved. Japan did not provide in the documentation box of CRF table 1.A(d) a clear explanation of the use of “NE”. During the review, the Party made reference to NIR section 3.2.3 for the justification of the application of “NE”. However, the ERT could only find a footnote to NIR table 3-9 (p.3-13) that partially explained why CO<sub>2</sub> emissions for some activities were not reported in the “reported emissions” column of CRF table 1.A(d). The ERT is of the view that a clear reference for the application of “NE” would increase transparency regarding the use of this notation key for future review, for example text (cross-referenced in the documentation box) explaining that “NE” is reported in column I in CRF table 1.A(d) for some fuels because Japan assumes that the carbon in these fuels is stored in long-lived products and the emissions are captured when the waste is incinerated or decomposed, and when fossil-fuel derived chemical products are used as feedstock to produce other chemical products. Japan provided comments in response to the draft report explaining that this issue will be investigated further.</p>
E.5	1.A.1.a Public electricity and heat production – other fossil fuels – CO <sub>2</sub> (E.16, 2016) Transparency	Increase the transparency of its reporting regarding the composition of other fuels for public electricity and heat production in order to justify the CO <sub>2</sub> IEF and ensure comparability of reporting.	Addressing. Japan included additional information in the NIR (table 3-57, p.3-70). The Party included a column explaining the “fuel type to be allocated to CRF” linked to the “waste types” and categories and added information in footnotes 8 and 9. However, the ERT is of the view that further information is required to clarify why it is “difficult to distinguish the AD on calorie basis for energy sector from the biogenic fraction” (NIR table 3-57, footnote 9).
E.6	1.A.3.b Road transportation – liquid fuels – CO <sub>2</sub> , CH <sub>4</sub> and N <sub>2</sub> O (E.8, 2016) (40, 2014) Transparency	Provide additional information on the annual number of vehicles by type, the annual mileage per vehicle and the fuel efficiency per vehicle type.	Resolved. The additional information on the annual number of vehicles by type, the annual mileage per vehicle and the fuel efficiency per vehicle type has been provided in NIR tables 3-42, 3-43 and 3-44 (pp.3-57–3-58).
E.7	1.A.3.b Road transportation – liquid fuels – CO <sub>2</sub> , CH <sub>4</sub> and N <sub>2</sub> O (E.9, 2016) (40, 2014) Adherence to UNFCCC Annex I inventory reporting guidelines	Include in the QA/QC procedures a comparison of the annual mileage and fuel efficiency by vehicle category with the fuel consumption reported in the energy balance to ensure that no discrepancies occur.	Resolved. The Party explained in the NIR (section 3.2.9.2.d, p.3-58) that no discrepancies occur because the general energy statistics (energy balance tables) use the data included in the statistical yearbook of motor vehicle transport and of motor vehicle fuel consumption for estimating emissions (i.e. the same statistics are used).

<i>ID#</i>	<i>Issue and/or problem classification<sup>a, b</sup></i>	<i>Recommendation made in previous review report<sup>c</sup></i>	<i>ERT assessment and rationale</i>
E.8	1.A.3.b Road transportation – liquid fuels – N <sub>2</sub> O (E.17, 2016) Transparency	Provide, in the NIR, additional justification of the performance of the close-coupled catalytic converter, including references to performance studies, in order to better explain the trend in the emissions for this category.	Resolved. Additional justification of the performance of the close-coupled catalytic converter is included in the NIR under “N <sub>2</sub> O emissions from gasoline passenger vehicles in Japan” in section 3.2.9.2.b (p.3-55). Japan also included a footnote citing a reference study.
E.9	1.A.5 Other (not specified elsewhere) – gaseous, liquid and solid fuels – CO <sub>2</sub> , CH <sub>4</sub> and N <sub>2</sub> O (E.18, 2016) Transparency	Include information in the NIR explaining where emissions from the fuel consumption of the Self-Defence Forces are included in the inventory.	Resolved. Japan included in the NIR (section 3.2.10.a, p.3-64, and section 3.2.11, p.3-67) information stating that emissions from self-defence are included in category 1.A.4.a (commercial/institutional).
E.10	1.B.2.b Natural gas – gaseous fuels – CH <sub>4</sub> (E.12, 2016) (45, 2014) Transparency	Clarify the text of the NIR regarding fugitive emissions from natural gas distribution to industrial consumers.	Addressing. Japan added an explanation in the NIR (section 3.3.2.2.e, p.3-97) indicating that under category 1.B.2.b.v (distribution) only emissions from city gas supply networks are estimated and that city gas supplied to industrial plants is included in the estimation. However, the original issue raised by the ERT was related to an explanation of the allocation of emission estimates of natural gas to industrial consumers (because, in the energy balance (annex 4), there are different quantities of natural gas and city gas reported to industrial consumers). Japan explained to the previous ERT that natural gas supplied to industry was included under natural gas transmission (category 1.B.2.b.iv) because the AD for this category (length of natural gas pipelines) also included the natural gas distribution networks to industrial consumers. As Japan uses a country-specific EF, there is no underestimation of emissions. Therefore, the ERT is of the view that a better clarification, in accordance with the original issue, is needed. The ERT noted that, in the 2016 and 2018 NIRs under category 1.B.2.b.iv, the Party reported that CH <sub>4</sub> emissions from the transmission of natural gas are estimated by multiplying the sales volume of natural gas by the country-specific EFs.

## IPPU

I.1	2. General (IPPU) – CO <sub>2</sub> , CH <sub>4</sub> and N <sub>2</sub> O (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 the 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.	Not resolved. Japan still reports the consumption of reducing agents for the production of soda ash, iron and steel, ferroalloys, lead and zinc under the energy sector (NIR, pp.4-31, 4-51, 4-56 and 4-60). The Party informed the ERT that it does not plan to reallocate emissions for these categories to the IPPU sector and that it reported the notation key “IE” in the CRF tables (see NIR table 4-1, p.4-1). The ERT understands the Party’s national circumstances but notes that the current allocation impairs comparability with the reports of other countries (see ID# I.27 in table 5).
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ID#	Issue and/or problem classification <sup>a, b</sup>	Recommendation made in previous review report <sup>c</sup>	ERT assessment and rationale
I.2	2.A Mineral industry – CO <sub>2</sub> (I.7, 2016) Comparability	Reallocate the emissions from the consumption of soda ash for glass production to category 2.A.3 (glass production) as required by the 2006 IPCC Guidelines and the UNFCCC Annex I inventory reporting guidelines.	Resolved. Japan reports emissions from soda ash used for glass production under category 2.A.3 (glass production). The NIR (section 4.2.3, table 4-9, p.4-11) shows the AD for the entire time series.
I.3	2.A.2 Lime production – CO <sub>2</sub> (I.8, 2016) Completeness	Provide a justification for the information that lime production does not lead to CO <sub>2</sub> emissions in sugar mills owing to subsequent recarbonation, or provide an estimation of these emissions in line with the 2006 IPCC Guidelines.	Addressing. Japan included in the NIR (section 4.2.2, p.4-8) the following explanation: “As regards lime production in sugar mills, this is not accounted for, since CO <sub>2</sub> emitted from lime production is reabsorbed in the sugar production process”. However, further documentation (e.g. communication from the company or literature concerning the plant operations) is needed to support this justification. In its comments to the draft review report, the Party explained that, according to an interview conducted with three domestic producers documented in a report by the Ministry of the Environment, in the sugar cane industry, slaked lime is acquired from outside to make the lime milk at all domestic producers, and therefore there are no CO <sub>2</sub> emissions. As for beet sugar, when limestone is calcined, the CO <sub>2</sub> emitted is reabsorbed into the lime cake. The Party explained that, on the basis of this information, CO <sub>2</sub> emissions from sugar manufacturing are not estimated. The ERT is of the view that this information should be included in the next NIR.
I.4	2.A.2 Lime production – CO <sub>2</sub> (I.8, 2016) Completeness	Work with the aluminium industry to obtain information to confirm that lime is not produced by aluminium manufacturers. If this is not possible, estimate and include in the inventory the CO <sub>2</sub> emissions related to the non-marketed lime that is consumed in aluminium production.	Addressing. Japan included in the NIR (section 4.2.2, p.4-8) information indicating that “the Adjusted Price Transaction Table does not identify any limestone consumption under the aluminium production sector, and therefore production is not confirmed”. However, the Party has not clarified whether further work was done to obtain information to confirm that non-marketed lime reagent was not produced by aluminium manufacturers. The ERT is aware that the aluminium industry in Japan ceased operations in 2014, and that the best industrial statistics values are used; however, the ERT is of the view that the Party should provide evidence that non-marketed lime was not produced by aluminium manufacturers, or estimate CO <sub>2</sub> emissions related to non-marketed lime for 1990–2014.
I.5	2.A.3 Glass production – CO <sub>2</sub> (I.9, 2016) Completeness	Estimate and include in the inventory the CO <sub>2</sub> emissions associated with the consumption of minor CO <sub>2</sub> -emitting raw materials for glass manufacturing or provide information demonstrating that the carbonate is not consumed.	Not resolved. Japan has not estimated and included the CO <sub>2</sub> emissions associated with minor CO <sub>2</sub> -emitting materials (such as strontium carbonate and sodium bicarbonate) under this category. In the NIR (section 4.2.3, p.4-11) the Party has also not provided information demonstrating that the carbonate is not consumed. During the review, Japan explained that “based on confirmed data from national statistics, the inventory team is not aware

ID#	Issue and/or problem classification <sup>a, b</sup>	Recommendation made in previous review report <sup>c</sup>	ERT assessment and rationale
I.6	2.B.5 Carbide production – CO <sub>2</sub> (I.10, 2016) Accuracy	Either revise the country-specific EF in consultation with the operators of CaC <sub>2</sub> plants, taking into account the fact that the country-specific EF used cannot be below the EF based on the stoichiometry of the reaction and the need to take into consideration the additional carbon that is oxidized in the process; or recalculate the CO <sub>2</sub> emissions from CaC <sub>2</sub> production by applying the default EF provided in the 2006 IPCC Guidelines (volume 3, chapter 3.6.2.2).	that such minor CO <sub>2</sub> -emitting raw materials are currently used”.  Resolved. Japan explained in the NIR (section 4.3.5.2.b, pp.4-28 and 4-29) that the CaC <sub>2</sub> production amount used for calculating the CO <sub>2</sub> EF includes not only CaC <sub>2</sub> but also unreactive CaO used as raw material. This is the reason for the country-specific EF being lower than the stoichiometric value derived from a reaction involving only CaC <sub>2</sub> . During the review Japan provided more information related to the country-specific EF, the amount of unreactive CaO and the purity and explained unreactive CaO lowers the CO <sub>2</sub> EF for CaC <sub>2</sub> below the EF based on the stoichiometry of the reaction. The ERT agrees with the Party that the purity grade of CaC <sub>2</sub> influences the country-specific EF and considers this accuracy issue to have been resolved.
I.7	2.B.6 Titanium dioxide production – CO <sub>2</sub> (I.11, 2016) Accuracy	Either revise the country-specific EF in consultation with the operators of the rutile TiO <sub>2</sub> plant, taking into account that the EF could not be lower than the EF based on the stoichiometry of the reaction and that, in addition to the stoichiometric EF, excess carbon is oxidized in the process; or recalculate the CO <sub>2</sub> emissions from rutile TiO <sub>2</sub> production applying the default EF provided in the 2006 IPCC Guidelines (volume 3, chapter 3.7.2.2).	Resolved. Japan explained in the NIR (section 4.3.6, p.4-30) that, in the case of Japanese manufacturers, reactions take place under high temperatures such as 1,000 °C, and therefore a second reaction takes place simultaneously. Because of this and considering that CO is completely used up in the reactions, 1 mole of TiO <sub>2</sub> yields only 1 mole of CO <sub>2</sub> . The Party also explained that there is no excess carbon at the end of the reaction and that CO <sub>2</sub> occurs only from input coke. The ERT considers that the explanation given is technically reasonable and relies on site-specific process control AD, but also believes that more clarity on this issue should be included in the NIR (see ID# I.24 in table 5).
I.8	2.B.8 Petrochemical and carbon black production – CO <sub>2</sub> (I.12, 2016) Accuracy	Justify that the country-specific CO <sub>2</sub> EF has been developed in a manner consistent with the 2006 IPCC Guidelines, covering the total CO <sub>2</sub> emissions from the steam cracking process, and is considered to be more accurate than the IPCC default EF; or recalculate the CO <sub>2</sub> emissions from ethylene production by applying the default EF provided in the 2006 IPCC Guidelines (volume 3, chapter 3.9.2.2).	Not resolved. Japan added text to the NIR (section 4.3.8.2, p.4-33) for category 2.B.8.b (ethylene production) justifying the country-specific EF but without explaining whether the CO <sub>2</sub> from the steam cracking process is considered in the EF calculations. In addition, the ERT considers that the CO <sub>2</sub> EF is not consistent with the 2006 IPCC Guidelines because the Party allocates the emissions of process off-gases to the energy sector. According to the 2006 IPCC Guidelines (volume 3, chapter 3, p.3.57), combustion emissions from fuels obtained from feedstocks should be allocated to the source category under the IPPU sector.
I.9	2.C.1 Iron and steel production – CO <sub>2</sub> and CH <sub>4</sub> (I.13, 2016) Transparency	Report the relevant AD (consumption of carbon electrodes in electric arc furnaces or steel production) for category 2.C.1.b in CRF table 2(I).A-Hs2.	Resolved. Japan reported in CRF table 2(I).A-Hs2 the AD related to the consumption of carbon electrodes under category 2.C.1.a (steel), instead of reporting “NE”. Category 2.C.1.b (pig iron) is related to the consumption of limestone and dolomite and was correctly reported by the Party.

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I.10	2.E.1 Integrated circuit or semi-conductor – HFCs, PFCs, SF <sub>6</sub> and NF <sub>3</sub> (I.14, 2016) Transparency	Report in the NIR information about the “use rate” per specific gas and “by-production rate” of C <sub>2</sub> F <sub>6</sub> .	Addressing. Japan did not report in the NIR (table 4-55, p.4-68) the “use rate of PFC etc.” per specific gas (CF <sub>4</sub> and C <sub>2</sub> F <sub>6</sub> ) and continued to report a range of 10–98 per cent for the “use rate of PFC etc.”. In addition, the Party did not report the by-production rate of C <sub>2</sub> F <sub>6</sub> . Instead, the Party included a footnote to the table explaining that “the CF <sub>4</sub> etc. by-production rate and by-product CF <sub>4</sub> etc. removal rate each include that for C <sub>2</sub> F <sub>6</sub> ”. During the review, Japan informed the ERT that under section 4.6.1.b (estimation method) it is stated that “default values are applied for the use rate of F-gases and the by-product generation rates”, and that this information should be sufficient. However, there is no cross reference to the EFs used from the 2006 IPCC Guidelines (page, table, etc.). In addition, when Japan described in the footnote that, for example “the CF <sub>4</sub> etc. includes C <sub>2</sub> F <sub>6</sub> ”, it is not clear that CF <sub>4</sub> and C <sub>2</sub> F <sub>6</sub> are the only PFCs reported under this category. Therefore, the Party should improve the transparency of the table by including “use rate” per specific gas (CF <sub>4</sub> and C <sub>2</sub> F <sub>6</sub> ) and the “by-production rate” of C <sub>2</sub> F <sub>6</sub> .
I.11	2.E.1 Integrated circuit or semi-conductor – HFCs, PFCs, SF <sub>6</sub> and NF <sub>3</sub> (I.14, 2016) Transparency	Report in the NIR information indicating that the fraction of gas controlled is not reported for confidentiality reasons.	Resolved. Japan provided in the NIR (section 4.6.1, p.4-68) an explanation that the fraction of gas controlled is not reported for confidentiality reasons.
I.12	2.E.1 Integrated circuit or semi-conductor – HFCs, PFCs, SF <sub>6</sub> and NF <sub>3</sub> (I.14, 2016) Adherence to the UNFCCC Annex I inventory reporting guidelines	Report the AD (consumption of F-gases) for category 2.E.1 in CRF table 2(II)B-Hs1.	Resolved. The AD for category 2.E.1 were reported in CRF table 2(II)B-Hs1 for the entire time series.
I.13	2.E.2 Thin-film transistor flat panel display – HFCs, PFCs, SF <sub>6</sub> and NF <sub>3</sub> (I.15, 2016) Transparency	Report in the NIR information about the “use rate” per specific gas and “by-production rate” of CHF <sub>3</sub> .	Addressing. Japan did not report in the NIR (table 4-56, p.4-70) the “use rate of PFC etc.” per specific gas (CF <sub>4</sub> and CHF <sub>3</sub> ) and continued to report a range of 40–97 per cent for the “use rate of PFC etc.”. In addition, the Party did not report the by-product rate of CHF <sub>3</sub> . Instead, the Party included a footnote to the table explaining that “the CF <sub>4</sub> etc. by-production rate and by-product CF <sub>4</sub> etc. removal rate each include that for CHF <sub>3</sub> ”. During the review, the Party explained that in its NIR under section 4.6.2.b (estimation method) it is stated that “in principle, default values are applied for the use rate of F-gases and the by-product rates”, and that this information should be sufficient. However, there is no cross reference to the EFs used from the 2006 IPCC Guidelines (page, table, etc.). In addition, when Japan described in the footnote that, for example, “the CF <sub>4</sub> etc. includes CHF <sub>3</sub> ”, it is not clear that CF <sub>4</sub> and CHF <sub>3</sub> are the only F-gases reported under this category. Therefore, the Party should improve the

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			transparency of the table by including the “use rate” per specific gas (CF <sub>4</sub> and CHF <sub>3</sub> ) and the “by-production rate” of CHF <sub>3</sub> .
I.14	2.E.2 Thin-film transistor flat panel display – HFCs, PFCs, SF <sub>6</sub> and NF <sub>3</sub> (I.15, 2016) Transparency	Report in the NIR information that the fraction of gas controlled is not reported for confidentiality reasons.	Resolved. Japan provided in the NIR (section 4.6.2, p.4-69) an explanation that the fraction of gas controlled is not reported for confidentiality reasons.
I.15	2.E.2 Thin-film transistor flat panel display – HFCs, PFCs, SF <sub>6</sub> and NF <sub>3</sub> (I.15, 2016) Adherence to the UNFCCC Annex I inventory reporting guidelines	Report the AD (consumption of F-gases) for category 2.E.2 in CRF table 2(II)B-Hs1.	Resolved. The AD for category 2.E.2 were reported in CRF table 2(II)B-Hs1 for the entire time series.
I.16	2.F Product uses as substitutes for ozone depleting substances – HFCs and PFCs (I.16, 2016) Transparency	Report the information provided during the review on the emissions of unspecified mixtures of HFCs from commercial refrigeration and PFCs from solvents, along with the average GWP of these mixtures.	Resolved. Japan reported in the NIR the required information. For category 2.F.1 (commercial refrigeration), see the footnote to NIR table 4-59 (p.4-74); for category 2.F.5 (solvents), see the text for PFCs in the NIR (p.4-92).
I.17	2.F.1 Refrigeration and air conditioning – HFCs (I.17, 2016) Transparency	Report in the NIR that the parameters “refrigerant contained per operated device” and “refrigerant contained per disposed device” are equal to “refrigerant charged per device at production” since these types of equipment are sealed tight.	Addressing. Japan reported as a footnote to NIR table 4-58 (p.4-72) that “emissions from use and disposal were estimated by summing up the values calculated for each year of the production of devices, and therefore the refrigerant contained per operated device (charge) and refrigerant contained per disposed device cannot be easily provided”. However, this information does not completely reflect the information provided to the ERT during the previous review that explained there are no leakages except during repairs because refrigerators are sealed tight, and therefore it considered that the parameters of the estimation model “refrigerant contained per operated device” and “refrigerant contained per disposed device” equal to “refrigerant charged per device at production”. The Party should provide complete information in the NIR.
I.18	2.F.1 Refrigeration and air conditioning – HFCs (I.18, 2016) Completeness	Estimate and report the HFC emissions related to refrigerant container management using equation 7.11 from the 2006 IPCC Guidelines.	Resolved. Japan reported in the NIR (p.4-74) that, for refrigeration containers, “upon consideration of emissions from non-refillable cylinders that are not captured under other sources, it was verified that they do not exceed 500 kt CO <sub>2</sub> eq nor do there exist any statistics or survey data that can be used as AD”. In annex 5 to the NIR (table A5-2, p.annex 5-4) emissions from refrigerant containers are reported as insignificant and the likely level of emissions is below 7 kt CO <sub>2</sub> eq.
I.19	2.F.1 Refrigeration and air conditioning	Report transparently the emissions from domestic	Addressing. Japan reported the emissions from domestic refrigeration, stationary air conditioning

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	– HFCs (I.19, 2016) Comparability	refrigeration, stationary air conditioning and mobile air conditioning and the AD and recovery of all subcategories of category 2.F.1 in CRF table 2(II)B-Hs2 for all phases of the lifetime of the equipment (i.e. manufacturing or assembly, operation, disposal and recovery).	and road vehicles under mobile air conditioning for “manufacturing”, “stocks” and “disposal” in CRF table 2(II)B-Hs2 (cells I, J and K, respectively). However, the emissions for “recovery” (cell L) are still reported as “NE” for all subcategories under category 2.F.1. The Party also included disaggregated data for the emissions from manufacturing, stocks and disposal in NIR table 4-58 (for domestic refrigeration), NIR table 4-64 (for stationary air conditioning) and NIR tables 4-65, 4-66 and 4-67 (for cars, railways and vessels, respectively). Regarding the AD (cells C, D and E) of all subcategories of category 2.F.1 (which also includes commercial refrigeration), the values were not reported in CRF table 2(II)B-Hs2, although these values are provided in the NIR tables (see ID# I.35 in table 5).
I.20	2.F.1 Refrigeration and air conditioning – HFCs (I.20, 2016) Transparency	Correct the reference to manufacturing and operation emissions from “HFC devices” for 1990 and 1995 in table 4-60 of the NIR.	Resolved. Japan corrected the reference in table 4-60 of the NIR (p.4-75).
I.21	2.F.2 Foam blowing agents – HFCs (I.21, 2016) Comparability	Improve the transparency of the reporting of AD for foam blowing agents in open and closed cells in CRF table 2(II)B-Hs2 using data currently reported in the NIR, where possible.	Addressing. Japan reported the AD for closed cells in CRF table 2(II)B-Hs2 under “amount in operating systems (average annual stocks)” in line with the information reported in the NIR (tables 4-68 and 4-69). Regarding open cells, the Party is now reporting “NO” for AD under “amount in operating system (average annual stocks)” instead of “NE”. However, Japan did not report the AD in the CRF table, as requested by the previous ERT, for “amount filled into new manufactured products”.
<b>Agriculture</b>			
A.1	3.B Manure management – CO <sub>2</sub> and N <sub>2</sub> O (A.7, 2016) (67, 2014) Transparency	Improve the transparency of the description of the methodology used to estimate emissions from the heaping and sun-drying of poultry waste.	Resolved. Japan included in the NIR (section 5.3.1 p.5-12) an explanation of how the EFs for hens and broilers for “sun-drying” and “piling” were established and provided a reference to the detailed method applied.
A.2	3.B.1 Cattle – CH <sub>4</sub> (A.12, 2016) Transparency	Report a justification for the CH <sub>4</sub> IEF in the NIR, together with background information on the management systems in Japan from the reference materials.	Resolved. Japan included in the NIR (section 5.3.1, p.5-18) background information on the livestock manure management systems in the country, explaining that, in Japan, composting systems (“composting” and “piling”) are the major management system. Justification for the high CH <sub>4</sub> IEF (3.8 per cent) associated with the piling system for dairy cattle is given in the NIR (section 5.3.1.d, p.5-20).
<b>LULUCF</b>			
L.1	4. General (LULUCF) – CO <sub>2</sub> , CH <sub>4</sub> and N <sub>2</sub> O (L.1, 2016) (table 3, 2014) (73 and 81,	Estimate and report emissions for all mandatory categories: (f) CO <sub>2</sub> , CH <sub>4</sub> and N <sub>2</sub> O emissions from controlled biomass burning for cropland	Resolved. See ID#s L.12 and L.13 below.



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	2013) (83 and 110, 2012) (77 and 79, 2011) Completeness	remaining cropland, from controlled burning and wildfires for grassland remaining grassland, and from wildfires on forest land converted to grassland and wetlands.	
L.2	4. General (LULUCF) – all gases (L.9, 2016) Consistency	Enhance QA/QC measures to ensure full correspondence between data reported in the NIR and in the CRF tables and a more accurate documentation of recent updates and improvements in the NIR.	Resolved. In the 2018 submission no inconsistencies between data in the NIR and in the CRF tables were found by the ERT, including related to the area of land converted to cropland. During the review the Party explained that the discrepancies between the CRF tables and NIR figures have been eliminated by improving the file structures and links (e.g. the values of the Excel file used when describing the value of NIR and the Excel file used for transferring data to the CRF Reporter software were matched by confirming the cell links and checking the QC check column in the files).
L.3	4. General (LULUCF) – all gases (L.10, 2016) Transparency	Clearly document in the NIR the main drivers for the recalculations and their impact on the sectoral estimates.	Resolved. Japan provided in the NIR (in the sectoral parts of the LULUCF chapter) the reasons for the recalculations and referred to chapter 10 of the NIR for the impacts on trends. Section 10.2.1 of the NIR (p.10-1) includes a comparison with the previous year's inventory for each sector, by category and by gas (NIR tables 10-2 to 10-6).
L.4	4. General (LULUCF) – all gases (L.11, 2016) Transparency	Include in the NIR a clear explanation for the difference between areas reported for cultivated histosols under the agriculture sector and cropland and grassland organic soils reported under the LULUCF sector using a similar rationale to the one provided during the review and which was reported in the 2014 and 2015 NIRs.	Not resolved. The NIR does not include a clear explanation for the difference between areas reported for cultivated organic soils (histosols) under the agriculture sector (category 3.D.a.6) and the areas of organic soils reported under categories 4.B (cropland) and 4.C (grassland). During the review, the Party explained that the area of organic soils (histosols) reported in the agriculture sector under category 3.D.a.6 does not include the area of organic soils of orchards for category 4.B (0.02 kha) and of grazed meadow (4.52 kha), wild land (11.92 kha) and unrenewed pastureland (37.06 kha) for category 4.C because these areas are not cultivated (see ID# A.6 in table 5). The Party may wish to include a table clarifying which areas of organic soils are excluded from category 3.D.a.6 when compared with the areas of organic soils in the LULUCF sector and make a cross reference to the relevant parts of its reporting on the agriculture sector.
L.5	4.A.1 Forest land remaining forest land – CO <sub>2</sub> (L.3, 2016) (77, 2014) (71, 2013) (88, 2012) Transparency	Provide information, in the NIR, that supports the assumptions made regarding the reporting of the biomass carbon stock pools in bamboo forest and the reporting of dead organic matter and soil carbon changes for the subcategories “bamboo” and	Resolved. Japan provided in the NIR (section 6.5.1.a., p.6-10) an explanation of the assumptions made to support the use of the notation key “NA” for biomass carbon stock pools in bamboo forest and the reporting of dead organic matter and soil carbon changes for the subcategories bamboo and “forests with less standing trees”. The Party also included in the NIR references that better support the assumptions made in the reporting (see references 25 and 26 in the NIR, p.6-95).

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		“forests with less standing trees”.	
L.6	4.B.1 Cropland remaining cropland – CO <sub>2</sub> (L.12, 2016) Transparency	Clearly explain in the NIR the resulting estimates from the Roth-C 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 carbon stock changes in cropland mineral soils.	Addressing. Japan included an explanation on the trends of the carbon stock changes in mineral soils resulting from implementing the Roth-C model (NIR, section 6.6.1.a, p.6-26). However, the ERT noted the need for more clarity. During the review, Japan explained that a clear explanation on the driver for the trend was under investigation.
L.7	4.B.2 Land converted to cropland – CO <sub>2</sub> (L.13, 2016) Transparency	Explain in the NIR the allocation of carbon stock changes in soils and the use of the notation key “IE” in reporting organic soils for land converted to cropland.	Resolved. Japan included in the NIR (section 6.6.2.b, p.6-36 under “Estimation method”) the necessary explanation. Also, the Party referred to the NIR (section 6.6.1.b, p.6-28) for the explanation of the methodology applied.
L.8	4.C.1 Grassland remaining grassland – CO <sub>2</sub> (L.14, 2016) Transparency	Clearly explain in the NIR the resulting estimates from the Roth-C 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. Japan included an explanation on the trends of the carbon stock change in mineral soils resulting from implementing the Roth-C model (NIR, section 6.7.1.a, p.6-38). However, the ERT noted the need for more clarity. During the review, Japan explained that a clear explanation on the driver for the trend was under investigation, as explained in the NIR (p.6-41 under “category-specific planned improvements”).
L.9	4.D Wetlands – CO <sub>2</sub> (L.15, 2016) Transparency	Justify more clearly in the NIR the assumption of insignificance in terms of the likely level of emissions from carbon stock changes in living biomass and mineral and organic soil carbon pools managed for peat extraction in accordance with paragraph 37(b) of annex I to decision 24/CP.19.	Resolved. The NIR (section 6.8.1.b, p.6-47) contains a clear explanation, on the basis of a field experiment with results indicating why the emissions from carbon stock changes in living biomass and mineral and organic soil carbon pools managed for peat extraction can be considered insignificant.
L.10	4.F.2 Land converted to other land – CO <sub>2</sub> (L.16, 2016) Transparency	Enhance the documentation in the NIR of what is allocated under other land and under conversions to this category from other land uses and better explain the rationale and justification for using “NA” for some of the carbon	Resolved. Japan provided in the NIR (table 6-45, p.6-65) information on what is allocated under other land. The conversions to this category (other land) from other land uses are explained in the NIR (section 6.10.2.b, p.6-67 and table 6-48). In the NIR (section 6.10.2.a, p.6-66) the Party also provided the rationale for including soil and stone mining under other land. The justification for using “NA” for carbon stock changes in soils for cropland and

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		pools reported under this land category.	grassland converted to other land (assumed to be zero or in a steady state) is included in section 6.10.2.a, page 6-66.
L.11	4(III) Direct N <sub>2</sub> O emissions from N mineralization/immobilization – N <sub>2</sub> O (L.17, 2016) Accuracy	Improve the consistency of the reporting for the sector across categories 4.B, 4.C and 4(III).	Not resolved. The CRF tables are still inconsistent. For example, the area of land converted to cropland reported in CRF table 4.B (32.17 kha) does not match the area in CRF table 4(III) (35.84 kha), and the area of grassland remaining grassland reported in CRF table 4.C (926.71 kha) does not match the total area in CRF table 4(III) (563.32 kha).
L.12	4(V) Biomass burning – CO <sub>2</sub> , CH <sub>4</sub> and N <sub>2</sub> O (L.18, 2016) Completeness	Develop a plan to obtain suitable AD for controlled burning and wildfires on grassland remaining grassland and for wildfires on land converted to grassland and report the associated emissions in future annual submissions to improve the completeness of the GHG inventory.	Resolved. Japan improved the reporting and, in the 2018 submission, estimated CH <sub>4</sub> and N <sub>2</sub> O emissions and reported CO <sub>2</sub> as “IE” for controlled burning under grassland remaining grassland (CRF table 4(V) and NIR section 6.16.c, p.6-93). For wildfires under grassland remaining grassland and for wildfires on land converted to grassland, the notation key “NO” was reported because Japan assumes that these areas are under intensive management and therefore the occurrence of wildfires is negligible (NIR, section 6.16, p.6-89). The ERT agrees with this assumption.
L.13	4(V) Biomass burning – CH <sub>4</sub> and N <sub>2</sub> O (L.19, 2016) Transparency	Justify more clearly in the NIR the assumption of insignificance in terms of the likely level of emissions of CH <sub>4</sub> and N <sub>2</sub> O from controlled burning and wildfires in river locations, under wetlands, and of emissions from wildfires on land converted to wetlands by including in the NIR a rationale similar to the detailed explanations and calculations provided to the ERT during the review week.	Resolved. Japan included in the NIR (section 6.16, p.6-93) the explanation of the insignificance of emissions of CH <sub>4</sub> and N <sub>2</sub> O from controlled burning and wildfires in river locations under wetlands.
L.14	4.G HWP – CO <sub>2</sub> (L.20, 2016) Transparency	Improve the documentation in the NIR of what is included in each HWP commodity reported under category 4.G by better describing how the methods used account for carbon losses due to destruction and renovation of buildings.	Addressing. Japan recalculated the emissions for this category (NIR, section 6.11.1.e, p.6-74) and included the floor area of extensions/reconstruction of buildings in the inflow of the HWP pools. The recalculation also revised the amount of wood used per unit floor area and the rate of domestic logs to reflect the values for construction in the years in which the destroyed buildings were built. However, it was not clear to the ERT from the description in the NIR (section 6.11.1.b, p.6-70) how the methods used accounted for carbon losses due to the destruction and renovation/reconstruction of buildings.
Waste			
W.1	5.A.1 Managed waste disposal sites – CH <sub>4</sub>	Provide additional details in the NIR on the impact on estimated CH <sub>4</sub> emissions of time lags in the AD for waste landfilling and additional	Resolved. An explanation was included in the NIR (section 7.2, p.7-6) stating that “since Japan employs the first-order decay method from the 2006 IPCC Guidelines, which causes time lags between trends in final disposal amount and emissions, there are some

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	(W.3, 2016) Transparency	information on any significant inter-annual changes and the trend in the CH <sub>4</sub> IEFs.	unexpected trends in IEFs” across the time series. The ERT considers the explanation sufficient and agrees with Japan that, owing to this time lag, waste landfilled in a certain year only produces CH <sub>4</sub> over the next few decades, so there is no direct correlation between the amount of waste landfilled in a year and the CH <sub>4</sub> emissions in that year, and IEFs have limited physical meaning. Therefore, there is no need to explain inter-annual changes and trends in the CH <sub>4</sub> IEFs.
W.2	5.A.3 Uncategorized waste disposal sites – CH <sub>4</sub> (W.4, 2016) Transparency	Include in the NIR additional information on the main factors contributing to the observed trend in the CH <sub>4</sub> IEF for uncategorized waste disposal sites.	Resolved. Additional information has been supplied in the NIR (pp.7-6 and 7-17) (see also ID# W.1 above).
W.3	5.C Incineration and open burning of waste – CO <sub>2</sub> (W.5, 2016) Accuracy	Ensure that the use of preliminary data would result in a more accurate estimate of emissions than extrapolating previous data in accordance with procedures in the 2006 IPCC Guidelines, and also include an explanation of any unexpected reduction in the time series of CO <sub>2</sub> IEFs in the NIR.	Resolved. The ERT checked the CO <sub>2</sub> IEF throughout the time series and the values for the latest years now match the rest of the time series for biogenic and non-biogenic waste. Japan also added text in the NIR (section 7.1.5, p.7-4) in response to this recommendation explaining that the preliminary data used in the inventory are considered under the AD of the latest reporting year under the Committee for Improvement of the Research on Cyclical Use of Waste, an expert committee organized by the Environmental Regeneration and Material Cycles Bureau of the Ministry of the Environment.
KP-LULUCF			
KL.1	CM – CO <sub>2</sub> (KL.4, 2016) Transparency	Improve the description of the different sources of land-use data used as inputs for soil carbon estimates for cropland in the Roth-C model and how these are harmonized to ensure consistent representation of land areas and to prevent the over- or underestimation of AD and net emissions or removals.	Addressing. Japan included in the NIR (sections 6.6.1.b, p.6-27, and 11.5.1.1.d, p.11-25) a description of the sources of land-use data used as inputs for soil carbon estimates for cropland in the Roth-C model. However, the explanation of how these data are harmonized to ensure a consistent representation of land and to prevent any over- or underestimation of AD and net emissions or removals needs to be better documented.
KL.2	CM – CO <sub>2</sub> (KL.5, 2016) Transparency	Report the results of the verification activities.	Resolved. The Party included in the NIR (section 11.5.1.6, p.11-47) information on the verification activities carried out when applying the Roth-C model. The ERT noted that there is still a need to clarify how the overall result of the model ensures that emissions are neither over- nor underestimated. This issue is considered in ID# L.6 above.

<i>ID#</i>	<i>Issue and/or problem classification<sup>a, b</sup></i>	<i>Recommendation made in previous review report<sup>c</sup></i>	<i>ERT assessment and rationale</i>
KL.3	GM – CO <sub>2</sub> (KL.6, 2016) Transparency	Report the results of the verification activities.	Resolved. The Party included in the NIR (section 11.5.1.6, p.11-47) information on the verification activities carried out when applying the Roth-C model. The ERT noted that there is still a need to clarify how the overall result of the model ensures that emissions are neither over- nor underestimated. This issue is considered in ID# L.8 above.

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

<sup>b</sup> The review of the 2017 annual submission of Japan did not take place during 2017 and, as such, the 2017 annual review report was not available at the time of this review. Therefore, the recommendations reflected in table 3 are taken from the 2016 annual review report. In addition, the review of the 2015 annual submission of Japan was not conducted, as per decision 27/CP.19. For these reasons, the years 2015 and 2017 are excluded from the list of years in which the issue has been identified.

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

8. In accordance with paragraph 83 of the UNFCCC review guidelines, the ERT noted that the issues included in table 4 have been identified in three successive reviews, including the review of the 2018 annual submission of Japan, and have not been addressed by the Party.

Table 4

##### Issues identified in three successive reviews and not addressed by Japan

<i>ID#</i>	<i>Previous recommendation for the issue identified</i>	<i>Number of successive reviews issue not addressed<sup>a</sup></i>
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	3 (2014–2018)
E.10	Clarify the text of the NIR regarding fugitive emissions from natural gas distribution to industrial consumers	3 (2014–2018)
IPPU		
	No issues identified	
Agriculture		
	No issues identified	
LULUCF		
	No issues identified	
Waste		
	No issues identified	

<i>ID#</i>	<i>Previous recommendation for the issue identified</i>	<i>Number of successive reviews issue not addressed<sup>a</sup></i>
KP-LULUCF	No issues identified	

<sup>a</sup> The review of the 2017 annual submission of Japan did not take place during 2017. In addition, the review of the 2015 annual submission of Japan was not reviewed following decision 27/CP.19, paragraph 9, in relation to Parties without a quantified emission limitation or reduction commitment for the second commitment period of the Kyoto Protocol. Therefore, the years 2015 and 2017 are not taken into account when counting the number of successive years in table 4.

**V. Additional findings made during the individual review of the 2018 annual submission**

9. Table 5 contains findings made by the ERT during the individual review of the 2018 annual submission of Japan that are additional to those identified in table 3.

Table 5

**Additional findings made during the individual review of the 2018 annual submission of Japan**

<i>ID#</i>	<i>Finding classification</i>	<i>Description of the finding with recommendation or encouragement</i>	<i>Is finding an issue and/or a problem?<sup>a</sup> If yes, classify by type</i>
General			
G.1	Article 3, paragraph 14, of the Kyoto Protocol	Japan reported in its NIR (chapter 15) that there have been changes in its reporting on the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol since the previous annual submission. The Party described the following changes in its NIR: adoption of a new policy called “Actions for Cool Earth 2.0” that provides support (1.3 trillion yen) and enhances collaboration with developing countries for technology and know-how; and capacity-building activities (training programme in Hyogo). The ERT concluded that, taking into account the confirmed changes in the reporting, the information provided is complete and transparent.	Not an issue/problem
G.2	QA/QC and verification	In its 2018 submission, Japan uses many country-specific EFs in the energy, IPPU, agriculture and waste sectors. During the review, the Party explained that QA/QC activities were performed to justify the appropriateness of these country-specific EFs for the inventory, such as comparing the country-specific EF values with the IPCC default values and investigating the reasons for any differences. If there are rational reasons for the differences, the new values are proposed to the Committee for Greenhouse Gas Emissions Estimation Methods for adoption, and experts consider whether or not the new values should be applied to the GHG inventory. During the review the ERT found several issues where the country-specific EFs were not correctly justified in the NIR or during the review week (see ID#s I.8 and A.2 in table 3 and ID#s E.13, I.25, I.26, I.32, I.33 and A.7 below), and no comparisons with the IPCC default values or EFs proposed elsewhere were provided upon the request of the ERT (see ID# W.4 below).  The ERT noted the importance of Japan improving the descriptions of the justification of the country-specific EFs for the above-mentioned issues in the appropriate sections of NIR, and recommends that the Party 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.	Yes. Adherence to the UNFCCC Annex I inventory reporting guidelines
G.3	Annual submission	The ERT noted that there were several categories for which issues were identified related to the completeness of the reporting of GHG emissions, or a possible underestimation of emissions (see ID#s I.3, I.4, I.5, I.8 in table 3 and ID#s I.26, I.31, I.32, I.33, I.34, A.7 and W.5 below). The ERT also noted that Japan does not have a quantified emission limitation and reduction commitment in the second commitment period of the Kyoto Protocol, and, therefore, in line with paragraph 11bis of decision 20/CMP.1 in conjunction with decision 4/CMP.11, the ERT believes that future ERTs may wish to consider the issues identified in this paragraph further to ensure that there is not an underestimation of emissions for these categories, taking into account that the application of adjustments is not applicable to Japan.	Not an issue/problem
Energy			
E.11	1.A Fuel combustion –	According to the IEA data comparison, data for the production of waste (non-biomass fraction) equivalent to 87,744 TJ (in 2016) and 242,963 TJ (in 2015) were reported to IEA, but not to the UNFCCC. The ERT checked CRF table	Yes. Adherence to the UNFCCC Annex

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and/or a problem? <sup>a</sup> If yes, classify by type
	sectoral approach – other fossil fuels – CO <sub>2</sub> , CH <sub>4</sub> and N <sub>2</sub> O	<p>1.A(b) and noted that waste (non-biomass fraction) is reported as “NA”. During the review Japan confirmed that in the sectoral approach the emissions from waste (non-biomass fraction) are reported under category 1.A (under other fossil fuels in each subcategory) and the amount of “waste incineration with energy recovery” included under category 1.A (other fossil fuels) can be seen in CRF table 1.A(a)s4. The Party confirmed that emissions from waste (non-biomass fraction) are not included in the reference approach in CRF table 1.A(b).</p> <p>The ERT recommends that Japan report emissions from the non-biomass fraction of waste in the reference approach (CRF table 1.A(b)).</p>	Inventory reporting guidelines
E.12	1.A.1.b Petroleum refining – gaseous fuels – CH <sub>4</sub> and N <sub>2</sub> O	<p>The ERT noted that for category 1.A.1.b the CH<sub>4</sub> IEFs for gaseous fuels reported in the 2018 submission were higher than those reported in the 2017 submission for 2012 (by 15.3 per cent), 2013 (33.9 per cent), 2014 (50.7 per cent) and 2015 (36.5 per cent). Similarly, the IEFs for N<sub>2</sub>O were also higher by similar proportions for the same years: 2012 (by 15.1 per cent), 2013 (33.0 per cent), 2014 (49.4 per cent) and 2015 (37.6 per cent). In the NIR (section 3.2.5.c.e, pp.3-37–3-38) Japan included some information explaining that CH<sub>4</sub> and N<sub>2</sub>O emissions have been calculated using a consistent estimation method since 1990 and that recalculations were done following a revision of fuel consumption for 1990–2015. However, no explanation was included in the NIR as to why the CH<sub>4</sub> and N<sub>2</sub>O EFs for 2012–2015 increased after the recalculations. During the review, Japan explained that the differences found in the 2018 submission compared with the 2017 submission, for both the CH<sub>4</sub> and N<sub>2</sub>O EFs, occurred because of the increase in the share of furnaces with higher EFs after the adoption of the results of the General Survey of the Emissions of Air Pollutants conducted in 2014 (which does not provide the EFs but the fuel consumptions and types of furnace used; see NIR p.3-36). In addition, the ERT noted a reduction of 95.5 per cent in the CH<sub>4</sub> IEF between 2010 (6.32 kg/TJ) and 2011 (0.28 kg/TJ) and a reduction of 52.0 per cent in the N<sub>2</sub>O IEF between 2010 (0.42 kg/TJ) and 2011 (0.20 kg/TJ).</p> <p>The ERT recommends that Japan explain in the NIR that the reported CH<sub>4</sub> and N<sub>2</sub>O IEFs from 2012 to 2015 increased when the new data from the General Survey of the Emissions of Air Pollutants (conducted in 2014) were implemented in the inventory because the survey identified an increase in the number of furnaces with higher EFs (based on furnace type and fuel consumption) for the period 2012–2015. The ERT also recommends that Japan explain in the NIR the reasons for the significant decline observed in the CH<sub>4</sub> and N<sub>2</sub>O IEF between 2010 and 2011.</p>	Yes. Transparency
E.13	1.B.1.a Coal mining and handling – CH <sub>4</sub>	<p>Japan reported in the NIR (section 3.3.1.1.b, p.3-75, table 3-61) that the EFs for CH<sub>4</sub> from underground mining activities were computed using J-COAL data and the volume of coal mined. The ERT noted that the CH<sub>4</sub> EF for mining activities (category 1.B.1.a.i) has decreased since the base year (from 25.91 kg CH<sub>4</sub>/t in 1990 to 2.98 kg CH<sub>4</sub>/t in 2016) and that inter-annual variations occur throughout the time series (especially between 1990 and 2003). During the review the Party explained that the inter-annual variation in the EF is probably due to significant natural variability caused by variations in the rate of mining and drainage of gas (as explained in the 2006 IPCC Guidelines, volume 2, p.4-15). The Party referred to section 3.3.1.1.a of its NIR (p.3-73), where there is an explanation that coal mining practices have changed recently, resulting in the decreasing trend in the CH<sub>4</sub> IEF. Specifically, coal is now mined in more shallow areas and therefore emits less CH<sub>4</sub>. The change has occurred because coal in deep areas is more costly to mine than coal in shallow areas. Additionally, areas that have been previously mined and thus are</p>	Yes. Transparency



ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and/or a problem? <sup>a</sup> If yes, classify by type
IPPU	I.22 2.A.2 Lime production – CO <sub>2</sub>	<p>already releasing CH<sub>4</sub> are re-mined for coal using the latest technology. This contributes to the low CH<sub>4</sub> emissions per amount of coal mined compared with other countries. The ERT agrees with the explanation that emissions from shallow mines and re-mined mines could be lower and asked the Party to provide reports for the direct measurements made by J-COAL as referenced in NIR table 3-61. Japan replied that such a report is not publicly available and informed the ERT that, to ensure the safety of coal mine workers in Japan, monitoring of the concentration of CH<sub>4</sub> and CO in coal mines is ordained by law. Under the law, mining companies must set rules on monitoring management. Mining companies conduct accurate monitor under strict management and checks (see NIR section 3.3.1.1.a.d, p.3-78).</p> <p>The ERT understands the national circumstance of Japan but notes that the Party is using a tier 3 method and, in order for the ERT to check the measurements and the values applied, it is important for the Party to provide to the ERT, even if on a confidential basis, documentation justifying the decrease in the CH<sub>4</sub> EF in accordance with the 2006 IPCC Guidelines (volume 2, chapters 4.1.7.1 and 4.1.7.2, p.4-31) and paragraph 41 of the UNFCCC Annex I inventory reporting guidelines, especially because the CH<sub>4</sub> EFs since 2003 are well below the IPCC default values (6.7–16.75 kg CH<sub>4</sub>/t).</p> <p>The ERT recommends that Japan describe in the NIR verification information consistent with the 2006 IPCC Guidelines (volume 2, chapters 4.1.7.1 and 4.1.7.2, p.4-31) and ensure that documentation is available during the review to justify the decrease in the CH<sub>4</sub> EF for category 1.B.1.a.i.</p> <p>Japan stated in the NIR (section 4.2.2, p.4-8) that the consumption of dolomite in dolomitic lime production is accounted for under category 2.A.4 other process uses of carbonates, and therefore will not be included under category 2.A.2 lime production. The ERT noted that in accordance with the 2006 IPCC Guidelines (volume 3, chapter 2, p.2-20) “all lime production, whether produced as a marketed or a non-marketed product, should be reported under IPCC Subcategory 2.A.2 Lime Production.” During the review Japan explained that the AD for dolomite consumption in dolomitic lime production are categorized under “emissive use” in the Adjusted Price Transaction Table and included under the code 2599-09 ceramic industry – other ceramic, stone and clay products, and cannot be separated (see the NIR, box, p.4-8, and table 4-10, p.4-13). The Party further explained in response to the draft report that the Adjusted Price Transaction Table was introduced in response to an encouragement from a previous ERT to ensure that double-counting and/or the omission of limestone was avoided in the inventory. Separating out the AD for dolomitic lime production would not be possible because the input-output table, the basis for the Adjusted Price Transaction Table, already combines dolomite use for dolomitic lime production with other dolomite use.</p> <p>The ERT encourages Japan to make efforts to separate the AD for dolomite consumption used in dolomitic production from the national statistics and reallocate CO<sub>2</sub> emissions from category 2.A.4 to category 2.A.2.</p>	Not an issue/problem

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and/or a problem? <sup>a</sup> If yes, classify by type
I.23	2.B.1 Ammonia production – CO <sub>2</sub>	<p>The ERT noted that inter-annual changes in the CO<sub>2</sub> IEF occur for the following years: 2004/2005 (–9.6 per cent), 2011/2012 (8.0 per cent) and 2015/2016 (–11.1 per cent). During the review, Japan explained that the changes in those years are primarily caused by a decrease, an increase and a decrease in emissions from oil and coke consumption, respectively.</p> <p>The ERT recommends that Japan include in the NIR the reasons for the inter-annual variation in the CO<sub>2</sub> IEF for 2004/2005 (–9.6 per cent), 2011/2012 (8.0 per cent) and 2015/2016 (–11.1 per cent).</p>	Yes. Transparency
I.24	2.B.6 Titanium dioxide production – CO <sub>2</sub>	<p>In response to a previous recommendation (see ID# I.7 in table 3), Japan provided in the NIR a justification for why the country-specific CO<sub>2</sub> EF for rutile TiO<sub>2</sub> is lower than the EF based on the stoichiometry of the reaction. During the review it became clear to the ERT that the explanation given is technically reasonable and relies on site-specific process control. However, the ERT is of the view that more clarity should be included in the NIR to explain that the CO<sub>2</sub> EF for rutile TiO<sub>2</sub> is lower than IPCC default owing to the second reaction happening simultaneously. In its comments to the draft annual review report Japan requested the ERT to provide the exact language to be included in the NIR. The ERT proposed to add “CO<sub>2</sub> EF for rutile TiO<sub>2</sub> is lower than the IPCC default” to the paragraph already included by the Party in the NIR (p.4-30).</p> <p>The ERT recommends that Japan add a sentence to the NIR clarifying that the CO<sub>2</sub> EF for rutile TiO<sub>2</sub> is lower than the IPCC default in addition to the text already provided in the NIR (p.4-30). As requested by the Party, the whole paragraph would read as follows: “CO<sub>2</sub> EF for rutile TiO<sub>2</sub> is lower than the IPCC default because in the case of Japanese manufacturers, reactions take place under high temperatures such as 1,000 degrees celsius, and therefore a second reaction (TiO<sub>2</sub> + 2Cl<sub>2</sub> + 2CO → TiCl<sub>4</sub> + 2CO<sub>2</sub>) is simultaneously taking place, in addition to the above mentioned reactions described in the 2006 IPCC Guidelines (yielding 3 mol of CO<sub>2</sub> from 2 mol of TiO<sub>2</sub>), and uses CO. Because of this, and assuming that this CO is used completely in the first-mentioned reaction, 1 mol of TiO<sub>2</sub> only yields 1 mol of CO<sub>2</sub>. (There does not exist any excess carbon. CO<sub>2</sub> occurs only from input coke).”</p>	Yes. Transparency
I.25	2.B.8 Petrochemical and carbon black production – CH <sub>4</sub>	<p>The ERT noted that the CH<sub>4</sub> IEF for the entire time series (0.0000057 t CH<sub>4</sub>/t in 2016) is well below the IPCC default values (0.003–0.86 t/t) for category 2.B.8.c ethylene dichloride and for vinyl chloride monomer. During the review the Party justified those values by explaining that “the installation of equipment for exhaust gas combustion has progressed. Due to this, the fraction of CH<sub>4</sub> in the tail gas is lower than the default value and is now below detectable levels.”</p> <p>The ERT recommends that Japan include in the NIR the above reasons provided during the review for the lower CH<sub>4</sub> IEF (compared with the IPCC default) for production of ethylene dichloride and for vinyl chloride monomer.</p>	Yes. Transparency
I.26	2.B.8 Petrochemical and carbon black production – CH <sub>4</sub>	<p>Japan reported in the NIR (section 4.3.8.2.a, p.4-33) that CH<sub>4</sub> emissions for category 2.B.8.b ethylene production were estimated on the basis of the exhaust gas from flare stacks (which is combustion) and the measured amount of exhaust gas from naphtha cracking furnaces and furnaces heated by recycled gas. The ERT noted that CH<sub>4</sub> is reported under the IPPU sector and part of CO<sub>2</sub> emissions (from process off-gases) under the energy sector (see ID# I.8 in table 3). According to the 2006 IPCC Guidelines (volume 3, chapter 3.9.2.2, p.3.75) the default fugitive CH<sub>4</sub></p>	Yes. Accuracy

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and/or a problem? <sup>a</sup> If yes, classify by type
I.27	2.C.1 Iron and steel production – CO <sub>2</sub>	<p>EF for steam cracking of ethane and naphtha for ethylene production is estimated from the total VOC EFs and the VOC species profile data are from the European Monitoring and Evaluation Programme/European Environment Agency air pollutant emission inventory guidebooks, whereas the Party's CH<sub>4</sub> EF is measured from process off-gases combustion (flare and process stack) and the methodological description in the NIR does not refer to any fugitive emissions from the steam cracking of naphtha from flanges, valves and other process equipment.</p> <p>The ERT is aware that Japan reported in its NIR that the CH<sub>4</sub> EF and emissions are confidential for category 2.B.8.b in CRF table 2(I).A-Hs1, but recommends that the Party either 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 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<sub>4</sub> EF.</p> <p>Japan does not report emissions from reducing agents (coke for steel, pig iron and sinter production; and fine ore for pellet production) under the iron and steel category (see ID# I.1 in table 3). Instead, emissions are reported under category 1.A fuel combustion. The ERT noted that this impairs comparability of the inventory with those of other countries that apply the 2006 IPCC Guidelines and report process off-gases (blast furnace gases and coke oven gases) under the IPPU sector. In response to a follow-up question regarding how comparability issues could be resolved for category 2.C.1, Japan responded that summing up the emissions from categories 1.A.2.a (energy sector – iron and steel) and 2.C.1 (IPPU sector – iron and steel production) could be an option for eliminating the comparability issue while at the same time not changing the allocation of emissions. The ERT concluded that the possible solution provided by the Party would only be applicable for the NIR text, while in the CRF tables those emissions would still be reported separated and therefore, in the case of the CO<sub>2</sub> IEF for category 2.C.1, the comparability issue would persist. The ERT notes that currently the country-specific CO<sub>2</sub> EF for category 2.C.1 (3.66 t CO<sub>2</sub>/t) is more than three times higher than the IPCC default values (0.08–1.72 t/t) and it is also the highest value among Parties, because Japan reports under this subcategory only the emissions from carbon electrodes in electric arc furnaces and from limestone and dolomite use.</p> <p>The ERT recommends that Japan include in the NIR the sum of CO<sub>2</sub> emissions from categories 1.A.2.a and 2.C.1 and provide a qualitative explanation on how this sum is comparable to the emissions that are calculated in line with the 2006 IPCC Guidelines. The ERT also recommends that the Party include in the NIR an explanation on why the country-specific CO<sub>2</sub> EF for category 2.C.1 is higher than the IPCC default values.</p>	Yes. Transparency
I.28	2.C.1.c Iron and steel production – CO <sub>2</sub>	<p>The ERT noted that in CRF table 2(I).A-Hs2 Japan reported “NA” for AD (production/consumption quantity) for category 2.C.1.c direct reduction iron. However, the Party reported in the NIR (section 4.4.1.3, p.4-52) that there was no production of direct reduced iron in Japan and therefore the notation key “NO” is reported. During the review Japan explained that it will correct the notation key in the next submission.</p> <p>The ERT recommends that Japan correct the notation key from “NA” to “NO” for the AD in CRF table 2(I).A-Hs2 (production/consumption quantity) for category 2.C.1.c.</p>	Yes. Comparability

ID#	Finding classification	Description of the finding with recommendation or encouragement	<i>Is finding an issue and/or a problem?<sup>a</sup> If yes, classify by type</i>
I.29	2.C.1 Iron and steel production – CO <sub>2</sub>	<p>Japan reported in the NIR (section 4.4.1.2, p.4-51) that CO<sub>2</sub> generated from pig iron production is emitted when coke is used as a reducing agent. It was not clear to the ERT whether only coke was used as the reducing agent for pig iron production. During the review the Party clarified that coke is the main reducing agent but pulverized coal and plastics are also consumed in the Japanese pig iron production process. As the Party reports reducing agents in the energy sector (see ID# I.1 in table 3), the ERT checked the NIR (table 3-10, p.3-13) and noted that only coke is reported as a reducing agent for iron and steel production. Information regarding the use of plastics as a reducing agent in blast furnaces is reported in the NIR (section 3.2.12, p.3-69). The ERT is of the view that Japan could increase the transparency of the reporting by including information in the NIR (under category 2.C.1) about all reducing agents used in iron and steel production.</p> <p>The ERT recommends that Japan include in the NIR a description (or table) indicating all reducing agents used in iron and steel production and make a cross reference to the NIR sections where information about the reducing agents can be found.</p>	Yes. Transparency
I.30	2.C.1 Iron and steel production – CO <sub>2</sub>	<p>The ERT noted that in CRF table 1.A(a)s2 an amount of 130,701.79 kt CO<sub>2</sub> is reported for solid fuels under category 1.A.2.a iron and steel. It was not clear to the ERT whether those emissions include pulverized coal injection consumed as a reducing agent in blast furnaces. During the review, the Party provided a spreadsheet with the carbon mass balance, which enabled the ERT to check the pulverized coal injection consumption. In addition, the Party explained that, as shown in the NIR (table 3.26, p.3-41), the CO<sub>2</sub> emissions from reducing agents under iron and steel are included in category 1.A.2.a. Japan explained that it will include information related to the pulverized coal injection in NIR table 3-10 in its next submission.</p> <p>The ERT recommends that Japan include information on pulverized coal injection in NIR table 3-10 to demonstrate its use as fuel for non-energy purposes (e.g. as feedstock).</p>	Yes. Transparency
I.31	2.C.2 Ferroalloys production – CO <sub>2</sub>	<p>Japan reported in the NIR (section 4.4.2, p.4-56) that CO<sub>2</sub> emissions generated from the oxidation of coke used as a reduction agent are reported under category 1.A in the energy sector (see ID# I.1 in table 3). It was not clear to the ERT whether other carbon-containing materials (such as ore and slag forming) were considered by the Party when estimating the CO<sub>2</sub> emissions for category 1.A. The 2006 IPCC Guidelines (volume 3, chapter 4, pp.4-33 and 4.34, equations 4.16 and 4.17) indicate that other carbon-containing materials should be considered in the emission estimates. During the review, Japan confirmed that other carbon-containing materials (ore, slag-forming materials) are not considered in the CO<sub>2</sub> estimates reported in the energy sector.</p> <p>The ERT recommends that Japan estimate CO<sub>2</sub> emissions related to the other carbon-containing materials (such as ore and slag forming).</p>	Yes. Completeness

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and/or a problem? <sup>a</sup> If yes, classify by type
I.32	2.C.2 Ferroalloys production – CH <sub>4</sub>	<p>Japan reported in the NIR (section 4.4.2, p.4-57) that CH<sub>4</sub> emissions from ferroalloys production were calculated by multiplying a country-specific EF on the basis of actual measurements obtained in Japan by the energy consumption of electric arc furnaces and that this is the same method used for calculating CH<sub>4</sub> emissions relating to fuel combustion in the energy sector (1.A.1 energy industries). The ERT noted that the NIR (p.4-56) states that CH<sub>4</sub> emissions are generated when the oxidization of coke, a reduction agent, takes place. The ERT notes the response provided by Japan during the review explaining that only ferrosilicon magnesium alloy is produced in the country. According to the 2006 IPCC Guidelines (volume 4, chapter 4.32, pp.4.35, 4.38 and 4.39) the amount of CH<sub>4</sub> emissions depends on the operation of the furnace and normally the EFs are presented in kg CH<sub>4</sub>/t ferroalloy because the value also depends on the type of ferroalloy produced. A tier 3 method is based on direct measurements rather than EFs and the inventory compiler should consult the guidance on plant-level measurements outlined in volume 1, chapter 2, and QA/QC measurements in volume 1, chapter 6, of the 2006 IPCC Guidelines. From the information provided by the Party in the NIR it was not possible for the ERT to understand how the measurement of the CH<sub>4</sub> emissions divided by the consumption of electricity in electric furnaces could provide a reliable country-specific CH<sub>4</sub> EF, considering that the quantity of CH<sub>4</sub> emissions from ferroalloys depends on the operation of the furnaces and on the type of ferroalloy produced and is based on the amount of coke consumed in the furnaces. In addition, if the Party uses direct measurements of CH<sub>4</sub> emissions to produce the country-specific EF (tier 3 method), then further information should be provided in the NIR in accordance with the 2006 IPCC Guidelines.</p> <p>The ERT recommends that Japan provide a more detailed explanation of how CH<sub>4</sub> emissions and the country-specific CH<sub>4</sub> EF are calculated and explain the reasons for not producing a country-specific EF on the basis of t CH<sub>4</sub>/t ferroalloy produced (as in CRF table 2(I).A-Hs2 and in the 2006 IPCC Guidelines), considering that the quantity of CH<sub>4</sub> emissions from ferroalloys depends on the operation of the furnaces and on the type of ferroalloy produced and is based on the amount of coke consumed in the furnaces. In case the Party measures the CH<sub>4</sub> emissions directly, the ERT recommends that Japan provide information in the NIR in accordance with the 2006 IPCC Guidelines (volume 1, chapter 2.2.2, p.2.8, and chapter 6.7.1, pp.6.12, 6.13 and 6.14).</p>	Yes. Accuracy
I.33	2.D.1 Lubricant use – CO <sub>2</sub>	<p>The ERT noted that the CO<sub>2</sub> IEF for the entire time series (e.g. 0.013 t CO<sub>2</sub>/t for 2016) is below the IPCC default range of values (0.589 (0.238-0.958) t CO<sub>2</sub>/t) for category 2.D.1 lubricant use. During the review Japan explained that the unit of the AD in CRF table 2(I).A-Hs2 was incorrect and confirmed that the</p>	Yes. Accuracy

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		<p>correct IEF for 2016 would be 0.013 kt CO<sub>2</sub>/TJ (or 13 t CO<sub>2</sub>/TJ). The ERT noted that, in this case, the CO<sub>2</sub> IEF would be higher than the IPCC default values.</p> <p>The ERT recommends that Japan verify and correct the units reported in CRF table 2(I).A-Hs2 and include in the NIR the reasons for the lower (or higher) CO<sub>2</sub> IEF (compared with the IPCC default) for this category. If the Party is not able to justify the lower (or higher) IEF, the ERT recommends that the Party apply the IPCC default value.</p>	
I.34	2.F Product uses as substitutes for ozone depleting substances – PFCs	<p>Japan reported in the NIR (section 4 and p.4-73, for commercial refrigeration) that PFC emissions in the “production” category were reported as “NO” because Japan had no record of their use in the production of the products. The emissions were also reported as “NO” in the “use” and “disposal” categories, because it was unlikely that PFCs were used in imported products or that refrigerants were refilled. During the review the ERT requested evidence that no PFCs are imported in commercial refrigeration products. The Party explained that it did not have readily available documentation but that this had been concluded on the basis of opinions from related industry organizations and experts, and after a discussion in the Committee for Greenhouse Gas Emissions Estimation Methods.</p> <p>The ERT understands the national circumstances of Japan but recommends that the Party provide documentation in the NIR to support 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, the ERT recommends that Japan make efforts to collect data on PFCs imported in products under commercial refrigeration and report the emissions in CRF table 2(II)B-Hs2.</p>	Yes. Completeness
I.35	2.F.1 Refrigeration and air conditioning – HFCs	<p>During the review, the ERT followed up on an previous issue raised by the ERT (see ID# I.19 in table 3). The ERT noted that the Party reports emissions from railways and vessels under commercial refrigeration instead of under transport refrigeration. Further, the ERT noted that the emissions reported for railways (NIR table 4-60) and vessels (NIR table 4-61) are those reported in CRF table 2(II)B-Hs2 as HFC-32, HFC-125, HFC-134a and HFC-143a (under commercial refrigeration). The emissions reported under “unspecified mix of HFCs” in the CRF table under commercial refrigeration are those coming from NIR table 4-59 (commercial refrigeration). Considering that the AD and emissions in the NIR (tables 4-60 and 4-61) are completely transparent and available, and that in accordance with paragraph 32 of the UNFCCC Annex I inventory reporting guidelines emissions shall be reported by chemical and by category, the ERT is of the view that the emissions from railways and vessels currently allocated under commercial refrigeration should be reported under transport refrigeration.</p> <p>The ERT recommends that Japan reallocate the AD and emissions relating to railways and vessels from commercial refrigeration to transport refrigeration.</p>	Yes. Comparability

<i>ID#</i>	<i>Finding classification</i>	<i>Description of the finding with recommendation or encouragement</i>	<i>Is finding an issue and/or a problem?<sup>a</sup> If yes, classify by type</i>
I.36	2.F.2 Foam blowing agents – HFCs	<p>The ERT noted that for category 2.F.2.a (foam blowing agents/closed cells) the average annual stock in the operating system increased by 203.6 per cent between 2005 and 2006. During the review, the Party explained that this occurred because uses of HFC-245fa and HFC-365mfc increased between 2005 and 2006.</p> <p>The ERT encourages Japan to explain in the NIR the reasons behind the increase in the uses of HFC-245fa and HFC-365mfc between 2005 and 2006, when the average annual stock in the operating system increased by 203.6 per cent.</p>	Not an issue/problem
Agriculture			
A.3	3. General (agriculture)	<p>The ERT noted that the notation key “NE” is used for several parameters in the inventory (e.g. animal weight, milk production for sheep, allocation for climate regions) included in CRF table 3.As2. The ERT understands that Japan does not use these parameters in its country-specific methodological approaches, and therefore it is not necessary to estimate these parameters for the emission estimations. However, the ERT is of the view that in such cases the notation key “NA” should be used.</p> <p>The ERT encourages Japan to revise the notation keys used in the CRF tables (from “NE” to “NA”) when reflecting cases in which parameters are not estimated because the country-specific methodological approach implemented by the Party does not require the use of these parameters.</p>	Not an issue/problem
A.4	3.C Rice cultivation – CH <sub>4</sub>	<p>Japan recalculated CH<sub>4</sub> emissions for this category in its 2017 submission. The ERT noted that CH<sub>4</sub> emissions decreased by 24 per cent for 2014 compared to those reported in the previous submission (2016). The decrease of emissions for the base year (1990) was even more significant (–35.4 per cent), which represents a decrease of more than 4.5 Mt CO<sub>2</sub> eq. Japan reported in the 2018 NIR (section 5.4.1, p.5-28) that a tier 3 method (DNDC-Rice model) was used to establish the CH<sub>4</sub> EF and a modified tier 2 method was used to estimate emissions. The Party stated in the NIR (p.5-28) that the estimation method used was developed through discussions in the Committee for Greenhouse Gas Emissions Estimation Methods on the basis of a paper by Katayanagi et al. (2016) (reference 67, p.5-65) and other relevant papers. The ERT acknowledges Japan’s efforts to provide scientific measurements of CH<sub>4</sub> emissions for this category; however, there is a lack of QA/QC activities and documentation in the NIR to compare this new estimation with the previous estimation and a lack of explanation as to why the new data on the amount of organic matter application are more accurate for the national circumstances.</p> <p>The ERT recommends that Japan include in its NIR verification information in line with the 2006 IPCC Guidelines (in accordance with paragraph 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.</p>	Yes. Transparency
A.5	3.D.a Direct N <sub>2</sub> O emissions from	<p>The ERT noted that Japan reports the amount of N for inorganic synthetic fertilizers with nitrification inhibitors in NIR table 5-45 (p.5-38) under category 3.D.a.1. In addition, the ERT noted that the total N for inorganic (synthetic) fertilizers applied to soils (category 3.D.a.1), including synthetic fertilizers with nitrification inhibitors (NIR table 5-44, p.5-38), decreased in Japan by more than 35 per cent between 1990 (611 kt N) and 2016 (395 kt N). From the</p>	Yes. Transparency

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	managed soils – N <sub>2</sub> O	<p>information in the NIR it was not clear to the ERT when Japan started to use synthetic fertilizers with nitrification inhibitors and which other circumstances could have influenced the decreasing trend in the total N for inorganic fertilizers between 1990 and 2016. The ERT further noted that this decreasing trend also applies to the total N in organic fertilizers applied to soils (category 3.D.a.2), which declined in the same period by 20 per cent (NIR, table 5-52, p.5-42). During the review Japan explained that statistics related to the use of synthetic fertilizers with nitrification inhibitors in the country started in 1996. In addition, Japan explained that the reason for the decrease in the total N for fertilizers (organic and inorganic) occurred because of the decrease in Japanese cropping areas (areas of paddy field decreased by 28 per cent from 2,055 kha in 1990 to 1,478 kha in 2016 (NIR table 5-48, p.5-39)). Another reason is that organic farming is recommended in Japan to mitigate the N pollution of groundwater. The ERT considers that these reasons have a significant impact on the decreasing trend in N<sub>2</sub>O emissions for categories 3.D.a.1 and 3.D.a.2 and should be included in the NIR.</p> <p>The ERT recommends that Japan 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.</p>	
A.6	3.D.a.6 Cultivation of organic soils (i.e. histosols) – N <sub>2</sub> O	<p>The ERT noted that the sum of the intended areas of organic soils under the agriculture sector (175.03 kha), as reported in NIR table 5-61 (p.5-51) and in CRF table 3.D (category 3.D.a.6), is different from the sum of the areas of organic soils reported in CRF tables 4.B (cropland, 174.57 kha) and 4.C (grassland, 56.47 kha). In response, Japan explained that the area reported under category 3.D.a.6 does not include the areas of uncultivated organic soils (which are reported under categories 4.B and 4.C) and made reference to a similar issue raised in the LULUCF sector for further clarification (see ID# L.4 in table 3). Japan further explained that the areas of organic soils not cultivated and excluded from category 3.D.a.6 are those from orchard (category 4.B, cropland) and grazed meadow, wild land and unrenewed (unplowed) pastureland (category 4.C, grassland). In addition, Japan explained that grazed meadow is defined as the area without any management for plant growth and that from the area of organic soil reported under pastureland under category 4.C (38.26 kha), 1.2 kha is reported as “intended grassland” in NIR table 5-61, and the remaining area (37.06 kha) is considered unrenewed. Japan further explained that “renewal” is a work action to manage pastureland with re-plowing and new sowing done once in several years.</p> <p>The ERT recommends that Japan clarify in the NIR the areas reported under category 3.D.a.6 (in line with the explanation above), including an explanation of the area of organic soils excluded from category 3.D.a.6 and how grazed meadow, pasture and unrenewed area are considered and defined in the inventory. The ERT also recommends that Japan make a cross reference to the relevant parts of its reporting on the LULUCF sector.</p>	Yes. Transparency
A.7	3.D.a.6 Cultivation of organic soils (i.e. histosols) – N <sub>2</sub> O	<p>In addition to ID# A.6 above, the ERT noted that the N<sub>2</sub>O IEF for the cultivation of organic soils for the entire time series (ranging from 1.34 to 1.40 kg N<sub>2</sub>O-N/ha/year between 1990 and 2016) is lower than the default EF (8 kg N<sub>2</sub>O-N/ha/year) from the 2006 IPCC Guidelines (volume 11, table 11.1). During the review Japan explained that a country-specific EF was developed for paddy fields and made reference to the NIR (section 5.5.1.6.b, p.5-50). The ERT noted that Japan uses a country-specific EF for intended paddy fields, of 0.3 kg N<sub>2</sub>O-N/ha/year, which is the reason for the lower IEF, and that paddy fields represent 96 per cent of the total area of organic soils in the country.</p>	Yes. Accuracy



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<p>The ERT recommends that Japan include a description of the QA/QC procedures undertaken to justify the use of the country-specific EF for N<sub>2</sub>O for the cultivation of histosols on intended paddy fields and, if the value cannot be justified, the ERT recommends that the Party revise the EF applying the IPCC default value of 8 kg/N<sub>2</sub>O-N/ha/year.</p>			
LULUCF			
L.15	4.A.1 Forest land remaining forest land – all gases	<p>Japan reported in NIR table 6-9 (p.6-8) the value for the carbon stock of deadwood (14.84 t C/ha) and in NIR table 6.8a (p.6-7) the value for living biomass in deforested areas (99.1 t dry matter/ha). The ERT noted that the value for carbon stock of deadwood is high (representing almost one quarter of living biomass in deforested areas). During the review, Japan explained that this high value for carbon stock of deadwood is due to the influence of the intensively managed forests, which results in a certain amount of deadwood from thinning and logging being left on site in forests.</p> <p>The ERT recommends that Japan verify the value for the carbon stock of deadwood and include in the NIR an explanation of the reasons why this value is high.</p>	Yes. Transparency
L.16	4.A.1 Forest land remaining forest land – CO <sub>2</sub>	<p>The ERT noted that forest land remaining forest land has been estimated as a steady sink since 1990. The accumulated implied carbon stock change factors (net change) adds up over 26 years to 38.77 t C/ha for intensively managed forests and 13.16 t C/ha for semi-natural forests. The ERT could not find in the NIR information on the major drivers for the changes in carbon stock, or information on the FM practice that has taken place both on intensively managed forests and semi-natural forests that caused this increase in carbon stock. During the review, Japan explained that the decrease in carbon stock change (absorption) is due to the maturation of forests in Japan, especially in intensively managed forests. The Party provided a spreadsheet showing that, after the 10<sup>th</sup> forest age class (over 50 years old), the growth in forests of the older age class hits the ceiling in any tree species, and showing the transition of the age composition of Japanese intensively managed forests. The Party further explained that, as a consequence of its maturing year by year, intensively managed forests of the 11<sup>th</sup> forest age class or older (over 51 years old) occupied 35 per cent of the total area in 2011. About 40 per cent of Japan’s forest area, and the ageing of forests planted in large quantities in the 1960s, have a major influence on the carbon stock. The ERT considers that the accumulated carbon stock in intensively managed forests from 1990 to 2016 represents a large increase and should be explained further in the NIR (e.g. with tables, figures of age distribution, indication of possible maximum carbon stock in these forest). The Party could also include information about Japanese conditions, for example, where large-scale afforestation was undertaken after the Second World War, primarily with cedar for building purposes. Japan may also wish to include logging statistics with explanations.</p> <p>The ERT recommends that Japan 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 “intensive managed forests” and “semi-natural forests” that caused the increase in carbon stock.</p>	Yes. Transparency

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L.17	4.A.2 Land converted to forest land – CO <sub>2</sub>	<p>The ERT noted that, in the NIR (tables 6.8.a and 6.8.b, p.6-7), Japan reported that when cropland (upland fields) is converted to other land uses, the biomass stock is assumed to be “0” (before conversion). However, according to table 5.9 of the 2006 IPCC Guidelines (volume 4, chapter 5.3.1.2, p.5.28) the default value of the biomass stock for cropland before conversion is 5 t C/ha (and not “0” as applied by the Party), and this biomass stock (5 t C/ha) is considered as a loss when converting cropland to other land uses, including forest land. The ERT also noted that changes in living biomass for all land use immediately after conversion is “0”, as described in NIR table 6-8a (it is assumed that all living biomass was immediately lost after conversion).</p> <p>During the review Japan explained that, firstly, if cropland (upland field) is converted to other land uses the conversion event occurs after the crops are harvested. Thus, the biomass stock of the annual crop just before conversion can be considered as “0” (as shown in NIR table 6.8.a). Secondly, if other land uses are converted to cropland (upland field), the entire carbon gain of the annual crop is lost in the same year (as for the general method of annual crop applied for cropland remaining cropland); thus, the net carbon stock change of living biomass for annual crops after conversion is set as “0”. Thirdly, if cropland (orchard) is converted to other land uses because this land contains perennial trees, the biomass stock before conversion is reported in conjunction with carbon stock changes under cropland remaining cropland. However, the ERT is of the view that for cropland, living biomass with a default value in biomass stock of 5 t C/ha should be removed (and reported as a loss) when cropland is converted to other land uses, including forest land (afforestation).</p> <p>The ERT recommends that Japan provide in the NIR an explanation or justification on why no biomass stock in living biomass is removed when cropland is converted to other land uses, including forest land. If this is not possible the ERT recommends that Japan include estimates for losses of living biomass for cropland to other land uses, including the relevant estimation of AR for 2013–2016 in category 4(KP-I)A.1.</p>	Yes. Accuracy
L.18	4.B.1 Cropland remaining cropland – CO <sub>2</sub>	<p>Japan reported in the NIR that since 1990 the area of rice fields on organic soils has been reduced by approximately 13,000 ha (NIR table 6-25, p.6-31). In the NIR the ERT could not find any information on what happened with this area of land. During the review, Japan explained that the reduction of organic soils area for rice fields is linked to the reduction of the whole rice field area, and that the same land-use conversion ratio is used for both mineral and organic soils rice fields (i.e. information is not extracted only for organic soils rice fields). The major land uses converted from rice fields are settlements (approximately 60 per cent) and upland fields (approximately 20 per cent).</p> <p>The ERT recommends that Japan provide a clear explanation in the NIR of the reduction of organic soil in rice fields, including information on the conversion rate and land types to which rice fields are converted (e.g. to settlements (60 per cent) and upland fields (20 per cent)).</p>	Yes. Transparency
L.19	4.E.2 Land converted to settlements – CO <sub>2</sub>	<p>Japan reported in the NIR that since 1990 the area of rice fields on organic soils has been reduced by approximately 13,000 ha (NIR table 6-25, p.6-31). Japan clarified during the review that approximately 60 per cent of this land was converted to settlements (see ID# L.18 above). Japan explained that the treatment of management of organic soil after the conversion consists of the treatment taken for the converted land; for example, soil drainage is not carried out in settlements, but is considered to be carried out in upland fields (CO<sub>2</sub> emissions from organic soils resulting</p>	Yes. Transparency

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		<p>from drainage after conversion to upland fields are included in the estimation under the subcategory upland fields). However, the ERT is of the view that if organic soils are converted to settlements they will likely remain drained and therefore the notation key “NO” reported in CRF table 4.E for the net carbon stock change per area for organic soils under category 4.E.2.2 (rice fields) is incorrect. The Party replied that when the land under organic soils is used for settlement, it is common to conduct embankment activities, remove defective soil, or solidify soil rather than drain the soil. However, it is unclear to the ERT how the organic soils used to conduct embankment activities, remove defective soils, or solidify soil are handled (e.g. if they are drained and therefore have access to oxygen). Drained organic matter may degrade (because of access by microbiota and oxygen) and release CO<sub>2</sub>. Therefore, if the organic matter is left for embankment (even with removing defective soils, solidifying soils, etc.) and remains drained, there may be an oxidation into CO<sub>2</sub> (and in that case the EF will likely not be the same as for drained cropland soils). The ERT further noted that, in CRF table 4.E, the area of organic soils is reported as “IE” for this category and included under mineral soils.</p> <p>The ERT recommends that the Party clarify and justify the use of the notation key “NO” for net carbon stock change per area for organic soils under category 4.E.2.2, considering that it is unclear how the organic soils used to conduct embankment activities, remove defective soils, and solidify soils are handled.</p>	
Waste			
W.4	5. General (waste) – CH <sub>4</sub> and N <sub>2</sub> O	<p>The Japanese quantification of both CH<sub>4</sub> and N<sub>2</sub>O emissions from waste is mainly based on country-specific EFs. Application of these EFs is generally not justified in the NIR. Instead, the NIR often refers to documents where the EFs are formally determined. The use of references in the NIR is in line with the UNFCCC Annex I inventory reporting guidelines; however, the documents referenced in the NIR could not be found by the ERT and were only obtained upon request. In addition, the information provided by Japan at the request of the ERT consisted, in part, of lengthy reports in Japanese. The ERT made a significant effort to try to identify relevant sections in these reports and subsequently understand what is reported (using modern tools of translation, but also seeking the help of individuals who are able to understand technical Japanese). The ERT understands that there is a chance that relevant sections of these reports were misunderstood. During the review it became clear to the ERT that Japan has performed a substantial amount of emission measurements upon which the country-specific EFs are based. However, the information received from Japan did not allow the ERT to check whether the Party has followed guidance on QA/QC in the 2006 IPCC Guidelines (volume 1, chapters 6.7.1.2 and 6.7.1.3). Relevant QA/QC issues are as follows: (1) whether measurement methods are appropriate and performed at representative installations under representative conditions, as specified on page 2.12 of the 2006 IPCC Guidelines, and (2) whether EFs were cross-checked against EFs determined elsewhere. In response, Japan stated that appropriate QA/QC is performed and that applicability and representativeness were discussed before deciding to use a country-specific EF. The ERT noted that a comparison of the Party’s EFs with EFs from elsewhere was not always easy owing to the different methodologies used (e.g. the Japanese EF for wastewater treatment is expressed in kg CH<sub>4</sub>/m<sup>3</sup> of wastewater treated, whereas most other methodologies are based on kg CH<sub>4</sub>/kg BOD treated). However, the ERT is of the view</p>	Yes. Transparency

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W.5	5.A Solid waste disposal on land – CH <sub>4</sub>	<p>that comparisons of EFs would be possible by assuming an average composition of Japanese wastewater (mg BOD/m<sup>3</sup>).</p> <p>The ERT noted that sharing emission measurements and their interpretation with the international scientific community could also be part of the QA/QC process. However, only a few measurements are actually made available by Japanese researchers. Japan stated that sharing emission measurements and its interpretations of these with the international scientific community as part of the performance of QA/QC checks (as suggested by the ERT) is not mentioned in the 2006 IPCC Guidelines. However, the ERT notes that the 2006 IPCC Guidelines (volume 1, chapter 2.2.4, p.2.12) make reference to the importance of publications in peer-reviewed journals etc., and state that it is good practice for countries to use their own, peer-reviewed published literature; in addition, table 2.2 on page 2.13 of the guidelines makes it clear that peer reviews make data more reliable than unpublished measurements made by industry or other specific studies. In the latter case, it is necessary to ensure that standard methods are used. The ERT also notes that the 2006 IPCC Guidelines (volume 1, chapter 6, p.6.13) give guidance on using secondary data sources for developing EFs and peer reviews are also mentioned there as being important.</p> <p>The ERT recommends that Japan improve the justification for the use of the country-specific EF in the NIR by including short descriptions of the type of information the country-specific EFs are based on. The ERT encourages Japan to prepare documents (preferably in English) describing the methodologies, their results and interpretations and refer to these documents in the NIR. For comparisons with EFs reported elsewhere, the country-specific EFs could be recalculated using the units used in the 2006 IPCC Guidelines (e.g. for such a comparison kg CH<sub>4</sub>/m<sup>3</sup> wastewater treated can be recalculated as kg CH<sub>4</sub>/kg BOD by using an estimate of the average BOD concentration in Japanese wastewater). The ERT encourages Japan to use peer-reviewed literature as the basis for its country-specific methods and EFs.</p> <p>Japan uses country-specific half-lives of biodegradation to calculate its CH<sub>4</sub> emissions from solid waste disposal on land as follows: food waste (3), paper/cardboard (7), textiles (7) and wood (36). The Party justifies the use of these country-specific model parameters by referring to an article by Ito (1992). The ERT noted that the 2006 IPCC Guidelines (volume 5, chapter 3, box 3.1, p.3.20) give specific guidance on determining country-specific values of k (which are proportional to 1/half-life) and indicate that country-specific model parameters should be based on measurements at a representative selection of landfills.</p> <p>During the review Japan justified the country-specific half-lives by providing to the ERT the article by Ito (1992) on research conducted at a landfill site in metropolitan Tokyo, which was the largest landfill for municipal solid waste in Japan at that time. On the basis of the expert judgment of the Committee for the Greenhouse Gas Emissions Estimation Methods, Japan regards the country-specific half-life as a representative value. However, the ERT noted that Ito (1992) does not provide a clear indication that the proposed half-lives were based on measurements at a set of landfills representative of landfills in Japan.</p> <p>The ERT notes that a change to the IPCC default half-life of biodegradation (food waste (4), paper/cardboard (12), textiles (12) and wood (23)) does not affect the total amount of CH<sub>4</sub> produced, but it does affect the moment the</p>	Yes. Accuracy

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and/or a problem? <sup>a</sup> If yes, classify by type
W.6	5.B.2 Anaerobic digestion at biogas facilities – CH <sub>4</sub>	<p>CH<sub>4</sub> potential is released and the actual emissions reported for each year. In the period 1990–2016 the amount of solid waste landfilled in Japan significantly decreased. In a scenario of decreasing waste over time, a more rapid degradation (shorter half-life, as proposed by Ito (1992)) results in increased emissions in the base year, reduced emissions in the decades after and overall an increase in the amount of emission reduction over the time series. On the other hand, if Japan were to apply the IPCC half-lives, biodegradation of food waste, paper/cardboard, and textiles would be slowed down (reducing the trend in emissions), and degradation of wood would be accelerated (increasing the trend). These effects would compensate for each other to some extent. However, the waste landfilled in Japan in the early 1990s is dominated by paper/cardboard and food. Therefore, most likely, the application of the IPCC default values would result in a decrease in emissions for 1990 and an increase in emissions for 2016. Additional calculations with the Japanese waste model would need to be performed in order to determine whether the effect is significant.</p> <p>Therefore, on the basis of the above, the ERT recommends that Japan:</p> <p>(a) Provide a justification for the use of the country-specific half-life of biodegradation <i>k</i> to calculate CH<sub>4</sub> emissions from solid waste disposal. According to the 2006 IPCC Guidelines (volume 5, chapter 3, box 3.1, p.3.20), proper justification of the rate constant for biodegradation (<i>k</i>, which is proportional to 1/half time) should be based on appropriate measurements at a set of landfills representative of landfills in Japan. Therefore, the ERT recommends that such proper justification make clear that the method of Ito (1992) is appropriate and the data set of landfills used for the justification is representative of Japan (e.g. representative type of waste, representative landfill technology, representative climate);</p> <p>(b) If it is not possible to provide the appropriate justification, calculate CH<sub>4</sub> emissions from solid waste disposal assuming the IPCC default half-lives of biodegradation from table 3.4 in the 2006 IPCC Guidelines (volume 3, chapter 3).</p> <p>Japan reported CH<sub>4</sub> emissions for anaerobic digestion of solid waste as “NO” in CRF table 5.B for the entire time series. Japan also reported in its NIR (section, p.7-23) that, owing to information in the existing manual on the operation of biogas facilities for municipal waste (which states that fermentation equipment at biogas facilities for municipal waste should be kept airtight), emissions can be reported as “NO”. However, the ERT is of the view that the existence of such a manual is insufficient justification that emissions are not occurring. In addition, the manual only focuses on emissions from the digester itself, where the pre- and post-treatment and storage of digestate might cause most emissions. During the review, Japan explained that the CH<sub>4</sub> EF is obtained on the basis of the results of actual CH<sub>4</sub> emission measurements. However, CH<sub>4</sub> emissions after biogas processing are neither included in the calculation of the CH<sub>4</sub> EF nor reported in the inventory because, on the basis of existing studies, emission estimates after biogas processing were 1.4 kt CO<sub>2</sub> eq (on the basis of the biggest emissions sources) and, in general, in Japan, emissions sources of less than 3 kt CO<sub>2</sub> eq are not reported. The Party provided to the ERT the estimation of CH<sub>4</sub> emissions (leakage) from biogas facilities based on the amount of CH<sub>4</sub> generated in accordance with the 2006 IPCC Guidelines (volume 5, chapter 4.1, p.4.4). From this information it was clear to the ERT that Japan assumed the CH<sub>4</sub> EF to be 2 per cent of the CH<sub>4</sub> generation, which is within the range (0–10 per cent) mentioned in the 2006</p>	Yes. Transparency

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and/or a problem? <sup>a</sup> If yes, classify by type
W.7	5.D.1 Domestic wastewater – CH <sub>4</sub>	<p>IPCC Guidelines, but below the default EF of 5 per cent. The ERT commends the Party for the information provided and agrees that the use of a CH<sub>4</sub> EF of 2 per cent is reasonable and within the scope of what other countries are using. The ERT concludes that emissions are well below the threshold of significance for Japan and that the correct notation key in the CRF table should be “NE” and not “NO”.</p> <p>The ERT recommends that Japan report CH<sub>4</sub> emissions from anaerobic digestion of solid waste as “NE” in CRF table 5.B and justify the use of this notation key in annex 5 to the NIR on the basis of the threshold of significance in accordance with paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines.</p> <p>Japan reported in the NIR (section 7.5.1.2, table 7-75, p.7-74) that emissions from the Gappei-shori Johkasou wastewater treatment unit (septic tanks) are calculated assuming an EF of 2.477 kg CH<sub>4</sub>/person/year until 2001 and 1.835 kg/person/year for 2002 onward. The Party further reported that this reduction in the EFs was motivated by the fact that in 2001 the building standards for Johkasou units (septic tank units) were revised (NIR, p.7-74) and as a result a new generation of Johkasou units was developed. These units operate partially under aerobic conditions and therefore have reduced CH<sub>4</sub> emissions. The CH<sub>4</sub> EF of this new type of Johkasou unit was determined by measurements. The ERT agrees that the new Johkasou units have a reduced EF on the basis of the anaerobic/aerobic system. However, it seems unlikely to the ERT that between 2001 and 2002 all Johkasou units were immediately replaced, because new technologies need time to be implemented. Therefore the ERT is of the view that an assumption of the replacement rate over the years (e.g. based on sales of units per year) for estimating the EF of Johkasou units after 2002 would make more sense.</p> <p>The ERT recommends that Japan calculate the CH<sub>4</sub> emissions from Gappei-shori Johkasou units assuming a more realistic scenario for the impact on the CH<sub>4</sub> EF, such as by incorporating in the calculation a more gradual replacement of the older generation (pre-2001) Johkasou units with the new anaerobic–aerobic Johkasou units, which comply with the new building standards.</p>	Yes. Accuracy
KP-LULUCF		No issues identified.	

<sup>a</sup> Recommendations made by the ERT during the review are related to issues as defined in paragraph 81 of the UNFCCC review guidelines, or problems as defined in paragraph 69 of the Article 8 review guidelines. Encouragements are made to the Party to address all findings not related to such issues or problems.

## **VI. Application of adjustments**

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

## **VIII. Questions of implementation**

12. No questions of implementation were identified by the ERT during the individual review of the Party's 2018 annual submission.

## Annex I

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

1. Tables 6–9 provide an overview of total GHG emissions and removals as submitted by Japan.

Table 6  
Total greenhouse gas emissions for Japan, 1990–2016  
(kt CO<sub>2</sub> eq)

	<i>Total GHG emissions excluding indirect CO<sub>2</sub> emissions</i>		<i>Total GHG emissions including indirect CO<sub>2</sub> emissions<sup>a</sup></i>		<i>Land-use change (Article 3.7 bis as contained in the Doha Amendment)<sup>b</sup></i>	<i>KP-LULUCF activities (Article 3.3 of the Kyoto Protocol)<sup>c</sup></i>	<i>KP-LULUCF activities (Article 3.4 of the Kyoto Protocol)</i>	
	<i>Total including LULUCF</i>	<i>Total excluding LULUCF</i>	<i>Total including LULUCF</i>	<i>Total excluding LULUCF</i>			<i>CM, GM, RV, WDR<sup>c</sup></i>	<i>FM</i>
FMRL								0.00
1990	1 204 248.49	1 266 694.36	1 209 618.65	1 272 064.52			11 020.90	
1995	1 294 880.30	1 372 124.44	1 299 465.17	1 376 709.30				
2000	1 284 422.89	1 372 245.17	1 288 554.63	1 376 376.91				
2010	1 230 487.98	1 300 302.15	1 232 843.72	1 302 657.89				
2011	1 280 759.19	1 350 969.90	1 283 030.50	1 353 241.22				
2012	1 320 268.62	1 393 114.77	1 322 460.14	1 395 306.29				
2013	1 340 478.20	1 407 395.86	1 342 672.48	1 409 590.14		-113.31	2 046.04	-50 749.21
2014	1 294 689.83	1 359 669.31	1 296 812.93	1 361 792.41		808.97	2 932.56	-52 171.56
2015	1 260 746.74	1 321 061.29	1 262 849.54	1 323 164.09		241.07	2 775.85	-49 012.94
2016	1 247 796.67	1 304 567.85	1 249 899.00	1 306 670.18		909.49	3 178.56	-46 861.95

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

<sup>a</sup> The Party reported indirect CO<sub>2</sub> emissions in CRF table 6.

<sup>b</sup> The value reported in this column refers to 1990.

<sup>c</sup> Activities under Article 3, paragraph 3, of the Kyoto Protocol, namely AR and deforestation.

<sup>d</sup> In accordance with decision 3/CMP.11, paragraph 8, Japan previously reported that it will report emissions and removals from CM, GM and RV under Article 3, paragraph 4, of the Kyoto Protocol. The base year for these activities is 1990.



Table 7

**Greenhouse gas emissions by gas for Japan, excluding land use, land-use change and forestry, 1990–2016**(kt CO<sub>2</sub> eq)

	CO <sub>2</sub> <sup>a</sup>	CH <sub>4</sub>	N <sub>2</sub> O	HFCs	PFCs	Unspecified mix of HFCs and PFCs	SF <sub>6</sub>	NF <sub>3</sub>
1990	1 160 633.57	44 337.53	31 739.13	15 932.31	6 539.30	NA	12 850.07	32.61
1995	1 242 437.69	41 759.44	33 040.45	25 213.19	17 609.92	NA	16 447.52	201.09
2000	1 266 866.20	37 778.53	29 689.94	22 852.00	11 873.11	NA	7 031.36	285.77
2010	1 213 928.60	34 735.13	22 475.78	23 305.23	4 249.54	NA	2 423.87	1 539.74
2011	1 263 669.91	33 688.53	22 007.81	26 071.50	3 755.45	NA	2 247.64	1 800.38
2012	1 304 274.45	32 849.94	21 650.57	29 348.60	3 436.33	NA	2 234.54	1 511.85
2013	1 316 263.86	32 514.44	21 718.17	32 094.57	3 280.06	NA	2 101.81	1 617.24
2014	1 266 296.36	31 879.07	21 301.90	35 765.73	3 361.43	NA	2 065.07	1 122.87
2015	1 225 769.27	31 140.88	20 979.49	39 242.60	3 308.10	NA	2 152.71	571.03
2016	1 206 420.95	30 792.28	20 676.48	42 517.72	3 375.33	NA	2 252.99	634.44
<b>Per cent change 1990–2016</b>	<b>3.9</b>	<b>-30.6</b>	<b>-34.9</b>	<b>166.9</b>	<b>-48.4</b>	<b>NA</b>	<b>-82.5</b>	<b>1 845.5</b>

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

<sup>a</sup> CO<sub>2</sub> emissions include indirect CO<sub>2</sub> emissions reported in CRF table 6.

Table 8

**Greenhouse gas emissions by sector for Japan, 1990–2016**(kt CO<sub>2</sub> eq)

	Energy	IPPU	Agriculture	LULUCF	Waste	Other
1990	1 090 422.44	114 765.30	37 620.75	-62 445.87	29 256.03	NA
1995	1 166 862.32	140 166.88	37 141.85	-77 244.14	32 538.26	NA
2000	1 197 582.80	111 513.61	35 305.46	-87 822.29	31 975.04	NA
2010	1 161 720.94	81 918.75	35 837.76	-69 814.17	23 180.44	NA
2011	1 211 822.29	83 779.37	35 281.92	-70 210.72	22 357.64	NA
2012	1 251 730.36	86 233.34	34 706.08	-72 846.15	22 636.51	NA
2013	1 261 978.02	90 578.56	34 723.04	-66 917.66	22 310.52	NA
2014	1 212 929.76	93 105.47	34 205.78	-64 979.48	21 551.41	NA
2015	1 173 624.06	94 438.78	33 642.46	-60 314.55	21 458.79	NA

	<i>Energy</i>	<i>IPPU</i>	<i>Agriculture</i>	<i>LULUCF</i>	<i>Waste</i>	<i>Other</i>
2016	1 154 040.06	97 485.00	33 505.37	-56 771.18	21 639.74	NA
<b>Per cent change 1990–2016</b>	<b>5.8</b>	<b>-15.1</b>	<b>-10.9</b>	<b>-9.1</b>	<b>-26.0</b>	<b>NA</b>

*Notes:* (1) Emissions/removals reported in the sector other (sector 6) are not included in the total GHG emissions. (2) Totals include indirect CO<sub>2</sub> emissions reported in CRF table 6.

Table 9

**Greenhouse gas emissions/removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol by activity, 1990<sup>a</sup>–2016, for Japan**  
(kt CO<sub>2</sub> eq)

	<i>Article 3.7 bis as contained in the Doha Amendment<sup>b</sup></i>		<i>Article 3.3 of the Kyoto Protocol</i>						<i>FM and elected Article 3.4 activities of the Kyoto Protocol</i>				
	<i>Land-use change</i>				<i>FM</i>				<i>CM</i>	<i>GM</i>	<i>RV</i>	<i>WDR</i>	
			<i>AR</i>	<i>Deforestation</i>									
FMRL					0.00								
Technical correction					1 590.20								
1990	NA								10 257.97	841.94	-79.00	NA	
2013					-50 749.21				3 543.71	-273.94	-1 223.73	NA	
2014					-52 171.56				4 274.14	-99.65	-1 241.93	NA	
2015					-49 012.94				4 198.81	-159.77	-1 263.19	NA	
2016					-46 861.95				4 681.04	-221.98	-1 280.50	NA	
<b>Per cent change base year–2016</b>									<b>-54.4</b>	<b>-126.4</b>	<b>1 520.8</b>	<b>NA</b>	

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

<sup>a</sup> Japan has selected CM, GM and RV under Article 3, paragraph 4, of the Kyoto Protocol. 1990 is reported for these activities. For activities under Article 3, paragraph 3, of the Kyoto Protocol, and FM under Article 3, paragraph 4, only the inventory years of the commitment period must be reported.

<sup>b</sup> The value reported in this column refers to 1990.

2. Table 10 provides an overview of key relevant data for Japan's reporting under Article 3, paragraphs 3 and 4, of the Kyoto Protocol.

Table 10

**Key relevant data for Japan under Article 3, paragraphs 3 and 4, of the Kyoto Protocol in the 2018 annual submission**

<i>Key parameters</i>	<i>Values</i>
Periodicity of accounting	NA
Election of activities under Article 3, paragraph 4	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 <sub>2</sub> emissions	NA
Cancellation of AAUs, ERUs, CERs and/or issuance of RMUs in the national registry for:	
1. AR in 2016	NA
2. Deforestation in 2016	NA
3. FM in 2016	NA
4. CM in 2016	NA
5. GM in 2016	NA
6. RV in 2016	NA
7. WDR in 2016	NA

## Annex II

### Additional information to support findings in table 2

#### Missing categories that may affect completeness

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

- (a) CO<sub>2</sub> emissions from lime production in sugar mills under category 2.A.2 (see ID# I.3 in table 3);
- (b) CO<sub>2</sub> emissions from non-marketed lime production by aluminium manufacturers for 1990–2014 under category 2.A.2 (see ID# I.4 in table 3);
- (c) CO<sub>2</sub> emissions from minor glass raw materials (such as strontium carbonate and sodium bicarbonate) under category 2.A.3 (see ID# I.5 in table 3);
- (d) CO<sub>2</sub> emissions from other carbon-containing materials (such as ore and slag forming) under category 2.C.2 (see ID# I.31 in table 5);
- (e) PFC emissions from the manufacturing, stocks and disposal of commercial refrigeration under category 2.F.1 (see ID# I.34 in table 5).

## Annex III

### Documents and information used during the review

#### A. Reference documents

##### Reports of the Intergovernmental Panel on Climate Change

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

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

##### Annual review reports

Reports on the individual reviews of the 2013, 2014, 2016 and 2017 annual submissions of Japan, contained in documents FCCC/ARR/2013/JPN, FCCC/ARR/2014/JPN, FCCC/ARR/2016/JPN and FCCC/ARR/2017/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/sites/default/files/resource/AGI%20report\\_2018.pdf](https://unfccc.int/sites/default/files/resource/AGI%20report_2018.pdf).

Annual status report for Japan for 2018. Available at [https://unfccc.int/sites/default/files/resource/2018%20ASR%20of%20Japan\\_complete\\_0.pdf](https://unfccc.int/sites/default/files/resource/2018%20ASR%20of%20Japan_complete_0.pdf).

Ito. 1992. A Study on Estimating Amounts of Landfill Gas, Metropolitan. *Tokyo Sanitation Engineering Journal No. 18*.

N Katayanagi N, Fumoto T, Hayano M, Takata Y, Kuwagata T, Shirato Y, Sawano S, Kajiura M, Sudo S, Ishigooka Y, Yagi K. 2016. Development of a method for estimating total CH<sub>4</sub> emission from rice paddies in Japan using the DNDC-Rice model. *Science of the Total Environment*, 547, 429–440

#### B. Additional information provided by the Party

Responses to questions during the review were received from Ms. Midori Yanagawa (Greenhouse Gas Inventory Office of Japan), including additional material on the methodology and assumptions used.