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Report of the individual review of the annual submission of Japan submitted in 2011*

* In the symbol for this document, 2011 refers to the year in which the inventory was submitted, and not to the year of publication.

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Contents

I. Introduction and summary

A. Overview

1. This report covers the centralized review of the 2011 annual submission of Japan, coordinated by the UNFCCC secretariat, in accordance with decision 22/CMP.1. The review took place from 12 to 17 September 2011 in Bonn, Germany, and was conducted by the following team of nominated experts from the UNFCCC roster of experts: generalist – Ms. Karin Kindbom (Sweden) and Ms. Riitta Pipatti (Finland); energy – Mr. Pierre Boileau (Canada); industrial processes – Mr. Jos Olivier (Netherlands) and Ms. Sonia Petrie (New Zealand); agriculture – Mr. Donald Kamdonyo (Malawi) and Mr. Marcelo Rocha (Brazil); land use, land-use change and forestry (LULUCF) – Mr. Mattias Lundblad (Sweden) and Mr. Richard Volz (Switzerland); and waste – Mr. Seungdo Kim (Republic of Korea). Ms. Pipatti and Mr. Rocha were the lead reviewers. The review was coordinated by Ms. Kyoko Miwa and Mr. Javier Hanna (UNFCCC secretariat).

2. In accordance with the "Guidelines for review under Article 8 of the Kyoto Protocol" (decision 22/CMP.1) (hereinafter referred to as the Article 8 review guidelines), 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.

B. Emission profiles and trends

3. In 2009, the main greenhouse gas (GHG) in Japan was carbon dioxide (CO_2), accounting for 94.7 per cent of total GHG emissions[1] expressed in CO_2 eq, followed by nitrous oxide (N_2O) (1.8 per cent) and methane (CH_4) (1.7 per cent). Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6) collectively accounted for 1.8 per cent of the overall GHG emissions in the country. The energy sector accounted for 90.8 per cent of total GHG emissions, followed by the industrial processes sector (5.3 per cent), the agricultural sector (2.1 per cent), the waste sector (1.8 per cent) and the solvent and other product use sector (0.01 per cent). Total GHG emissions (excl. LULUCF) amounted to 1,209,213.17 Gg CO_2 eq and decreased by 3.7 per cent between the base year[2] and 2009. Net removals in the LULUCF sector amounted to 71,523.47 Gg CO_2 eq and increased by 2.8 per cent between 1990 and 2009. The trends in emissions from the base year to 2009 are reasonable.

4. Tables 1 and 2 show GHG emissions from Annex A sources, emissions and removals from the LULUCF sector under the Convention and emissions and removals from activities under Article 3, paragraph 3, and, if any, under Article 3, paragraph 4, of the Kyoto Protocol (KP-LULUCF), by gas and by sector and activity, respectively. In table 1, CO_2, CH_4 and N_2O emissions included in the rows under Annex A sources do not include emissions and removals from the LULUCF sector.

[1] In this report, the term "total GHG emissions" refers to the aggregated national GHG emissions expressed in terms of CO_2 eq excluding LULUCF, unless otherwise specified.

[2] "Base year" refers to the base year under the Kyoto Protocol, which is 1990 for CO_2, CH_4 and N_2O, and 1995 for HFCs, PFCs and SF_6. The base year emissions include emissions from Annex A sources only.

Table 1

Greenhouse gas emissions from Annex A sources and emissions/removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, by gas, base year to 2009[a]

			Gg CO_2 eq								*Change*
		Greenhouse gas	*Base year*[a]	*1990*	*1995*	*2000*	*2005*	*2007*	*2008*	*2009*	*Base year–2009 (%)*
Annex A sources		CO_2	1 141 196.05	1 141 196.05	1 223 692.68	1 251 556.70	1 282 255.72	1 296 306.76	1 213 252.91	1 144 569.40	0.3
		CH_4	31 901.35	31 901.35	29 605.37	25 789.16	22 676.29	21, 61.57	21 213.20	20 708.25	–35.1
		N_2O	31 615.17	31 615.17	32 657.01	28 946.15	24 020.78	22 689.27	22 444.21	22 141.05	–30.0
		HFCs	20 260.17	17 930.00	20 260.17	18 800.43	10 566.32	13, 79.24	15 298.30	16 671.73	–17.7
		PFCs	14 240.36	5 670.00	14 240.36	9 519.49	7 002.07	6 411.99	4 616.01	3 271.47	–77.0
		SF_6	16 961.45	38 240.00	16 961.45	7 188.49	4 807.94	4 407.45	3 795.22	1 851.27	–89.1
KP-LULUCF	Article 3.3[b]	CO_2							2 037.37	2 668.30	
		CH_4							0.03	0.01	
		N_2O							2.37	3.12	
	Article 3.4[c]	CO_2	–47.06						–46 132.52	–49 766.22	105 745.8
		CH_4	NA						12.70	5.12	NA
		N_2O	NA						1.29	0.52	NA

Abbreviations: KP-LULUCF = land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, NA = not applicable.

[a] "Base year" for Annex A sources refers to the base year under the Kyoto Protocol, which is 1990 for CO_2, CH_4 and N_2O, and 1995 for HFCs, PFCs and SF_6. The "base year" for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol is 1990.

[b] Activities under Article 3, paragraph 3, of the Kyoto Protocol, namely afforestation and reforestation, and deforestation. Only the inventory years of the commitment period must be reported.

[c] Elected activities under Article 3, paragraph 4, of the Kyoto Protocol, including forest management, cropland management, grazing land management and revegetation. For cropland management, grazing land management and revegetation the base year and the inventory years of the commitment period must be reported.

Table 2
Greenhouse gas emissions by sector and activity, base year to 2009[a]

			Gg CO_2 eq								*Change*
		Sector	*Base year*[a]	*1990*	*1995*	*2000*	*2005*	*2007*	*2008*	*2009*	*Base year–2009 (%)*
Annex A		Energy	1 079 001.79	1 079 001.79	1 156 813.93	1 190 907.22	1 226 960.97	1 241 883.54	1 161 173.15	1 098 087.84	1.8
		Industrial processes	120 020.52	130 398.54	121 335.34	94 377.30	73 841.58	74 437.85	70 832.12	63 772.19	–46.9
		Solvent and other product use	287.07	287.07	437.58	340.99	266.41	159.95	129.10	120.50	–58.0
		Agriculture	31 294.64	31 294.64	30 070.21	27 657.80	26 549.07	26 128.30	25 757.41	25 402.11	–18.8
		Waste	25 570.53	25 570.53	28 760.00	28 517.10	23 711.08	22 246.65	22 728.06	21 830.53	–14.6
		LULUCF	NA	–69 576.66	–81 512.51	–87 289.34	–90 273.48	–83 747.52	–78 318.30	–71 523.47	NA
		Total (with LULUCF)	**NA**	**1 196 975.91**	**1 255 904.54**	**1 254 511.08**	**1 261 055.64**	**1 281 108.77**	**1 202 301.56**	**1 137 689.69**	**NA**
		Total (without LULUCF)	**1 256 174.55**	**1 266 552.57**	**1 337 417.05**	**1 341 800.42**	**1 351 329.12**	**1 364 856.28**	**1 280 619.85**	**1 209 213.17**	**–3.7**
		Other[b]	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA
KP-LULUCF	Article 3.3[c]	Afforestation and reforestation							–389.56	–415.08	
		Deforestation							2 429.33	3 086.51	
		Total (3.3)							**2 039.77**	**2 671.43**	
	Article 3.4[d]	Forest management							–45 388.82	–49 005.74	
		Cropland management	NA						NA	NA	NA
		Grazing land management	NA						NA	NA	NA
		Revegetation	–47.06						–729.70	–754.84	1 503.9
		Total (3.4)	**–47.06**						**–46 118.52**	**–49 760.58**	**NA**

Abbreviations: LULUCF = land use, land-use change and forestry; KP-LULUCF = LULUCF emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, NA = not applicable, NO = not occurring.

[a] "Base year" for Annex A sources refers to the base year under the Kyoto Protocol, which is 1990 for CO_2, CH_4 and N_2O, and 1995 for HFCs, PFCs and SF_6. The "base year" for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol is 1990.

[b] Emissions/removals reported in the sector other (sector 7) are not included in Annex A to the Kyoto Protocol and are therefore not included in national totals.

[c] Activities under Article 3, paragraph 3, of the Kyoto Protocol, namely afforestation and reforestation, and deforestation. Only the inventory years of the commitment period must be reported.

[d] Elected activities under Article 3, paragraph 4, of the Kyoto Protocol, including forest management, cropland management, grazing land management and revegetation. For cropland management, grazing land management and revegetation the base year and the inventory years of the commitment period must be reported.

5. Table 3 provides information on the most important emissions and removals and accounting parameters that will be included in the compilation and accounting database.

Table 3
Information to be included in the compilation and accounting database in t CO_2 eq

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]	*Accounting quantity*[c]
Commitment period reserve	5 335 431 899			5 335 431 899	
Annex A emissions for current inventory year					
CO_2	1 144 569 400			1 144 569 400	
CH_4	20 708 250			20 708 250	
N_2O	22 141 049			22 141 049	
HFCs	16 671 729			16 671 729	
PFCs	3 271 465			3 271 465	
SF_6	1 851 272			1 851 272	
Total Annex A sources	**1 209 213 167**			**1 209 213 167**	
Activities under Article 3, paragraph 3, for current inventory year					
3.3 Afforestation and reforestation on non-harvested land for current year of commitment period as reported	–415 083			–415 083	
3.3 Afforestation and reforestation on harvested land for current year of commitment period as reported	NA			NA	
3.3 Deforestation for current year of commitment period as reported	3 086 509			3 086 509	
Activities under Article 3, paragraph 4, for current inventory year[d]	–49 005 739			–49 005 739	
3.4 Forest management for current year of commitment period					
3.4 Cropland management for current year of commitment period					
3.4 Cropland management for base year					
3.4 Grazing land management for current year of commitment period					
3.4 Grazing land management for base year					
3.4 Revegetation for current year of commitment period	–754 838			–754 838	
3.4 Revegetation in base year	–47 062			–47 062	

Abbreviations: NA = not applicable.

[a] "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustments.

[b] "Final" includes revised estimates, if any, and/or adjustments, if any.

[c] "Accounting quantity" is included in this table only for Parties that chose annual accounting for activities under Article 3, paragraph 3, and elected activities under Article 3, paragraph 4, if any.

[d] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

II. Technical assessment of the annual submission

A. Overview

1. Annual submission and other sources of information

6. The 2011 annual inventory submission was submitted on 26 April 2011; it contains a complete set of common reporting format (CRF) tables for the period 1990–2009 and a national inventory report (NIR). Japan also submitted information required under Article 7, paragraph 1, of the Kyoto Protocol, including information on: activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, accounting of Kyoto Protocol units, changes in the national system and in the national registry, and the minimization of adverse impacts under Article 3, paragraph 14, of the Kyoto Protocol. The standard electronic format (SEF) tables were submitted on 26 April 2011. The annual submission was submitted in accordance with decision 15/CMP.1. Japan requested some flexibility in submitting its 2011 submission because of the disaster the country suffered with the earthquake and tsunami in March 2011. Japan is commended for the efforts made under these circumstances.

7. Where necessary, the expert review team (ERT) also used the previous year's submission during the review. In addition, the ERT used the standard independent assessment report (SIAR), parts I and II, to review information on the accounting of Kyoto Protocol units (including the SEF tables and their comparison report) and on the national registry.[3] The values used in this report are based on the values contained in the submission of 26 April 2011.

8. During the review, Japan provided the ERT with additional information and documents which are not part of the annual submission. The full list of information and documents used during the review is provided in annex I to this report.

Completeness of inventory

9. The inventory covers all source and sink categories for the period 1990–2009 and is complete in terms of gases, years and geographical coverage. However, the ERT noted that Japan continues to report actual emissions of fluorinated gases (F-gases) as not estimated (NE) for the years 1990–1994 due to lack of activity data (AD) for these years (see para. 47 below). In a few other cases, "NE" was incorrectly used instead of "IE" or "NA" (see sector comments). The ERT reiterates a recommendation made in previous review reports that Japan report in its next annual submission a complete time series of actual F-gas emissions, for example using extrapolation methods for estimating these missing emissions.

10. The ERT noted that in this submission Japan has estimated a number of categories in the LULUCF sector which previously were reported as "NE" (including dead organic matter (DOM) and soil organic carbon (SOC) for forest land remaining forest land for early years in the time series). Several source/sink categories are, however, still reported as "NE" (including SOC for cropland remaining cropland and grassland remaining grassland). The ERT recommends that, for its next annual submission, Japan improve the completeness of

[3] The SIAR, parts I and II, is prepared by an independent assessor in line with decision 16/CP.10 (paras. 5(a), 6(c) and 6(k)), under the auspices of the international transaction log administrator using procedures agreed in the Registry System Administrators Forum. Part I is a completeness check of the submitted information relating to the accounting of Kyoto Protocol units (including the SEF tables and their comparison report) and to national registries. Part II contains a substantive assessment of the submitted information and identifies any potential problem regarding information on the accounting of Kyoto Protocol units and the national registry.

the reporting, especially for those relating to carbon stock changes for mandatory categories (see paras. 77, 78, 85, 86 and 87 below).

2. A description of the institutional arrangements for inventory preparation, including the legal and procedural arrangements for inventory planning, preparation and management

Overview

11. The ERT concluded that the national system continued to perform its required functions.

12. Japan described a minor change of the national system since the previous annual submission and this change is described in paragraph 124 of this report.

Inventory planning

13. The NIR described the national system and institutional arrangements for the preparation of the inventory. The Ministry of the Environment (MOE) has overall responsibility for the national inventory and is the designated single national entity responsible for the compilation and submission of the inventory. The MOE also organizes the Committee for the Greenhouse Gas Emission Estimation Methods (the Committee) which suggests improvements to the inventory and examines and approves revisions in methodology and parameters. The Greenhouse Gas Inventory Office of Japan (GIO), at the Centre for Global Environmental Research of the National Institute for Environmental Studies, is responsible for the calculations, inventory compilation and the archiving of all data. Relevant ministries, agencies and organizations provide the GIO with the appropriate data (e.g. activity data and emission factors). Those ministries and agencies are also requested to perform QA/QC by checking and verifying the inventory, including the CRF tables, NIR and the spreadsheets used for the emission estimations. Relevant ministries and organizations involved include the MOE, Ministry of Economy, Trade and Industry, Ministry of Land, Infrastructure, Transport and Tourism, Ministry of Agriculture, Forestry and Fisheries, Ministry of Health, Labour and Welfare as well as the Federation of Electric Power Companies, Japan Coal Energy Center, Japan Cement Association, Japan Iron and Steel Federation and Japan Paper Association. Private consultancy companies are contracted to perform quality control (QC) of the CRF tables, NIR, spreadsheets and other information compiled by the GIO. The GHG Inventory Quality Assurance Working Group (QA-WG), organized by the GIO, performs quality assurance (QA) of the inventory by experts not directly involved in the inventory.

14. In response to a question from the ERT during the review, regarding how timely cooperation is ensured with other ministries, agencies and groups involved in the inventory preparation, Japan clarified that, according to Article 7 of the Act on Promotion of Global Warming Countermeasures, the national government shall calculate GHG emissions and sinks in Japan each year to prepare the inventory. Under this Act, the relevant ministries have responsibilities regarding inventory compilation; preparation of AD, emission factors (EFs) and other parameters and data as members of the national government. In addition, the MOE requests the relevant agencies and groups to provide the data that are not available from the relevant ministries in order to fulfil the legal obligation. Their roles are clarified in the QA/QC plan for the Japanese GHG inventory.

15. The NIR describes the annual cycle of inventory preparation, including timing, milestones and roles and responsibilities. The ERT commends Japan for a well-developed system for inventory planning and compilation.

Inventory preparation

Key categories

16. Japan has reported key category tier 1 and tier 2 analyses, both level and trend assessments, as part of its 2011 submission. The key category analysis performed by Japan (tier1) and that performed by the secretariat[4] produced similar results. Japan has included the LULUCF sector in its key category analysis, which was performed in accordance with the Intergovernmental Panel on Climate Change (IPCC) *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC good practice guidance) and the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF).

17. In annex 1 of the NIR, Japan reports on tier 1 and tier 2 key categories for the base year and for the most recent inventory year. The results of Japan's key category analyses are not fully reflected in CRF table 7. The NIR lists 35 key categories for 2009, whereas the CRF table 7 in the current submission includes only 20 key categories. The ERT found that CRF table 7 includes only those categories identified as key in the tier 1 analysis. Japan confirmed that it considers the 35 key categories based on the results of tier 1 and tier 2 analyses for level and trend, as presented in table A1-1 in annex 1 to the NIR, as Japan's key categories for 2009. For years other than 1990 and the most recently reviewed inventory year, Japan uses the tier 1 method for its key category analysis. Japan explained that it reports only the results of tier 1 assessment in the CRF tables for the whole time series. The ERT reiterates the recommendation from previous review reports that, in its next annual submission, Japan report all key categories, according to tables A1-1 (latest inventory year) and A1-2 (1990) of annex 1 to the NIR, in the CRF table 7 for both 1990 and the latest inventory year, because it was unclear to the ERT which categories were considered key by Japan. Japan also performed a key category analysis for KP-LULUCF, correlating UNFCCC categories to corresponding activities under the Kyoto Protocol, leading to the conclusion that forest management (FM), revegetation (RV) and deforestation (D) are considered key.

Uncertainties

18. Japan has calculated and provided information on uncertainties on total level, and on sector and gas (or aggregated gases) level, in tables 1–4 of the NIR. In annex 7 of the NIR, disaggregated information is presented in the format provided in table 6-1 of the uncertainty chapter of the IPCC good practice guidance. The uncertainties are calculated using a tier 1 approach and are in accordance with the IPCC good practice guidance. Japan uses a decision tree for choosing uncertainty values, where data derived from measurements or expert judgement are available. When that is not the case, default values from the IPCC good practice guidance are used. Japan uses its uncertainty assessment as one of the factors in prioritization of inventory improvement. The uncertainty of total net emissions in 2009 is estimated at 2 per cent and the uncertainty introduced into the trend in total net emissions is estimated at 1 per cent.

[4] The secretariat identified, for each Party, the categories that are key categories in terms of their absolute level of emissions, applying the tier 1 level assessment as described in the Intergovernmental Panel on Climate Change *Good Practice Guidance for Land Use, Land-Use Change and Forestry*. Key categories according to the tier 1 trend assessment were also identified for Parties that provided a full set of CRF tables for the base year or period. Where the Party performed a key category analysis, the key categories presented in this report follow the Party's analysis. However, they are presented at the level of aggregation corresponding to a tier 1 key category assessment conducted by the secretariat.

Recalculations and time-series consistency

19. Recalculations have been performed and reported in the NIR and CRF table 8(a) but not fully in accordance with the IPCC good practice guidance. The ERT noted that recalculations reported by Japan for the years between 1990 and 2008 have been undertaken to take into account the following:

(a) Energy: changes in AD for several categories (e.g. fuel combustion activities, energy industries, manufacturing industries and construction as well as transportation), and revised EFs for road transportation;

(b) Industrial processes: changes in AD for lime production and limestone use, soda ash use and calcium carbide production, in response to the recommendation of the 2010 annual review report, revised AD for SF_6 production and HFC consumption and due to changes in the EF for cement production;

(c) Solvent and other product use: revised AD for N_2O use for anaesthesia;

(d) Agriculture: correction of errors in the reporting of nitrogen excretion under manure management for swine and poultry in response to recommendations in the 2010 annual review report; changes in AD (revision of three-year average AD to annual AD) and correction of other identified errors (discrepancies between total values and integrated values from the detail level for swine and poultry population) (see paras. 62 and 66 below);

(e) LULUCF: reclassification/reallocation of land areas and newly available data for the estimation of carbon stock changes;

(f) Waste: newly obtained AD for waste incineration.

20. The impact of the recalculations is a decrease in the total GHG emissions in 1990 of 0.2 per cent, and a decrease in 2008 of 0.1 per cent. The rationale for the recalculations is often provided in the NIR and in CRF table 8(b), but the justification is often missing. Moreover, Japan does not provide information quantifying the impact of the recalculations at the key category level in the NIR, as identified in the previous review report. The ERT recommends that Japan provide relevant justifications and quantified information of the resulting changes at key category level for recalculations in the NIR of its next annual submission and more complete information in CRF table 8(b) in order to improve transparency and facilitate future reviews. (see also para. 43 below).

Verification and quality assurance/quality control approaches

21. The inventory compilation process in Japan, and the QA/QC plan including roles and responsibilities and QA/QC activities, are described in the NIR chapter 1 and annex 6. The QA/QC approaches are implemented in accordance with the IPCC good practice guidance. Japan's QA-WG each year performs an expert peer review of the inventory to confirm the soundness of estimation methods, AD, EFs as well as to confirm the soundness of the content reported in the CRF tables and NIR. During 2010 Japan's QA-WG undertook a detailed review of the industrial processes and the solvent and other product use sectors. Japan is commended for its efforts in this detailed review of individual sectors.

Transparency

22. The NIR and the CRF tables of the 2011 submission are presented generally in a transparent way. Japan uses notation keys throughout the CRF tables and includes explanations in CRF table 9(a) for emissions that are reported as "NE" or included elsewhere ("IE"). The ERT noted improvements in the transparency of the NIR since the previous submission, especially in the energy sector (e.g. providing translation of key documents relating to the transport category emissions, explanations for issues noted in

previous review reports in the NIR). However, some issues remain where transparency could be improved such as in reporting of recalculations. These are further specified in the sectoral sections below (see paras. 69 and 72 below, for example.). Japan states in chapter 10.4.2 of the NIR that it plans to further improve transparency by examining the descriptions of methodologies, assumptions, data and other elements in the NIR, and by adding necessary information to NIR. The ERT welcomes these plans.

23. During the review, Japan provided English translations of background documents for the energy sector in response to a question raised by the ERT. The ERT commends Japan for its efforts in providing this information. However, the ERT reiterates the recommendation from previous review reports that Japan incorporate into its NIR information on AD and EFs from key background documents, particularly for those key sectors/categories that are lacking in transparency (see paras. 32, 33, 43 and 44 below). Although all essential information should be provided in the NIR, the ERT also recalls the encouragement in the previous review report that Japan makes English translations of key background documents available in its next annual submission.

24. The ERT noted that Japan's use of notation keys is not always transparent and not in line with the UNFCCC reporting guidelines. In all sectors except waste, (see para. 37, 48, 61, 85, 86, and 110 below) the ERT could not always determine whether, for example, "NE" in some instances should instead be not occurring ("NO") or included elsewhere ("IE"). The ERT recommends that Japan review the application of notation keys (see sectoral paragraphs for details) and revise these, as appropriate, in its next annual submission.

Inventory management

25. As reported in the NIR, Japan has a centralized archiving system, managed by the GIO, which includes the archiving of disaggregated EFs and AD, and documentation on how these factors and data have been generated and aggregated for the preparation of the inventory. The archived information also includes: internal documentation on QA/QC procedures, external and internal reviews; and documentation on annual key categories and key category identification, and planned inventory improvements.

3. Follow-up to previous reviews

26. The ERT acknowledges the improvements made by Japan in response to recommendations of previous review reports. Japan has also provided a table in the NIR (table 10-3 in chapter 10), with information on Japan's follow-up of ERT recommendations from earlier review reports. The ERT encourages Japan to also list recommendations from previous review reports where action has not yet been taken, including plans and time frames for their implementation. The ERT noted that since its previous submission Japan has included information and examples regarding the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol. The ERT also noted improvements in the descriptions of the emission trends in the NIR, and also noted the explanation from Japan regarding the missing estimates for actual emissions of HFCs, PFCs and SF_6, which was provided to the ERT during the review. However, Japan has not followed up on some of the recommendations of previous review reports, such as: to provide quantified information on recalculations at the relevant category level within the respective category-specific recalculations section of the NIR; to provide better documentation of the drivers of emission trends; and to provide estimates of actual emissions of HFCs, PFCs and SF_6 for the years 1990–1994, for example using extrapolation methods recommended by IPCC good practice guidance for estimating these missing emissions. The ERT recommends that Japan reconsider implementing the above

recommendations in order to improve the transparency and completeness of its next annual submission.

4. Areas for further improvement

Identified by the Party

27. The 2011 NIR identifies the same, only very general areas for improvement as in the 2010 NIR (chapter 10.4.2).

(a) Japan will hold meetings of the Committee for Greenhouse Gas Emission Estimation Methods and will consider improvements of estimation methods, AD, EFs and other elements used in the current inventory. In case of implementation, Japan will prioritize highly important issues such as those relevant to key categories and those pointed out in previous review reports;

(b) Japan will further improve transparency of the inventory by examining descriptions of methodologies, assumptions, data and other elements in the NIR, and by adding necessary information to the NIR.

Identified by the expert review team

28. During the review, the ERT identified cross-cutting issues for improvement. These are listed in paragraph 139 below.[5]

29. Recommended improvements relating to specific categories are presented in the relevant sector chapters of this report.[6]

B. Energy

1. Sector overview

30. The energy sector is the main sector in the GHG inventory of Japan. In 2009, emissions from the energy sector amounted to 1,098,087.84 Gg CO_2 eq, or 90.8 per cent of total GHG emissions. Since 1990, emissions have increased by 1.8 per cent. The key drivers for the rise in emissions are growth in power generation from natural gas and growth in fuel use in the transport category. Within the sector, 35.4 per cent of the emissions were from energy industries, followed by 29.2 per cent from manufacturing industries and construction, 20.6 per cent from transport and 14.8 per cent from other sectors. The remaining 0.04 per cent were from fugitive emissions from fuels.

31. Japan has performed recalculations for the energy sector between the 2010 and 2011 submissions following changes due to updates in AD and revisions of EFs. The impact of these recalculations on the energy sector is an increase in emissions of 0.06 per cent for 2008 and an increase in emissions by 0.01 per cent in 1990. The main recalculations took place in the following categories:

(a) Energy industries;

(b) Manufacturing industries and construction;

(c) Other sectors.

[5] The 2011 review report of Japan was published after the submission due date of the 2012 annual submission.

[6] The 2011 review report of Japan was published after the submission due date of the 2012 annual submission.

32. The ERT commends Japan for increasing the transparency of the energy sector by providing English translations of some key documents supporting the emissions estimation methodologies (see also paras. 22 and 23 above). The ERT notes that transparency could be further improved by incorporating summaries of the findings in these key documents directly into the NIR.

33. The ERT commends Japan on the improvements to its NIR and CRF tables in its 2011 submission. Transparency has been greatly improved and significant efforts have been made to address previous review report recommendations.

2. Reference and sectoral approaches

Comparison of the reference approach with the sectoral approach and international statistics

34. The sectoral and reference approach estimates compare well for Japan in 2009. The overall difference for CO_2 estimates is 0.92 per cent, with the sectoral approach producing higher emission estimates than the reference approach. For 1990 the difference is –1.01 per cent. In 2008 a larger discrepancy was observed in the reference approach for CO_2 emissions from the combustion of solid fuels (5.26 per cent) due to a significant stock change in imported steam coal. However, the overall difference for 2008 was only 2.0 per cent. The ERT recommends that Japan provide a more detailed explanation of this issue in the NIR of its 2013 annual submission, because a stock change in the supply of steam coal should be compensated for by consumption in the appropriate sector.

International bunker fuels

35. The AD for bunker fuels is derived from quantities listed as bonded imports and exports (i.e. a different tax rate is paid for these fuels) within Japan's energy statistics. Jet kerosene, diesel oil, fuel oil and residual fuel oil are listed as bonded fuels in the statistics and these are used with either country-specific or default EFs for the emission estimates. For domestic flights, a separate method is used which uses AD (from the publication Statistical Yearbook of Air Transport (Ministry of Land, Infrastructure, Transport and Tourism)) on domestic departures and arrivals rather than fuel sales. This method can be considered equivalent to a tier 2a method in the IPCC good practice guidance.

Feedstocks and non-energy use of fuels – CO_2

36. Japan reports CO2 emissions from the use of solid fuels under the category of non-ferrous metals within the energy sector, because these fuels are consumed in the production of non-ferrous metals. The ERT recommends that Japan report these emissions within the industrial processes sector, as required by the Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories (hereinafter referred to as the Revised 1996 IPCC Guidelines), because the emissions result from the oxidation of the coal and petroleum coke-based anodes rather than their combustion. Moreover, the ERT recommends that Japan complete the columns "Associated CO2 emissions" and "Allocated under" in the additional information table of CRF table 1.A(d), which are currently reported with the notation key "NE". The ERT recommends that Japan use the information in CRF table 1.A(d) and provide accompanying information in the "Feedstocks and non-energy use of fuels" section of the NIR.

3. Non-key categories

Coal mining and handling: solid fuels – CO_2 and CH_4

37. CH_4 emissions from recovery/flaring are reported as "NE" due to lack of data as reported by Japan. The ERT notes that it is unclear from the information provided in the

NIR whether emissions from this activity are really "NE" or should be "NO". The ERT recommends that Japan improve the transparency of its reporting by explaining whether emissions from these activities occur in Japan, including the reasons for why AD are not available to estimate them, or instead that they are not occurring, and therefore should be reported as "NO".

38. Japan reports NE for fugitive CO_2 emissions from coal mining and handling. In a response to a question from the ERT Japan explained that there are no default emission factors for this activity in the IPCC Revised 1996 IPCC Guidelines. The ERT encourages Japan to estimate these emissions using country-specific emission factors.

Transport: gaseous fuels – CO_2, CH_4, N_2O

39. Japan reports AD and CO_2 emissions from the use of gaseous fuels in road transportation as "IE". In the CRF table 1.A(a), Japan states that these fuels are included as solid fuels under the commercial/institutional category. The ERT considers that gaseous fuels reported under the commercial/institutional category are either town gas or gasworks gas, and that these emissions result from pipeline transportation of these fuels in local distribution systems. However, the NIR is unclear about whether these gases are from pipeline transport or another type of transport. The ERT recommends that Japan improve the transparency of the NIR by explaining how allocation of these fuels is conducted and whether these emissions could not be better allocated with other pipeline gas in the Other transportation category.

C. Industrial processes and solvent and other product use

1. Sector overview

40. In 2009, emissions from the industrial processes sector amounted to 63,772.19 Gg CO_2 eq, or 5.3 per cent of total GHG emissions, and emissions from the solvent and other product use sector amounted to 120.50 Gg CO_2 eq, or 0.01 per cent of total GHG emissions. Since the base year (1990 for CO_2, CH_4 and N_2O and 1995 for F-gases), emissions have decreased by 46.9 per cent in the industrial processes sector, and decreased by 58.0 per cent in the solvent and other product use sector. The key drivers for the fall in emissions in the industrial processes sector are a 99.8 per cent reduction in HFC by-product emissions from HCFC-22 production, mainly by the use of abatement technology, a 35.5 per cent reduction in clinker production in cement production, a 93.2 per cent reduction in SF_6 emissions from electrical equipment, a decrease of 85.6 per cent in the emissions from adipic acid production, mainly by the use of abatement technology, a 88.9 decrease in PFC emissions from solvents, further aided by decreases in CO_2 emissions from limestone and dolomite use, lime production and ammonia production and a decrease in F-gas emissions from semiconductor manufacture, although this was partly offset by a substantial increase in HFC emissions from refrigeration where HFCs have substituted ODS substances. Within the industrial processes sector, 38.8 per cent of the emissions were from cement production (CO_2), followed by 23.9 per cent from refrigeration and air conditioning equipment (HFCs), 11.7 per cent from limestone and dolomite use (CO_2) and 8.4 per cent from lime production (CO_2). Ammonia production accounted for 3.0 per cent (CO_2) and semiconductor manufacture accounted for 3.8 per cent (HFCs, PFCs, and SF_6). All other categories accounted for the remaining 10.4 per cent of the sector.

41. Japan has performed substantial recalculations for the industrial processes sector between the 2010 and 2011 submissions in response to the 2010 annual review report. Categories recalculated for the entire time series include CO_2 emissions from lime production and limestone use, soda ash use and calcium carbide production, after a thorough check for omissions or double counting of dolomite or limestone use resulting in a

revision in the AD for limestone and dolomite use, lime production, soda ash use and calcium carbide production and improved accuracies. Other recalculations were made for SF_6 from production of F-gases for 2005 and very small revisions in HFCs from refrigeration and air conditioning equipment for 1999–2008. The impact of recalculations on the industrial processes sector is a decrease in emissions of 5.9 per cent for 2008. The main recalculations took place in the following categories:

(a) Cement production – CO_2;

(b) Lime production – CO_2;

(c) Limestone and dolomite use – CO_2;

(d) Calcium carbide – CO_2 (reallocation of limestone use related CO_2 to limestone and dolomite use).

42. Japan has also made recalculations for the solvent and other product use sector between the 2010 and 2011 submissions due to revised AD for N_2O use for anaesthesia. The impact of these recalculations on the solvent and other product use sector is a decrease in sector emissions of 19.5 per cent for 2008.

43. The reasons for the recalculations are briefly described in the NIR and the CRF table 8(a). However, the types of changes (in AD, EFs or methods) are not specified in CRF table 8(b), and justifications as described by the IPCC good practice guidance, and a time series for previously reported and new emissions and showing the differences per year, are not provided in the NIR. This leads the ERT to conclude, as also noted in the previous review report, that transparent documentation as recommended in the IPCC good practice guidance (section 7.3.3) and the UNFCCC reporting guidelines is generally missing from the NIR and in the CRF, table 8(b). In response to a request from the ERT to provide this information during the review, Japan provided tables with time series of original and recalculated emissions and the differences between these two estimates. However, the ERT noted that a full and transparent description of the specific changes (parameters and values) and a demonstration that the new values are indeed improved data were still missing, in particular for the main recalculations mentioned in paragraph 41 above. The ERT recommends that Japan provide this information in the recalculation sections of its next annual submission, in addition to, if applicable, information about new recalculations, as recommended by the IPCC good practice guidance.

44. The ERT observed that, despite reiterated recommendations in previous review reports, in the NIR there is still a lack of sufficient transparency in the methodological descriptions, as well as data sources and the rationale for their selection, in particular for the largest key categories (cement production and refrigeration and air conditioning equipment) and for the most important categories with high degrees of abatement (adipic acid production, production of halocarbons and SF_6 other than HCFC-22, and semiconductor manufacture). This is not in accordance with the IPCC good practice guidance and the UNFCCC reporting guidelines that require the Party demonstrate the appropriateness of methods and data, including the selection of methods and data sources for AD and EFs. The ERT reiterates the recommendation from the previous review report that Japan improve the transparency of the corresponding sections in the NIR of its next annual submission, by including detailed and complete methodological descriptions, as well as clear information on data sources and the rationale for their selection. The additional information requested by the ERT during the review, may serve as an example of which category-specific information ERTs expect in the NIR.

45. For several categories where fuels are used as feedstock or other non-combustion uses (such as production of soda ash, iron and steel, ferroalloys and aluminium) which, according to the Revised 1996 IPCC Guidelines should be assigned to industrial processes

(see also para. 36 above), Japan reports CO_2 emissions partly or completely under stationary combustion in the energy sector. In cases where secondary fuels such as blast furnace gas are produced, the ERT agrees that associated combustion emissions of CO_2 are logically reported under the energy sector with any remainder to be reported in the industrial processes sector. However, for other categories, where fuels are used not for combustion but to produce anodes, such as those used for aluminium production, the ERT recalls the reiteration of the recommendation in previous review reports that Japan allocate these emissions under the industrial processes sector, in line with the IPCC good practice guidance. In addition, the ERT recommends that Japan report fugitive CH_4 emissions from coke under the solid fuel transformation category in the energy sector instead of under other (chemical industry) in the industrial processes sector and similarly, the corresponding CO_2 emissions related to fuel conversion losses.

46. However, irrespective of where the emissions are reported, since these activities are industrial processes the ERT recommends that Japan include for each industrial process category a description of which method and methodological tier is used to calculate the CO_2 emissions, and include in the section in the NIR on feedstocks and non-energy use of fuels how annually completeness of these emissions is ensured (e.g. by providing a complete carbon balance account and indicating which parts are reported in which category) and provide reference to the corresponding sections in the energy sector for more details. The ERT also recommends that Japan report AD in the CRF tables 2(I).A-G, such as the production of steel for the category iron and steel production, to facilitate comparison between Parties.

47. Apart from the improvement in limestone and dolomite accounting in subcategories where it is used (see para. 41 above) and minor changes made for emissions from the production of halocarbons and SF_6, for which Japan is commended, no other sectoral recommendations from previous review reports have been implemented in its 2011 submission. The ERT noted that the reporting of emissions for this sector is largely complete. However, "NE" is reported for PFC emissions for the years 1990–1994 from aluminium production and for actual F-gas emissions from consumption of halocarbons and SF_6, despite reiterated recommendations in the previous review reports to provide estimates for these years. During the review, Japan explained that it is investigating ways to provide estimates for these years but has not managed to lower the uncertainties. The ERT welcomes these efforts, but notes that, whether basic AD are available or missing, the IPCC good practice guidance provides estimation methods, for example using extrapolation for estimating these missing emissions. Although this will result in less accurate estimates, according to the IPCC good practice guidance this is no reason not to provide such estimates. Therefore, the ERT again strongly recommends that Japan estimate and report these missing F-gas emissions for the years 1990–1994 in its next annual submission and explain the methods used for the estimates (e.g. extrapolation) (see para. 129 below).

48. The ERT noted that "NE" is also reported for a few categories for which there are no default IPCC methods (e.g. CH_4 from aluminium production) and for actual emissions of HFCs from metal production and solvent use in CRF table2(I) and table2(II), which are accidentally used since the background tables show either no HFC emissions or "IE". Throughout the sectoral tables, CO_2 and CH_4 recovery are also reported as "NE". The ERT recommends that Japan consider investigating the correct reporting for these categories, using "NO" if there is no evidence that these activities occur. Moreover, Japan reports CO_2 emissions from the categories degreasing and dry cleaning and chemical products, manufacture and processing as "NE", as well as not applicable ("NA") for paint application and other, partly because Japan does not convert the quantity of carbon released in the form of non-methane volatile organic compounds (NMVOC) into CO_2 equivalent emissions in the CO_2 column of CRF table 3, which is encouraged in the UNFCCC reporting guidelines

in the note to CRF table 3. Since most Parties do report these emissions, the ERT encourages Japan to consider reporting these emissions in its next annual submission.

49. In response to the observation by the ERT that no CO_2 emissions from lubricant and paraffin wax use are reported under the industrial processes sector, Japan explained that the emissions from the use of waste oil, which includes these fuel types, are reported as energy use under stationary combustion in the energy sector and the remainder under waste incineration in the waste sector. The ERT recommends that Japan transparently explain in the NIR which EFs were used and which categories in the energy sector and waste sector have been used to report CO_2 emissions from the use of lubricants and paraffin waxes, because these emissions are not mentioned in section 3.2.9 on feedstocks and non-energy use of fuels of the NIR nor in the CRF tables for transport emissions or CRF table 1.A(d).

50. For some categories, the ERT observed that Japan uses uncertainties for production data with a value of 10 per cent, which are high compared with the IPCC default values (e.g. cement clinker 1-2 per cent and SF_6 production about 0.2 per cent in countries where the predominant end use does not require highly purified SF_6 gas (e.g. electrical equipment, insulated windows)). In response to a question raised by the ERT during the review, Japan explained that these are "national default" values used for AD labelled as "non-fundamental statistics". The ERT recommends that Japan reassess these country-specific uncertainties and adopt more realistic category-specific uncertainty estimates for AD in the industrial processes sector.

2. Key categories

Production of halocarbons and SF_6 – HFC-23

51. The ERT notes the considerable effort made by Japan to reduce HFC-23 emissions from the production of HCFC-22 sub-category. In response to a request from the ERT to assess whether the emission estimates to which abatement systems are applied could be underestimated for recent years, Japan provided information on the abatement system and on category-specific QA/QC activities for this category which showed that reported emissions are not underestimated. To improve transparency of the information provided in the NIR and explain the country-specific circumstances that resulted in very low emission levels, the ERT recommends that Japan provide a summary of this information in the NIR of its next annual submission, in addition to the information provided in the note of Table 4-32.

Consumption of halocarbons and SF_6 – HFCs

52. The ERT commends Japan for its broad coverage of the HFCs emissions from refrigeration and air conditioning in the NIR, which includes descriptions of the methodologies used and provides tables for a selection of the key parameter values used, in particular for the transparency of the largest subcategory, commercial refrigeration. However, the ERT observed that the transparency of the reporting for commercial refrigeration could be further improved and, therefore, the ERT recommends that Japan include information on whether the level and trend of emissions are calculated according to the IPCC good practice guidance and how time-series consistency was maintained (e.g. when different sources are used over time for AD and EFs).

53. In the NIR, for the product life factor (PLF) value, indicated as 'fugitive refrigerant ratio during use' in table 4.38, no annual average values are included, but instead a broad range of 2 to 17 per cent is given. For the largest subcategories listed in table 4.39 of the NIR, only ranges are provided. In the CRF tables 2(II).F for all subtypes of refrigeration and air conditioning only manufacturing emissions are reported, which include stock and disposal emissions. Moreover, for any subtype of refrigeration, no AD, such as PLF values,

and their trend over time as required in the UNFCCC reporting guidelines, are reported. Because Japan uses many country-specific EFs, the ERT could not assess whether annual average values are within the range of default IPCC values and of values reported by other Parties. Furthermore, it is not clear whether Japan explains the country-specific circumstances that result in relatively low PLFs.

54. In response to a question raised by the ERT regarding the lower range of the PLF for large-size refrigerators that is lower than the IPCC default range, Japan informed the ERT that current EFs are based on an extensive survey of 260,000 units in the period 2007–2009. In addition, although Japan did not explain the key factors that cause the absolute annual increase in the emissions from commercial refrigeration to decline since 2008 and the percentage annual increase since 2004, from which the ERT concluded that the emissions trend of this subcategory, which accounts for almost 24 per cent of total sectoral emissions, is plausible and that reported emissions for 2008 and 2009 are not underestimated.

55. However, the ERT recommends that Japan report in its next annual submission specific references to the data sources of the actual input data used, or to determine annually, AD and EFs for each year and to explain trends in both AD and EFs (in particular PLFs), how EF trends as noted in the NIR tables were determined and how time-series consistency was maintained in case of missing data. To improve transparency and facilitate comparison between Parties, the ERT further strongly recommends that, for this large key category to comply with UNFCCC reporting guidelines requirements, Japan complete the CRF table for the subcategory commercial refrigeration by reporting separately the emissions from manufacturing, stocks and disposal, if possible per substance, and by including the AD in all cases where the emissions are calculated for these three components (as indicated in the method boxes in the NIR). The ERT recommends that Japan explain and justify in the NIR of its next annual submission why it reports almost all HFC emissions in this subcategory as "unspecified". In addition, the ERT recommends that Japan include in the NIR information on the methodological tier used and specify which factors are country-specific and which are IPCC defaults. Japan could further improve the transparency of the information of this key category by providing the shares of the six subtypes of commercial refrigeration/air conditioning systems listed in table 4-39 of the NIR and their annual average PLF over time.

3. Non-key categories

Chemical industry – CO_2

56. Instead of only including the confidential CO_2 emissions from calcium carbide and ethylene production in the total for CO_2 in the chemical industry category, to improve consistency and transparency in the CRF table 2(I), the ERT recommends that Japan report these confidential emissions under one of the subcategories. For example, together as an additional specified subtype under the subcategory other (chemical industry) so that the sum of CO_2 emissions of the subcategories under the chemical industry is consistent with the total for chemical industry in the CRF table 2(I). The ERT noted from the NIR that country-specific EFs for CO_2 emissions from reducing agents used for calcium carbide production, based on measurement data, are used for 2008 and 2009, and the IPCC default EF is used for the preceding years 1990–2007. Since the time-series consistency of the EF of this approach is unclear from the NIR, the ERT recommends that Japan include an explanation on how time-series consistency is achieved in the NIR of its next annual submission. The confidential CO_2 emissions from ethylene production included in the chemical industry are rather small in total, apparently because most carbon is captured in off-gases as by-products (which are included as fuels combusted), and that CO_2 is accounted for in stationary combustion. The ERT recommends that, for ethylene production, Japan note in the NIR that most carbon losses in the production process are

reported as combustion of refinery gas in the energy sector and also explain in the NIR of its next annual submission which method Japan uses to achieve complete carbon accounting.

Ferroalloys production – CO_2

57. The CO_2 emissions from oxidation of coke as reducing agent in ferroalloys production are reported under stationary combustion in the energy sector. Since this category is considered to be an industrial process according to the IPCC good practice guidance, the ERT recommends that Japan comply with the preferred IPCC allocation for reporting and collect the data and reallocate and report these emissions under this sector, also to facilitate comparisons between Parties. In addition, to improve transparency the ERT recommends that Japan include in the NIR of its next annual submission a description of which method or methodological tier is used to calculate the CO_2 emissions and by including in the section in the NIR on Feedstocks and non-energy use of fuels annually information on complete carbon balance accounting, with reference to the corresponding stationary combustion section in the NIR for more details, and also recommends that Japan report in the CRF tables the production total to facilitate comparison between countries. These ERT recommendations should also be applied to CO_2 emissions from iron and steel and aluminium production.

Aluminium production – CO_2

58. During the review the ERT learned that as well as coke, pitch is also used for binding the anode paste, and the CO_2 emissions from anode use are reported under the stationary combustion in the energy sector. For completeness and transparency, the ERT recommends that Japan add this information to the NIR of its next annual submission and check whether imported pitch is also used for this application, in which case the emissions should also be accounted for by taking the mass of this reducing agent multiplied by an EF, as described in the Revised 1996 IPCC Guidelines.

Production of halocarbons and SF_6 – HFCs, PFCs, SF_6

59. The ERT notes emissions reductions from the production of F-gases under the fugitive emissions sub-category since 1995 and, in particular, the significant reductions in SF_6 emissions. During the review, Japan explained that this was achieved by completing installations of recovery/destruction units at all SF_6 plants in 2009 and a clarified that the production emissions are also properly accounted for during process interruptions and that emissions of handling of returned gas cylinders are also included in this category. To improve transparency of the information provided in the NIR, the ERT recommends that Japan provide a summary of this information in its next annual submission, including how country-specific circumstances caused the low present emission levels.

D. Agriculture

1. Sector overview

60. In 2009, emissions from the agriculture sector amounted to 25,402.11 Gg CO_2 eq, or 2.1 per cent of total GHG emissions. Since 1990, emissions have decreased by 18.8 per cent. The key drivers for the reduction in emissions are a decrease in CH_4 emissions from rice cultivation as result of crop area decline, and the decrease in N_2O emissions from agricultural soils, because the amount of nitrogen fertilizers applied to cropland has decreased. Within the sector, 27.8 per cent of the emissions were from manure management, followed by 27.0 per cent from enteric fermentation, 23.0 per cent from

agricultural soils and 21.9 per cent from rice cultivation. The remaining 0.3 per cent were from field burning of agricultural residues.

61. All relevant sector categories are estimated; with the exception of emissions from prescribed burning of savannas. Emissions from this activity are reported, in some years (1990 – 2003), as "NE"; but the use of "NE" is not in line with the UNFCCC reporting guidelines, because Japan does not have this emission source; instead, these emissions should always be reported as "NO". The ERT recommends that Japan revise the use of notation keys in its next annual submission.

62. Japan has performed recalculations for the agriculture sector between the 2010 and 2011 submissions in response to the recommendations of the 2010 annual review report. The impact of these recalculations on the agriculture sector is a decrease in emissions in all years of the time series, in particular 0.34 per cent for 2008 and 0.06 per cent for 1990. The reasons of recalculations include:

(a) Enteric fermentation, manure management (CH_4, N_2O) – changes in AD due to revision of the 3-year averages for animal population (e.g. cattle) and correction of errors in swine and poultry population;

(b) Direct soil emissions (N_2O) – new nitrogen content and residue ratio were adopted;

(c) Field burning of agriculture residues (N2O) – nitrogen content and residue rate were changed in accordance with the newly adopted data in direct soil emissions.

63. In response to recommendations of previous review report, Japan has made some improvements that increased the transparency of the NIR, in particular the description of the use of certain parameters in specific categories (see para. 71 below). The ERT welcomes the improvements made.

64. During the review, Japan has identified several planned improvements (see paras. 67 and 68 below). During the review Japan explained that these issues are considered in the annual meetings of the breakout group on agriculture of the Committee; and most of them are considered "long-term issues". The ERT recommends that Japan provide more information on the planned improvements in the NIR of its next annual submission, in particular, where possible, a more specific timeframe for such improvements.

2. Key categories

Manure management – N_2O

65. The information provided in the NIR by Japan about the N_2O EF for grazing cattle is still not completely transparent. During the review a reference[7] was provided to the ERT. However, it was in Japanese and, therefore, the ERT could not assess whether the value used is acceptable. The ERT recommends that Japan improve the description of the N_2O EFs for all major animal categories in the NIR of its next annual submission.

66. In response to a recommendation in the previous review report, Japan has revised errors in the reporting of nitrogen excretion for swine and poultry and also solved minor discrepancies in the population activity data. The ERT welcomes the effort of Japan to follow up previous recommendations.

67. During the review, the ERT identified that the allocation of the N_2O emissions for buffalo, sheep, goats and horses is misplaced in the type of animal waste management system reporting of CRF table 4.B(b). The total nitrogen is calculated by multiplying the

[7] Japan Livestock Technology Association, *GHG emissions control in livestock* Part 6, March 2001.

population of each type of animal by the nitrogen content of manure per head of animal; and then the amount of nitrogen per manure management category is calculated by multiplying the total nitrogen by the percentage of each management category. According to table 6-27 of the NIR it was expected that the results should be presented in the "pasture, range and paddock" column of CRF table 4.B(b); however, they are presented in the column "other". Japan recognized the problem and stated that it will separate the emissions in its next annual submission.

Rice cultivation – CH_4

68. Japan continues to make efforts to update the country-specific EF for rice cultivation emissions. During the review, Japan explained that the survey on quantities of organic amendments is expected to be completed by 2013. As soon as the results of this survey are concluded, it will be described in the CRF as the supplemental information of the emission estimates. The ERT welcomes Japan's efforts on this matter.

3. Non-key categories

Enteric fermentation – CH_4

69. As noted in previous review reports, livestock characterization is not reported completely transparent in the NIR. In particular, dairy cattle is classified as lactating, non-lactating and heifers (under 2 years old). During the review, Japan further explained the rationale behind the characterization. The information presented clarified that such characterization does not lead to potential underestimations. The ERT recommends that Japan revise and improve the explanations about animal characterization, in particular tables 6.2 and 6.9 of its NIR.

70. The ERT noted discrepancies between AD reported by Japan and information presented by the Food and Agriculture Organization of the United Nations (FAO). During the review, Japan further explained that the differences between the data from the FAO and the animal population data used for the emission estimates (i.e. sheep, goats and horses) may occur due to poor data quality having been presented to FAO.

71. Following a recommendation made in the previous review report, Japan has presented more information in the NIR on data for cattle types, dry matter intake, weight and the resulting EFs. Japan also presented the equations to estimate dry matter intake. The ERT welcomes the improvements made by Japan. However, extra information to support the lower EFs for swine, goats and sheep, which were present in the references provided during the review, could be also included in the NIR. The ERT recommends that Japan provide this information in its next annual submission.

Manure management – CH_4

72. The values of the CH_4 IEF (in all years) for dairy cattle (62.2 kg/head/yr for 2009) are among the highest of reporting Parties (3.2 – 84.8 kg/head/yr). In the NIR, it was explained that the high water content in manure makes anaerobic condition easily, that is the reason of high EF where the piling is used as animal waste management system. Further explanations were given by Japan to confirm this during the review. Other EFs (non-dairy, swine and poultry) are also country-specific and the NIR lacks detailed information about the development of such EFs. The ERT recommends that Japan revise the information presented in the NIR to further improve the transparency in its next annual submission.

E. Land use, land-use change and forestry

1. Sector overview

73. In 2009, net removals from the LULUCF sector amounted to 71,523.47 Gg CO_2 eq. Since 1990, net removals have increased by 2.8 per cent. Within the sector, forest land and grassland contributed with net removals of 73,668.32 Gg CO_2 eq and 276.24 Gg CO_2 eq, respectively, whereas cropland, wetlands, settlements and other land contributed with net emissions of 265.11 Gg CO_2 eq, 22.72 Gg, 815.99 Gg CO_2 eq and 1,049.01 Gg CO_2 eq respectively. In addition, the category other (lime application) contributed with emissions of 268.25 Gg CO_2.

74. In response to a request from the ERT during the review, Japan explained that the small increase in net removals between 1990 and 2009 is a combination of a decrease in removals from forest land and grassland and decreases in emissions from cropland, wetland, settlements and other land. This is due to the maturity of Japanese forests and a decrease in the conversion of forest land to other land uses due to economic circumstances and an overall decline of agriculture in Japan. The ERT recommends that Japan improve the description of drivers for the trends as well as other reasons for variations in the reported categories over time in its future annual submissions.

75. Japan has performed substantial recalculations for the LULUCF sector between the 2010 and 2011 submissions. The impact of these recalculations on the LULUCF sector is an increase in net removals of 9.8 per cent for 1990 and a decrease in net removals of 0.6 per cent for 2008. This resulted in a decline in the overall trend between 1990 and 2008, which had been reported as an increase in net removals of 24.4 per cent in the previous submission, and an increase in net removals of 12.6 per cent in the current submission. The main recalculations for the 1990 estimates took place in the following sink/source categories:

(a) Carbon stock change in dead organic matter and soils in forest land due to newly available data resulting in a total increase in net removals for the category of 8.6 per cent (6,208.70 Gg CO_2 eq);

(b) Carbon stock change in living biomass and soils in grassland due to a recalculation of the distribution of land resulting in a total decrease in net removals for the category of 21.6 per cent (121.88 Gg CO_2 eq).

The main recalculations for the 2008 estimate took place in the following sink/source categories:

(a) Carbon stock change in soils in grassland due to a recalculation of the distribution of land resulting in a total decrease in net removals for the category of 59.3 per cent (441.10 Gg CO_2 eq);

(b) Carbon stock change in living biomass in wetlands due to a change in methodology for estimating areas resulting in a total decrease in net emissions for the category of 82.3 per cent (75.77 Gg CO_2 eq);

(c) Carbon stock change in living biomass and soils in settlements due to a change in the area allocation method resulting in a total decrease in net emissions for the category of 39.0 per cent (324.23 Gg CO_2 eq);

(d) Carbon stock change in living biomass and dead organic matter in other land due to a change in the area allocation method resulting in a total increase in net emissions for the category of 115.3 per cent (446.53 Gg CO_2 eq).

76. Japan described the recalculations since the previous year's submission in the NIR. Given that many of the recalculations are relatively large, the ERT recommends that, in the

NIR of its next annual submission, Japan also include quantifications of the changes on the level of aggregation where the recalculations where made, especially for 1990 and for the latest reported year but also for intermediate years if needed for transparency reasons.

77. The ERT commends Japan for its efforts in reducing the number of categories reported using notation keys (including living biomass in land converted to forest land as well as DOM and SOC for forest land remaining forest land). During the review, Japan informed the ERT about the rationale for several of the categories still reported using notation keys. Even though the ERT notes improvements, several mandatory source/sink categories are still reported as "NE" (see paras. 78, 85, 86 and 87 below). Therefore, the ERT concludes that the reporting of LULUCF is only partially complete. According to the NIR, Japan plans to improve the reporting for many of the source/sink categories currently reported under the LULUCF sector, and also plans to develop reporting for categories currently reported as "NE". The ERT recommends that Japan continue its work to improve the reporting, especially relating to carbon stock changes for mandatory categories. The ERT also encourages Japan to further improve the transparency regarding the explanation of notation keys in the NIR and in the CRF table 9(a) when necessary.

78. The ERT noted that emissions from organic soils are not estimated for all the mandatory categories. Even though the areas of organic soils are small in relation to the total area for most of the reported categories, the impact on emissions from organic soils for some categories (i.e. cropland and grassland) can be relatively important. The ERT, therefore, recommends that Japan make any possible efforts to report carbon stock changes for organic soils in its next annual submission.

79. The ERT concludes that Japan's LULUCF inventory is mostly complete, but that estimates for soil organic carbon stock changes for some mandatory categories are still missing (see para. 85, 86 and 87 below). The ERT therefore recommends that Japan include estimates of these source/sink categories in its next annual submission.

2. Key categories

Forest land remaining forest land – CO_2

80. Of Japan's total land area (37.8 million hectares (ha)) the largest part constitutes forest land, covering about 24.9 million ha. All forests in Japan are considered managed.

81. From 1990 to 2009 the area of forest land remaining forest land has increased slightly (112.5 kha). This is mainly because the land areas previously included in the category land converted to forest land and continuously reported under this category (after 20 years) is larger than the areas leaving the category for other categories. Net removals from the category increased steadily until 2003 but after that year a pronounced decrease has been observed. As explained by Japan in response to a question raised by the ERT, this was to do with the maturity (affecting both growth and drain) of the forests in the country.

82. The level of net removals, as well as the trend, changed between the previous and the latest submission largely due to the inclusion of the carbon stock changes in dead organic matter and soils for the years 1990–2004 and recalculations for these pools for the latest reporting years. The reason for this was that necessary data became available to run the CENTURY-jfos model which is currently used to estimate carbon stock changes in dead organic matter and soil organic carbon. With this improvement the ERT concludes that Japan has resolved most of the time-series consistency problems raised in previous review reports related to an incomplete time series of carbon stock changes in dead organic matter in forest land.

83. Japan also improved the methodology used to estimate changes in carbon stocks of living biomass allowing separate reporting of carbon stock changes in living biomass for forest land remaining forest land and land converted to forest land.

84. The ERT noted that the reported uncertainties for the category are quite low (5 per cent). In response to questions raised by the ERT during the review, Japan stated that further re-examinations of the uncertainty analysis will be performed in the near future. The ERT encourages Japan to present the results of these investigations in its next annual submission.

3. Non-key categories

Forest land converted to settlement – CO_2

85. The area of forest land converted to settlement constitutes 196.7 kha (0.5 per cent of the total land area). The ERT notes that carbon stock changes in soils is reported as "NE" for this category, whereas carbon stock changes in soils are reported for deforestation under Article 3, paragraph 3, of the Kyoto Protocol. This pool could be an important source of emissions and, therefore, the ERT recommends that Japan provide estimates for carbon stock changes in this pool in its next annual submission.

Cropland remaining cropland – CO_2

86. The area of cropland remaining cropland constitutes 3,907.6 kha (10.3 per cent of the total land area of the country). The ERT noted that carbon stock changes are not estimated for any carbon pools in this category. For living biomass and dead organic matter Japan uses the notation key "NA" and for soil organic carbon "NE" is used. According to the information provided in the NIR the appropriate notation key for living biomass and dead organic matter should be "NO" whereas for soil organic carbon "NE" is correct. The ERT recommends that Japan provide estimates for carbon stock changes and use appropriate notation keys for this category in its next annual submission.

Grassland remaining grassland – CO_2

87. The area of grassland remaining grassland constitutes 861.0 kha (2.2 per cent of the total land area). The ERT noted that carbon stock changes are not estimated for any carbon pools in this category. For living biomass and dead organic matter Japan uses the notation key "NA" and for soil organic carbon "NE" is used. According to the information provided in the NIR the appropriate notation key for living biomass and dead organic matter should be "NO" whereas for soil organic carbon "NE" is correct. The ERT recommends that Japan provide estimates for carbon stock changes and use appropriate notation keys for this category in its next annual submission.

Land converted to forest land – CO_2

88. The ERT notes the improvement of reporting living biomass for land converted to forest land separately from forest land remaining forest land in the 2011 submission, making the reporting of the forest land category more transparent.

Agricultural lime application – CO_2

89. The ERT notes that the EF for dolomite used by Japan for estimating the emissions from agricultural lime application is incorrect. Japan uses the value of 0.122 Mg CO_2-C/Mg (which is the default value for this calculation provided in the IPCC good practice guidance for LULUCF). However, based on the stoichiometric formula, the EF should be 0.13 Mg

CO_2-C/Mg. The ERT recommends that Japan correct this in its next annual submission (see para. 104 below).

F. Waste

1. Sector overview

90. In 2009, emissions from the waste sector amounted to 21,830.53 Gg CO_2 eq, or 1.8 per cent of total GHG emissions. Since 1990, emissions have decreased by 14.6 per cent. The key driver for the fall in emissions was the decrease in the amounts of solid waste sent to landfill sites as a result of converting the treatment of biodegradable wastes from disposal in landfill sites to incineration before 2007. Landfilled amounts have been stabilized since 2007. Within the sector, 71.6 per cent of the emissions were from waste incineration, followed by 15.1 per cent from solid waste disposal on land, 10.7 per cent from wastewater handling and 2.6 per cent from other (decomposition of petroleum-derived surface-active agents and composting).

91. Japan has performed recalculations for the waste sector between the 2010 and 2011 submissions mainly as a result of applying newly obtained AD for industrial waste incineration. These recalculations for CO_2 in waste incineration lead to an increase in emissions of 20.2 per cent in waste incineration in 2008. The impact of the recalculations on the waste sector is an increase in emissions of 13.3 per cent for 2008.

92. The NIR is generally transparent and complete. Japan has mostly applied country-specific methods and EFs in this sector. The ERT encourages Japan to report the comparison results of country-specific EFs with the IPCC default values, e.g. for waste composition and corresponding DOC values to enhance the QA/QC procedures for this sector.

2. Key categories

Solid waste disposal on land – CH_4

93. Emissions from this category amounted to 3,303.02 Gg CO_2 eq, applying the first order decay method with country-specific parameters. Japan has elaborated the approach to obtain more completed country-specific data. Japan estimated historical AD back to 1954 without clearly explaining the method used to obtain those data. The ERT encourages that Japan clarify how it estimated the historical data back to 1954 in a more transparent manner in its next annual submission.

Waste incineration – CO_2

94. CO_2 emissions from this category amounted to 13,983.52 Gg CO_2 eq, applying country-specific EFs for waste compositions. The ERT noted that according to the *2006 IPCC Guidelines for National Greenhouse Gas Inventories*, rubber and leather as well as paper contain fossil carbon. However, Japan assumed no emissions from those materials. Furthermore, during the review, Japan informed that it plans to consider the possibility of CO_2 emissions from waste paper, leather and rubber containing fossil fuel-derived carbon in the future based on its own research and investigations. The ERT welcomes the plan and encourages Japan to report the result of such research in its next annual submission.

3. Non-key categories

Wastewater handling – CH_4 and N_2O

95. CH_4 emissions from this subcategory amounted to 1,247.42 Gg CO_2 eq, applying a country-specific method based on multiplying biological oxygen demand-based AD and country-specific EFs. Japan estimated the emissions from wastewater without separating those from sludge. Japan has elaborated country-specific EFs by treatment scale and process type in a complete manner. The CRF 6.(B) reported "NE" for the recovery of CH_4 emissions in disagreement with the description of the NIR. The ERT recommends that Japan provide consistent information on the CH_4 recovery from this category in the NIR and the CRF.

96. N_2O emissions from this subcategory amounted to 1,087.40 Gg CO_2 eq, applying a country-specific method. Japan has estimated the N_2O emissions from industrial wastewater handling using country-specific EFs. Since the Revised 1996 IPCC Guidelines do not provide methods for estimating N_2O from this category, Japan multiplied the amount of nitrogen in industrial wastewater by the country-specific N_2O EFs. Japan classified the wastewater facilities for domestic and commercial wastewater handling into four types according to treatment quantity and process type, and estimated the emissions by applying the site-specific EFs. The ERT appreciates Japan's effort to develop the site-specific EFs.

Other (waste) – CO_2, CH_4 and N_2O

97. Japan has estimated and reported CO_2 emissions from decomposition of petroleum-derived surfactants and CH_4 and N_2O emissions from composting of organic wastes. The ERT appreciates Japan's efforts and encourages the Party to continue its efforts to estimate the emissions from other sources. However, there is no information in the NIR about what type of decomposition was applied to petroleum-derived surfactants. The ERT recommends that Japan provide the information on the type of decomposition of petroleum-derived surfactants in the NIR of its next annual submission.

G. Supplementary information required under Article 7, paragraph 1, of the Kyoto Protocol

1. Information on activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol

Overview

98. Japan reports emissions/removals from activities under Article 3, paragraph 3, of the Kyoto Protocol (afforestation, reforestation and deforestation) as well as emissions/removals from the elected activities forest management and revegetation under Article 3, paragraph 4, of the Kyoto Protocol. The reporting has been prepared in line with the IPCC good practice guidance for LULUCF and the emissions/removals reported are clearly differentiated from emissions from categories included under Annex A to the Kyoto Protocol. Japan has chosen commitment period accounting for the activities accounted for under KP-LULUCF.

99. Japan reports emissions/removals for the mandatory and elected activities for 1990 (where relevant), 2008 and 2009. In 2009, afforestation and reforestation contributed with a net removal of 415.08 Gg CO_2 eq, whereas, deforestation constituted a source of 3,086.51 Gg CO_2 eq. Forest management contributed with net removals of 49,005.74 Gg CO_2 eq. Net removals from revegetation were estimated to 47.06 Gg CO_2 eq in 1990 and 754.84 Gg CO_2 eq in 2009. The key category analysis for KP-LULUCF identified FM, RV and D as key categories. The analysis was done by correlating LULUCF categories to corresponding

activities under the Kyoto Protocol in line with the IPCC good practice guidance for LULUCF.

100. As noted in the previous review report, Japan clearly describe the land area-related information for activities and the process to detect the land use and land-use changes. For afforestation, reforestation and deforestation, Japan has detected changes using remote sensing techniques, and for forest management, the land-related information is based on a field survey at sample plots which are selected randomly from the National Forest Resource Database (NFRDB). The area for revegetation is estimated using several sources of information including the Urban Parks Status Survey and the Road Tree Planting Status Survey.

101. Japan has estimated all carbon pools for the reported activities. The ERT notes that Japan does not separate the reporting of mineral soils and organic soils under afforestation, reforestation and deforestation and forest management. Dead wood is not separately reported under revegetation (either included under living biomass or set to zero). Carbon stock change in litter under revegetation is only provided for some of the subcategories under revegetation, but since the amount of litter can be assumed to increase this can be agreed as a conservative estimate. Soils are not reported under revegetation and Japan provides verifiable information in the NIR demonstrating that this pool is not a net source of emissions.

102. Japan fulfils the requirements set out in paragraph 5 to 9 of the annex to decision 15/CMP.1 and it provides a useful summary of the KP-LULUCF reporting related to the required information on page 51 of the NIR. Japan follows the annotated NIR for the supplementary information required under Article 7, paragraph 1 of the Kyoto Protocol.

103. Japan has made minor recalculations for all reported KP-LULUCF activities between the 2010 and 2011 submissions related to updated data. For 1990 this resulted in an increase in net removals for revegetation of 3.4 per cent (1.55 Gg CO_2 eq). For 2008 the recalculation resulted in a decrease in net removals for afforestation and reforestation of 0.6 per cent (2.39 Gg CO_2 eq) and an increase in net removals for revegetation of 1.9 per cent (13.50 Gg CO_2 eq). The effect of the recalculations of deforestation and forest management was negligible. The NIR only briefly explained the recalculations that are the result of updated AD for afforestation and reforestation and revegetation activities.

104. As also noted in paragraph 89 above, the EF for dolomite used by Japan for estimating the emissions from agricultural lime application is incorrect. Japan uses the value of 0.122 Mg CO_2-C/Mg (which is the default value for this calculation provided in the IPCC good practice guidance for LULUCF). However, based on the stoichiometric formula, the EF should be 0.13 Mg CO_2-C/Mg. The ERT recommends that Japan correct this in its next annual submission.

Activities under Article 3, paragraph 3, of the Kyoto Protocol

Afforestation and reforestation – CO_2

105. Afforestation and reforestation activities and associated net removals are reported in line with the requirements of the annex to decision 15/CMP.1, and the removal estimates have been prepared in accordance with the IPCC good practice guidance for LULUCF.

106. The area reported under afforestation and reforestation increased from 27.54 kha in 2008 to 28.26 kha in 2009. No afforestation and reforestation lands were harvested during the period 2008–2009. Net removals increased by 25.52 Gg CO_2 eq between 2008 and 2009 and according to that, afforestation and reforestation constituted a net removal of 415.08 Gg CO_2 eq in 2009.

107. During the review, Japan provided the ERT clarifications on the issue of how it verifies whether the changes detected using remote sensing techniques really resulted in afforestation and reforestation and whether or not the changes can be considered directly human-induced. The ERT found the information useful and recommends that Japan further improve and complete the information on how these changes are interpreted and verified in the NIR of its next annual submission.

Deforestation – CO_2

108. Deforestation activities and associated emissions are reported in line with the requirements of the annex to decision 15/CMP.1, and the emission estimates have been prepared in accordance with the IPCC good practice guidance for LULUCF.

109. The area of deforestation activities increased by 8.34 kha between 2008 and 2009 to a total area of 309.44 kha in 2009. Net emissions in 2009 were 3,086.51 Gg CO_2 eq, which is an increase of 657.18 Gg compared with 2008.

110. The ERT noted that Japan used the notation key "NO" for the reporting of gains in below-ground biomass under deforestation for 2009. Japan explained that the correct notation key should be "IE". The ERT recommends that Japan revise this in its next annual submission and make any efforts needed to improve the use of notation keys in future reporting.

111. During the review Japan also provided to the ERT clarifications on the issue of how it verifies whether the changes detected using remote sensing techniques resulted in deforestation and how this could be distinguished from harvesting on forest management areas. The ERT found the information useful and recommends that Japan further improve and complete the information on how it interprets and verifies these changes in the NIR of its next annual submission.

Activities under Article 3, paragraph 4, of the Kyoto Protocol

Forest management – CO_2

112. Forest management and the associated net removals are reported in line with the requirements of the annex to decision 15/CMP.1, and the removal estimates have been prepared in accordance with the IPCC good practice guidance for LULUCF.

113. The area of forest management activities in 2009 was 14,351.52 kha, which is an increase of 709.37 kha compared with 2008. Net removals in 2009 were 49,005.74 Gg CO_2 eq, which is an increase of 3,616.92 Gg CO_2 eq (8.0 per cent) compared with 2008.

114. The overall uncertainty of the estimation of the total removals for forest management (CO_2, CH_4 and N_2O) is 27 per cent.

115. Lands under forest management activities are clearly distinguished from afforestation and reforestation lands; therefore, emissions/removals from forest management activities are accounted separately from emissions/removals from afforestation and reforestation, which is in accordance with the provisions set out in paragraph 9(c) of the annex to decision 15/CMP.1.

Revegetation – CO_2

116. Revegetation and associated net removals have been reported in line with the requirements of the annex to decision 15/CMP.1, and net removals have been prepared in accordance with the IPCC good practice guidance for LULUCF.

117. The area of revegetation activities in 2009 was 76.05 kha, which is an increase of 2.75 kha compared with 2008. Reported net removals for 2008 and 2009 were 729.70 Gg CO_2 eq and 754.84 Gg CO_2 eq respectively. Net removals in the base year (1990) were 47.06 Gg CO_2.

118. The overall uncertainty of the estimation of the total removals (only CO_2) for revegetation in 2009 is reported as 70 per cent.

119. Lands under revegetation activities are clearly distinguished from afforestation, reforestation and deforestation lands; therefore, emissions/removals from revegetation activities are accounted separately from emissions/removals from afforestation, reforestation and deforestation activities in line with the provisions of paragraph 9(c) of the annex to decision 15/CMP.1. Revegetation occurs on settlements, wetlands and deforestation land. Land classified as deforestation land is not included in revegetation land, and therefore, the reporting of revegetation does not overlap with lands subject to afforestation, reforestation and deforestation.

2. Information on Kyoto Protocol units

Standard electronic format and reports from the national registry

120. Japan has reported information on its accounting of Kyoto Protocol units in the required SEF tables, as required by decisions 15/CMP.1 and 14/CMP.1. The ERT took note of the findings included in the SIAR on the SEF tables and the SEF comparison report.[8] The SIAR was forwarded to the ERT prior to the review, pursuant to decision 16/CP.10. The ERT reiterates the main findings contained in the SIAR.

121. Information on the accounting of Kyoto units has been prepared and reported in accordance with chapter I.E of the annex to decision 15/CMP.1, and reported in accordance with decision 14/CMP.1 using the SEF tables. This information is consistent with that contained in the national registry and with the records of the international transaction log (ITL) and the clean development mechanism registry, and meets the requirements set out in paragraph 88 (a–j) of the annex to decision 22/CMP.1. The transactions of Kyoto Protocol units initiated by the national registry are in accordance with the requirements of the annex to decision 5/CMP.1 and the annex to decision 13/CMP.1. No discrepancy has been identified by the ITL and no non-replacement has occurred. The national registry has adequate procedures in place to minimize discrepancies.

National registry

122. The ERT took note of the SIAR and its finding that the reported information on the national registry is complete and has been submitted in accordance with the annex to decision 15/CMP.1. The ERT further noted from the SIAR and its finding that the national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1, and continues to adhere to the technical standards for data exchange between registry systems in accordance with decisions 16/CP.10 and 12/CMP.1. The national registry also has adequate security, data safeguard and disaster recovery measures in place and its operational performance is adequate.

[8] The SEF comparison report is prepared by the international transaction log (ITL) administrator and provides information on the outcome of the comparison of data contained in the Party's SEF tables with corresponding records contained in the ITL.

Calculation of the commitment period reserve

123. Japan has reported its commitment period reserve in its 2011 annual submission. Japan reported that its commitment period reserve has not changed since the review of the initial report (5,335,431,899 t CO_2 eq), as it is based on the assigned amount and not the most recently reviewed inventory. The ERT agrees with this figure.

3. Changes to the national system

124. Japan has reported a minor change in its national system since the previous annual submission. The change relates to the name of the Climate Change Policy Division, Global Environment Bureau, which was changed to the Low-carbon Society Promotion Office, Global Environment Bureau. The ERT concluded that, taking into account the confirmed change in the national system, Japan's national system continues to be in accordance with the requirements of national systems set out in decision 19/CMP.1.

4. Changes to the national registry

125. Japan reported minor changes in its national registry since the previous annual submission. Minor changes reported were regarding new contact information and that non-confidential information for 2009 had been made publicly available. The ERT concluded that, taking into account the confirmed changes in the national registry, Japan's national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1, and continues to adhere to the technical standards for data exchange between registry systems in accordance with relevant decisions of the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol (CMP).

5. Minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol

126. Japan has, in this submission, improved its reporting of the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol by for the first time listing such actions. The ERT noted that actions reported to minimize adverse impacts include:

(a) Technical assistance in the energy and environmental sectors, consisting of human resources development through accepting trainees and dispatching experts on energy conservation and renewable energy to countries in the Middle East and East Asia. Assistance was given in the establishment and implementation of legal systems. There have also been joint policy studies, where country policies related to energy conservation were compared and estimations of the possibilities of energy-use reductions in highly energy-consuming industries were made;

(b) Assistance to oil-producing countries in diversifying their economies, for example, including the formulation of various projects as well as the provision of training opportunities;

(c) Japan also reported that there is no support for the use of environmentally unsound and unsafe technologies in Japan;

(d) Development of carbon capture and storage technologies.

127. The reported information is considered complete and transparent regarding how Japan strives to minimize adverse social, environmental and economic impacts on developing country Parties. However, Japan did not report on how it prioritizes actions in implementing its relevant commitments under Article 3, paragraph 14, of the Kyoto Protocol. The ERT reiterates the recommendation from the previous review report that Japan report, in its next annual submission, on how it gives priority to actions in

implementing its commitments under Article 3, paragraph 14, of the Kyoto Protocol, as required in paragraph 24 of the annex to decision 15/CMP.

III. Conclusions and recommendations

128. Japan made its annual submission on 26 April 2011. The annual submission contains the GHG inventory (comprising CRF tables and an NIR) and supplementary information under Article 7, paragraph 1, of the Kyoto Protocol (information on: activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol; Kyoto Protocol units; changes to the national system and the national registry; and the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol). This is in line with decision 15/CMP.1. Japan is commended for the efforts made under the circumstances of the earthquake and tsunami in March 2011.

129. The ERT concludes that the inventory submission of Japan has been prepared and reported in accordance with the UNFCCC reporting guidelines. The inventory submission is complete and Japan has submitted a complete set of CRF tables for the years 1990–2009 and an NIR; these are complete in terms of geographical coverage, years, gases and sectors, but generally complete in terms of categories. In the industrial processes sector, actual emissions of HFCs, PFCs and SF_6 were reported as "NE" for the years 1990–1994, despite IPCC good practice guidance for estimating missing emissions (see para. 47 above), and in the LULUCF sector there are, in spite of improvements made, still several mandatory source/sink categories reported as "NE".

130. The submission of information required under Article 7, paragraph 1, of the Kyoto Protocol has been prepared and reported in accordance with decision 15/CMP.1.

131. Japan's inventory is generally in line with the Revised 1996 IPCC Guidelines, the IPCC good practice guidance and the IPCC good practice guidance for LULUCF, except for the issues mentioned in the sectoral sections (see paras. 33, 43–45, 57–58, 76, 98 and 103 above).

132. Japan has performed recalculations for the inventory between the 2010 and 2011 submissions in response to the recommendations of the 2010 annual review report following changes in AD and EFs and in order to rectify identified errors. The impact of these recalculations on the total GHG emissions is a decrease in emissions of 0.1 per cent for 2008 and a decrease in emissions by 0.1 per cent also when the LULUCF sector is excluded. The main recalculations took place in the following sectors/categories:

(a) Energy: energy industries, manufacturing industries and construction, and other sectors;

(b) Industrial processes: limestone and dolomite use, lime production, soda ash use and calcium carbide production;

(c) Agriculture: enteric fermentation, manure management, direct soil emissions and field burning of agricultural residues;

(d) LULUCF: carbon stock change in living biomass in wetlands, settlements and other land, dead organic matter in other land and soils in grassland and settlements;

(e) Waste: waste incineration.

133. Japan reports emissions/removals from activities under Article 3, paragraph 3, of the Kyoto Protocol (afforestation, reforestation and deforestation) as well as emissions/removals from forest management and revegetation under Article 3, paragraph 4, of the Kyoto Protocol. Japan fulfils the requirements of reporting as set out in paragraph 5

to 9 of the annex to decision 15/CMP.1 and Japan provides a useful summary of the KP-LULUCF reporting related to the required information in the NIR.

134. Japan has performed recalculations for the KP-LULUCF activities between the 2010 and 2011 submissions following changes in AD. The impact of these recalculations on each KP-LULUCF activity for 1990 and 2008 is as follows.

(a) Afforestation and reforestation: a decrease in net removals for 2008 of 0.6 per cent (2.4 Gg CO_2 eq);

(b) Revegetation: an increase in net removals for 1990 of 3.4 per cent (1.55 Gg CO_2 eq) and an increase in net removals for 2008 of 1.9 per cent (13.5 Gg CO_2 eq);

(c) Recalculations for deforestation and forest management were negligible.

135. Japan has reported information on its accounting of Kyoto Protocol units in accordance with chapter I.E of the annex to decision 15/CMP.1, and used the required reporting format tables as required by decision 14/CMP.1.

136. The national system continues to perform its required functions as set out in the annex to decision 19/CMP.1.

137. The national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1, and continues to adhere to the technical standards for data exchange between registry systems in accordance with relevant CMP decisions.

138. Japan has reported information under chapter I.H of the annex to decision 15/CMP.1, "Minimization of adverse impacts in accordance with Article 3, paragraph 14" as part of its 2011 annual submission. The reported information is considered complete and transparent. However, Japan did not report on how it prioritizes actions in implementing its relevant commitments.

139. The ERT identifies the following cross-cutting issues for improvement:

(a) Provision of information as recommended by the IPCC good practice guidance on the justification, selection of new data and methods and to quantify the size of the recalculation for the complete time series at the relevant category level within the respective category-specific recalculation sections of the NIR and in CRF table 8(b) (see paras. 26, 33, 43, 76, and 103 above);

(b) Improvement of the transparency of country-specific methods, EFs, AD and other parameters in the NIR, in particular for key categories, and if that is not possible, the provision of English translations of key background documents describing these or the rationale behind election of such methods or parameters (see specific recommendations for each sector);

(c) Revision of the use of notation keys, as appropriate, for some categories in several of the sectors in order to be in line with the UNFCCC reporting guidelines and to improve the transparency in the reporting (see specific recommendation for each sector);

(d) Provision of an improvement plan outlining planned improvements, including the time frame for their implementation. This should take into consideration the identification and listing in the NIR of review recommendations which have not yet implemented, including time plans for their implementation. This would be in addition to the listed actions taken and improvements made by following the ERT recommendations, presented in chapter 10 of the NIR.

140. In the course of the review, the ERT formulated a number of recommendations relating to completeness of the annual submission and transparency of the information presented in Japan's annual submission. The key recommendations are:

(a) In the energy and industrial processes sectors: for CO_2 emissions from feedstocks and non-energy use of fuels, increase the transparency of the explanations for how Japan reports the split of emissions between the industrial processes sector and specific energy sector categories, in particular for coke input in blast furnaces and electric arc furnaces and products such as blast furnace gas, coke oven gas, carbon anodes, lubricants, waxes, etc. (see paras. 36, 45, 49, 57, and 58 above);

(b) In the energy and industrial processes sectors: amend the allocation of CO_2 emissions from non-combustion processes (e.g. emissions from production of soda ash, iron and steel, ferroalloys and aluminium) under the industrial processes sector and not under the energy sector; and of coke production emissions under the energy sector in accordance with the Revised 1996 IPCC Guidelines (see also paras. 45, 46, and 57 above);

(c) In the industrial processes sector: improve the completeness of reporting, especially for emissions of HFCs, PFCs and SF_6 through time series, and explain the methods used for the estimates (see para. 47 above);

(d) In the LULUCF sector: continue the work to improve the completeness of reporting, especially related to carbon stock changes for mandatory categories (see para. 77 above);

(e) Provide the information on how Japan gives priority to actions in implementing its commitments under Article 3, paragraph 14, of the Kyoto Protocol (see para. 138 above).

IV. Questions of implementation

141. . No questions of implementation were identified by the ERT during the review.

Annex I

Documents and information used during the review

A. Reference documents

Intergovernmental Panel on Climate Change. *2006 IPCC Guidelines for National Greenhouse Gas Inventories*. Available at <http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html>.

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"Guidelines for national systems under Article 5, paragraph 1, of the Kyoto Protocol". Decision 19/CMP.1. Available at <http://unfccc.int/resource/docs/2005/cmp1/eng/08a03.pdf#page=14>.

"Guidelines for the preparation of the information required under Article 7 of the Kyoto Protocol". Decision 15/CMP.1. Available at <http://unfccc.int/resource/docs/2005/cmp1/eng/08a02.pdf#page=54>.

"Guidelines for review under Article 8 of the Kyoto Protocol". Decision 22/CMP.1. Available at <http://unfccc.int/resource/docs/2005/cmp1/eng/08a03.pdf#page=51>.

Status report for Japan 2011. Available at <http://unfccc.int/resource/docs/2011/asr/jpn.pdf>.

Synthesis and assessment report on the greenhouse gas inventories submitted in 2011. Available at <http://unfccc.int/resource/webdocs/sai/2011.pdf>.

FCCC/ARR/2010/JPN. Report of the individual review of the greenhouse gas inventory of Japan submitted in 2010. Available at <http://unfccc.int/resource/docs/2011/arr/jpn.pdf

UNFCCC. *Standard Independent Assessment Report*, parts I and II. Available at <http://unfccc.int/kyoto_protocol/registry_systems/independent_assessment_reports/items/4061.php>.

B. Additional information provided by the Party

Responses to questions during the review were received from Mr. Kohei Sakai (National Institute for Environmental Studies, Greenhouse Gas Inventory Office of Japan), including additional material on the methodology and assumptions used. The following documents[1] were also provided by Japan:

Environmental Agency, 1992. The Report on Estimation of CO_2 Emissions in Japan.

Japan Livestock Technology Association. 2001. "Chikusan niokeu Onshitukoukagasu no Hassei Seigyo Part 6" (GHGs estimations control in livestock Part 6"

Kainou, K. 2005. Analysis and adequacy review of carbon emission factors for energy sources.

Ministry of the Environment, Committee for the Greenhouse Gases Emissions Estimation Methods, GHGs Estimation Methods, Committee Report Part 2 - Report of the Breakout Group on Transport, August 2006.

Morisada, K., et al. "Organic carbon stock in forest soils in Japan", Geoderma 119. 2004. pp.21–32.

Osada, T.; Fukumoto, Y.; Tamura, T.; Shiraihi, M.; Ishibashi, M. 2005. *Greenhouse gas generation from livestock waste composting.* Non-CO_2 GrecnhouseGases (NCGG-4) Rotterdam: Milpress. ISBN 9059660439

Spreadsheet 'Recalculations_by_subcategory_110912.xls' providing for Industrial Process categories which where recalculated tables with time series of old and new emissions and the differences.

[1] Reproduced as received from the Party.

Annex II

Acronyms and abbreviations

AD	activity data
CH_4	methane
CO_2	carbon dioxide
CO_2 eq	carbon dioxide equivalent
CRF	common reporting format
EF	emission factor
ERT	expert review team
F-gas	fluorinated gas
GHG	greenhouse gas; unless indicated otherwise, GHG emissions are the sum of CO_2, CH_4, N_2O, HFCs, PFCs and SF_6 without GHG emissions and removals from LULUCF
HFCs	hydrofluorocarbons
IPCC	Intergovernmental Panel on Climate Change
KP-LULUCF	Land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol
LULUCF	land use, land-use change and forestry
NA	not applicable
N_2O	nitrous oxide
NIR	national inventory report
PFCs	perfluorocarbons
QA/QC	quality assurance/quality control
SEF	standard electronic format
SF_6	sulphur hexafluoride
SIAR	standard independent assessment report
UNFCCC	United Nations Framework Convention on Climate Change