UNITED NATIONS
NATIONS UNIES

FRAMEWORK CONVENTION ON CLIMATE CHANGE - Secretariat
CONVENTION - CADRE SUR LES CHANGEMENTS CLIMATIQUES - Secrétariat

FCCC/WEB/IRI/2004/JPN 13 April 2005

JAPAN

REPORT OF THE INDIVIDUAL REVIEW OF THE GREENHOUSE GAS INVENTORY SUBMITTED IN THE YEAR 2004[1]

I. OVERVIEW

A. Introduction

1. This report covers the desk review of the 2004 greenhouse gas (GHG) inventory submission of Japan, coordinated by the United Nations Framework Convention on Climate Change (UNFCCC) secretariat, in accordance with decision 19/CP.8 of the Conference of the Parties. The review took place from 8 to 25 November 2004 and was conducted by the following team of nominated experts from the roster of experts: Generalists – Mr. Paul Filliger (Switzerland) and Ms. Kristina Saarinen (Finland), Energy – Mr. Mario Contaldi (Italy) and Mr. Hugh Saddler (Australia), Industrial Processes – Ms. Karin Kindbom (Sweden) and Ms. Kristine Zommere (Latvia), Agriculture – Mr. Ayite-Lo Ajavon (Togo) and Ms. Hongmin Dong (China), Land-use Change and Forestry (LUCF) – Ms. Dominique Blain (Canada) and Mr. Richard Volz (Switzerland), Waste – Mr. Philip Acquah (Ghana) and Ms. Katarina Mareckova (Slovakia). Mr. Mario Contaldi and Ms. Hongmin Dong were the lead reviewers of this review. The review was coordinated by Ms. Rocío Lichte (UNFCCC secretariat).

2. In accordance with the UNFCCC "Guidelines for the technical review of greenhouse gas inventories from Parties included in Annex I to the Convention" a draft version of this report was communicated to the Government of Japan, which provided comments that were considered and incorporated, as appropriate, in this final version of the report.

B. Inventory submission and other sources of information

3. In its 2004 submission, Japan has submitted a complete set of common reporting format (CRF) tables for the years 1990–2002. In addition, detailed background worksheets covering activity data (AD) and emission factors (EFs) have been provided. The CRF tables were initially submitted on 24 May 2004; an updated set of CRF tables and the national inventory report (NIR) became available in October 2004. The inventory is presently based on Japan's fiscal year (April to March) which may be a reason for the delay in submission. During the 2003 in-country review this aspect was discussed intensively and it was decided that it would be preferable for Japan to continue reporting on a fiscal year basis but also to continue to work on the possibilities of converting to calendar year. The 2004 expert review team (ERT) agrees with this conclusion, taking into account the conclusions of the lead reviewers[2] and the "Report of the individual review of the greenhouse gas inventory of Japan submitted in the year 2003"[3] on this matter. The decision to convert data from fiscal year to calendar year should depend on

[1] In the symbol for this document, 2004 refers to the year in which the inventory was submitted, and not to the year of publication.
[2] At their second meeting, lead reviewers concluded that the use of non-calendar-year data in inventory preparation should not be considered departures from the IPCC good practice guidance provided that the principles of good practice guidance are applied correctly and are consistent with national circumstances (see FCCC/SBSTA/2004/3, paragraph 19).
[3] FCCC/WEB/IRI(2)/2003/JPN.

the number of additional errors which the change would introduce into the inventory. The ERT encourages Japan to reduce the delay in submitting its NIR.

4. Where needed the ERT also used the previous year's submission and other information. The full list of materials used during the review is provided in annex 1 to this report.

C. Emission profiles and trends

5. In the year 2002, the most important GHG in Japan was carbon dioxide (CO_2), contributing 93.7 per cent to total[4] national GHG emissions expressed in CO_2 equivalent, followed by nitrous oxide (N_2O) – 2.7 per cent, methane (CH_4) – 1.5 per cent, hydrofluorocarbons (HFCs) – 1.0 per cent, perfluorocarbons (PFCs) – 0.7 per cent, and sulphur hexafluoride (SF_6) – 0.4 per cent. The share of CO_2 is high compared to those reported by other countries. In contrast, the shares of CH_4 and N_2O are low. The Energy sector accounted for 89 per cent of total national GHG emissions, followed by Industrial Processes (6 per cent), and Agriculture and Waste (2.5 per cent each). Total reported GHG emissions (CO_2, CH_4, N_2O, HFCs, PFCs and SF_6, excluding LUCF) amounted to 1,330,793 Gg CO_2 equivalent in 2002, showing an increase of 12.1 per cent since 1990, where total reported GHG emissions (CO_2, CH_4, N_2O, excluding LUCF) amounted to 1,187,210 Gg CO_2 equivalent. CO_2 emissions (without LUCF) increased from 1990 to 2002 by 11 per cent, N_2O emissions decreased by 12 per cent, and CH_4 emissions decreased by 21 per cent. The sum of emissions of the fluorinated gases (F-gases) decreased from 1995 to 2002 by 43 per cent. Because estimates for the LUCF sector for 1996–2002 are missing, and no estimates of actual emissions for the F-gases are provided for the period 1990–1994, the trends have to be interpreted carefully (e.g., the comparison of the 2002 data from Industrial Processes with the 1990 data as given in the NIR (chapter 2.3.2) has to be interpreted with care given that data on actual emissions of F-gases are missing for 1990). With this reservation, no apparent trend inconsistencies could be found.

D. Key sources

6. Japan has reported a key source tier 1 analysis, both level and trend assessment, as part of its 2004 submission. The key source analyses performed by the Party and the secretariat[5] produced very similar results for the level assessment and somewhat different results for the trend assessment because the disaggregation levels are different. Japan's key source analysis, which was revised in response to comments from the 2003 in-country review, is well adapted to the country's special features. The ERT recommends Japan to take steps towards introducing a tier 2 analysis and to use the key source analysis more intensively to structure the NIR and establish which sources are to have priority in the improvement of the inventory.

E. Main findings

7. The complete set of CRFs, the NIR and the very detailed background worksheets give a comprehensive picture of the inventory. The inventory is mainly on a high level of development and consistent 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) except for the adjustments made to avoid double counting in the form of negative emissions, for example, for Mobile Combustion, which is a trend key source. According to the NIR, actual measurements or estimates based on research conducted in Japan have been used for the EFs and IPCC default values have been used for sources from which emissions were thought to be fairly low.

[4] In this report, the term total emissions refers to the aggregated national GHG emissions expressed in terms of CO_2 equivalent excluding LUCF, unless otherwise specified.

[5] The secretariat had identified, for each individual Party, those source categories which are key sources in terms of their absolute level of emissions, applying the tier 1 level assessment as described in the IPCC good practice guidance. Key sources according to the tier 1 trend assessment were also identified for those Parties providing a full CRF for the year 1990. Where the Party has performed a key source analysis, the key sources presented in this report follow the Party's analysis. However, they are presented at the level of aggregation corresponding to a tier 1 key source assessment conducted by the secretariat.

8. Japan has made several improvements since the last submission in response to the recommendations of the 2003 in-country review. The improvements (listed in chapter 10.4.1 of the NIR) cover various aspects of the NIR and the CRF tables.

9. The ERT recommends that Japan take further steps towards presenting a high-quality inventory. The main emphasis should be on completeness. The lack of LUCF data from 1996 onwards is an issue that should be resolved soon within the framework of the new Land Use, Land-use Change and Forestry (LULUCF) reporting. Similarly, the time series for actual emission estimates for the F-gases should be completed for 1990–1994. The Party has identified various other fields for improvement. The ERT recommends that Japan set priorities for the extended list of improvements. The development of a formal quality assurance/quality control (QA/QC) plan would enhance the quality of the inventory.

F. Cross-cutting topics

Completeness

10. The inventory is largely complete except for the LUCF categories, where no estimates are reported for the years 1996–2002. In this sector the implementation of the planned improvements may require several years: Japan intends to use the IPCC Good Practice Guidance for LULUCF (hereinafter referred to as LULUCF good practice guidance) to provide data for LULUCF and for the different subcategories. However, based on the results of previous reviews, the ERT encourages the Party to check its extrapolation methods using the latest forestry statistics from 1995 and to give high priority, using the IPCC good practice guidance methodology and default values, to improving its LULUCF inventory from its next submission.

11. Further sources which are not estimated are listed in the NIR (chapter 1.8, annex 5) and in the CRF (table 9). The ERT agrees that most of these missing sources are very small but some may be of a certain importance (e.g., fugitive emissions from venting and flaring; and HFC emissions from transport and industrial refrigeration). For the years 1990–1994, potential emissions of F-gases are reported but actual emissions are not due to lack of data. The ERT recommends that Japan develop a plan for including the sources and sinks that are not yet estimated. The plan should give a rough estimate of the importance of the missing sources in order to allow for priorities to be set and for a timetable for filling the gaps to be presented.

Transparency

12. The complete CRF files, and in particular the detailed background worksheets linked with the NIR, add greatly to the transparency of the inventory. Notation keys are used throughout the tables. The NIR is in line with the UNFCCC reporting guidelines. However, for the key sources more information on methods and assumptions could be included in the NIR. A transparency problem arises from the corrections made to avoid double counting in the form of negative emissions, which need to be better explained. This is especially true for the corrections made in 1.A.3 Mobile Combustion. This correction itself becomes a trend key source, which shows the importance of this subject. A short supplementary paper – as proposed by the 2003 in-country review team – or an annex to the NIR would help to clarify this somewhat confusing subject.

13. There are some inconsistencies between the information given by the CRF notation keys and those used in the NIR. Though these inconsistencies are explained in annex 5.1.2 of the NIR, the ERT recommends the Party to make the NIR tables consistent with the CRF in its next submission.

Recalculations and time-series consistency

14. The ERT noted that recalculations reported by the Party of the time series 1990–2001 had been undertaken to take into account additional sources, revisions in AD and Japan's General Energy Statistics. The Party's reported recalculations match those identified by the secretariat. A description of the rationale for these recalculations is provided in table 8(b) and in the NIR. The effect of the recalculations on levels and trends is very small (in 1990 it is 0.01 per cent and in 2001 it is 0.22 per cent for total CO_2

equivalent emissions), except in the case of the PFC and SF_6 trends as new sources with increasing trends have been included. The recalculations seem to be justified.

15. There are inconsistencies in table 10-1 of the NIR, which compares the 2003 and 2004 submissions after the recalculations: the values given for CO_2 and total aggregate emissions (without LUCF) are different from those reported in the CRF and other tables of the NIR. The table should be corrected.

Uncertainties

16. A quantitative uncertainty analysis (tier 1) has been carried out. The method, assumptions and results are very well documented in two annexes to the NIR. The uncertainty of total emissions has been estimated at 2 per cent, which is low compared to the uncertainties reported by other countries. The total uncertainty is dominated by the uncertainty of CO_2 emissions from fuel combustion, which is well known. Some sensitivity analysis (on N_2O emissions from agricultural soils) has been carried out in response to a recommendation of the 2003 in-country review. The sensitivity is small as the percentage of N_2O emissions is low. Developments towards using the tier 2 method are mentioned in the NIR. The ERT encourages this further development of the uncertainty analysis and recommends Japan to use it to a greater extent to prioritize future improvements.

Verification and quality assurance/quality control approaches

17. The Party has not yet developed a formal QA/QC plan. Many internal checks and a short description of QA/QC procedures during the inventory preparation are described in the NIR and reviews by external experts (sectoral breakout groups) are documented. A review by a third party is planned but has not yet been implemented. The ERT recommends that the numerous QA/QC procedures presently carried out should be incorporated into a formal QA/QC plan which is an important part of the future improvement of the inventory.

G. Areas for further improvement

Identified by the Party

18. A detailed list of improvements suggested by the Japanese "Committee for Greenhouse Gases Emissions Estimation Methods" is presented in the NIR. It covers among other things QA/QC aspects, estimation of missing sources, use of country-specific information instead of IPCC defaults, the checking of EFs and improvements to the collection of AD. The detailed list shows that the Party is fully aware what improvements are needed. The ERT agrees with the Party that priority-setting for realizing the improvements is important. It could be developed in the context of the above-mentioned plan for making the inventory more complete.

Identified by the ERT

19. The ERT identifies the following cross-cutting issues for improvement as most important. The Party should:

(a) Report LUCF data from 1996 onwards within the framework of the new LULUCF reporting;

(b) Report actual HFC, PFC and SF_6 emissions for 1990–1994;

(c) Create a formal QA/QC plan;

(d) Set priorities for including the missing sources and sinks and for introducing the various improvements identified by the Party.

20. Recommended improvements relating to specific source/sink categories are presented in the relevant sector sections of this report.

II. ENERGY

A. Sector overview

21. In 2002, the Energy sector accounted for 89.1 per cent of Japan's total GHG emissions. Over the period 1990–2002 GHG emissions from the sector increased by 12.0 per cent. Within the sector six key sources have been identified under the level assessment, covering about 90 per cent of total national emissions. Under the trend assessment seven key sources in the Energy sector were identified, although not always the same sources as under the level assessment. In general emissions from the sector are estimated in accordance with the IPCC good practice guidance.

Completeness

22. All significant emission sources are included in the inventory, but CO_2 and N_2O emissions from 1.B.1 Solid Fuel Fugitive Emissions are still not estimated ("NE" is reported), neither are CH_4, CO_2 and N_2O emissions from category 1.B.1c Solid Fuel Transformation. In the Transport and Bunker Fuels categories (tables 1.A(a)s3 and 1.C, respectively) some sources are reported at a higher level of aggregation, with emissions of CO_2 reported as "included elsewhere" ("IE"), and corresponding emissions of CH_4 and N_2O are reported as "NE" for some fuel types.

Transparency

23. The methodology used to estimate emissions is country-specific, and the AD, EFs and detailed methodologies are generally well described in the NIR. The main source of AD is Japan's Energy Balance Table (from the *General Energy Statistics* published by the Agency for Natural Resources and Energy). For the Stationary Combustion category this is supplemented by enumeration surveys of all facilities emitting smoke and soot (Ministry of the Environment, *Research of Air Pollutant Emissions from Stationary Sources*), which collects energy use and measured emissions data. It is noted, however, that the last such survey was in fiscal 1999. Extensive energy balance and other supporting data are provided in the worksheets that underlie the CRF.

Areas for further improvements identified by ERT

24. The 2004 synthesis and assessment (S&A) report identified a number of minor improvements and corrections which could be made. These concern apparently anomalous emission estimates in earlier years for solid fuels in Energy Industries, and various subcategories of Manufacturing Industries and Construction. These are discussed in detail under Key sources below.

25. There are some further minor issues where the response provided by the Party to the findings of the S&A report provides a full explanation of the query but where, in the interests of greater clarity in future submissions, it would be advantageous to provide more information. These include the unusually high CO_2 implied emission factors (IEFs) for the subcategory Manufacture of Solid Fuels and Other Energy Industries, the lack of detailed AD since 2000 for the subcategory Agriculture/Forestry/Fisheries, and the absence of a clear explanation in the NIR of where emissions from flaring in oil refining are reported.

B. Reference and sectoral approaches

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

26. The gap between the estimates using the two approaches is relatively small and is explained in some detail in the NIR (annex 4). However, the difference is higher in 2002 than in any previous year (it is above 2 per cent for the first time). If this trend continues in future inventories, some further explanation should be provided. In the previous review it was noted that all the values in the column for fraction of carbon oxidized are assumed in the 2003 submission to be 1.0, whereas country-specific or default IPCC values (page 1.29 of the Reference Manual) could have been used. The 2004 NIR explains that some EFs used in the reference approach are based on direct measurement of emissions, in which

case a factor of 1.0 is correct. However, it does not appear that this applies to all the EFs used, so this issue remains to be addressed.

International bunker fuels

27. There is a large difference between the bunker AD reported in the CRF (table 1.C) and the bunker consumption data reported to the International Energy Agency (IEA). Between 1995 and 1996 there is a very large decrease in CO_2 emissions attributed to marine bunkers. Both these matters should be explained in the Party's next submission. Also, in CRF table 1.C Japan uses a classification of petroleum fuels used in marine transport that is different from the default classification in the table. It is probable that these are simply different names for what are actually the same products; it would be helpful if this could be clarified in Japan's next submission.

Feedstocks and non-energy use of fuels

28. Non-default fractions are used according to table 1.A(d) for fraction of carbon stored (1.00 instead of 0.50 for lubricants, 0.86 instead of 1.00 for bitumen, and various values for a number of other fuels). No explanation for these values is provided. While in many cases the quantities of carbon stored may be derived from actual country-specific measurements, this is unlikely to be so in all cases, for example, in the case of lubricants. The next submission should explain the basis for the various values used.

29. The previous review noted that in table 1.A(d) the source category Manufacturing Industries and Construction is used throughout as being the source from which the feedstocks have been subtracted, and observed that this category is too general to be very informative, and it would be useful to provide a more detailed description of the relevant subcategories. This issue has not been addressed in the current submission, so the recommendation still applies.

C. Key sources

30. Japan identifies CO_2 from stationary combustion – solid fuels, liquid fuels, and gaseous fuels, CO_2 from mobile combustion – road transportation, CO_2 from mobile combustion – waterborne navigation, and CO_2 from mobile combustion – aircraft as key sources according to the level analysis. All these except mobile combustion – aircraft are also key sources according to the trend analysis, as is fugitive CH_4 emissions from coal mining and handling.

Stationary combustion: solid fuels – CO_2

31. There are a number of emission estimates relating to different sources which appear to be anomalous and should be explained in the Party's next submissions. These are described in detail in the following paragraphs.

32. In 1.A.1 Energy industries, the CO_2 IEFs for most years of the time series (1990–1999) have been identified as the lowest among reporting Parties. The response provided by the Party to the S&A report, indicating that this is attributable to the low EF used for imported coal in public electricity generation, does not explain the observation. In 1.A.1c Manufacture of Solid Fuels and Other Energy industries, the CO_2 IEF values (88–91.3) for the years 1990–2002 are extremely low. This issue was identified in the previous review report and it is explained in the NIR (annex 2) as arising from the fact that the EFs in this sector include an allowance for non-energy use of part of the carbon in these fuels (coal tar, benzene, toluene and xylene (BTX) etc.). However, this does not seem to explain the trend in the CO_2 IEF values, which show sharp increases between 1999 and 2000 (by 35 per cent) and between 2000 and 2001 (by 22 per cent). The response provided by the Party to the S&A report – that standard calorific values used in the General Energy Statistics were revised after 2000 – does not explain the observation, because the change which that revision would introduce is too small to explain the anomalies observed.

33. In 1.A.2a Iron and Steel and 1.A.2b Non-ferrous Metals, unusual inter-annual variations in the CO_2 IEF between 1999 and 2000 have been noted: the IEF values decreased by 6.4 per cent (for iron and

steel) and by 5.1 per cent (for non-ferrous metals) between those years, and since 2000 show a continuously decreasing trend. The response provided by the Party to the S&A report – that the apparent anomaly is caused by a change in the calorific value used for bituminous coal in Japan's General Energy Statistics – does not explain the observation, because it is mainly coking coal, not bituminous coal, that is used in the iron and steel industry. It may be related in some way to the observed increase over the same period in 1.A.1c (see paragraph 32above) as the two sectors are very closely related.

34. The relationship between 1.A.2c Chemicals and 1.A.2f Other appears very anomalous. In 1997 and earlier years activity in Chemicals was large and activity in Other is shown as a negative, while from 1998 onward activity in Chemicals is much lower and activity in Other is positive. This suggests an error in the allocation of energy consumption between the sectors in 1997 and earlier years. The sum of activity (energy consumption) in the two sectors over time is reasonably constant. This should be explained in Japan's next submission.

35. In 1.A.2e Food Processing, Beverages and Tobacco, the trend in fuel consumption and corresponding CO_2 emissions shows a sharp increase between 1998 and 1999: consumption and emissions increased by 27 per cent and 26 per cent, respectively, between those years. The response provided by the Party to the S&A report – that statistical data for food processing, beverages and tobacco have only been available since fiscal 1999 – does not resolve the observation; the time series should be updated.

Stationary combustion: liquid and gaseous fuels – CO_2

36. The comment under paragraph 35 above also applies to liquid and gaseous fuels used in this sector.

Road transportation – CO_2

37. Energy consumption and emissions from the use of natural gas in road vehicles are not reported because they are said to be negligible (NIR section 3.1.3.1). Natural gas vehicles are said to comprise only 0.03 per cent of the total fleet. On that basis, they would pro rata contribute 75 Gg CO_2. In fact, gas vehicles are likely to be much more heavily used, and to be larger (e.g., buses) than average vehicles, and it may therefore not be correct to consider these emissions as negligible. This issue should be addressed in Japan's next submission.

D. Non-key sources

Fugitive emissions: oil, natural gas and other sources

38. Emissions from flaring have not been estimated ("NE" is reported). This issue is well explained in the NIR with respect to flaring at oil/gas wells, but no mention is made of refinery or petrochemical flaring. Flaring at refineries should also be reported in this section. An alternative but less satisfactory approach is to use AD and EFs for liquid fuels used at oil refineries that include emissions attributable to flaring. It is possible that this is the approach used by Japan, since emissions are based on direct measurement. If so, this should be explained in the NIR.

III. INDUSTRIAL PROCESSES AND SOLVENT USE

A. Sector overview

39. The Industrial Processes sector accounted for 5.5 per cent of total national GHG emissions in 1990 and 5.9 per cent in 2002. The emissions over time show large inter-annual variations due to the inclusion of F-gases from 1995, with a peak in 1996 when sectoral emissions contributed 8.9 per cent of total national emissions, but have shown a decrease from 1996 to 2002. Emissions from the Industrial Processes sector increased by 21.4 per cent between 1990 (where emissions include CO_2, CH_4 and N_2O) and 2002 (where emissions include CO_2, CH_4, N_2O, HFCs, PFCs and SF_6), and by 7.8 per cent between 2001 and 2002. Most gases and sources of emissions are covered except for source categories 2.A.4 Soda

Ash Production and Use, 2.A.5 Asphalt Roofing and 2.A.6 Road Paving with Asphalt, for which no emission estimates are provided. Actual emissions of HFCs, PFCs and SF_6 in the period 1990–1994 have not been estimated; however, potential emissions are provided for those years. Reported emissions of non-methane volatile organic compounds (NMVOCs) from solvent and other product use are not converted into CO_2 and the notation key "not occurring" ("NO") is incorrectly used.

40. The reporting is transparent overall and the appropriateness of the methodologies used is easy to assess. The time series of emissions from subsectors are not discussed or explained in the NIR and it is recommended that Japan make its inventory more transparent in this respect. There are no descriptions of indirect GHGs in the NIR.

41. Actual emissions of F-gases are not reported before 1995. The notation keys are widely used for confidentiality reasons, and HFCs and PFCs are reported as aggregate CO_2 equivalent emissions. Table 9 has been completed.

42. Recalculations of HFC, PFC and SF_6 emissions have been carried out for all years from 1995 to 2001. Two new sources have been included in the inventory – category 2.C.4 SF_6 used in Magnesium Foundries, and HFCs from polyethylene foam under source category 2.F.2 Foam Blowing. Compared to the 2003 submission, estimated PFC emissions for the years 1995 to 2001 increased by between 9.5 and 35.2 per cent as a result of the recalculations, estimated SF_6 emissions increased by between 1.08 and 25.08 per cent, and estimated HFC emissions increased by between 1.02 and 1.80 per cent. The new source for SF_6 (SF_6 in magnesium foundries) may account for the increases in emissions between the two submissions. For PFCs, however, the increased emissions are not explained and it is not clear which source has been recalculated.

43. Japan assesses the uncertainty of the Industrial Processes sector at 2 per cent.

B. Key sources

Cement production – CO_2

44. Emissions from limestone in cement production accounted for 59 per cent of the Industrial Processes sector emissions in 2002. A country-specific method is used which is based on consumption of limestone. The EF is calculated by multiplying the weight-to-weight ratio of limestone to CO_2 in the chemical reaction, taking into account the purity of the limestone used. The description in the NIR is transparent. Nevertheless the method is not in line with the IPCC good practice guidance in that limestone consumption is used as the AD instead of clinker production, and it is recommended that Japan explore the possibility of using the method based on clinker production.

Limestone and dolomite use – CO_2

45. A country-specific method is used, where the EF is based on the average lime (CaO) content in limestone and the average CaO and magnesium oxide (MgO) content in the dolomite. The description of the method and the EF given in the NIR is transparent. The method is in line with the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC Guidelines).

Adipic acid production – N_2O

46. It is good practice to use plant measurement data for the estimates, as Japan does. The trend in the N_2O IEF values shows large inter-annual fluctuations. This issue has been addressed by the Party in response to the 2003 in-country review, when it explained that an N_2O abatement unit was installed at the plant in 1999. The EF remained constant from 1990 to 1998 at 250 kg/t and then declined to 25 kg/t in 1999 and to 19 kg/t in 2001, with a spike in 2000 at 101 kg/t. Japan explained that the spike in 2000 was the result of the low utilization of the abatement unit during 2000. In the interests of greater transparency it is recommended that Japan provide further explanation of the large fluctuations and provide more detailed information in the NIR regarding the time series of N_2O emissions and the connection to N_2O abatement.

Production of halocarbons and SF_6 – HFCs and SF_6

47. The figure for by-product emissions and fugitive emissions has been prepared by the Chemical and Bio Sub-Group of the Japanese Ministry of Economy, Trade and Industry (METI). The CO_2 equivalent emissions decreased by 63 per cent from 1995 to 2002. The ERT recommends that Japan discuss the trend and provide relevant information regarding the choice of method, the determination of generation factors and the EF used in the NIR.

Consumption of halocarbons – HFCs, PFCs and SF_6

48. Aggregate emissions of HFCs, PFCs and SF_6 (expressed in CO_2 equivalent) show a decreasing trend, by 30 per cent from 1995 to 2002, mainly due to decreasing emissions of SF_6. The ERT encourages Japan to discuss and explain the trend in the NIR.

C. Non-key sources

Iron and steel production – CO_2

49. Emissions for steel and pig iron (coke) are included under 1.A Fuel Combustion and reported as "IE". The ERT encourages Japan to investigate this source and to try to allocate process emissions to the Industrial Processes sector.

IV. AGRICULTURE

A. Sector overview

50. In 2002, the Agriculture sector accounted for 33,618 Gg CO_2 equivalent emissions, or approximately 2.5 per cent of total national GHG emissions. Emissions from the sector fell by 13.8 per cent between 1990 and 2002. CH_4 contributed 40.3 per cent of the emissions from the sector and N_2O the remaining 59.7 per cent in 2002. Manure Management, Agricultural Soils, Enteric Fermentation and Rice Cultivation were the major source categories, contributing 38.0, 24.1, 19.9 and 17.3 per cent, respectively, to the total emissions for the sector. Field burning of crop residues was a minor contributor, and prescribed burning of savannahs, or equivalent activity, does not occur in Japan according to the NIR.

51. Between 1990 and 2002, GHG emissions from enteric fermentation decreased by 7.4 per cent (with dairy cattle emissions decreasing by 14.8 per cent and non-dairy cattle emissions increasing by 2.0 per cent) and emissions from manure management decreased by 12.3 per cent because of a decrease in livestock population. Emissions from agricultural soils and rice cultivation declined by 16.5 per cent each over the same period because of a fall in the area of agricultural land. Emissions from field burning of agricultural residues have declined by 8.4 per cent since 1990.

52. The key source analysis conducted by Japan identified N_2O emissions from manure management and CH_4 from rice cultivation as key sources. The ERT recommends the use of a more aggregated level of sub-sources, as proposed by table 7-1 of the IPCC good practice guidance, because of the general correlation of estimation methods.

53. Although the complete set of CRFs, the NIR and the detailed worksheets facilitated the review of the inventory, the ERT recommends that Japan provide information on the underlying assumptions for those sub-categories for which country-specific methods have been used.

B. Key sources

Rice cultivation – CH_4

54. The assumption is made that the proportions of intermittently and continuously flooded fields in the total paddy area of the country are 98 per cent and 2 per cent, respectively, although the reference source is not clear. The ERT encourages Japan to report the references used clearly, making use of cross-references between the NIR and the worksheets.

Manure management

55. The major animal waste management systems (AWMS) in use in Japan are deposition, composting and pit storage. Further information on these systems would be useful. The relevant EFs seem to be high given the values used by other Parties. The ERT encourages Japan to provide a scientific discussion of the values used.

C. Non-key sources

Indirect N_2O emissions

56. The use of country-specific EFs is reported in the NIR and CRF table Summary 3, but only default EFs are applied in the calculations. Japan is undertaking a review of the use of the default EFs and plans to complete this in time for its next submission. The ERT encourages the inventory team to use country-specific data on nitrogen (N) excretion in future submissions.

Animal production – N_2O, CH_4

57. The NIR is unclear as to which categories of grazing animals occur and whether a common EF is acceptable for them. Comments from Japan suggest that the grazing animals are cattle, and EFs have been developed for cattle only. The ERT encourages Japan to provide AD and country-specific EFs in the documentation box of CRF table 4.D in its next submission.

Agricultural residues burned

58. Data on biomass of rice residues burned were used directly to estimate residues from other cereals burned without calculating the proportions of different residues burned. The ERT recommends that this methodology be revised, especially if the quantity of other crop residues produced and burned on the field is large. The ERT suggests that this source be recalculated for the whole time series.

V. LAND-USE CHANGE AND FORESTRY

A. Sector overview

59. Japan does not provide estimates of emissions or removals from the LUCF sector for the years 1996–2002 ("NE" is reported). Notation keys are reported in table 5 and in the sectoral background tables. In table 5.A only removals by parks and conservation zones are reported for the years 1996–2002. In the 2003 submission those estimates were also reported in CRF tables 5 for the years 1996–2001. The NIR describes the methodologies used and provides background data for the years 1990–1995. The methodologies described are not applied to calculate estimates for sectoral background tables 5.A and 5.B. It is unclear whether the LUCF chapter of the NIR reflects the state of knowledge in 1995 or whether it has been updated.

60. The information and data provided in CRF table 8(a) and comparison with the 2003 submission show that no recalculations have been undertaken for the LUCF sector for the 1990–1995 estimates. In table 7, it is recognized that the inventory is not complete and that the quality of the estimates is only moderate. Japan intends to use the LULUCF good practice guidance to provide data for LULUCF and for the different subcategories. No information on cross-cutting issues (QA/QC, uncertainties, time-series consistency and trend) or on planned improvements is provided for this sector.

B. Sink and source categories

5.A Changes in forest and other biomass stocks

61. Even though no estimates of emissions and removals are provided for the years 1996–2002, the background data on semi-natural forests, parks and green spaces are available and are presented in table 5.A. However, they are neither summarized nor carried over to table 5. Temperate plantations and commercial forests are indicated as "NO", whereas in table 5.B for the subcategory Temperate Broadleaf

"NE" is reported. Biomass removed in harvest is not reported for the years 1996–2002. "IE" is reported in table 5 but there is no explanation as to where these emissions are reported. Table 5.A provides "0" and different notation keys for biomass removed and wood use.

62. Japan reports in table 9 that the latest forestry statistics data are from 1995, so that it is not possible to calculate the later years. The ERT recommends the Party to check whether growth rates could be extrapolated from the pre-1995 statistics.

5.B, 5.C and 5.D

63. For the years 1996–2002, emissions due to forest and grassland conversion are not estimated ("NE" is reported). The 2003 submission reported grassland conversion as "NO". The modification is presumably a response to the 2003 in-country review team's question about the likelihood of grassland conversion not occurring in Japan. CRF table 9 indicates that no data are available after 1995 and the land classification differs from those in the CRF. Emissions and removals from soil are reported as "NE" for all mineral and organic soils in warm temperate climate as well as for liming of agricultural soils. "NO" is reported for organic soils in cool temperate and tropical climates. CRF table 9 indicates that Japan is unable to determine whether emissions of categories 5.C and 5.D occur or not.

Recommendations

64. The use of the notation keys should be clarified in all tables and should be more consistent. Clarification is needed as to whether commercial forests do indeed not occur in Japan or are included elsewhere. Since Japan mainly uses notation keys and reports only partial estimates for one subcategory, it is recommended that the quality of the estimates be reported as "low" in table 7. The NIR indicates that Japan has deferred its review of the use of notation keys in the LUCF sector until its assessment of the LULUCF good practice guidance is completed. The ERT recommends Japan to make use of the documentation boxes to make it clearer why data are lacking or incomplete, or give further explanations.

65. The reviewers are aware that the compilation and processing of national data and the development of corresponding estimates may take several years. However, based on the results of previous reviews, the ERT encourages the Party to check its extrapolation methods using the latest forestry statistics from 1995 and the IPCC good practice guidance methodology and default values to improve its LUCF inventory.

VI. WASTE

A. Sector overview

66. In 2002, the Waste sector contributed 2.5 per cent to total national GHG emissions. In 1990 the figure was 2.0 per cent. Emissions from the sector increased by 33 per cent from 1990 to 2002. CO_2 emissions from 6.C Waste Incineration (non-biogenic waste) are identified as a key source by level and trend according to the Party's tier 1 key source analysis, and this is the only key source identified in the sector. This sub-source contributed 73 per cent to sectoral emissions in 2002, while CH_4 emissions from solid waste disposal on land accounted for 12 per cent. The increasing trend in total waste emissions is driven by increased emissions from waste incineration, which have increased by about 43 per cent since 1990. The CRF indicates that 78 per cent of waste generated in 2002 was incinerated and only 5 per cent disposed on land. The policy preference for increased incineration is largely driven by the national circumstances of Japan (i.e., the non-availability of land) as well as a policy mechanism to promote thermal recycling to maximize the use of chemical energy in waste.

67. The inventory is practically complete in terms of gases, sources and years covered, except for a few sources, such as N_2O from industrial waste water and CO_2 from managed waste disposal sites which have not been estimated because they are not considered to be significant. The use of notation keys and the explanations provided in the CRF completeness table 9 have improved the transparency of the reporting. For instance, non-CO_2 emissions from biogenic waste incineration are reported as "IE" in CFR

table 6.C, and this is adequately explained in CRF table 9 as accounted for under Non-biogenic Waste (under Waste Incineration) in response to an observation made during the 2003 in-country review.

68. Japan plans to study and report a country-specific source category identified as GHG emissions from decomposition of synthetic detergents and inter-facial active agent in a watershed in a sewage works.

69. Country-specific methodologies and EFs based on the IPCC good practice guidance or relevant to the national circumstances are generally used. The EFs are well documented and referenced in the NIR. The ERT noted that the 2004 submission provides adequate information on the methodology used in the NIR and in CRF table 6.C in response to the recommendations of the 2003 in-country review. Methodologies are also summarized in the documentation boxes of the CRF tables. In addition, detailed AD and EFs for the entire time series are provided. These have significantly improved the transparency and comparability of the Japanese inventory, as well as its consistency with the UNFCCC reporting guidelines, compared to previous submissions. The 2003 in-country review observed that the methods used are based on extensive research on waste done in Japan.

B. Key sources

6.C Waste incineration – CO_2

70. The 2003 in-country review noted that Japan should consider reporting emissions from incineration with waste-to-energy facilities under the Energy sector, in accordance with the IPCC good practice guidance, instead of continuing to account for them under category 6.C Waste Incineration (non-biogenic waste). The Party explained that its data on energy production from waste incineration are still not complete, and, moreover, that its reporting preference was based on a policy to promote thermal and chemical energy recycling.

C. Non-key sources

6.A Solid waste disposal on land – CH_4

71. CH_4 emissions from this source (which accounted for 0.3 per cent of total national emissions in 2002) fell by 8.4 per cent between 1990 and 2002. This trend has been driven by policy and legislation that favour incineration instead of landfilling. The per capita emissions are the lowest among the reporting Parties because only 5 per cent of municipal solid waste (MSW) generated is disposed at solid waste disposal sites (SWDS) for a population of 127 million.

72. Japan uses country-specific models based on the first order decay (FOD) methodology, consistent with the IPCC good practice guidance tier 2 approach. The relevant additional data provided in the CRF include population data, MSW generation, fraction of MSW to SWDS, and composting. The ERT, however, noted that fractions of CH_4 recovered for energy and/or flaring should be estimated. This is essential for reporting CO_2 emissions from CH_4 flaring and CH_4 utilization for energy under Energy category 1.A.1, in accordance with the IPCC good practice guidance.

6.B Waste-water handling – CH_4 and N_2O

73. CH_4 emissions from industrial and domestic and commercial waste-water handling under category 6.B, as well as N_2O emissions from domestic and commercial waste-water handling and human sewage, have been estimated. Country-specific methodologies and EFs have been employed, and are adequately summarized in the NIR. However, neither the corresponding AD nor the additional information have been provided in the CRF ("NE" is reported), and thus no IEFs have been calculated for these sources.

74. The ERT noted the country-specific method employed for N_2O emissions from human waste treatment plants: Japan is one of the few countries that have developed country-specific EFs for this source category.

ANNEX 1: MATERIALS USED DURING THE REVIEW

A. Support materials used during the review

2003 and 2004 Inventory submissions of Japan. 2004 submission including a set of CRF tables for 1990–2002 and an NIR.

UNFCCC secretariat (2004). "Report of the individual review of the greenhouse gas inventory of Japan submitted in the year 2003 (In-country review)". FCCC/WEB/IRI(2)/2003/JPN (available on the secretariat web site <http://unfccc.int/files/national_reports/annex_i_ghg_inventories/national_inventories_submissions/application/pdf/jpnrep03.pdf>).

UNFCCC secretariat. "2004 Status report for Japan" (available on the secretariat web site <http://unfccc.int/files/national_reports/annex_i_ghg_inventories/inventory_review_reports/application/pdf/jap04.pdf>).

UNFCCC secretariat. "Synthesis and assessment report of the greenhouse gas inventories submitted in 2004. Part I": FCCC/WEB/SAI/2004 (available on the secretariat web site <http://unfccc.int/resource/webdocs/sai/2004.pdf>) and Part II – the section on *Japan* (unpublished).

UNFCCC secretariat. Review findings for Japan (unpublished).

Japan's comments on the draft "Synthesis and assessment report of the greenhouse gas inventories submitted in 2004" (unpublished).

UNFCCC secretariat. "Handbook for review of national GHG inventories." Draft 2004 (unpublished).

UNFCCC secretariat. "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories", "Part II: UNFCCC reporting guidelines on national communications" and "Guidelines for the technical review of greenhouse gas inventories from Parties included in Annex I to the Convention." FCCC/CP/1999/7 (available on the secretariat web site <http://unfccc.int/resource/docs/cop5/07.pdf>).

UNFCCC secretariat. "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories" and "Guidelines for the technical review of greenhouse gas inventories from Parties included in Annex I to the Convention." FCCC/CP/2002/8 (on the secretariat web site <http://unfccc.int/resource/docs/cop8/08.pdf>).

UNFCCC secretariat. Database search tool – *Locator* (unpublished).

IPCC. *IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories, 2000* (available on the following web site: <http://www.ipcc-nggip.iges.or.jp/public/gp/english>).

IPCC/OECD/IEA. *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories, volumes 1–3, 1997* (available on the following web site: <http://www.ipcc-nggip.iges.or.jp/public/gl/invs1.htm>).

B. Additional materials

No additional information or materials were requested by the ERT during this review.

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