UNITED
NATIONS

UNFCCC Framework Convention on Climate Change

Distr.
GENERAL

FCCC/ARR/2005/USA
25 May 2006

ENGLISH ONLY

Report of the individual review of the greenhouse gas inventory of the United States of America submitted in 2005*

* In the symbol for this document, 2005 refers to the year in which the inventory was submitted, and not to the year of publication.

CONTENTS

I. Overview

A. Introduction

1. This report covers the centralized review of the 2005 greenhouse gas (GHG) inventory submission of the United States of America, coordinated by the United Nations Framework Convention on Climate Change (UNFCCC) secretariat, in accordance with decision 19/CP.8. The review took place from 10 to 15 October 2005 in Bonn, Germany, and was conducted by the following team of nominated experts from the roster of experts: Generalists – Mr. Riccardo de Lauretis (Italy) and Mr. Tinus Pulles (the Netherlands); Energy – Mr. Simon Eggleston (United Kingdom of Great Britain and Northern Ireland), Mr. Tomas Gustafsson (Sweden) and Mr. Francis Yamba (Zambia); Industrial Processes – Ms. Maria Jose Lopez (Belgium) and Ms. Virginia Sena (Uruguay); Agriculture – Mr. Jorge Alvarez (Peru) and Ms. Britta Hoem (Norway); Land Use, Land-use Change and Forestry (LULUCF) – Mr. Sandro Federici (European Community) and Mr. Walter Oyhantçabal (Uruguay); Waste – Mr. Faouzi Ahmed Senhaj (Morocco) and Mr. Jose Villarin (Philippines). Mr. Jose Villarin and Mr. Tinus Pulles were the lead reviewers. The review was coordinated by Mr. Harald Diaz-Bone and Mr. Javier Hanna (UNFCCC secretariat).

2. In accordance with the "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 the United States, 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 2005 submission, the United States submitted a complete set of common reporting format (CRF) tables for the years 1990–2003 and a national inventory report (NIR). The full list of materials used during the review is provided in the annex to this report.

C. Emission profiles and trends

4. In 2003, the most important GHG in the United States was carbon dioxide (CO_2), contributing 84.7 per cent to total[1] national GHG emissions expressed in CO_2 equivalent, followed by methane (CH_4), 7.9 per cent, and nitrous oxide (N_2O), 5.4 per cent. Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulphur hexafluoride (SF_6) taken together contributed 2.0 per cent of the overall GHG emissions in the United States. The Energy sector accounted for 86.5 per cent of total GHG emissions, followed by Agriculture (6.3 per cent), Industrial Processes and Solvent and Other Product Use (4.5 per cent) and Waste (2.7 per cent). Total GHG emissions amounted to 6,893,813.39 Gg CO_2 equivalent and had increased by 13.3 per cent from 1990 to 2003. Total GHG emissions increased by 0.6 per cent from 2002 to 2003, in line with the trends observed from 1990 onwards.

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

D. Key categories

5. The United States has reported a key category tier 1 analysis, both level and trend assessment, as part of its 2005 submission. The key category analyses performed by the Party and the secretariat[2] produced similar results. (An exception being that the secretariat's key category analysis for Industrial Processes identifies Consumption of Halocarbons and SF_6 – Other, which is not included in the key categories list provided by the Party; in response to questions from the expert review team (ERT), the United States explained how some data must be separated due to confidentiality for this source's inclusion in the CRF tables, as detailed in the documentation box of CRF Table 2(II).Fs2.) The United States has not included the LULUCF sector in its key category analysis. In its response to the previous 2005 review stages, the United States indicated that it intended to perform a key category analysis following the Intergovernmental Panel on Climate Change (IPCC) *Good Practice Guidance for Land Use, Land-use Change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF) in its next inventory submission. The Party reports on its efforts to implement a robust plan to support data gathering for both a tier 1 and a tier 2 level analysis and to incorporate the tier 2 approach in its future inventories.

E. Main findings

6. The quality of the inventory submission of the United States is high and the inventory complies closely with the "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories" (hereinafter referred to as the revised UNFCCC reporting guidelines) and the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC good practice guidance). All the required inventory data and methodological information are provided in the CRF and in the NIR. No inconsistencies were identified between the CRF and the NIR. The NIR and its annexes provide very detailed descriptions of the methodologies used for preparation of the inventory.

F. Cross-cutting topics

1. Completeness

7. A full CRF time series is available for the years 1990–2003. The geographical coverage is complete[3] and almost all sources and sinks are covered, as are the relevant GHGs (CO_2, CH_4, N_2O, HFCs, PFCs and SF_6) and the indirect GHGs nitrogen oxides (NO_X), carbon monoxide (CO) and non-methane volatile organic compounds (NMVOCs), as well as sulphur dioxide (SO_2). CRF table 9 and the NIR provide an overview of source/sink categories which are reported as "not estimated" ("NE"), recognizing 25 cases that need further investigation and will be included in the United States' future inventories. In three of these cases, the United States indicates that it expects the source to be very small. No indication for the size of the other sources is given. The ERT noted that some of these source/sink categories that are not estimated might account for significant amounts of emissions and could even be key categories (e.g. 1.B.2 Fugitive Emissions from Oil and Natural Gas – CO_2).

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[2] The secretariat identified, for each individual Party, those source categories which 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 (IPCC) *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*. Key categories 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 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.

[3] See also comments on geographical coverage and forest data in paragraph 57.

8. The United States has reported emissions from non-energy use of fuels separately from emissions from fuel combustion. In table 313 of the NIR, it has provided some background data for the emissions from non-energy use, and estimates these emissions to be 118,000.0 Gg CO_2 equivalent in 2003. The NIR states that "Where appropriate data and methodologies are available, non-energy uses of fossil fuels used for industrial processes are reported in the Industrial Processes sector". Also, the United States reports "NE" under Solvent and Other Product Use. The ERT recommends that the United States better explain the relation between the estimate of emissions from non-energy use of fuels in table 3.11 and the amounts reported under the relevant source categories, including Solvent and Other Product Use.

2. Transparency

9. Together with the complete set of CRF tables for the years 1990–2003, the United States has submitted a NIR which, including annexes, encompasses 850 pages of text, tables and graphs. This is an increase in the number of pages of almost 10 per cent over the 2004 submission and of more than 40 per cent over the 2003 submission. The ERT noted that this increasing amount of information makes it difficult for the ERT, given the format of the centralized review process under the UNFCCC, to have sufficient time to assess in depth all the information contained in the United States NIR. The ERT noted that this is not necessarily only a problem with the size of the United States inventory submission, but rather reflects the realities and limitations of the review process.

10. The large amount of material in the submission also increases the risk of inconsistencies between the NIR and the CRF, as noted during previous 2005 review stages. In its response to the previous 2005 review stages, the United States indicated that it would work to correct the inconsistencies for its future inventory submissions.

3. Recalculations and time-series consistency

11. The ERT noted that recalculations of the time series 1990–2003 had been undertaken to take into account improved methods and updated activity data (AD), emission factor (EFs) and other parameters. The rationale for the recalculations is provided in the NIR. The major changes include separate estimation of emissions from non-energy use of fuels in the Energy sector, and the inclusion of data on different types of management of agricultural soils. Since the recalculation has been performed for the complete time series, time-series consistency is not affected. The recalculations result in a total increase in the estimates of total national GHG emissions equal to 0.7 per cent in 1990 and 1.1 per cent in 2002.

12. The United States has applied a tier 3 approach for N_2O emissions from soils to replace the tier 1 method used in the past. The ERT was unable to assess the applicability and quality of the new estimates, which are based on a new tier 3 model (DAYCENT) within the available time. The ERT proposes that the future ERTs look at this model in more detail in the next in country review of the United States inventory submission.

4. Uncertainties

13. The United States has performed a number of uncertainty analyses and presents the results at the sectoral level as upper and lower limits of the 95 per cent confidence intervals. Quantitative estimates for the overall uncertainty of the total inventory or for individual gases are not reported in the NIR. In its comments to the draft review report, the United States noted that total level and trend uncertainty would be provided in the 2006 inventory submission. The ERT further encourages the United States to specify how the estimations of uncertainties have been used to plan and prioritize future improvements to the inventory.

5. Verification and quality assurance/quality control approaches

14. The institutional arrangements set up in the United States to compile the annual inventory submission are clearly described in the NIR and comply with the requirements of the IPCC good practice guidance.

6. Follow-up to previous reviews

15. The ERT noted that, compared to previous submissions, the completeness and transparency of the inventory have improved, especially with regard to the description of methodologies. A number of source/sink categories that were previously not estimated have also been included in the inventory, specifically CO_2 emissions from Non-energy Use of Fossil Fuels and Petrochemical Production, and N_2O emissions from Settlements Remaining Settlements and Forest Land Remaining Forest Land. The ERT noted with appreciation that for six source categories – Aluminium Production, Electrical Equipment, Semiconductor Manufacture, SF6 Used in Aluminium and Magnesium Foundries, Wastewater Handling and N_2O From Human Sewage – a tier 2 approach has been applied to estimate uncertainty (these categories were previously analysed using a tier 1 approach), and for sources where uncertainty values were not estimated before a tier 1 approach has been applied.

G. Areas for further improvement

1. Identified by the Party

16. The United States indicates in the NIR that it is continuing to improve its estimates of uncertainty and also developing some national EFs where uncertainty is high.

2. Identified by the ERT

17. The ERT identified the following cross-cutting issues for further improvement: the Party should provide uncertainty estimates at total inventory level and use uncertainty information for planning future improvements to the inventory, which the United States has indicated it will provide in the 2006 inventory submission; furthermore, in order to facilitate future reviews and comparisons across Parties by non-United States readers, the ERT encourages the United States to ensure all units are unambiguous (e.g., “metric ton” or “short ton” instead “ton”, “United States Gallon” instead “Gallon”, etc.) or to use units from the International System of Units (SI) in the CRF and the NIR if possible.

II. Energy

A. Sector overview

18. In 2003, the Energy sector accounted for emissions amounting to 5,963,352 Gg CO_2 equivalent, or 86.5 per cent of total GHG emissions in the United States. CO_2 emissions from fuel combustion contributed 82.5 per cent of total national GHG emissions and 97.4 per cent of total CO_2 emissions. Between 1990 and 2003, emissions from the Energy sector increased by 16.0 per cent (from 5,141,730 Gg CO_2 equivalent), mainly caused by increases in emissions from Energy Industries and Transport – of 25.7 per cent and 21.2 per cent, respectively. In 2003, emissions from fuel combustion in Transport contributed 26.3 per cent to total national emissions. Emissions from the Energy sector increased by 0.7 per cent between 2002 and 2003.

19. It appears that all source categories are addressed for the Energy sector and that all years and gases are covered. The Party mentions that the statistics for the allocation of fuel consumption to individual end-use sectors are not sufficiently certain and a subsectoral breakdown is therefore not reported (this is the case for subcategories 1.A.1.b Petroleum Refining; 1.A.1.c Manufacture of Solid Fuels and Other Energy Industries; 1.A.2.a Iron and Steel; 1.A.2.b Non-Ferrous Metals;

1.A.2.c Chemicals; 1.A.2.d Pulp, Paper and Print; 1.A.2.e Food Processing, Beverages and Tobacco; 1.A.4.c Agriculture/Forestry/Fisheries). Previous ERTs have recommended that the United States make the necessary effort to report emissions at a more disaggregated level, following the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Revised 1996 IPCC Guidelines) and the revised UNFCCC reporting guidelines. This ERT reiterates this recommendation.

20. The recalculations carried out in the Energy sector are well documented in the NIR. They have been performed to take into account new EFs and changes in the methodologies. As a result of the recalculations, the estimates of total sectoral emissions for the most recent years have increased by about 0.1 per cent compared to the 2004 submission, while the estimates for total sectoral emissions in 1990 have decreased by only 0.05 per cent.

21. A clear and comprehensive uncertainty analysis has been performed by primary fuel type for every end-use category following the tier 2 IPCC recommended method.

22. The United States is encouraged to include, not only in the documentation box of CRF Table 1.1(a), but also in the CRF completeness table 9, information on where the emissions from each subsector that are described as "included elsewhere" ("IE") have been included, rather than just using the notation key "IE" when the source is allocated to another sector, as is currently done. This is in line with the revised UNFCCC reporting guidelines.

B. Reference and sectoral approaches

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

23. CO_2 emissions from fuel combustion have been calculated using the reference and the sectoral approaches. For the year 2003, there is a difference of 1.9 per cent between the reference and the sectoral approaches. Explanations are provided in the documentation box of CRF table 1.A(c). In addition, the NIR provides explanations for the fluctuations in the differences between the two approaches over the years.

2. International bunker fuels

24. In 2003, the value of the CO_2 emissions (24,635 Gg) for Marine Bunkers was 63.4 per cent less than its 1990 level (67,272 Gg). The trend is unstable and fluctuates. As noted in the United States' comments to the 2004 centralized review report, the United States has begun to examine the split between domestic and international marine data more closely. The United States has noted fluctuations in the current data set and plans to find ways either to explain the fluctuations or to improve the data set with other available information. The ERT commends this effort and encourages the United States to carry it through.

25. Data on Aviation Bunkers are derived from information on sales to United States airlines and the amounts spent by foreign carriers on fuel. The NIR should make it clear how these data together with the national energy data have been validated.

C. Key categories

1. Public electricity and heat production: Liquid – CO_2

26. The EFs for CO_2 from Public Electricity and Heat Production (80.2 t/TJ) were identified by the ERT as the highest of all reporting Parties. The Party responded to previous 2005 review stages that the EFs applied are the most appropriate for the United States. The ERT noted that, while the NIR describes how these are derived, further discussion of the reasons behind these country-specific values would improve the transparency of the reporting.

2. Road transportation: Gasoline – CO_2

27. The EFs for CO_2 from gasoline (ranging from 70.01 to 70.44 t/TJ) were identified by the ERT as being lower than the IPCC default for North America (72.10 t/TJ). The Party responded during previous 2005 review stages that the EFs applied are the most appropriate for the United States. The ERT noted that, while the NIR describes how these are derived, further discussion of the reasons behind these country-specific values would improve the transparency of the reporting.

3. Road transportation: Gasoline and diesel – N_2O

28. The inter-annual changes of the N_2O implied emission factors (IEFs) for gasoline between 2001 and 2002 and between 2002 and 2003 (–9.8 per cent and –8.7 per cent, respectively) have been identified as outliers. The inter-annual changes of the N_2O IEFs for diesel oil for 1990–1991, 1995–1996, 1997–1998 and 1999–2000, and between 2002 and 2003 range from –3.5 per cent to –1.9 per cent. The trend fluctuates. The 1990 and 1992–2003 N_2O IEFs for diesel (ranging from 0.21 to 0.23 kg/TJ) are the lowest of reporting Parties. In its answer to previous 2005 review stages, the United States explained that these changes are due to changing technologies. The United States has pointed out that their N_2O emissions are based on distance travelled by vehicle type and age of each vehicle type, not fuel consumption and this may be the cause of these outliers. The ERT would welcome a discussion in the NIR with respect to how fuel consumption from the national energy statistics compares to fuel consumption based on the statistics of vehicle distance travelled.

4. Other: Other fuels – CO_2, N_2O

29. Emissions from all municipal waste incineration are included in 1.A.5 Other. The ERT noted that, if these emissions are from plants with energy recovery, the emissions should be reported under 1.A.1 Energy Industries; if they are not, then they should be reported in the Waste sector. It is not clear whether emissions from open burning of waste are also reported under 1.A.5 Other.

D. Non-key categories

1. Other: Gaseous fuels – All gases

30. The United States provides AD (fuel use) for gaseous fuels for the entire time series. However, emissions are only estimated for the years 2000–2003. Previous years are reported as "not applicable " ("NA") for CO_2 and "0.0" for CH_4 and N_2O. The United States is encouraged to estimate these emissions for earlier years from the available data.

2. Navigation: Residual oil – All gases

31. Fuel use varies widely (the inter-annual changes are as high as 250 per cent from 1999 to 2000). The ERT notes that the United States intends to review these changes and the data used.

3. Fugitive emissions from fuels – CO_2

32. The NIR states (page 30 in annex 2): "Since October 2000 a portion of the carbon dioxide produced by the coal gasification plant has been exported to Canada by pipeline". To improve transparency, and to demonstrate that the inventory is complete, the United States is encouraged to provide information on the fate of this gas (storage or use) and to indicate where leakage from such transport is reported.

III. Industrial Processes and Solvent and Other Product Use

A. Sector overview

33. In 2003, the Industrial Processes sector generated emissions of 308,587.67 Gg CO_2 equivalent, or 4.5 per cent of the total national GHG emissions of the United States. CO_2 emissions from the sector amounted to 147,171.56 Gg CO_2, or 2.5 per cent of total national CO_2 emissions. CH_4 emissions from Industrial Processes accounted for 0.5 per cent of total national CH_4 emissions, while N_2O emissions from Adipic Acid production and Nitric Acid Production accounted for 5.9 per cent of total national N_2O emissions. In 2003, combined emissions of HFCs, PFCs and SF_6 totalled 137,019.55 Gg CO_2 equivalent. Overall, emissions from the Industrial Processes sector increased by 2.9 per cent from 1990 to 2003, despite some decreases in emissions from several Industrial Processes categories, such as Iron and Steel Production, Electrical Equipment, Production of HCFC-22, and Aluminium Production. The increase in overall emissions was driven by an increase in emissions from Cement Production and, in particular, emissions from the use of substitutes for ozone depleting substances. Emissions from the sector decreased by 2.2 per cent between 2002 and 2003.

34. Methodologies are clearly described, as are the AD and EFs used. Nonetheless, the ERT noted that the transparency of the inventory reporting could be improved by adding documentation on plant-specific quality assurance/quality control (QA/QC) procedures implemented by industries, in particular for emissions or EFs reported directly by industrial companies, for example, in the case of HFC-23 emissions from production of HCFC-22. Furthermore, for some key categories, default EFs and estimated production based on plant capacity are still being applied to estimate emissions, and there is no indication of the size of the latter. This is, for example, the case for N_2O emissions from some plants which produce adipic acid and for PFCs from some plants which produce aluminium. The ERT encourages the Party to obtain plant-specific data from all major plants of a given source category. It should, however, be stated that the United States has made improvements in this respect compared with its previous submissions.

35. With regard to completeness, the ERT noted that some sources of emissions are not estimated in the inventory of the United States. These include CO_2 from Calcium Carbide, Ethylene, Food and Drink, and Solvents and Other Product Use; CH_4 from Ammonia Production, Ferroalloys Production and Aluminium Production; and PFCs from Metal Production and PFCs and SF_6 from Production of Halocarbons and SF6. The ERT encourages the Party to investigate the possibility of including the emissions from these sources in its future inventories, as the Party states, in CRF table 9, that it will do.

B. Key categories

1. Aluminium production – PFCs

36. Emissions from most smelters in the 2005 inventory submission have been calculated using smelter-specific parameters collected through voluntary United States programmes instead of the IPCC defaults. The ERT noted that reporting in the NIR the smelter-specific coefficients used would help to increase the transparency of the inventory.

2. Adipic acid production – N_2O

37. The ERT welcomes the planned improvements reported in the NIR regarding the acquisition of direct measurement data from two of the four plants, and more information on the performance of the control systems in place. In its comments on the draft review report, the United States stated that it will provide further explanation of the inter-annual fluctuations in future submissions, if it is determined to reflect the quality of the inventory emission estimate. The estimates are based on annual production levels and on the performance and actual operation of the control systems in place in all plants. The ERT

notes that the United States acknowledges that further analyses and data are needed to better understand emissions from this sector.

3. Iron and steel production – CO_2

38. As indicated in the previous (2004) review report, the ERT encourages the United States to better document the EFs used, to separate out the emissions from energy use in Iron and Steel Production, and to allocate the component of coke carbon to the processes where it is released, in order to improve the transparency of the estimates. On the other hand, the United States reflects each step of the mass balance of carbon in the CRF tables, presenting some negative CO_2 emissions. To improve comparability among Parties, the ERT recommends that the United States detail the mass balance in the NIR, instead of doing so in the CRF tables, and complete the CRF tables with the required AD and emissions estimates. In its comments on the draft review report, the United States informed that it plans to implement a new methodology for this source, to address this issue and enable more transparency. Emissions from the production of Coke will be considered energy emissions, and emissions associated with the consumption of coke will be considered industrial process emissions.

4. Production of halocarbons and SF_6 – HFCs

39. In 2003, AD for HCFC-22 production were not reported, and thus the HFC-23 IEF could not be calculated. This issue was resolved during the review process, as the Party provided the necessary data. The ERT encourages the Party to include the AD for HCFC-22 production for the complete time series in its future submissions.

5. Consumption of halocarbons and SF_6 – HFCs and PFCs

40. The United States has applied the Environmental Protection Agency Vintaging Model to estimate emissions of HFCs and PFCs. The model is well explained, and the equations and assumptions are clearly shown in annex 3.8 to the NIR. However, the values for key parameters included in the equations are not provided to protect the confidential business information, as it is stated in the referred annex.

C. Non-key categories

Nitric acid production – N_2O

41. The Party estimates that 20 per cent of nitric acid production plants in the United States are equipped with non-selective catalytic reduction (NSCR) and has developed a weighted average EF for plants with and without this abatement technology, using the following EFs: 2 kg N_2O/t nitric acid (HNO_3) for plants using NSCR systems and 9.5 kg N_2O/t HNO_3 for plants not equipped with NSCR. In its comments on the draft review report, the United States explained that, while data on the abatement technology used by facilities is difficult to obtain due to confidentiality concerns, the United States is investigating sources of information to clarify the number of plants with NSCR.

IV. Agriculture

A. Sector overview

42. In 2003, the Agriculture sector in the United States accounted for 6.3 per cent of total national GHG emissions, amounting to 433,285 Gg CO_2 equivalent. CH_4 emissions from the Agriculture sector amounted to 7,705.39 Gg, or 29.7 per cent of total national CH_4 emissions. N_2O emissions amounted to 875.72 Gg, or 73.3 per cent of total national N_2O emissions. Over the period 1990–2003, emissions from the sector increased by 1.6 per cent. In 2003, N_2O emissions contributed 62.7 per cent and CH_4 accounted for the remaining 37.3 per cent of sectoral emissions. Agricultural Soils, Enteric Fermentation

and Manure Management were the major subcategories, contributing 58.5 per cent, 26.5 per cent and 13.1 per cent, respectively, to the total emissions of the sector.

43. The United States identifies three key categories in its analysis for 2003, including Agricultural Soils: Direct Emissions – N_2O, Enteric Fermentation in domestic livestock – CH_4, and Agricultural Soils: Indirect Emissions – N_2O. The analysis includes both level and trend assessments, and discusses qualitative approaches. The ERT recommends that the United States separate the N_2O emissions from Animal Production from the Direct N_2O Emissions from Agricultural Soils in its key category analysis next year.

44. The ERT noted some inconsistencies between the data on Agriculture as shown in the CRF tables. For example, the ERT noted that the population used for non-dairy cattle for Enteric Fermentation is not the same as the non-dairy cattle population used for Manure Management, though the documentation box of the CRF table 4.A explains: "Note that calves, age 0–6 months, are not included in the cattle population data in the enteric fermentation sector, and they are included for manure management as it is assumed that no emissions occur from these animals. Emissions estimates for bulls were not developed using the tier II approach, therefore, they are not included in the Non-Dairy Cattle average daily feed intake or CH4 conversion, and there is no additional information available." Also, the nitrogen excretion (Nex) rates used for different animal waste management systems (AWMS) are different for emissions from Manure Management and from Agricultural Soils. The ERT recommends that the Party describe this matter more transparently in its next submission.

45. The ERT recommends that the Party move dairy heifers to the category Non-Dairy Cattle in its livestock population characterization, as already mentioned in the 2004 review report. The ERT also recommends that the Party update the population data for goats and horses. A constant number has been used for six consecutive years in the case of goats and for three consecutive years in the case of horses.

B. Key categories

1. Enteric fermentation – CH_4

46. The documentation box of CRF table 4.A states that the emissions estimates for bulls are not calculated using the tier 2 approach. The ERT recommends that the Party clarify if these estimates are included in the total sum of the CH_4 emissions from non-dairy cattle reported in Table 4, and also include the population of bulls in the population data of non-dairy cattle reported in Table 4.A, so as to make the IEF more comparable with other Parties.

2. Agricultural soils – N_2O

47. The United States has developed a new process-based tier 3 model named DAYCENT which is used to calculate N_2O emissions from major crops on mineral soils. For non-major crops on mineral soils and emissions from Cultivation of Histosols, the IPCC methodology is used. Since it is not possible for the United States to fill in CRF table 4.D completely by using the process-based model, the ERT during the centralized review had problems to assess the applicability of these methods or the quality of the new estimates which are based on the new DAYCENT model. The model can be reviewed in more detail in a next in country review of United States. .

48. The Nex calculated for Anaerobic Lagoon, Liquid System, Pasture Range and Paddock, Solid Storage and Dry Lot and Other manure management systems in 4.B(b) are not consistent with the Nex AD used for Animal Wastes Applied to Soils in table 4.D. The ERT recommends that the United States improve the consistency of the CRF tables of its next submission.

49. It is not clear whether the same Nex rates have been used for calculating N_2O from Manure Management and N_2O from Direct Soil Emissions, and the amount of ammonia (NH_3) volatilizing from manure. The Party is encouraged to report the Nex rates used in the DAYCENT model in the NIR of its next submission to improve the transparency of its reporting.

50. The ERT was unable to replicate the emissions data produced by the DAYCENT model. All direct soil emissions are reported under Synthetic Fertilizer and no fractions are reported in CRF table 4.D. The ERT encourages the Party to report the data in order to increase comparability and the transparency of the inventory.

51. The ERT noted that the same area for Cultivation of Histosols is used for all years in CRF table 4.D. However, in table 3–106 in the annex to the NIR annual values are given. The ERT encourages the Party to use the annual area estimations in the CRF tables as well, as this would simplify the comparison of the IEF with those reported by other Parties.

C. Non-key categories

1. Manure management – CH_4

52. The ERT noted that the IEF for CH_4 from manure management of dairy cattle increased by more than 3.5 per cent between 2002 and 2003, while at the same time the number of animals fell by 0.3 per cent. In its comments to the draft review report United States explained that in some states there has been a shift to larger facilities, with more liquid-based systems to manage and store manure, which have higher CH_4 emission than dry systems. The ERT recommends that the Party provide this explanation for mentioned above changes in the next submission.

2. Manure management – N_2O

53. The ERT was unable to clarify whether the amount of nitrogen (N) used for calculating the emissions of N_2O from Manure Management has been corrected for NH_3 volatilization during storage, or whether the amount of N volatilized from manure storage is used in a consistent manner in the calculation of N_2O from Manure Management and of indirect N_2O emissions from N volatilization. The ERT recommends that the Party clarify these issues in its next submission.

V. Land Use, Land-use Change and Forestry

A. Sector overview

54. The ERT acknowledged the effort made by the Party to report its data using the new LULUCF reporting tables, pursuant to decision 13/CP.9.

55. In 2003, the LULUCF sector represented a net sink of 828,046 Gg, offsetting 14.2 per cent of total CO_2 emissions in the United States. From 1990 to 2003, net removals of CO_2 declined by 20.5 per cent. In 2002, CO_2 net removals from the sector amounted to 826,483 Gg.

56. The NIR provides a very detailed description of the methodologies used and the system of data acquisition for estimating the LULUCF sector. Most AD and EFs have been derived from accurate national studies and many sources of data are well documented. However, due to the structure of the NIR and the amount of information in it, the ERT was not able to find the relevant information easily during the review process.

57. The United States reports forest data only for the conterminous United States. The ERT noted that forest area in important parts of the United States territory, in particular Alaska, is not included in

the inventory. It recommends that the Party report its forest data for the complete territory of the United States in its next submission.

58. The time series of net carbon (C) stock changes in forest soils shows a high inter-annual variability. The variations are especially significant between 1997 and 1998 (116 per cent), and between 1998 and 1999 (822 per cent). The United States explained that the 1990–2003 time period resulted in a decrease in total forest area of those forest types with high soil carbon density as compared to those with lower soil carbon density. However, it is impossible to provide within the inventory document the detailed tables showing these changes, so the United States proposed that United States Forest Service data can be reviewed in more detail in a next in-country review of the United States. The United States indicates in the NIR that as more information becomes available about historical land use the ongoing effects of changes in land use and forest management will be better accounted for in its estimates of soil carbon.

B. Sink and source categories

59. The ERT noted that there is a general problem of completeness and transparency which derives from the United States' system of detection of land use and tracking of land-use changes, as required by section 2.1 of IPCC good practice guidance for LULUCF. This problem has two major consequences: the Party has not been able to report data for any kind of land use and land-use change in accordance with section 2.1 of IPCC good practice guidance for LULUCF; and the Party has not reconstructed a complete and consistent time series for relevant land uses and land-use changes since 1971. The ERT recommends that the United States combine its inventory data with some proximal and remote sensing techniques in order to be able to detect any land use and land-use change at national level.[4] It could be useful to adopt a system of definitions for all land-use classes and a system of hierarchical rules that is able to classify completely and unequivocally any kind of area detected.

60. The ERT recommends that the United States separate land-use changes ("land converted to") from land uses ("land remaining") because of the implications for the level and dynamic of C stocks. The ERT also recommends that the United States further disaggregate the data in its future submissions or to provide explanations of the specific difficulties it faces in disaggregating data, as recommended in the IPCC good practice guidance for LULUCF.

1. Forest land

61. The United States does not estimate non-CO_2 emissions caused by forest fires. Considering that since 1990 fire has consistently affected United States forests[5] the ERT considered that emissions of CH_4 and N_2O from forest fires could be significant and therefore recommends that the United States include these emissions in its future inventory submissions. In its response to ERT questions, the United States indicated that the major impediment for estimating CH_4 and N_2O from fires is that United States statistics do not indicate the amount of mass of wood or other biomass burned. Nonetheless, the United States does intend to provide emissions of CH_4 and N_2O from fires in future inventory submissions.

2. Cropland

62. CRF table 5(IV) seems to report wrong values for lime AD for both types (limestone and dolomite). The CRF values are 1,000 times less than the values reported in the NIR (table 7–13). In its response to ERT questions, the United States noted this error and replied that it will be corrected for the 2006 inventory submission.

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[4] See for example <https://zulu.ssc.nasa.gov/mrsid>.

[5] See <http://www.nifc.gov/stats/wildlandfirestats.html> and UNECE Forest Fire Statistics (2002) at <http://www.unece.org/trade/timber/ff-stats/99-01/99-01.xls>.

3. Settlements

63. Urban trees represent a significant part of total tree canopy cover in the United States (3 per cent) and the related reported net annual increase in living biomass pool remains constant for the whole period 1990–2003. Since the area reported is also constant, gross removals can only be based on the annual growth rate of trees. Considering that the growth rate is the first derivative of a sigmoidal function, it unlikely to be constant for the whole time series. Accordingly, the net change of C stock in living biomass pool reported for urban trees should reflect the dynamic resulting from increases due to annual growth rate minus any losses due to mortality, pruning and thinning. In its response to questions from the ERT, the United States indicated that a constant value for urban tree cover area and trees yield have historically been reported and, subsequently, net removals. The United States also said that this approach was based on data constraints; urban trees data was based on 1990 United States census data. The United States went on to state that it hopes to incorporate a new set of data on urban trees to derive a carbon sequestration trend from 1990 to the present, and address the "steady state" problem identified by the ERT.

64. The United States reports carbon stock change of "landfilled yard trimmings and food scraps" under category 5.E.1 Settlements Remaining Settlements, and does not consider this carbon stock should be reported as part of the Harvested Wood Products (HWP) pool. The ERT notes that the United States properly reports the HWP pool under category 5.G Other. However, although there is no definitive guidance on this issue, the ERT believes that such a stock should be regarded as a portion of the HWP pool even if it is mainly composed by not-wooden biomass; the ERT consideration is based on the evidence that same principles and reporting methodologies are applied to both the carbon stocks. Moreover, the ERT notes that the "proportion of initial carbon sequestered" (i.e. the fraction of degradable organic carbon which does not decompose) reported in table 7–18 of the NIR is higher than recent literature shows[6]. Thus, the ERT recommends that the Party report the carbon stock changes of "landfilled yard trimmings and food scraps" together with other HWP carbon stocks in the category 5.G. of the LULUCF sector in its next submissions. Finally, the ERT strongly recommends that the Party provide improved explanations and justifications, in light of recent literature, and if necessary reconsider the appropriateness of factors and assumptions applied in the calculation.

VI. Waste

A. Sector overview

65. In 2003, the GHG emissions of the Waste sector in the United States amounted to 183,822 Gg CO_2 equivalent or 2.7 per cent of total national GHG emissions. Solid Waste Disposal on Land accounted for 71.4 per cent, and Wastewater Handling for 28.6 per cent of the Waste sector. The overall trend of the sector shows a decrease in emissions of 12.5 per cent between 1990 and 2003. A decrease in CH_4 emissions from Solid Waste Disposal on Land, by 23.8 per cent over this period, was the main contributor to this change in overall Waste sector emissions.

66. The United States reports estimates for all gases in the sector. The background data tables in the CRF have been updated since previous submissions, and this has given greater transparency to the subsequent recalculations done in this sector. Emissions from waste incineration are reported under the Energy sector. As mentioned in the recommendation provided in the section of that sector, it is important that emissions associated with non-energy recovery be reported under the Waste sector.

[6] Bogner, J. and Matthews, E. (2003). Global methane emissions from landfills: New methodology and annual estimates 1980–1996. Global Biogeochemical Cycles. Vol. 17, No. 2.

67. Extensive recalculations have been performed in this sector, resulting in a 15.8 per cent lower estimate for emissions in 1990 and a 26.6 per cent lower estimate for emissions in 2002 compared with the 2004 submission. Most of this can be attributed to a methodological change in the calculations for Solid Waste Disposal on Land and improved estimates of the amount of solid waste disposed to landfills. Emissions associated with waste-water handling have likewise been recalculated to take into account changes in AD, measurements and methodology.

B. Key categories

1. Solid waste disposal on land – CH_4

68. Methane generation at industrial landfills is pegged at 7 per cent of CH_4 emissions from municipal landfills. This is explained in the 2005 NIR annex 3 (section 3.14), following the recommendation of the 2004 review report. This method of simply basing industrial landfill emissions on municipal landfill emissions through a proportionality constant gave the ERT cause for some doubts. The constant itself (7 per cent) may be outdated, having been obtained from a 1993 Environmental Protection Agency (EPA) study (see step 3 in section 3.14 of the annex to the NIR, page 233), and the use of municipal waste data as a proxy or driver for industrial landfill emissions is questionable. Industrial production data might be more appropriate as a proxy indicator. The ERT recommends that the United States re-evaluate this method for its next submission.

69. The per capita waste generation rate fluctuates from 2.05 kg/person/day in the early 1990s, decreasing to 1.96 in 1996, increasing to 2.11 in 1999, and then remaining constant at 2.00 in the last three years. The United States in its comments to the draft review report provided explanations on this trend. The ERT recommends that the Party include these explanations in its next submissions.

2. Wastewater Handling – CH_4

70. Wastewater Handling is a key category by trend assessment using the IPCC tier 1 approach. The United States has used the IPCC default methodology for its estimations of emissions. The Party has performed recalculations for the full time series for Domestic Wastewater to take into account population adjustment (to include all territories of the United States), and the increasing value of the biochemical oxygen demand (BOD) factor (from 0.06 to 0.09 kg BOD per capita). The time series for Industrial Wastewater has also changed to take into account new data on flow and organic load.

71. As mentioned in the previous (2004) review report, no rationale has been given for the use of the assumption for the fraction of BOD_5 (biochemical oxygen demand 5-day test) (16.25 per cent) of domestic waste water that degrades in anaerobic conditions. In its comments to the draft review report, the United States provided the rationale for the used fraction of BOD_5. With the ERT's encouragement, the United States indicated that it will include this equation in the future NIR submissions. Industry-specific parameters are used, with slight improvements to the data since the 2004 submission.

3. Waste incineration – CO_2, N_2O

72. Waste Incineration is a key category by trend assessment. The United States has used a country-specific method to estimate CO_2 and N_2O emissions, which are reported in the Energy sector. As in the previous (2004) review, the ERT recommends that the United States report under the Waste sector data from the incineration of hazardous and industrial non-hazardous wastes without energy recovery, and differentiate the amounts of the different streams incinerated, biogenic and non-biogenic.

Annex

Documents and information used during the review

A. Reference documents

IPCC. Good practice guidance and uncertainty management in national greenhouse gas inventories, 2000. Available at <http://www.ipcc-nggip.iges.or.jp/public/gp/english/>.

IPCC. Good practice guidance for land use, land-use change and forestry, 2003. Available at <http://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf.htm>.

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B. Additional information provided by the Party

Responses to questions during the review were received from Mr. Leif Hockstad (United States Environmental Protection Agency) including additional material on the methodology and assumptions used.

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