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UNITED STATES OF AMERICA

REPORT OF THE INDIVIDUAL REVIEW OF THE GREENHOUSE GAS INVENTORY SUBMITTED IN THE YEAR 2003[1]

(Centralized review)

I. OVERVIEW

A. Introduction

1. In accordance with decision 19/CP.8 of the Conference of the Parties, the United Nations Framework Convention on Climate Change (UNFCCC) secretariat coordinated a centralized review of the 2003 greenhouse gas (GHG) inventory submission of the United States of America (US). The review took place from 8 to 13 September 2003 in Bonn, Germany, and was conducted by the following team of nominated experts from the roster of experts: Generalists – Mr. William Kojo Agyemang-Bonsu (Ghana) and Mr. Jan Pretel (Czech Republic); Energy – Mr. Audace Ndayizeye (Burundi), Mr. Poorundeo Ramgolam (Mauritius) and Ms. Karen Treanton (International Energy Agency, IEA); Industrial Processes – Mr. Jamidu Katima (Tanzania) and Mr. Jos G. J. Olivier (Netherlands); Agriculture – Ms. Tajda Mekinda-Majaron (Republic of Slovenia) and Ms. Penny Reyenga (Australia); Land-use Change and Forestry (LUCF) – Mr. Daniel Martino (Uruguay) and Mr. Nijavalli H. Ravindranath (India); Waste – Ms. Tatiana Tugui (Republic of Moldova) and Ms. Irina B. Yesserkepova (Kazakhstan). Mr. William Kojo Agyemang-Bonsu and Ms. Penny Reyenga were the lead reviewers of this review. The review was coordinated by Ms. Astrid Olsson (UNFCCC secretariat).

2. In accordance with the UNFCCC review guidelines, a draft version of this report was communicated to the Government of the United States of America, 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 2003 submission, the US submitted a complete set of common reporting format (CRF) tables for the years 1990–2001 and a national inventory report (NIR). The full list of materials used during the review is provided in annex 1 to this report.

C. Emission profiles and trends

4. In the year 2001, the most important GHG in the US was carbon dioxide (CO_2), contributing 83.5 per cent to total[2] national GHG emissions expressed in CO_2 equivalent, followed by methane (CH_4) – 8.7 per cent, and nitrous oxide (N_2O) – 6.1 per cent. Perfluorocarbons (PFCs), hydrofluorocarbons

[1] In the symbol for this document, 2003 refers to the year in which the inventory was submitted, and not to the year of publication. The number (3) indicates that this is a centralized report.

[2] 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.

(HFCs) and sulphur hexafluoride (SF_6) taken together contributed 1.6 per cent (PFCs 0.1 per cent, HFCs 1.2 per cent, SF_6 0.3 per cent) of the overall GHG emissions in the country. The Energy sector accounted for 85.4 per cent of total GHG emissions, followed by Agriculture (6.8 per cent), Industrial Processes (4.1 per cent) and Waste (3.6 per cent). Total GHG emissions (excluding LUCF) amounted to 6,936,208.61 Gg CO_2 equivalent and increased by 13 per cent from 1990 to 2001. CO_2, N_2O, and PFC, HFC and SF_6 emissions increased by 16 per cent, 7 per cent and 18 per cent,[3] respectively. CH_4 emissions decreased by 6 per cent over the same period. The fastest-growing sources of emissions include energy industries (24.2 per cent), transport (20.6 per cent) and agriculture (7.7 per cent).

D. Key sources

5. The US has reported a key source analysis using the tier 1 level and trend assessment as part of its 2003 submission. The key sources analysis performed by the Party and the secretariat[4] produced similar results (the US analysis, based on all years 1990–2001, identified 24 key sources while the secretariat identified 27 key sources).

E. Main findings

6. All required inventory data and methodological information were provided in the CRF and in the NIR; no major inconsistencies between the CRF and the NIR were identified. The NIR provides detailed descriptions of the methodologies used for inventory preparation. However, only a brief description of the national inventory system is provided. In general, the quality of the US inventory (both the CRF and the NIR) can be rated as high.

F. Cross-cutting topics

Completeness

7. The US submitted GHG inventories for the years 1990–2001 using the CRF, accompanied by a very comprehensive NIR, which includes all information prescribed by the UNFCCC guidelines. All major sources and sinks are covered. Where emissions or removals are not reported, explanations are provided in the NIR and the CRF.

Transparency

8. Methods and the rationale for selecting information sources and emission factors (EFs) were adequately described and documented in the NIR and relevant tables. Some transparency is lost where more complex methods or models have been used, as these are more difficult to document in the NIR. Transparency could be improved by more accurate use of the "IE" (included elsewhere) notation key where subcategories are reported elsewhere and the provision of a complete explanation of these.

Recalculations and time-series consistency

9. The expert review team (ERT) noted that recalculations of the time series 1990–2000 have been undertaken to take into account changes in methods, EFs and data. Each year the US recalculates and revises the emission and sinks estimates for all years as a result of the use of better methods or data. The effect of the latest recalculations for the base year was an increase by 0.15 per cent in CO_2 equivalent emissions excluding LUCF and 0.67 per cent including LUCF. The rationale for the recalculations is provided in the NIR on a sectoral basis.

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[3] Largely due to the 132 per cent increase in emissions of HFCs.

[4] 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.

Uncertainties

10. The NIR provides quantitative information on uncertainty estimates only for a limited number of sources. Qualitative indications of uncertainties have been provided; they are based largely on expert judgement. Overall, the uncertainty for N_2O emissions estimates is considerably higher than that for CH_4 and other precursors; all these gases involve far more uncertainty than CO_2 emissions from fossil fuel combustion. The US states in its NIR that beginning with the 2004 submissions it intends to provide quantitative estimates for all source and sink categories, in accordance with the new UNFCCC reporting guidelines (FCCC/CP/2002/8).

Verification and quality assurance/quality control approaches

11. No information on quality assurance/quality control (QA/QC) is available. The US intends to include the process of self-verification or independent review procedure according to 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) in the preparation of its next NIR.

Follow-up to previous reviews

12. The 2003 inventory submission significantly improved the consistency of the data provided in the CRF tables and in the NIR. No major inconsistencies have been identified for inventory year 2001.

G. Areas for further improvement

Identified by the Party

13. The US indicates that it is working to improve its estimates for all source and sink categories and is planning to implement, in accordance with the new UNFCCC reporting guidelines on annual inventories, a quantitative uncertainty analysis for the 2004 inventory submission, including, where possible, a tier 2 key source analysis.

Identified by the ERT

14. The ERT identifies the following major areas for improvement related to cross-cutting issues in the US inventory. The Party should provide in the next NIR: quantified uncertainty estimates; information on the QA/QC management system; and a more detailed description of the national inventory system. Recommended improvements relating to specific source/sink categories are presented in the relevant sector sections of this report.

II. ENERGY

A. Sector overview

15. In the year 2001, the Energy sector accounted for 85.5 per cent of the US's total emissions excluding LUCF. The four largest key sources contributed 75.5 per cent of the US's total emissions: CO_2 emissions from stationary sources for gas, oil and coal and from road vehicles. Over the period 1990–2001, GHG emissions from the sector increased by 15.1 per cent and reached a peak in 2000 (when they were 1.4 per cent higher than the 2001 value). Most of the growth occurred in energy industries (24.2 per cent) and in transport (20.6 per cent).

16. In general, the NIR is complete and transparent for the Energy sector, with a detailed discussion of activity data (AD), methodologies and EFs. Supporting documentation and references are provided. Calculations for the key energy sources are reported in the NIR and are consistent with the IPCC good practice guidance.

17. Although statistics of total fossil fuels and other energy consumption are mentioned in the NIR as relatively accurate, the allocation of the consumption to individual end-use sectors is less certain and in some cases a subsectoral breakdown is therefore not reported. The ERT recommends that the United States make the necessary efforts to report emissions at a more disaggregated level following the *Revised 1966 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC Guidelines).

18. CO_2 emissions from solid fuel transformation, oil exploration, transportation/refining, storage, natural gas exploration, production/processing and multilateral operations were not estimated ("NE"). The ERT recommends that the United States consider whether these activities would be key sources if they were estimated and, if they would be, to include them in the inventory.

19. Uncertainties were discussed qualitatively in the NIR for each energy source. The Party stated in the NIR that it would provide quantitative estimates for all source categories in the 2004 submission. No information on self-verification or QA/QC procedures for the Energy sector is provided in the NIR.

B. Reference and sectoral approaches

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

20. CO_2 emissions from the Energy sector were calculated using the reference and sectoral approaches. For the 2001 inventory, there is a difference of 0.93 per cent between the two approaches. Apparent consumption under the US reference approach corresponds closely to the International Energy Agency (IEA) data.

International bunker fuels

21. The use of notation keys for gasoline, lubricants and coal for marine bunkers, and gasoline for aviation bunkers is inconsistent between table 1.C and table 1.A(b). In addition, the AD reported for jet kerosene are inconsistent between the tables. These figures and notation keys should be checked and reported consistently. The ERT also recommends that the United States reconcile the differences between the CRF data and the IEA data on marine and aviation bunkers and harmonize the data submitted to different international organizations.

22. The ERT recommends that efforts be made to estimate non-CO_2 gases from aviation bunker fuels using the separate landing/take off cycle (LTO) and cruise tier 2 method. The ERT does note that the Party is making efforts to collect accurate AD on international fuel consumption.

Feedstocks and non-energy use of fuels

23. A detailed explanation of methodologies, data sources and uncertainties on feedstocks and non-energy use of fuels is reported in the NIR.

C. Key sources

Stationary combustion

24. AD and emissions for 1.A.1.b Petroleum Refining and 1.A.1.c Manufacture of Solid Fuels and Other Energy Industries, along with all subcategories of 1.A.2 Manufacturing Industries and Construction, are reported under 1.A.2.f Manufacturing Industries and Construction – Other. The ERT acknowledges that this reporting structure reflects the manner in which fuel consumption data is collected, however the ERT would encourage the Party to collect data or develop methods that would enable reporting of emissions from these subcategories following the IPCC structure.

25. The 2001 CO_2 implied emission factors (IEFs) for liquid fuels for manufacturing industries and construction category and Other subcategory CO_2 are the lowest among the reporting Parties. The Party explained that the CO_2 IEF is most likely lower because of the large amount of liquid fuels used for non-

energy purposes. However, the ERT considers that, when using a sectoral calculation, the amount of liquid fuels used for non-energy purposes should not be included in the AD as an amount of fuel combusted, and recommends that the Party revise its assumption.

26. For the agriculture/forestry/fisheries subcategory, the "IE" notation key was used, with no indication of where these emissions were included. The ERT encourages the Party to document where the corresponding AD and emissions were reported and to make the necessary efforts to report emissions from this subcategory following the IPCC structure.

Mobile combustion

27. The trends observed for the N_2O IEF for gasoline and diesel in road transport for the period 1990–2001 are unusual. For gasoline, the IEF reaches a peak in 1994 (12.03 kg/TJ) and then slowly decreases. The 2001 value (9.37 kg/TJ) is 10.8 per cent lower than the 1990 value (10.50 kg/TJ). For diesel, the IEF reaches a peak in 1995 (2.47 kg/TJ) and then decreases. The 2001 value (2.30 kg/TJ) is 1.6 per cent lower than the 1990 value (2.33 kg/TJ). The ERT recommends that the US provide documentation in the NIR to support these changes in the IEFs. In response to the draft of this report the Party has explained that the reduction in the IEFs is due to the introduction of newer vehicles with catalyst and engine designs meeting the more recent and stringent EPA Environmental Protection Agency (EPA) Tier 1 and low emission vehicle (LEV) standards. These standards result in lower N_2O emissions compared with earlier catalyst designs.

28. Domestic emissions from aviation are calculated by subtracting the international bunker estimate from the domestic total. The AD for aviation gasoline differ between the CRF and IEA data as the definitions of international bunker fuels used to compile the two data sets are different. The ERT encourages the Party to make efforts to harmonize the data submitted to different international organizations.

29. In the estimation of emissions from aviation, the US does not separate cruise and LTO emissions for non-CO_2 gases (or for CO_2). The ERT encourages the Party to use the higher tier for estimation of these emissions.

Fugitive emissions

30. For oil and gas operations, CH_4 emissions and AD from "other leakage" are reported as "IE". However, it is not clear where those emissions are included. The ERT encourages the Party to provide the information in a more transparent way.

D. Non-key sources

Stationary and mobile combustion

31. For the category 1.A.5 Other, CH_4 and N_2O emissions for liquid, solid, biomass and other fuels are reported as "NE" (with the exception of N_2O from other fuels). CH_4 and N_2O emissions from gaseous fuels were reported as not occurring ("NO"). The ERT encourages the Party to explain why emissions from gaseous fuels do not occur.

32. For 1.A.3.e Other Transportation, CH_4 and N_2O emissions for gaseous fuels are reported as "NE", while CO_2 emissions have been reported. The ERT encourages the Party to make the necessary efforts to include those emissions in its next GHG inventory submission.

33. AD and CH_4 emissions from solid fuel transformation are reported as "IE", but no information is given as to where they are included in the CRF. The ERT encourages the Party to provide the information in a more transparent way.

Fugitive emissions

34. CO_2 emissions from activities under the 1.B.2.a Oil and 1.B.2.b Natural Gas subcategories are reported as "NE" or "IE". N_2O emissions from flaring are reported as "NE". The ERT encourages the Party to make the necessary efforts to estimate and report the emissions from these sources and to provide clear references to where the corresponding emissions were reported.

III. INDUSTRIAL PROCESSES AND SOLVENT USE

A. Sector overview

35. In 2001, Industrial Processes emissions accounted for 4.1 per cent of total CO_2 equivalent emissions (without LUCF), almost the same as in 1990 (5 per cent). CO_2 emissions represented 51 per cent of the sector's emissions in 2001 (of which cement production and iron and steel production accounted for 14 per cent and 21 per cent respectively). Actual emissions of fluorinated gases (F-gases) accounted for 39 per cent and those of N_2O (mainly from nitric acid production) for only 9 per cent. In the period 1990–2001, Industrial Processes CO_2 equivalent emissions fell by 5 per cent, mainly because of decreases of 13 per cent in CO_2 emissions – notably from iron and steel production – and of 27 per cent in N_2O emissions, in particular from adipic acid production. This was partly compensated by an 18 per cent increase in F-gases mainly as a result of the increase of emissions from substitution of ozone-depleting substances.

36. Both actual and potential emissions for individual fluorinated gases were reported, except for compounds of which the consumption and emissions are considered confidential. For industrial processes, in addition to the key sources identified by the Party, the secretariat also found SF_6 from magnesium production to be a key source.

37. Major improvements have been made with the addition of N_2O from product use as a new source (4.5 Tg CO_2 equivalent in 1995), and with the completion of 1990–2001 recalculations of SF_6 from electrical equipment and from magnesium production, and of CO_2 from feedstocks/product use and N_2O from adipic acid production, which were generally well explained.

38. The transparency of this technological sector could be improved by providing more detailed information on actual EFs used per type of technology, technology fractions in total production, and specific information on what proportion of total AD was based on capacity rather than actual production, as well as regarding the implementation of IPCC methodologies (corresponding IPCC tier). In addition, transparency could be improved by adding summary documentation on QA/QC procedures implemented by industries, in particular for emissions or EFs reported directly by industrial companies.

39. Regarding completeness, the major sources have been estimated. However, the ERT encourages the Party to conduct a quantitative survey on the significance of the non-reported sources identified in annex X, in particular SF_6 and N_2O. The non-estimated sources listed in table 9 (completeness table) of the CRF were based on the sources listed explicitly in the CRF, while annex X defines some of the excluded sources in a broader or narrower sense. The Party explained that the discrepancies with the IPCC Guidelines regarding the lack of methodology for CH_4 from coke production and SF_6 from soundproof double-glazed windows will be addressed in future NIRs.

40. Comparability between sources could be improved by allocating them to the recommended IPCC (sub)categories and by closer correspondence between the sources listed as "IE" in the CRF tables and the explanation where they have actually been included instead. This also applies to deviations at subcategory level.

B. Key sources

Ammonia production and urea fertilizer application – CO_2

41. The CO_2 emissions from this key source have been recalculated for all years, and it has now been split into ammonia production and subsequent urea production/application, adjusted to account for the net import of urea. This method of calculating separately emissions related to urea consumption, which is explicitly not recommended by the IPCC Guidelines, changes (in this case increases) the amount of CO_2 emissions allocated to the country as it takes into account a net import/export of urea by about 0.8 Tg CO_2 in 1990 and about 1.5 Tg CO_2 in recent years. Although the methodology appears very accurate, the ERT questions whether this approach is in accordance of the definition of national emissions that a Party is required to report. In response to this draft report the Party has indicated that it is currently reviewing the approach to ensure it is consistent with national inventory reporting requirements.

Adipic acid production – N_2O

42. Emissions from this source are based on a mix of plant-specific data and IPCC good practice guidance default factors for plants where direct measurement data were not used. The Party explained that plant-level direct measurements are based on a standard measurement protocol using continuous emission monitors (CEMs). For full compliance with the IPCC good practice guidance, the ERT encourages the Party in its efforts to obtain documentation on measurement QA/QC activities and protocols from the plants where direct measurement data are used. Confidentiality precludes the reporting of plant-specific emission control efficiencies. However, the Party is attempting to obtain plant-specific information as well for those plants, although there is no formal requirement for facilities in the US to submit these data.

Iron and steel industry – CO_2

43. Emissions are calculated on the basis of a direct mass balance of carbon-containing raw materials and products, and includes coke production since this is considered by the Party to be an industrial (non-energy) use of coal. The present breakdown of CO_2 emissions of this category in the CRF, although it is meant to provide insight into the country-specific method, leads to AD and IEFs for steel production that may cause confusion. Therefore, although the present format of the CRF for this source category suggests that for each of the sub-sources mentioned (net) CO_2 emissions should be reported, the ERT recommends that the Party only include in the CRF the net emissions for the two types of iron and steel production – blast oxygen furnace (BOF) and electric arc furnaces (EAF) – possibly including emissions from coke production, and provide detailed information on the calculations in the NIR.

Consumption of halocarbons and SF_6

44. The Vintage Model used by the US is well described in detail in annex K. However, no information on EFs and related factors used is provided, nor are references for them, except for IEFs for some subcategories in the CRF. Because of the nature and complexity of the Vintage Model, the thousands of data points that it uses and the frequency of the updates as additional market information becomes available, the ERT strongly recommends that the Party provide more transparency in factors used and their trend over time. This refers to reporting non-confidential national average values of manufacturing losses, and leakage and maintenance losses per gas and application, whenever possible. In response to the draft of this report, the Party has indicated that it will investigate supplying additional details, such as EF averages, ranges and trends, similar to the information contained in the Godwin et al. (2003) paper, which was provided to the ERT.

45. The Party reports in the sectoral background tables 2(II).F a number of fluorinated gas consumption categories as "IE" with the data included in another entry in the same row of the CRF table. In response to this draft report the Party explained that it reports total annual consumption of halocarbons

for the end-use which has the largest IEF (mostly stocks), thereby providing IEFs which are as comparable as possible given the confidential nature of much of the background data.

C. Non-key sources

Solvent and other product use – CO_2

46. Although CO_2 emissions from product use (non-energy use emissions from the use of carbon containing products) (3.A-C) are reported in the CRF table 9 (completeness table) as "NE", these are partly reported in the Energy sector and partly in the Industrial Processes sector. Although the methodology is well documented in the NIR, it does not provide details of the exact source allocation. The ERT recommends that the Party improve the transparency of the source allocation over various sectors (1, 2, 3, 6) and document the QC performed to ensure that there is no double counting and no missing parts. In addition, the ERT encourages the Party to reallocate these emissions to the Solvent and Other Product Use sector as recommended by the IPCC Guidelines.

N_2O from product usage – N_2O

47. This (minor) source has been added to the inventory and reported under Industrial Processes. The ERT recommends that the US allocate these emissions to the Solvent and Other Product Use sector as recommended by the IPCC Guidelines. In response to the draft of this report the Party has indicated that it will move this source to the Solvents and Other Product Use sector in the next submission.

IV. AGRICULTURE

A. Sector overview

48. The Agriculture sector contributed 6.8 per cent of total national CO_2 equivalent emissions in 2001. Between 1990 and 2001 emissions from the sector increased by 7.7 per cent. Emissions in all subsectors increased over this period with the exception of enteric fermentation, where they declined by 2.6 per cent because of declining animal populations.

49. The reporting of emissions in the CRF for the Agriculture sector is complete. Some minor enteric fermentation and manure management source categories (for example, buffalo, mules and asses, and camels and llamas) are reported as "NE" as data are not available on these species. Prescribed burning of savannas (4.E) is reported as "NO".

50. Information about AD, methodologies, EFs and qualitative estimates of uncertainty has been provided in the NIR. No information is provided on QA/QC procedures for the sector. To improve transparency the documentation of the methodologies and data used to estimate emissions from manure management should be improved in future submissions. In its response to this draft report, the Party states in its NIR that beginning with the 2004 submissions it intends to provide information on its QA/QC procedures for all source and sink categories, in accordance with the new UNFCCC reporting guidelines (FCCC/CP/2002/8).

51. Recalculations of previous inventories have been made following revisions to AD, changes to the diet information for non-dairy cattle and changes to the method for estimating volatile solid excretion rates for cattle. The changes have been applied appropriately across the time series and are explained in the NIR and the CRF.

B. Key sources

Manure management – CH_4

52. The NIR provides no information on the source of the methane conversion factor (MCFs) used for non-liquid manure management systems. The MCFs do not vary between the cool and temperate regions and the values for dairy cattle reported in table 4.B(a) are not consistent with the IPCC

Guidelines. The ERT recommends that the Party improve the documentation of the methodology and assumptions in the NIR. In response to the draft of this report the Party has indicated that for the next submission it will assign climate zones to each State for the dry systems and will include documentation in the NIR.

53. No information is provided in the CRF or the NIR on the allocation of waste between manure management systems. Table 4.B(a) only provides details on the allocation of wastes between climate regions within a manure treatment. Improved documentation should be provided in the NIR, and the allocations provided in table 4.B(a) for all manure management systems within a climate region should add up to 100. In response to the draft of this report, the Party explained that as emissions were calculated on a state-by-state basis it was not practical to include all information in the CRF. Detailed tables will be included in the next submission.

54. The emissions for goats, horses and sheep are based on an extrapolation of a 1990 tier 2 based emission estimate using the national population data from 1991-2001. Although a reference to the source document for the 1990 emission estimate is given, no details on volatile solid production, MCFs or waste treatments are provided in either the NIR or the CRF (all are identified as "NE" in table 4.B(a)). The IEFs for these sources are higher than those reported by other Parties and the IPCC Guidelines, and without access to the source document it is not possible to analyse the reasons for these differences. In response to the draft of this report, the Party has indicated that it will provide a more comprehensive summary of the base tier 2 methods upon which the estimates are based in the next submission.

C. Non-key sources

Manure management – N_2O

55. The nitrogen excretion rates for animals in the US are based on country-specific data. In response to questions from the ERT the US indicated that the excretion rates are based on experimental measurements. The ERT recommends that the Party document this in the NIR to ensure transparency.

V. LAND-USE CHANGE AND FORESTRY

A. Sector overview

56. The LUCF sector represents a net sink of 838,137 Gg, offsetting 12 per cent of the US's total emissions. From 1990 to 2001 net removals have declined by 21.9 per cent.

57. All the LUCF tables in the CRF have been completed with AD, IEFs and notation keys reported as appropriate. Emissions and removals from categories 5.B and 5.C are reported as either included elsewhere ("IE") (i.e., under 5.A Temperate Forests) or "NE" because of lack of data (i.e., tropical and boreal forests). Non-CO_2 emissions associated with biomass burning are reported as "NO". The US also reports removals associated with landfilled yard trimming under 5.E.

58. The NIR provides a thorough description of methods used and explanatory comments on the national method are provided in the documentation boxes of the CRF. The US has adopted a carbon stock change approach based on forest inventory data to estimate net emissions or removals. As the US forest inventory data are periodic, with a frequency of five and 10 years, models are used to project forest inventory data in the intervening years. Some transparency is lost as a result of the use of these models, and this is further complicated by the inability to report all AD and EFs. In its response to this draft review report the US states that it will continue its efforts to improve the transparency of the NIR and stock reporting in the CRF.

59. No specific QA/QC procedures have been reported in the NIR for the LUCF sector. Many of the estimates have undergone peer review, having been published in scientific papers. The NIR provides a very detailed assessment of uncertainties and the methods adopted. Quantitative estimates are provided for some emissions or removals categories. The uncertainties arise from several sources; limitations of

models, year (associated with the forest inventory), assumption of constant soil carbon density, timberlands data used to extrapolate to non-timberlands, overlaps between urban tree and forest carbon estimates, and lack of information on the fate of carbon in landfills.

B. Sink and source categories

Changes in forest and other woody biomass stocks

60. The emissions and removals associated with urban trees did not change for the period 1990–2001. The ERT suggests that an explanation of the fixed estimates should be provided in the NIR. In addition, the production approach adopted does not provide an accurate estimate of domestic stocks of harvested wood products (HWP). The ERT encourages the Party to improve estimates by using annual data on production, consumption and decay. In response to this draft report the Party has explained that the single annual estimate should be representative of the period 1990 to 2001 as it is based on data collected throughout the period.

61. The ERT encourages the Party to collect data and report changes in carbon stocks for tropical and boreal forest areas. The Party is also encouraged to use consistent land category descriptions between the CRF and NIR. The CRF reports plantations, naturally regenerated evergreen and deciduous land categories, but the NIR discusses timberlands and non-timberlands. In its response to this draft report, the Party explained that using land category descriptions such as used in the CRF would be difficult in the US given the way that the forest survey in the US is implemented. The US will continue to evaluate ways of disaggregating its land categories (i.e., timberlands and non-timberlands) into the CRF categories.

Forest grassland conversion and abandonment of managed lands

62. Fluxes arising from these activities are not reported under IPCC categories 5.B and 5.C as they are assumed to be encompassed in the overall estimate of fluxes in forests (5.A) based on forest inventories. To increase transparency, the ERT encourages the Party to report the emissions and removals associated with forest and grassland conversion and managed lands abandoned and regenerating separately from the forest inventory. In response to this draft report, the Party has indicated that it plans to evaluate this for future submission.

63. The US indicated that it accounts for the carbon loss associated with forest fires but reports the resulting non-CO_2 gas emissions as "NO". The ERT recommends that the Party estimate the non-CO_2 gas emissions or report them as "NE" in the CRF.

CO_2 emissions and removal from soils

64. Net CO_2 removals from soils decreased by 83 per cent during 1990–2001 due to a reduction of 84 per cent in removals between 1996 and 1997. Although some information is provided, the ERT felt that this significant reduction in removals was not adequately explained. The ERT recommends that the Party provide a clear explanation for the large reduction in removals in the NIR. In addition, the large differences in the IEFs for organic soils compared to IPCC default values – over 10 times for cool upland crops and pastures/forests – should be explained. In response to the draft of this report, the Party has indicated that the large decline is due to the methodology used. The Party is currently developing a new approach for estimating forest soil carbon which should minimize this problem. In relation to the EFs for organic soils, the Party has indicated it is using country-specific EFs which it believes are more representative of US soils than the IPCC defaults and the EFs are documented in the NIR.

65. There appears to be an inconsistency between the values of CO_2 removals from forest soils reported in the CRF and the NIR. In response to this draft report the Party has indicated that the NIR reports emissions from the forest floor and removals from forest soils separately while the net removals are reported in the CRF. The ERT recommends that for consistency the Party also report the emissions and removals separately in table 5 of the CRF.

Other: landfilled yard trimmings

66. The US inventory includes a country-specific activity – landfilled yard trimming – under Other. No other country reports this stock and it is not covered in the IPCC Guidelines. The ERT recommends that the Party include a clear justification for its inclusion, improve the documentation of the AD and EFs used, and provide quantitative estimates of uncertainties for this activity. In response to this draft report the Party has indicated that it plans to undertake an uncertainty analysis of this activity for the next submission.

VI. WASTE

A. Sector overview

67. Emissions from the Waste sector represented approximately 3.6 per cent of total GHG emissions in the US in 2001. During the period 1990–2001 emissions from the sector decreased by 0.9 per cent. Landfills were the largest source of anthropogenic CH_4 emissions, accounting for 33 per cent of the US total. During the period 1990–2001 CH_4 emissions from landfills decreased by 4 per cent. This slightly downward trend is the result of increased landfill gas recovery.

68. The Waste sector covers emissions from three sources: solid waste disposal on land, waste-water handling and waste incineration. Emissions of N_2O from waste water and CH_4 emissions from waste incineration are reported as "NE" because of difficulties in obtaining data and the large uncertainties. The US has indicated that it will investigate these emissions for inclusion in future inventories. Emissions from municipal solid waste (MSW) combustion, generated as a result of combustion of plastic, synthetic rubber and synthetic fibres, are reported as "IE". Table 9 indicates that these emissions are included in the Energy sector.

69. Country-specific methods were used for estimating emissions from solid waste disposal sites (SWDS) and waste incineration. Emissions from waste-water handling have been estimated using the IPCC default value. The assumptions and methodologies used for estimating emissions are well described in the NIR and comprehensive statistical data on MSW are provided for the period 1960–2001.

70. All CRF tables specific to the Waste sector were submitted, and contained data and notation keys. The methodologies described and EFs given in the CRF and the NIR are comparable to those from other Parties. Qualitative uncertainty estimates are provided in table 7 of the CRF. Major sources of uncertainties associated with the inventory estimates of methane emissions from landfills include the landfill coefficients for which there have been limited updates to reflect changes in management practice. Recalculation tables were provided in the CRF for inventory years 1990–2000.

B. Key sources

Solid waste disposal on land – CH_4

71. Compared with other Annex I Parties, the US has one of the higher figures for CH_4 emissions per capita from SWDS. This can be explained by the high waste generation rate (3.56 kg/capita/day) and the relatively large fraction of the waste disposed at SWDS (0.61). The ERT identified that the composition of landfilled waste reported in additional information table 6.A of the CRF was less than 1. The US has confirmed that the proportion of waste allocated to the category Other should be 0.22 instead of 0.02 and has indicated that it will correct this error in its next submission.

ANNEX 1: MATERIALS USED DURING THE REVIEW

A. Support materials used during the review

2002 and 2003 Inventory submissions of the United States of America. 2003 submission including CRF for years 2001 and an NIR.

UNFCCC secretariat. "Report of the individual review of the greenhouse gas inventory of the United States of America submitted in the year 2000 (desk review)". FCCC/WEB/IRI(1)/2000/USA (available at http://unfccc.int/program/mis/ghg/countrep/usadeskrev.pdf).

UNFCCC secretariat. "Report of the individual review of the greenhouse gas inventory of the United States of America submitted in the year 2000 (in-country review)". FCCC/WEB/IRI(2)/2000/USA (available at http://unfccc.int/program/mis/ghg/countrep/usaincountrep.pdf).

UNFCCC secretariat. "2003 Status report for the United States of America" (available at http://unfccc.int/program/mis/ghg/statrep2003.html).

UNFCCC secretariat. "Synthesis and assessment report of the greenhouse gas inventories submitted in 2003. Part I." FCCC/WEB/SAI/2003 (available at http://unfccc.int/program/mis/ghg/s_a2003.html) and Part II – the section on the USA (unpublished).

UNFCCC secretariat. Review findings for the USA (unpublished).

UNFCCC secretariat. "Handbook for review of national GHG inventories." Draft 2003 (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." FCCC/CP/1999/7 (available at http://www.unfccc.int/resource/docs/cop5/07.pdf).

UNFCCC secretariat. "Guidelines for the technical review of greenhouse gas inventories from Parties included in Annex I to the Convention." FCCC/CP/2002/8 (available at 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 at http://www.ipcc-nggip.iges.or.jp/public/gp/gpgaum.htm).

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

IISI (2002) *World Steel in Figures. 2002 Edition* (available at http://www.worldsteel.org/media/wsif/wsif2002.pdf).

Maiss, M. and Brenninkmeijer, C. A. M. 1998. "Atmospheric SF_6: Trends, sources, and prospects." *Environmental Science & Technology* 32 (20), pp. 3077–3086.

B. Additional materials

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

Godwin, D. S., van Pelt, M. M. and Peterson. K. 2003. "Modelling emissions of high global warming potential gases from ozone depleting substance substitutes." Paper provided by the US Environmental Protection Agency during the review.

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