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NATIONAL COMMUNICATIONS

COMMUNICATIONS FROM PARTIES INCLUDED IN ANNEX I TO THE CONVENTION: GUIDELINES, SCHEDULE AND PROCESS FOR CONSIDERATION

Possible revisions to the guidelines for the preparation of national communications by Parties included in Annex I to the Convention

Addendum

METHODOLOGICAL ISSUES

Note by the secretariat

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I. INTRODUCTION

A. Mandate

1. The Conference of the Parties, at its first session (COP 1), decided that the Subsidiary Body for Scientific and Technological Advice (SBSTA) should consider the methodological issues arising from the review of national communications, including those identified in the compilation and synthesis of national communications and in available in-depth review reports, and make recommendations thereon to the COP at its second session (decision 4/CP.1).[1] The COP further decided that the SBSTA should provide advice to the COP and to the Subsidiary Body for Implementation (SBI) on further development, refinement, improvement and use of comparable methodologies for national inventories of emissions and removals of greenhouse gases and for projecting national emissions and removals of greenhouse gases and comparing the respective contributions of different gases to climate change.

2. The SBSTA, at its first session, considered the allocation and control of emissions from international bunker fuels, and requested the secretariat to provide an options paper on that subject to the SBSTA for consideration at a future session (FCCC/SBSTA/1995/3).

3. The SBSTA, at its second session, requested the secretariat to prepare a report suggesting possible revisions to the guidelines for the preparation of first communications by Annex I Parties (FCCC/SBSTA/1996/3), taking into account the submissions by Parties and the experience from the review process, for consideration at its third session, aiming at adopting revised guidelines at COP 2 in time for the preparation of the second national communications by Annex I Parties. The SBSTA, with a view to overcoming inconsistencies in the presentation of data on inventories, further requested the secretariat to address issues such as electricity trade, bunker fuels, use of global warming potentials (GWPs), land-use change and forestry, and temperature adjustments in the documentation to be prepared for consideration by the SBSTA at its third session.

B. Scope of the note

4. This document is an addendum to the secretariat's proposal for revised guidelines for the preparation of national communications by Annex I Parties (FCCC/SBSTA/1996/9). It should be read in conjunction with that document and with the second compilation and synthesis of national communications (FCCC/CP/1996/12 and Add. 1 and 2). It should also be read in conjunction with the submissions of the seven Parties that commented on potential revisions to the guidelines for the preparation of national communications by Annex I Parties (FCCC/SBSTA/1996/MISC. 4).

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[1] For decisions adopted by the Conference of the Parties at its first session, see document FCCC/CP/1995/7/Add.1.

5. The present note includes separate sections pertaining to methodological issues in the following areas: accounting for the emissions associated with electricity trade, allocation and control of emissions from marine bunker and aviation fuels, use of GWPs, land-use change and forestry, and the use of temperature adjustments. It also includes options for consideration and suggestions for possible action by the SBSTA. The note is accompanied by a companion document (FCCC/SBSTA/1996/9/Add.2) that contains additional information on the electricity trade and bunker issues.

6. The basic assumption in drafting this note has been that the allocation of emissions should be done in a transparent and comparable way, avoiding double counting or incomplete accounting of emissions. The secretariat recognized that Parties, in the context of their evaluation of policies and measures for their national planning, may need special accounting methodologies. It has been assumed that such needs may best be met by parallel Party-specific accounting, in addition to an agreed common methodology. The SBSTA is invited to consider this assumption and to confirm it.

C. Possible action by the Subsidiary Body for Scientific and Technological Advice

7. The SBSTA may wish to consider several actions related to issues referred to in this note such as:

(a) Making recommendations to the COP, in cooperation with the SBI, regarding the reporting of emissions, and in this context, *inter alia*, confirm, modify or reject the assumption in paragraph 6 above; or

(b) Deferring the consideration of the issues to a future session and requesting Parties to submit comments on this subject; and/or

(c) Requesting Parties, as an interim step, to provide the supplementary information based on one or more of the sections in this note as part of their national inventories due in April 1997;

(d) Advising the Ad Hoc Group on the Berlin Mandate (AGBM) and the SBI to consider the implications for their own work;

(e) Requesting the secretariat to analyse the issues further.

8. Any definitive conclusions resulting from this note would have to be reflected in the recommendations to the COP concerning revisions to the guidelines for the preparation of national communications (FCCC/SBSTA/1996/9).

II. ACCOUNTING FOR THE EMISSIONS ASSOCIATED WITH ELECTRICITY TRADE

A. Introduction

9. The primary purpose of this section on electricity trade is to identify preliminary options for allocating the greenhouse gas (GHG) emissions associated with electricity trade. It also provides information on the current extent of trading and on possible future trends, and points to some potential implications of electricity trading (see also FCCC/SBSTA/1996/9/Add.2).

B. Background

10. The Intergovernmental Panel on Climate Change (IPCC) Guidelines for National Greenhouse Gas Inventories suggest that Parties calculate GHG emissions from energy activities using data on the domestic consumption of carbon-based fuels. This methodology presumes that GHG emissions associated with the process of generating electricity will be accounted for by the generating Party by measuring the consumption of fossil fuels associated with generation, regardless of whether or not that generated electricity is consumed domestically or exported. This approach would also apply to projections of emissions.

11. In the first national communications received, there are several alternative examples of how Parties might account for the emissions associated with electricity trade. For example, one Party (Denmark) accounted for its net imports of electricity in 1990 by simulating production of that electricity from available plants within its own borders; another Party (Netherlands) stated that it had accounted for net electricity imports in its 2000 projection without attaching emissions to it, and yet another Party (Switzerland) stated that emissions generated from exported or imported electricity were not taken into account in their projections. In the case of Denmark, the electricity adjustment makes a difference of about 12 per cent in carbon dioxide (CO_2) emissions in 1990.

12. Inconsistent treatment of the emissions associated with electricity exports and imports creates difficulties in comparing GHG inventory information. It may also lead to double counting of emissions by both the generating and consuming Party or the under-reporting of emissions from electricity trade.

C. Extent of electricity trading

13. Electricity is currently exported and imported by many Parties. Recent efforts by many Parties to liberalize their electricity markets and to remove physical barriers to electricity trade could increase the amount of such trade in the future. The extent of existing

electricity trade as well as future trends in electricity trade for the Nordic region of Europe, Western Europe, Eastern and Central Europe, and North America are discussed in document FCCC/SBSTA/1996/9/Add.2.[2] [3]

D. Implications of electricity trading

14. The current trend to deregulate and liberalize the domestic industries in many countries and the likely increase in the extent of international electricity trading will have implications for the structure of the industry and for GHG emissions, precursors of ozone such as nitrogen oxides (NO_x), and for other air pollutants, such as particulates and sulphur dioxide (SO_2), that are hard to predict. It may also have consequences for the role of governments in planning and regulating electricity production. The impacts that will affect emissions will vary between regions and over time. For example, it is likely that this trend will:

(a) Increase the efficiency of generation;

(b) Change the cost structure of the industry and prices to consumers;

(c) Decrease the level of investments in renewable technologies and demand-side management programmes and alter investment patterns in other technologies;

(d) Change the projected retirement dates and utilization rates of many generation facilities.

15. A recent study of deregulation of the market between Denmark, Norway and Sweden suggests that the costs of reducing emissions could be significantly lower if common reduction goals are developed and countries use electricity trading to reach their goals.

E. Options to account for the greenhouse gas emissions associated with electricity trade

16. In the context of the Convention, electricity trade could be viewed as an activity that may best be addressed jointly by the Parties involved. In order to account for emissions associated with the export or import of electricity two options can be considered, with either the exporting Party or the importing Party doing the accounting. However, an accurate

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[2] In the context of this note, the Nordic region refers to Denmark, Finland, Norway, and Sweden. Western Europe refers to Austria, Belgium, France, Germany, Italy, Luxembourg, the Netherlands, Portugal, Spain, Switzerland, and the United Kingdom of Great Britain and Northern Ireland. Eastern and Central Europe consist of Belarus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, the Russian Federation, Slovakia, and Ukraine. North America refers to Canada, Mexico, and the United States of America.

[3] Other regions in the world, for example, Latin America, also trade electricity. The secretariat is attempting to obtain data on this region and others.

estimate of the emissions associated with electricity imports only appears feasible on the basis of information obtained from the exporting Party regarding, for example, the actual or average sources of electricity. There does not appear to be an obvious basis for an option whereby the importing country would make a determination of the emissions by itself. Therefore, further consideration is given to a modified set of the two options for the treatment of such emissions, as described below. They include either requesting Parties which generate electricity to account for all emissions, even if the electricity is exported; or requesting Parties which consume electricity to account for the emissions on the basis of information provided by, and in coordination with, the exporting Party.

17. These options, their advantages and disadvantages are discussed in detail in FCCC/SBSTA/1996/9/Add.2. In this regard, the following issues arise for the second of these options:

(a) Should calculations be based on actual sources with marginal emissions, or average sources?

(b) Should calculations be completed, for example, on every trade, monthly for all trades, or annually for all trades?

(c) How should transmission losses and secondary effects of changes to the grid be treated?

(d) How should emissions based on electricity trades between more than two Parties be estimated?

18. Should Parties determine a need for supplementary information to be included as part of their national inventories due in April 1997, as identified in paragraph 7 above, they may wish to consider, for example:

(a) A list all of the countries with which they traded electricity physically and contractually in 1994, 1995, and 1996 (both imports and exports);[4]

(b) The quantity of electricity exported or imported from each country in terawatt hours; and

(c) Information on the emissions associated with electricity trade, as available.

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[4] The contractual and physical transfer of electricity internationally may differ, for example, when three Parties are involved.

III. ALLOCATION AND CONTROL OF INTERNATIONAL BUNKER FUELS

A. Introduction

19. The primary purpose of this section is to identify options for the allocation and control of GHG emissions from international bunker fuels. It also provides information on the current extent of such emissions, possible future trends in international aviation and shipping, and issues that should be considered with regard to the options (see also FCCC/SBSTA/1996/9/Add.2).

B. Background

20. The COP, by decision 4/CP.1, requested the SBSTA and the SBI, taking fully into account ongoing work in Governments and international organizations, including the International Maritime Organization (IMO) and the International Civil Aviation Organization (ICAO), to address the issue of the allocation and control of emissions from international bunker fuels, and report on this work to the Conference at its second session. Subsequently, the SBSTA, at its second session, requested the secretariat to address issues such as bunker fuels in the documentation to be prepared for consideration by the SBSTA at its third session, with a view to overcoming inconsistencies in the presentation of data on inventories (FCCC/SBSTA/1996/8, para. 62).

21. International bunker fuels, that is, fuel sold to any air or marine vessel engaged in international transport is reported separately from other sectors in national emission inventories. The IPCC Guidelines recommend that such emissions should as far as possible be excluded from the totals and subtotals in the energy sector.[5] This reflects the decision of the Intergovernmental Negotiating Committee for a Framework Convention on Climate Change (see A/AC.237/55, annex I, para. 1(c)).

22. On this basis, 22 Parties provided emission estimates from bunker fuels, the majority reporting such information separately from total CO_2 emissions in accordance with the guidelines, as indicated in table 1. Eight Parties differentiated between aviation and marine bunker fuel emissions. Five Parties reported only CO_2 emissions from bunker fuels. Of the nine countries with economies in transition, only Bulgaria and Poland reported emissions from bunker fuels and only for their base year (see also FCCC/CP/1996/12/Add.1.).

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[5] IPCC Guidelines for National Greenhouse Gas Inventories, Sections 1A3, 1A3a-i and 1A3b-i provide more detail.

23. CO_2 emissions from bunker fuels represented between 4 and 14 per cent of national CO_2 emissions for the majority of the Parties, although ranging as high as 24 per cent for the Netherlands and as low as less than 1 per cent for the United States of America. Aggregate CO_2 emissions from bunker fuels represent about 2.8 per cent of the national emissions of the 22 Parties reporting emissions.

24. For the majority of the 15 Parties reporting NO_X emissions from bunker fuels these emissions represented between 6 and 26 per cent of national NO_X emissions. Bunker fuel emissions of methane (CH_4), nitrous oxide (N_2O), carbon monoxide (CO) and non-methane volatile organic compounds (NMVOC) represented less than one per cent of national emissions for most of the reporting Parties. Data on additional gases may be found in document FCCC/SBSTA/1996/9/Add.2.

25. In addition, the secretariat obtained information from other sources, as reported in FCCC/SBSTA/1996/9/Add.2. These data suggest that in 1990 global bunker CO_2 emissions from the aviation sector were about 435 Mton and from the marine sector about 441 Mton. The emissions in each sector represented about 2 per cent of CO_2 emissions from all sources in 1990.[6]

26. In the future, aviation and marine emissions are likely to grow. National communications provide only limited information on this issue, but the ICAO Committee on Aviation Environmental Protection (CAEP) uses an annual air traffic growth rate of 5 per cent. The resulting effect on emissions will be somewhat less because of improvements in engine efficiency, airframe design and traffic control systems. In the marine sector, the number of cargo vessels and the weight of cargo carried grew each year by 1 and 2 per cent respectively in recent years. This pattern is expected to continue for the foreseeable future, unless world trade is severely disrupted. For the marine sector CO_2 emissions are likely to grow at a rate corresponding to the growth in marine trade, although NO_x emissions may decline as improved technology is introduced in response to concerns over air quality and acidification.

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[6] The percentage of global emissions in 1990 was estimated by using global data for all sources from the IPCC Working Group I report, "Radiative forcing of climate change 1994", and bunker data from Balashov and Smith, "ICAO analyses trends in fuel consumption by world airlines", *ICAO Journal,* August 1992.

Table 1. Anthropogenic emissions of CO_2 and NO_x from international bunkers, 1990 (Gigagrams)[a]

	CO_2			NO_X		
	Aviation	Marine	Total	Aviation	Marine	Total
Australia	4 228.0	2 053.0	6 281.0	16.3	54.4	70.8
Austria		..	..	..	..	..
Belgium	..	..	..	..	..	..
Bulgaria[b]	..	..	162	..	..	..
Canada	3 614.0	2 066.0	5 680.0	4.7	13.0	17.7
Czech Republic	..	..	..	..	..	..
Denmark	1 915.0	3 059.0	4 975.0	5.1	66.1	71.1
Estonia	..	..	..	..	..	..
Finland	..	..	2 800.0	..	..	22.0
France	..	..	8 586.0	..	..	110.5
Germany	19 569.0	51.0	155.0	206	..	..
Greece	..	..	11 730.0	..	..	..
Hungary	..	..	..	..	..	..
Iceland	..	..	294.0	..	..	2.5
Ireland	..	..	1 172.0	..	..	5.3
Italy	3 956.6	8 494.0	12 450.0	15.5	234.4	250.0
Japan	..	..	31 000.0	..	..	..
Latvia	..	..	..	..	..	..
Liechtenstein	..	..	..	..	..	..
Luxembourg	..	..	..	..	..	..
Monaco	..	..	..	..	..	..
Netherlands	4 500.0	35 900.0	40 600.0	..	..	..
New Zealand	..	..	2 413.0	..	..	26.9
Norway	300.0	1 500.0	1 800.0	0.7	32.1	32.8
Poland [b]	..	..	530.0	..	..	..
Portugal	..	..	3 938.0	..	..	43.0
Romania	..	..	..	..	..	..
Russian Federation	..	..	..	..	..	..
Slovak Republic	..	..	..	..	..	..
Spain	5 948.0	12 076.0	18 024.0	23.6	248.2	271.8
Sweden	..	..	4 190.0	..	..	60.0
Switzerland	..	..	2 160.0	..	..	..
United Kingdom	..	..	20 729.0	..	..	249.0
United States	..	..	82 942.0	..	..	..
Total	..	..	282 026.0	..	..	1 440.1

Notes: The following symbols have been used in some tables:
Two dots (..) indicate that data are not available.
Parentheses ( ) on either side of negative amounts are inserted for clarity.
< Signifies "less than"; > signifies "greater than".

[a] Based on national communications (see FCCC/CP/1996/12/Add.2).

[b] Estimates correspond to the base year (1988).

C. Options for the allocation and control of emissions from international bunker fuels

27. This section elaborates on document A/AC.237/44/Add.2 "Allocation and control of emissions from bunker fuels". It incorporates information provided by Parties and organizations. The implications of the allocation options are discussed in detail in FCCC/SBSTA/1996/9/Add.2 along with the specific characteristics of the aviation and marine sectors. Options that appear to be less practical because of data requirements or because they would not cover all emissions are so identified.

Allocation options for emissions from the use of bunker fuel

Option 1 No allocation, as in the current situation.

Option 2 Allocation of global bunker sales and associated emissions to Parties in proportion to their national emissions.

Option 3 Allocation to Parties according to the country where the bunker fuel is sold.

Option 4 Allocation to Parties according to the nationality of the transporting company, or to the country where a ship of aircraft is registered, or to the country of the operator.

Option 5* Allocation to Parties according to the country of departure or destination of an aircraft or vessel. Alternatively, the emissions related to the journey of an aircraft or vessel could be shared by the country of departure and the country of arrival.

Option 6* Allocation to Parties according to the country of departure or destination of passenger or cargo. Alternatively, the emissions related to the journey of passengers or cargo could be shared by the country of departure and the country of arrival.

Option 7* Allocation to Parties according to the country of origin of passengers or owner of cargo.

Option 8* Allocation to the Party of all emissions generated in its national space.

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* Options considered to be less practical because of data requirements or inadequate global coverage.

Considerations regarding allocation and control

28. The experience gained with allocation methods for emissions from other sectors may be instructive. In the case of road transport, emissions are allocated to the Party where fuel is taken in. For other sectors, such as the cement industry, the emissions are allocated to the Party where emissions actually occur. Finally, there is no sector for which the emissions are calculated and allocated in relation to individual persons or goods.

29. In relation to the allocation options for emissions from bunker fuels, the following questions are relevant:

(a) Would it be feasible for the Party to control the emissions allocated to it?

(b) Could the required data be generated with sufficient precision?

(c) Is the method based on the "polluter pays" principle?

(d) Is the method equitable?

(e) Does the allocation method cover all international emissions?

(f) Is the method suitable for all greenhouse gases?

(g) Should the method apply to both aviation and marine emissions?

(h) Does the method provide a suitable basis for making projections?

30. In addition to the above points, the following factors could be considered:

(a) If international emissions are allocated to Parties, these Parties would need to decide whether and how to develop control measures. This could be in the form of action at the national level and/or at the level of cooperation with other Parties and/or at the international level;

(b) If the Parties decide not to allocate bunker fuel emissions to specific Parties, the international aviation and marine shipping sector will still need to be considered in relation to Article 4.2 of the Convention. In that case, Parties may need to determine whether and how emissions should be controlled. In this respect, ICAO and IMO may be of assistance;

(c) Also the Parties would need to consider whether to apply allocations retrospectively or as of some future date. For instance, the Parties could make a retrospective correction for international emissions from the reference year 1990 or to any

future year. This could affect whether Parties would meet their national goals and may therefore need further consideration by other Convention bodies;

(d) Option 8 would lead to incomplete coverage at the global level, since emissions over international territories would not be allocated.

IV. USE OF GLOBAL WARMING POTENTIALS

A. Introduction

31. A recommendation concerning GWPs may be found in document FCCC/SBSTA/1996/9 on possible revisions to the guidelines for national communications by Annex I Parties. This section provides background information that Parties may wish to consider regarding GWPs. It contains a brief history of the changes in GWPs and the most recent scientific information. It was developed from information provided by the IPCC.

B. Background

32. The guidelines for the preparation of the first communications by Annex I Parties state: "Parties may choose to use GWPs to reflect their inventories and projections in carbon dioxide-equivalent terms using information provided by the IPCC in its 1992 Supplementary Report, pending the decision of COP 1. While awaiting updated information from the IPCC, any use of GWPs should be based on the direct effects of the greenhouse gases over a 100-year time-horizon. In addition, Parties may also make use of at least one other time-horizon and may also include, separately, data incorporating the indirect effects of methane. This is only the initial focus and, for future communications, indirect effects of other greenhouse gases will have to be looked at, as far as scientific understanding allows" (A/AC.237/55, decision 9/2, annex).

33. At COP 1, it was decided that Parties may use GWPs to reflect their inventories and projections in carbon dioxide-equivalent terms. In such cases, the 100-year time-horizon values provided by the IPCC in its 1994 Special Report should be used. Parties may also make use of at least one of the other time horizons provided by the Panel in its 1994 Special Report (FCCC/CP/1995/7/Add.1).

34. In the first 28 national communications of Parties included in Annex I, all Parties reported the emissions of greenhouse gases in standard units of mass. Sixteen Parties expressed their emissions in carbon dioxide-equivalent terms using 1990, 1992 and/or 1994 GWPs, mostly for the 100-year time-horizon.

35. Inconsistent use of GWPs makes it difficult to compare greenhouse gas inventory information.

C. Discussion

36. The GWP is an attempt to provide a simple measure of the relative radiative effects of the emissions of various greenhouse gases. The index is defined as the cumulative radiative forcing between the present and some chosen time horizon caused by a unit mass of gas emitted now, expressed relative to that for some reference gas (here CO_2 is used). The global warming contribution of different GHG emissions can be compared by multiplying the mass of the emissions of a GHG by its GWP to obtain the equivalent mass of carbon dioxide.

37. In the IPCC First Assessment Report 1990, preliminary values for GWPs were given, which attempted to account for direct effects of the greenhouse gases as well as the indirect effects on stratospheric water vapour, carbon dioxide and tropospheric ozone. Gases included were carbon dioxide, methane, nitrous oxide and a range of chlorofluorocarbons (CFCs).

38. The IPCC in its supplementary report to the IPCC Scientific Assessment 1992 stated that the indirect GWP components reported in 1990 were likely to be in error and should not be used. A new set of only direct GWPs was provided. The new direct values were generally within 20 per cent of the values of 1990, the difference being entirely due to the difference in assumed lifetimes. Gases included were carbon dioxide, methane, nitrous oxide and a range of CFCs, hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), CO, NMVOCs and NO_x.

39. In the 1994 IPCC report, "Radiative forcing of climate change" new GWP values were published taking account of the direct and indirect effects where possible. The indirect effects of NO_x, and CO and of CFCs associated with the depletion of the ozone layer were not included in the calculations. The number of gases was expanded.

40. Updated GWP values were published in the IPCC Second Assessment Report, 1995. The report notes that net GWPs of CFCs tend to be positive, but no numeric values were given. Decreases of about 10 per cent to 15 per cent in comparison to the values of 1994 are because of improved or new estimates of atmospheric lifetimes and molecular radiative forcing factors, and improved representation of the carbon cycle. Table 2 presents the GWPs as they have changed over time in subsequent IPCC publications.

Table 2. Global warming potentials, 100-year time-horizon, 1992-1995

Gas	1992[a]	1994[b]	1995[c]
CO_2	1	1	1
CH_4	11	24.5	21
N_2O	270	320	310
CFC-11	3400	4000	..
CFC-12	7100	8500	..
CFC-13	13000	11700	..
CFC-14	>4500	..	..
CFC-113	4500	5000	..
CFC-114	7000	9300	..
CFC-115	7000	9300	..
CFC-116	>6200	..	..
HCFC-22	1600	1700	..
HCFC-123	90	23	..
HCFC-124	440	480	..
HCFC-141b	580	630	..
HCFC-142b	1800	2000	..
HCFC-225ca	..	170	..
HCFC-225cb	..	530	..
CCl_4	1300	1400	..
CH_3CCl_3	100	110	..
H-1301	..	6200	..
HFC-23	..	12100	11700
HFC-32	..	580	650
HFC-41	..	..	150
HFC-43-10mee	..	1600	1300
HFC-125	3400	3200	2800
HFC-134	..	1200	1000
HFC-134a	1200	1300	1300
HFC-152a	150	140	140
HFC-143	..	290	300
HFC-143a	3800	4400	3800
HFC-227ea	..	3300	2900
HFC-236fa	..	8000	6300
HFC-245ca	..	610	560
CF_3Br	4900	..	..

Table 2. (*continued*)

Gas	1992[a]	1994[b]	1995[c]
$CHCl_3$	25	5	..
CH_2Cl_2	15	9	..
SF_6	..	24900	23900
CF_4	..	6300	6500
C_2F_6	..	12500	9200
C_3F_8	..	..	7000
C_4F_{10}	..	..	7000
$c\text{-}C_4F_8$	..	9100	8700
C_5F_{12}	..	..	7500
C_6F_{14}	..	6800	7400

Sources: IPCC, "Climate Change 1992", "Climate Change 1994," and the "Second Assessment Report 1995".

Notes:

[a] Only direct effect.
[b] Indirect effects were included where possible, with the exception of CFCs.
[c] Because of the difficulties in calculating the indirect effects of CFCs and halons, no values were included. Net GWPs of CFCs tend to be positive, while net GWPs of halons tend to be negative.

V. ACCOUNTING FOR LAND-USE CHANGE AND FORESTRY

A. Introduction

41. The purpose of this section is to identify the methodological issues associated with estimating and reporting the carbon emitted or sequestered as a result of land-use change and forestry. It also provides data submitted by Parties in their national communications, and discusses the policy significance of different options.

B. Background

42. The IPCC Guidelines for the land-use change and forestry sector provide a methodology, including standard data tables, for reporting on this sector. On this basis, 28 Parties submitted inventory data for 1990. However, only 18 Parties submitted projections for this sector. Several Parties submitting data provided incomplete data sets. In

some cases, this was attributed to a lack of appropriate activity data and statistics. For several countries, updates with substantial changes were provided or indications were given that further changes would be forthcoming.[7]

43. The SBSTA, at its second session, invited Annex I Parties to forward to the secretariat their suggestions related to the presentation of inventory data for years subsequent to 1990 and on projections in this sector, as well as on aggregating data on greenhouse gas sources and sinks by 1 April 1996. The secretariat did not receive any submissions following this invitation. However, some Parties expressed concern, during the review process, regarding the methodologies used to estimate carbon emissions or sinks for the land-use change and forestry sector and others have expressed concern with regard to how sequestered carbon should be presented and reported.

Inventory calculations

44. With regard to the IPCC Guidelines for calculating emissions and sinks, there are uncertainties related to, for example:

(a) Estimates of biomass density and its rate of change in different regions;

(b) Emission factors associated with different types of biomass and land clearing practices;

(c) Methods for estimating the changes in different land-use areas;

(d) Assumptions and methods for estimating the storage of carbon in wood products;

(e) Appropriate period of time for calculating sources and sinks.

Reporting and presentation

45. With regard to reporting and presentation of data on this sector, combined with data from other sectors, Parties have expressed a need for clarification as to how Parties should provide information. Some Parties prefer to subtract the carbon sequestered or stored in sinks from their emissions in other sectors, i.e., they take a "net approach", while others prefer not to add or subtract the data from this sector to the other sectors, but present them in different tables; that is, a "gross approach". These two approaches may be linked to the way Parties have formulated their national goals and can have significant effects on projections of CO_2 in the year 2000, as shown in table 3. The table is based on information submitted by only 18

[7] During the in-depth reviews, Parties noted that the definition of anthropogenic emissions and sinks may need clarification with regard to forest fires and the effect of climate change on growth.

Parties. The data from five Parties (Austria, Finland, Latvia, New Zealand, Sweden) indicate that carbon dioxide sequestered or emitted from land-use change and forestry amounted to nearly a third of the gross CO_2 emissions from other sectors. Consequently, in the base year small shifts in the figures for carbon stored may have significant impacts, as may be seen in columns 3 and 8 which are two indicators of whether a Party may stabilize emissions.

Table 3. Projections of gross and net anthropogenic emissions of CO_2 after consideration of land-use change and forestry[a] [b]
(Gigagrams)

	1990 gross[c]	2000 gross	Variation %	1990 LUCF	2000 LUCF	1990 net[d]	2000 net	Variation %
	(1)	(2)	(3)	(4)	(5)	(6) (= (1)+(4))	(7) (=(2)+(5))	(8)
Australia	288 965	332 799	15.1	130 843	121 992	419 808	454 791	8.3
Bulgaria[e]	96 878	69 878	-27.9	-4 697	< -5 801	77 189	< 64 077	< -17.0
Czech Republic	163 584	135 536	-17.1	-2 300	-2 800	161 284	132 736	-17.7
Denmark	58 353	53 753	-7.9	-2 600	-2 600	55 753	51 153	-8.3
Finland	54 200	70 200	29.5	-31 000	(-40 000) - (-23 000)	23 500	30 200 - 47 200	30.2 to 103.4
France	383 167	397 833	3.8	-32 000	-39 000	351 167	358 833	2.2
Germany	1 014 155	917 000	-9.6	-20 000	-20 000	994 155	897 000	-9.8
Ireland	30 719	36 988	20.4	-5 133	-8 066	25 586	28 922	13.0
Italy	423 776	482 440	13.8	-36 730	-46 730	387 046	435 710	12.6
Japan	1 173 00	1 200 000	2.3	-90 000	-92 000	1 083 000	1 108 000	2.3
Latvia	22 976	16 956	-26.2	-14 000	-8 940	8 976	8 016	-10.7
Netherlands	174 000	167 600	-3.7	-1 500	-1 800	172 500	165 800	-3.9
New Zealand	25 530	29 160 - 29 940	14.2 - 17.2	-17 700	-18 600	7 830	10 560 - 11 340	34.9 to 44.8
Spain	222 908	276 523	24.1	-23 170	-25 700	199 738	250 823	25.6
Sweden	61 300	63 800	4.1	-34 000	-29 000	27 300	34 800	27.5
Switzerland	45 400	43 800	-3.5	-5 200	-5 300	40 200	38 500	-4.2
UK	586 720	586 720	0	-9 167	~ -9 157	577 553	577 553	0
USA	5 012 789	5 163 136	3.0	-476 710	-539 049	4 536 079	4 624 087	1.9
Austria	59 900	65 800	9.8	- 15 000	..	44 900	..	..
Canada	461 200	510 000	10.6	..	..	..	..	..
Estonia	37 800	17 500 - 23 000	(-53.7) - (-39.2)	1 796	..	39 596	..	..
Greece	82 100	94 500	15.1	..	..	..	..	..
Hungary[e]	81 534	68 741	-17.8	-3 097	..	78 437	..	..
Iceland	2 172	2 282	5.1	..	..	..	..	..
Liechtenstein	208	245	18.1	-22	..	186	..	..
Luxembourg	11 244	7 556	-33.3	..	..	..	..	..
Monaco	..	..	..	..	..	..	..	..
Norway	35 400	39 500	11.2	-10 200	..	25 200	..	..
Poland[e]	478 880	338 000 - 455 000	(-18.59) - (9.7)	1 408	..	477 472	..	..
Portugal	38 689	54 274	28.8	..	..	..	..	..
Romania[e]	198 479	..	..	..	..	195 554	..	..
Russian Federation	2 330 0001	930 000 - 2 026 000	(-19.1) - (-15.1)	-734 000	..	1 596 000	..	..
Slovakia	57 808	48 639	-16.5	-4 451	..	53 357	..	..

Note: LUCF = land-use change and forestry.

[a] Based on data contained in tables B.1 and B.2 of document FCCC/CP/1996/12/Add.1.

[b] Austria, Canada, Estonia, Greece, Hungary, Iceland, Liechtenstein, Luxembourg, Monaco, Norway, Poland, Portugal, Romania, Russian Federation, and Slovakia did not give projections of the land-use change and forestry sector.

[c] Gross emission = CO_2 emissions from carbon sources excluding land-use change and forestry.

[d] Net emission = Gross CO_2 emission minus CO_2 sequestered or emitted from changes in land-use on forestry.

[e] Some countries with economies in transition use a different base year than 1990: Bulgaria (1988); Hungary (August 1985-87); Poland (1988); and Romania (1989).

C. Discussion

46. Judging from the in-depth reviews, there is a need to elaborate on the methodologies to calculate emissions and sinks in the land-use change and forestry sectors, particularly with regard to the uncertainties listed above. The IPCC has activities under way to do this, including, for example, developing improved methods to account for emissions from wood products, better data on boreal forests, and an improved classification system for tropical regions. The IPCC will take up several, but not all, proposals for improved methodologies related to this sector at its plenary session in September 1996.

47. With regard to the question of how to report information, there appear to be two options, namely, the "gross" or the "net" approach. In considering this issue, Parties may wish to bear in mind the effects of these two approaches on global forestry actions under Article 4.1(b), as well as the impact on individual Parties (see paragraphs 48 and 49 below). Also, the ability of a Party to meet a target may change with time depending on its circumstances. For example, some Parties that opt for the "net" approach may benefit in the near term by using carbon sinks to offset other emissions. In the long term, as forests mature and reach a steady state of growth, this could mean that a smaller sink would be available and therefore larger reductions in other sectors would be needed to achieve a national goal.

48. The information reported by Finland and Sweden can be used to illustrate how the net approach affects some Parties. The forests in these countries are currently sequestering carbon and will continue to do so in the year 2000. As a result, they reduce the amount of carbon in the atmosphere. In addition, the 1990 figures for net removals of CO_2 are equivalent to more than 50 per cent of their "gross" emissions. This sequestration rate may not necessarily be maintained in 2000 and beyond, since natural processes will lessen the size of the sink. Indeed, this rate of sequestration is generally expected to level off in the future and consequently, when using the "net" approach, achievements towards meeting national goals with regard to the Convention and sustainable forest management practice could be viewed negatively.

49. In contrast, the "gross" approach may be viewed as giving less emphasis to the role of forests and the incentives to encourage good forest management practices. This could have implications for countries seeking to use a comprehensive approach to achieving national goals, along with investments in this sector.

50. Parties may therefore wish to consider whether data should be presented and reported using the "net" or the "gross" approach.

VI. USE OF TEMPERATURE ADJUSTMENTS

A. Introduction

51. The purpose of this section is to provide information for an initial discussion on matters related to the use of temperature adjustments for calculating national GHG inventories. It introduces basic factors needed to calculate temperature adjusted emissions.

B. Background

52. A significant part of the energy consumption in some countries, and hence of emissions of CO_2 and some other GHGs and precursors, stems from the use of energy to heat and cool buildings. In cold winters, the total amount of energy used for heating will be higher than in mild winters. In hot summers, the total amount of energy used for cooling will be higher than in mild summers. These conditions vary between countries and within countries, particularly those with large land areas.

53. The importance of this issue has been noted by several Parties. One Party adjusted its CO_2 emission estimate for 1990 upward to take account of warmer climatic conditions and presented this adjusted figure as the working figure. In addition, it provided the actual emission estimates in its national inventory of anthropogenic emissions and removals for 1990. Several Parties noted that 1990 had not been a normal climatic year, but did not adjust their inventory data. Six Parties provided additional information during the in-depth reviews. When calculating projections of national emissions, three Parties adjusted the starting points for their projections and two gave quantitative indications of what such an adjustment would have meant for them. All these estimated adjustments were in the range of 0-5 per cent.

54. Adjustments by some Parties to their GHG estimates in 1990 or the starting points for their projections, whether to account for unusually mild or cold winters or unusually hot or cool summers, can impair the comparability of GHG estimates among Parties. They can also have effects on a Party's baseline emissions, thereby altering the level of effort necessary for a Party to meet its commitments to reduce GHG emissions. On the other hand, one Party noted that without temperature adjustments, fluctuations between cold and mild seasons could easily lead to inaccurate interpretations of trends in CO_2 emissions and that it would not be clear what fraction of the change in CO_2 emissions would be induced by policy measures, and what fraction would be due to variations in the outside temperature. Another Party indicated that the Convention is explicit in setting a base year and that the complexity of negotiating adjustments is not warranted. Finally, it should be noted that if adjustments were allowed, inventories would not reflect real emissions.

C. Options for the use of temperature adjustments

55. There are two issues that need consideration with regard to temperature adjustments. The first is the method of calculating the adjustments. In this regard, several factors need consideration, for example:

(a) The basis for the adjustment, that is, absolute temperatures or indicators such as "degree days";

(b) The extent to which geography and the location of population centres should be considered;

(c) The time periods to be used;

(d) The fuels to be considered.

56. In addition, there is a need to consider whether and how these factors would affect projections. However, in so far as only one Party has provided temperature-adjusted data,[8] there is little information available to determine how the use of these different factors could affect emissions.

57. The second issue concerns whether and how to report temperature-adjusted emissions. In order to ensure transparency, there appear to be two choices, namely, requesting Parties to provide only data that are not temperature-adjusted or giving those Parties wishing to do so the option of providing supplementary adjusted data along with a description of their method. Other Convention bodies may need to consider how to treat the additional information.

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[8] Five Parties provided estimates.