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METHODOLOGICAL ISSUES

LAND-USE, LAND-USE CHANGE AND FORESTRY

Synthesis report on national greenhouse gas information reported by Annex I Parties for the land-use change and forestry sector and agricultural soils category

Note by the secretariat

CONTENTS

I. INTRODUCTION

A. Mandate

1. The Subsidiary Body for Scientific and Technological Advice (SBSTA), at its eleventh session, requested the secretariat to compile and synthesize information on the completeness and comprehensiveness of Annex I Party national greenhouse gas inventories for the agricultural soils and land-use change and forestry (LUCF) categories (FCCC/SBSTA/1999/14, para. 46 (l)).

B. Scope of the note

2. This note responds to the above mandate by synthesizing the information most recently submitted by Annex I Parties for the agricultural soils category and land-use change and forestry sector. In general, such submissions follow the structure of the 1996 Revised Guidelines for National Greenhouse Gas Inventories of the Intergovernmental Panel on Climate Change (IPCC), (referred to here as the IPCC Guidelines), as the SBSTA decided, at its fourth session, that the IPCC Guidelines should be applied by Annex I Parties on a mandatory basis for inventories due in 1998 and beyond (FCCC/SBSTA/1996/20, para. 30). Decision 2/CP.3 (FCCC/CP/1999/7/Add.1) reaffirms that Parties should use these guidelines to estimate and report anthropogenic emissions by sources and removals by sinks under the Kyoto Protocol.

3. The IPCC Guidelines were developed to facilitate the reporting of greenhouse gas (GHG) emissions from sources and removals by sinks under the Convention. The Guidelines do not address the special reporting needs of some aspects of the Kyoto Protocol, such as Article 3.3 and 3.4. However, this note follows the structure of the IPCC Guidelines by synthesizing information on emissions and removals of all GHGs in the LUCF sector and the agricultural soils category. The note also analyses the initial and most recent base year data for these categories. In addition, it synthesizes information on methods and sources of data used by Annex I Parties.

C. Approach

4. The information sources used by the secretariat are summarized in table 1. The secretariat generally relied on data provided by Annex I Parties in their most recent annual GHG inventories.[1] If an annual inventory was not available for a particular Party, the most recent national communication (NC) was used.

5. GHG inventories were used for 31 Parties and NCs for five.[2] Of the 31 inventories, 25 were submitted in 1999. In 22 of these cases, the last year for which data were reported was 1997. Two inventories included data for 1998, and one Party reported data for 1996. Six Parties submitted their most recent inventories in 1998: the last year for which data was reported was 1996 in five instances, and 1995 for one Party.

6. NCs were the source of data from five Parties. The latest reported data for Iceland and Italy were for 1995, and for Portugal and Romania 1994. Slovenia's first NC and Liechtenstein's report both reported data for 1990 only.

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[1] Annual inventories submitted in year 2000 were not considered.

[2] Liechtenstein did not submit any inventories or NCs. Instead a report submitted in 1995 was used for the purpose of this synthesis. Although Luxembourg has not submitted a second NC, it provided an inventory in 1998 (which was used in this document) for consideration in the second compilation and synthesis of second NCs.

7. The annual GHG inventories and the NCs contain data for various years. However, for the period 1990 to 1997 there is not one single year for which all Parties have submitted data on LUCF and agricultural soils. Consequently, it was decided to use the following years for this synthesis[3] (see also table 1):

1997: 24 Parties (65 per cent of all Annex I Parties)
1996: Hungary, Ireland, Luxembourg, the Netherlands, the Russian Federation and Slovakia
1995: Iceland, Italy and Spain
1994: Portugal and Romania
1990: Liechtenstein and Slovenia.

8. Parties may wish to carefully review the data presented in this note, because in some instances, the data presented in national communications differed from data provided in national inventories, requiring the secretariat to make assumptions about which data were appropriate. The most efficient way for Parties to clarify or correct data is in their annual GHG inventory submissions.

D. Possible action by the SBSTA

9. The SBSTA may wish to take note of the information in this document, particularly when considering Article 3.3 and 3.4 of the Kyoto Protocol and any future guidance to the IPCC.

[3] The data for 1998 submitted by Germany and Ukraine were not used in this synthesis.

Table 1: Sources and reporting of information

Party	Source of information used for this synthesis [a]	Years reported	Reporting on LUCF[b]	Reporting on agricultural soils
Australia	INV99	1990-1997	Yes	Yes
Austria	INV99	1990-1997	Yes	Yes
Belgium	INV99	1990-1997	Yes	Yes
Bulgaria	INV99	1997	Yes	Yes
Canada	INV99	1990-1997	Yes	Yes
Czech Republic	INV99	1997	Yes	Yes
Denmark	INV99	1997	Yes	Yes
Estonia	INV99	1997	Yes	Yes
Finland	INV99	1990, 1995-1997	NR	Yes
France	INV99	1990-1997	Yes	Yes
Germany	INV99	1990-1998[e]	Yes	Yes
Greece	INV99	1990-1997	NR	Yes
Hungary	INV98	1991-1996	Yes	Yes
Iceland	NC2 (1997)	1991-1995	NR	Yes
Ireland	INV98	1995-1996	Yes	Yes
Italy	NC2 (1998)	1990, 1994-1995	Yes	Yes
Japan	INV99	1990-1997	Yes[c]	Yes
Latvia	INV99	1997	Yes	Yes
Liechtenstein	Report (1995)	1990	NR	NR
Lithuania	INV99	1995-1997	Yes	-[d]
Luxembourg	INV 98	1990, 1994-1996	Yes	Yes
Monaco	INV99	1990-1997	NR	NR
Netherlands	INV98	1990-1996	Yes	Yes
New Zealand	INV99	1997	Yes	Yes
Norway	INV99	1990-1997	Yes	Yes
Poland	INV99	1997	Yes	Yes
Portugal	NC2 (1997)	1990-1994	Yes	Yes
Romania	NC2 (1998)	1989-1994	Yes	
Russian Federation	INV99	1995-1996	Yes	Yes
Slovakia	1NV98	1995-1996	Yes	Yes
Slovenia	NC1 (1997)	1990	Yes	Yes
Spain	INV98	1990-1995	NR	Yes
Sweden	INV99	1990, 1996-1997	Yes	Yes
Switzerland	INV99	1997	Yes	Yes
Ukraine	INV99	1990-1998[e]	Yes	
United Kingdom	INV99	1990-1997	Yes	Yes
USA	INV99	1990-1997	Yes	Yes

[a] INV98 – inventory submission 1998; INV99 – inventory submission 1999; NC1 – first national communication; NC2 – second national communication. Years between brackets in this column indicate the year in which the NC or report was submitted.

[b] NR – Not reported. Whilst both Finland and Spain did not report on the LUCF sector in their latest annual inventories, both Parties reported on this sector in their national communications.

[c] Though the inventory primarily contained data for 1997, the CO_2 emissions for the LUCF sector were provided for 1995.

[d] From agriculture, forestry and land-use and wood stock change reported as aggregate sector. Sectoral tables were not provided.

[e] Whilst Germany and Ukraine reported inventory data for 1998, this information was not used in this synthesis report. Priority was given to using the same inventory year for as many Parties as possible.

II. COMPLETENESS AND COMPARABILITY OF LATEST SUBMISSIONS OF ANNUAL INVENTORIES AND NATIONAL COMMUNICATIONS

10. The revised guidelines for the preparation of national communications by Parties included in Annex I to the Convention, request Parties to report inventories using the formats recommended in the IPCC Guidelines (see decision 9/CP.2 (FCCC/CP/1996/15/Add.1)), which include summary tables, sectoral tables, overview tables, and worksheets or equivalent information, including activity data and emission factors. The worksheets for LUCF and agricultural soils are explicitly requested. Up to the adoption of decision 3/CP.5 (FCCC/CP/1999/6/Add.1), no specific guidance existed on how annual inventories should be reported.[4] Consequently, an assessment of the completeness and comparability of reporting on the basis of, *inter alia*, the type of information contained in the GHG inventory submissions and national communications, should be considered with this limitation in mind. Table 2 summarizes information according to its type as submitted by Parties. Additional details are provided below.

Summary reports

11. Summary reports according to the IPCC format, incorporating both information on LUCF (category 5A to 5E) and agricultural soils (category 4D) were submitted by 34 Parties. Hungary, Liechtenstein and Ukraine did not provide the summary reports, and the summary reports submitted by Austria, Lithuania, Luxembourg, Romania and Slovenia did not follow the IPCC format.

Sectoral reports

12. The LUCF and agriculture sectoral reports (respectively tables 5 and 4 of the IPCC Guidelines) with information at the category level, were submitted by 21 Parties. Hungary, Portugal and Slovenia submitted sectoral information, but not according to the IPCC sectoral report format. Sectoral reports for agriculture, providing disaggregated data for agricultural soils (sub-module 4D), were submitted by all Parties that reported on agricultural soils.

Worksheets

13. Worksheets, providing activity data and emission factors for LUCF, were submitted by seven Parties (Australia, Hungary, Japan, Slovakia, Slovenia, Sweden and Switzerland), whilst worksheets for agricultural soils were submitted by four Parties (Australia, Hungary, Japan and Sweden).

Overview tables

14. Overview tables, according to the IPCC format for the LUCF sector, were provided by Australia, Bulgaria, Canada, Czech Republic, France, Italy, Japan, New Zealand, Russian Federation, Sweden, Switzerland, United Kingdom and the United States of America. Thirteen of these Parties provided an indication of the quality of the estimates. Thirteen Parties provided estimates for agricultural soils using overview tables.

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[4] The UNFCCC reporting guidelines for annual inventories of Annex I Parties were adopted by decision 3/CP.5. These guidelines explicitly request that emission factors and activity data be reported through the national inventory report and the common reporting format.

Activity data and emission factors

15. Australia, Bulgaria, Greece, Hungary, Japan, Portugal, Slovenia and Switzerland reported activity data for the LUCF sector. Except for Switzerland, the same countries reported activity data and emission factors for the agricultural soils category.

Notation keys

16. Notation keys indicate whether emissions or removals are not occurring (NO), not estimated (NE), not applicable (NA), or estimated but included elsewhere (IE). Notation keys are used by 12 Parties. In many instances Parties left cells empty or entered a 'zero', but it remains unclear whether in such cases no estimates have been made or whether emissions or removals are indeed "zero".

Table 2: Reporting of summary and sectoral reports, worksheets, overview tables, activity data, and notations keys in the latest submissions from Annex I Parties

Country	Source	Summary report	Sectoral report	Worksheets	Overview tables	Activity data	Notation keys
Australia	INV99	Yes	Yes	Yes	Yes	Yes	Yes
Austria	INV99	Yes[b]	No	No	No	No	No
Belgium	INV99	Yes	Yes	No	No	No	No
Bulgaria	INV99	Yes	Yes	No	Yes	Yes	No
Canada	INV99	Yes	Yes	No	Yes	No	Yes
Czech Republic	INV99	Yes	Yes	No	Yes	No	Yes
Denmark	INV99	Yes	Yes	No	No	No	No
Estonia	INV99	Yes	Yes	No	No	No	No
Finland[c]	INV99	Yes	No	No	Yes	No	Yes
France	INV99	Yes	Yes	No	Yes	No	No
Germany	INV99	Yes	No	No	No	No	Yes
Greece	INV99	Yes	Yes	No	No	Yes	No
Hungary	INV98	No	Yes[b]	Yes	No	Yes	No
Iceland	NC2	Yes	No	No	No	No	No
Ireland	INV98	Yes	No	No	No	No	Yes
Italy	NC2	Yes	No	No	Yes	No	No
Japan	INV99	Yes	Yes	Yes	Yes	Yes	Yes
Latvia	INV99	Yes	Yes	No	No	No	No
Liechtenstein	report	No	No	No	No	No	No
Lithuania	INV99	Yes[b]	No	No	No	No	No
Luxembourg	Report	Yes	No	No	No	No	No
Monaco	INV99	Yes	No	No	No	No	No
Netherlands	INV98	Yes	No	No	No	No	No
New Zealand	INV99	Yes	Yes	No	Yes	No	Yes
Norway	INV99	Yes	Yes	No	Yes[d]	No	Yes
Poland	INV99	Yes	No	No	No	No	No
Portugal	NC2	Yes	Yes[b]	No	No	Yes	No
Romania	NC2	Yes[b]	No	No	No	No	No
Russian Federation	INV99	Yes	Yes	No	Yes	No	No
Slovakia	1NV98	Yes	No	Yes	No	No	No
Slovenia	NC1	Yes[b]	Yes[b]	Yes	No	Yes	No
Spain[c]	INV98	Yes	No	No	No	No	No
Sweden	INV99	Yes	Yes	Yes	Yes	No	No
Switzerland	INV99	Yes	Yes	Yes	Yes	Yes	Yes
Ukraine	INV99	No	No	No	No	No	No
United Kingdom	INV99	Yes	Yes	No	Yes	No	Yes
USA	INV99	Yes	Yes	No	Yes	No	Yes

[a] INV98 – inventory submission 1998; INV99 – inventory submission 1999; NC1 – first national communication; NC2 – second national communication.

[b] Summary reports are provided but not according to IPCC format.

[c] Whilst both Finland and Spain did not report on the LUCF sector in their latest annual inventories, both Parties reported on this sector in their national communications.

[d] Information provided in the overview table did not include LUCF.

III. GREENHOUSE GAS EMISSIONS AND REMOVALS IN THE LUCF SECTOR

A. Reporting on estimates of CO_2 emissions and removals

17. Thirty-one Parties reported carbon dioxide ($CO_{2)}$ emissions and/or removals from the LUCF sector in their latest submissions.[5] Whilst all of these Parties except Lithuania reported CO_2 *removals*, less then half reported *emissions* (see table 3). One reason for this could be the footnote to table 5 (sectoral report on LUCF) and tables 7A and 7B (summary report and short summary report for GHG inventories) in volume 1 of the IPCC Guidelines, which requests Parties not to provide an estimate of both CO_2 emissions and CO_2 removals. Instead Parties are requested to provide an estimate of net CO_2 emissions[6] and to place a single number in either the CO_2 emissions or CO_2 removals column, as appropriate.

18. Six Parties (Finland, Greece, Iceland, Liechtenstein, Monaco and Spain) did not report CO_2 emissions or removals in their latest submissions, either by indicating the notation key NE (Finland), by entering "zero" in the relevant cells (Spain), or by not providing any values. For all reporting Parties the LUCF sector constitutes a net sink for CO_2 (emissions - removals), except for Australia, Estonia, Lithuania, and the United Kingdom (see figure 1).

19. Eleven Parties reported for all years from 1990 to 1997 (35 per cent of all Parties reporting on LUCF); Germany and Ukraine reported for the period 1990 to 1998. Bulgaria, the Czech Republic, Denmark, Estonia, Latvia, New Zealand, Poland and Switzerland reported only for 1997. Other Parties reported for different periods (see table 1).

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[5] Finland and Spain had reported on LUCF in previous submissions.

[6] The term "net emissions" is used in this note to refer to the arithmetic sum of CO_2 emissions and CO_2 removals in the LUCF sector or in a given category of this sector. This sum may be positive or negative, corresponding to net emissions or net removals.

Table 3: GHG emissions and removals in the LUCF sector (Gg)[a]

Party	Year	CO_2 emissions	CO_2 Removals	CH_4	N_2O	NO_x	CO	NMVOC	Aggregate GHG emissions from LUCF in CO_2 equivalent[b, e]
Australia	1997	130 347	96 298	174.34	1.97	69.11	3 667.62	NA	38 321
Austria	1997		13 753						-13 753
Belgium	1997		2 057	5.07	3.26			29.29	-940
Bulgaria	1997		5 852						-5 852
Canada	1997		19 000	40.00	2.80				-17 292
Czech Republic	1997		4 639	2.25		0.04	19.65		-4 591
Denmark	1997		997		0.49			9.01	-845
Estonia	1997	12 639	4 646	0.01			0.08		7 993
Finland[c]	1997	NE	NE						
France	1997	89 615	157 387	100.62	17.98	2.75	96.79	400.35	-60 085
Germany	1997		33 493	NO	NO	NO	NO	NO	-33 493
Greece	1997								
Hungary	1996	1 490	5 421	0.30		0.10	2.30		-3 925
Iceland	1995								
Ireland	1996		6 497	26.88	0.89				-5 657
Italy	1995	11 692	36 199	183.30	20.00	1.00	34.2	156.1	-14 458
Japan	1995	942	97 648	4.00		1.00	36.00	0.00	-96 622
Latvia	1997	5	14 320				0.02		-14 315
Liechtenstein	1990								
Lithuania[d]	1997	2 800							2 800
Luxembourg	1996		295		0.034			0.835	-284
Monaco	1997								
Netherlands	1996		1 700						-1 700
New Zealand	1997	1 889	18 897	6.64	0.05	1.65	58.08	NE	-16 853
Norway	1997		16 499						-16 499
Poland	1997	674	41 195	0.22	0.002				-40 516
Portugal	1994		1 152	NA	NA	NA	NA	NA	-1 152
Romania	1994		6 590						-6 590
Russian Federation	1996		840 000	400	3				-830 670
Slovakia	1996	760	6 041	1			13		-5 260
Slovenia	1990	3 610	5 904	0.61	0.004	0.15	5.35		-2 280
Spain[c]	1995								
Sweden	1997		31 774						-31 774
Switzerland	1997		5 355						-5 355
Ukraine	1997		68 806						-68 806
United Kingdom	1997	27 075	11 557						15 518
USA	1997	NA	764 683	NE	NE	NE	NE	NE	-764 683

Notation keys: NO: not occurring; NE: not estimated; NA: not applicable to source category.

[a] For the sake of consistency (see paragraph 16 above), where "0" was reported by a Party, the secretariat did not include it in this and the following tables.

[b] The totals may not tally due to rounding off to the nearest integer.

[c] Whilst both Finland and Spain did not report on the LUCF sector in their latest annual inventories, both Parties reported on this sector in their national communications.

[d] Sectoral tables not provided: the emissions from agriculture, forestry, land-use and wood stock change are reported together.

[e] CH_4 and N_2O emissions are converted to CO_2 equivalent emissions by using the global warming potentials of 21 for CH_4, and 310 for N_2O (Source: Second Assessment Report of the IPCC (1995)).

B. Reporting on CO_2 emissions and removals for IPCC categories 5A to 5E in the LUCF sector

20. The IPCC Guidelines identify four sources and sinks in the land-use change and forestry sector, namely: 5A, changes in forest and other woody biomass stocks; 5B, forest and grassland conversion; 5C, abandonment of managed lands; and 5D, CO_2 emissions and removals from soil. Under category 5E, 'other' sources and/or sinks can be reported. The emissions and removals reported by Parties for these categories in their latest submissions are presented in table 4.

Changes in forest and other woody biomass stocks (5A)

21. The emissions and/or removals in the LUCF sector were reported by all the Parties reporting on this sector.[7] For 27 Parties, the removals of CO_2 by existing forests, plantations and non-forest trees (without changes in land-use) are larger than the emissions, making this category a net sink for the majority of Annex I Parties.

Forest and grassland conversion (5B)

22. CO_2 emissions due to forest and grassland conversion were reported by 11 Parties. CO_2 emissions were reported to be "not occurring" (NO) in the Czech Republic and Switzerland, and "not estimated" (NE) by Finland, Norway and the United States. It is not clear if emissions are not occurring or not estimated for many of the remaining Parties (see also table 4).

Abandonment of managed lands (5C)

23. CO_2 removals due to the abandonment of managed lands (croplands, pastures, plantation forests) where a regrowth of natural vegetation occurs, were estimated by six Parties. Seven Parties reported emissions or removals as either not estimated or not occurring. Switzerland included its removals in worksheet 5A, along with changes in forest and other woody biomass stocks.

CO_2 emissions and removals from soil (5D)

24. According to the IPCC Guidelines (Volume 3, Reference Manual, pp. 4.2, 4.87), CO_2 emissions from agricultural soils are to be included under LUCF. At the same time, table 7A (summary report for national GHG inventories in volume 1: IPCC Reporting Instructions) allows for reporting CO_2 emissions or removals from agricultural soils, either in the agriculture sector (under D: agricultural soils) or in the LUCF sector (under D: emissions and removals from soil).

25. CO_2 emissions from soils were reported by seven Parties, ranging from 23,409 Gg for the United Kingdom to 5 Gg for Latvia. Canada and Iceland reported CO_2 emissions from soils through the summary table of the agriculture sector (under category 4D: agricultural soils). CO_2 *removals* from soil were reported by Italy and Poland. The CO_2 emissions from soils are higher than the net CO_2 removals from the category 'changes in forest and other woody biomass stocks' for the United Kingdom (2.2 times) and Estonia (3.8 times).

[7] However, Ukraine did not provide estimates according to the IPCC source/sink categories 5A to 5E.

Others (5E)

26. Canada and the United Kingdom reported other CO_2 emissions and only Australia reported other CO_2 removals. The management practices included are emissions from fires outside of wood production forests for Canada, emission from soils due to upland and lowland drainage, peat extraction and increases in crop biomass for the United Kingdom, and the net uptake from prescribed burning of forest and wildfires and pasture improvement and minimum tillage for Australia.

Table 4: CO_2 emissions and removals according to different IPCC categories (Gg)

Party	Year	5A[a]	5B[a]	5C[a]	5D[a]	5E[a,b]	Total CO_2 emissions and/or removals
Australia	1997	-23 673	61 946	NE	NE	-4 224	34 050
Austria	1997	-13 753					-13 753
Belgium	1997	-2 057					-2 057
Bulgaria	1997	-5 852					-5 852
Canada	1997	-30 000	4 000	-4 000	5 000	6 000	-19 000
Czech Republic	1997	-4 639	NO	NO	NE		-4 639
Denmark	1997	-997					-997
Estonia	1997	-3 386	18	-1260	12 621		7 993
Finland[c]	1997	NE	NE	NE	NE	NE	
France	1997	-83 365	12 343	-48	3 298	0	-67 772
Germany	1997	-33 493	NE	NE	NE	NE	-33 493
Greece	1997						
Hungary	1996	-5 421	1 490				-3 931
Iceland	1995						
Ireland	1996	-6 497					-6 497
Italy	1995	-25 304	811	-157	-95		-24 507
Japan	1995	-97 648	942				-96 706
Latvia	1997	-14 320			5		-14 315
Liechtenstein	1990						
Lithuania	1997	2 800					2 800
Luxembourg	1995	-295					-295
Monaco	1997						
Netherlands	1996	-1 700					-1 700
New Zealand	1997	-18 897	1 889	NE	NE		-17 008
Norway	1997	-16 499	NE	NE	NE	NE	-16 499
Poland	1997	-29 880	101	-7 905	-2 836		-40 521
Portugal	1994	-1 152					-1 152
Romania	1994	-6 590					-6 590
Russian Federation	1996	-840 000					-840 000
Slovakia	1996	-6 041	760				-5 281
Slovenia	1990	-3 072	1 480	-702			-2 294
Spain[c]	1995						
Sweden	1997	-31 774					-31 774
Switzerland	1997	-5 355	NO	IE	NE		-5 355
Ukraine	1997						-68 806
United Kingdom	1997	-10 457			23 409	2 567	15 518
United States of America	1997	-764 683	NE	NE	NE	NA	-764 683
Number of Parties reporting		30	11	6	7	3	
Percentage of Parties reporting (%)		100	37	20	23	10	

Notation keys: NO: not occuring; IE: estimated but included elsewhere; NE: not estimated; and NA: not applicable.

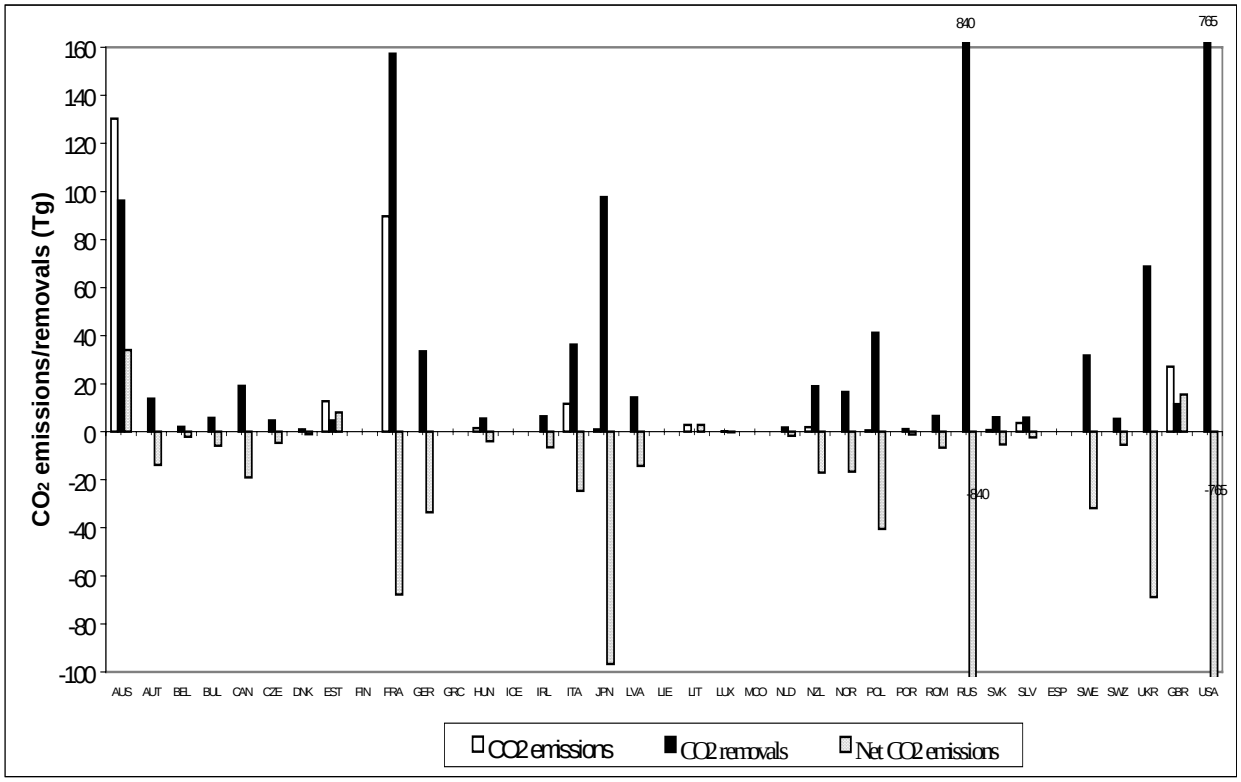
[a] The categories are: 5A – changes in forest and other woody biomass stocks; 5B – forest and grassland conversion; 5C – abandonment of managed lands; 5D – CO_2 emissions and removals from soil; 5E – others.

[b] For 5E (others) Parties reported as follows:

- Australia = prescribed burning of forests and wildfire; pasture improvement and minimum tillage;
- Canada = fires outside of wood production forests;
- United Kingdom = emissions from soils due to upland and lowland drainage and peat extraction and increases in crop biomass.

[c] Whilst both Finland and Spain did not report on the LUCF sector in their latest annual inventories, both Parties reported on this sector in their national communications.

Fig 1: CO_2 emissions, removals and net emissions from the LUCF sector



Note: Values for CO_2 emissions and removals are taken from table 3. The net emissions are estimated by taking the net value (CO_2 emissions – CO_2 removals).

C. CH_4, N_2O, and other non-CO_2 greenhouse gases in the LUCF sector[8]

27. CO_2 equivalent emissions for methane (CH_4) and nitrous oxide (N_2O) are to be calculated using the global warming potentials (GWP) provided by the IPCC in its Second Assessment Report ("1995 IPCC GWP values"[9]) based on the effects of the greenhouse gases over a 100-year time horizon. N_2O was reported by 11 Parties, compared to 15 Parties reporting CH_4. The percentage share of CH_4 and N_2O in CO_2 equivalent emissions is presented in table 5 for those 15 Parties.

28. The CH_4 and N_2O emissions in CO_2 equivalent accounted for approximately 35 per cent of the aggregate GHG emissions in the LUCF sector for Belgium, and between approximately 8 and 17 per cent for Canada, Denmark, Ireland and Italy. For all other Parties the share was less then 3 per cent (see table 5).

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[8] According to the IPCC Guidelines, CH_4 and N_2O emissions resulting from burning forests and/or grasslands are to be estimated and reported. The IPCC provides default methods to estimate all the non-CO_2 GHG emissions (CH_4, N_2O, NO_X, CO and NMVOC) based on the CO_2 emission estimates resulting from burning forests and/or grasslands.

[9] CH_4 and N_2O emissions are converted to CO_2 equivalent emissions by using the global warming potentials of 21 for CH_4, and 310 for N_2O (Source: Second Assessment Report of the IPCC (1995)).

29. The total emissions for the LUCF sector in CO_2 equivalent are provided in table 3. Considering all the GHGs, the LUCF sector is a net source of emissions for Australia, Estonia, Lithuania, and the United Kingdom.

Table 5: Share of CH_4 and N_2O in the total aggregate LUCF emissions and/or removals

Party	Year	CO_2 emissions [Gg]	CO_2 removals [Gg]	Net CO_2 emissions /removals [Gg] [c]	CH_4 [Gg]	N_2O [Gg]	Total CO_2 equivalent emissions [a] [Gg] [c]	Share of CH_4 and N_2O in the aggregate GHG emissions of the LUCF sector [b] (percentage)
Australia	1997	130 347	96 298	34 049	174.34	1.97	38 321	1.9
Belgium	1997		2 057	-2 057	5.07	3.26	-940	35.2
Canada	1997		19 000	-19 000	40.00	2.80	-17 292	8.2
Czech Republic	1997		4 639	-4 639	2.25		-4 592	1.0
Denmark	1997		997	-997		0.49	-845	13.2
Estonia	1997	12 639	4 646	7 993	0.01		7 993	0.003
France	1997	89 615	157 387	-67 772	100.62	17.98	-60 085	3.0
Hungary	1996	1 490	5 421	-3 931	0.30		-3 925	0.1
Ireland	1996		6 497	-6 497	26.88	0.89	-5 657	11.5
Italy	1995	11 692	36 199	-24 507	183.30	20.00	-14 458	17.3
Japan	1995	942	97 648	-96 706	4.00		-96 622	0.1
New Zealand	1997	1 889	18 897	-17 008	6.64	0.05	-16 853	0.7
Poland	1997	674	41 195	-40 521	0.22	0.002	-40 516	
Russian Federation	1996		840 000	-840 000	400	3	-830 670	1.1
Slovakia	1996	760	6 041	-5 281	1		-5 260	0.3
Slovenia	1990	3 610	5 904	-2 294	0.61	0.004	-2 280	0.1

[a] To calculate total CO_2 equivalent emissions for the LUCF sector the 1995 IPCC GWP values were used.

[b] The share of CH_4 and N_2O was calculated as follows: $[(CH_4 \times 21) + (N_2O \times 310)] \times 100 / (CO_2$ emissions + CO_2 removals + $(CH_4 \times 21)$ emissions + $(N_2O \times 310)$ emissions).

[c] Negative values indicate a removal of CO_2, positive values indicate a net source of emissions.

30. Among the precursors of GHGs, carbon monoxide (CO) is reported by 11 Parties, nitrogen oxides (NO_x) by eight, and non-methane volatile organic compounds (NMVOC) by five Parties. Although not mandatory, it is not clear why some Parties only reported one, or a selection of non-CO_2 GHGs, since the IPCC Guidelines provide default methods to estimate emissions of all GHGs on the basis of CO_2 emissions from particular categories. Australia, France, Italy, New Zealand, and Slovenia reported for nearly all the gases. USA reported that all non-CO_2 gases are "not estimated", Portugal that all these gases are "not applicable", and Germany reported these gases as "not occurring" (see also table 3).

D. Comparison of the LUCF sector with other sectors and national emissions

31. The net CO_2 emissions from the LUCF sector and the total CO_2 emissions from all other sectors (including and excluding LUCF) are shown in figure 2a. Figure 2b shows the aggregate GHG emissions and/or removals from the LUCF sector and the aggregate GHG emissions from all other sectors (including and excluding LUCF). Table 6 presents the values for the total CO_2 emissions, including and excluding LUCF, and aggregate GHG emissions in CO_2 equivalent, including and excluding LUCF.

32. For Australia, Estonia, Lithuania, and the United Kingdom, the LUCF sector is a net source of emissions, both of CO_2 and of all GHGs. In the case of Latvia, the LUCF sector is a sink. The LUCF sector partially offsets the CO_2 emissions from other sectors for 27 Parties. It reduces CO_2 emissions from other sectors by over 10 per cent for 13 Parties, and by over 50 per cent for four of these Parties.

33. There is no single year for which all the Annex I Parties reported CO_2 emissions from the LUCF sector. The total CO_2 removals for all Parties in the LUCF sector for the latest year reported are 2,035 Tg. In comparison, the total CO_2 emissions from all other sectors (excluding LUCF) is estimated to be 13,578 Tg, indicating that the LUCF sector offsets the total CO_2 emissions of all Annex I Parties by approximately 15 per cent. Considering aggregate GHG in CO_2 equivalent, the LUCF sector offsets approximately 12 per cent of the aggregate GHG emissions (excluding LUCF). More detail is provided in table 6.

Fig 2a: Net CO_2 emissions from the LUCF sector and total CO_2 emissions from all other sectors (including and excluding LUCF).

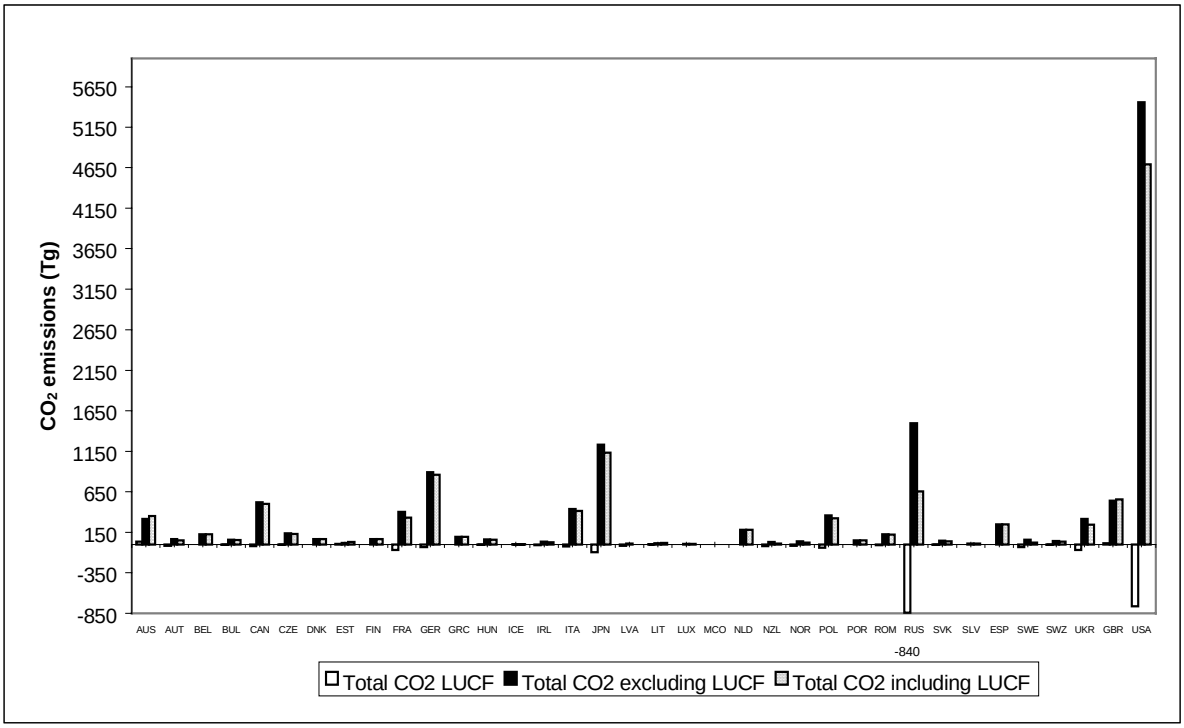
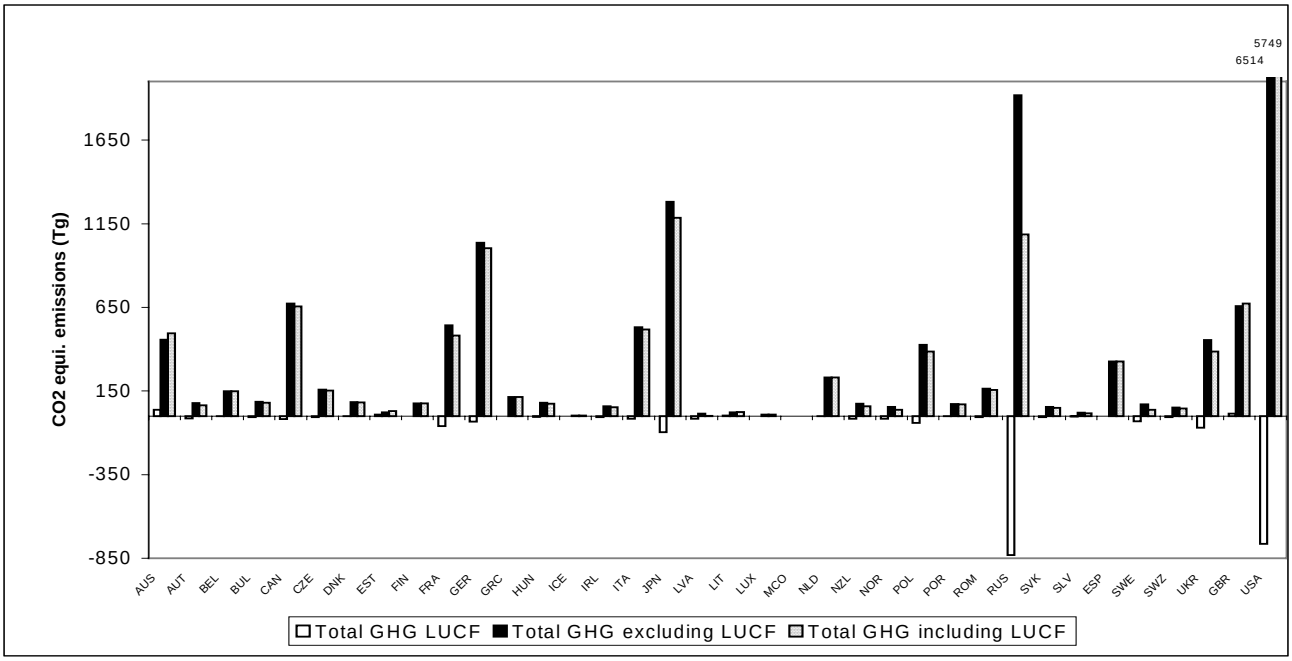


Fig 2b: Aggregate GHG emissions and/or removals from the LUCF sector and aggregate GHG emissions from all other sectors (including and excluding LUCF)



Note: The data for these tables may be found in table 6.

Table 6: National total CO_2 emissions and aggregate GHG emissions in CO_2 equivalent of all sectors (including and excluding LUCF)

Party	Inventory year	LUCF net CO_2 emissions [Gg]	Total CO_2 excluding LUCF [Gg]	Total CO_2 including LUCF [Gg]	Percentage increase or decrease in total CO_2 emissions with the inclusion of LUCF [a, c]	Aggregate GHG in the LUCF sector [Gg]	Aggregate GHG from all sectors excluding LUCF [Gg]	Aggregate GHG from all sectors including LUCF [Gg]	Percentage increase or decrease in total GHG emissions with the inclusion of LUCF [c]
Australia	1997	34 050	315 353	349 403	10.8	38 321	456 508	494 829	8.4
Austria	1997	-13 753	66 062	52 309	-20.8	-13 753	77 571	63 818	-17.7
Belgium	1997	-2 057	126 288	124 231	-1.6	-940	148 795	147 856	-0.6
Bulgaria	1997	-5 852	59 148	53 296	-9.9	-5 852	84 461	78 609	-6.9
Canada	1997	-19 000	519 280	500 280	-3.7	-17 230	672 910	655 680	-2.6
Czech Republic	1997	-4 639	137 125	132 486	-3.4	-4 591	157 768	153 177	-2.9
Denmark	1997	-997	64 322	63 325	-1.6	-845	83 351	82 506	-1.0
Estonia	1997	7 993	20 716	28 708	38.6	7 993	23 097	31 090	34.6
Finland	1997		64 600	64 600			76 184	76 184	
France	1997	-67 772	402 237	334 465	-16.8	-60 085	542 652	482 567	-11.1
Germany	1997	-33 493	894 000	860 507	-3.7	-33 493	1035 804	1002 311	-3.2
Greece	1997		95 410	95 410			114 719	114 719	
Hungary	1996	-3 931	60 475	56 545	-6.5	-3 925	79 124	75 199	-5.0
Iceland	1995		2 282	2 282			2 692	2 692	
Ireland	1996	-6 497	34 819	28 322	-18.7	-5 657	58 882	53 225	-9.6
Italy	1995	-24 745	438 490	413 745	-5.6	-14 417	531 985	517 569	-2.7
Japan	1997	-96 705	1230 831	1134 126	-7.9	-96 610	1280 270	1183 660	-7.5
Latvia	1997	-14 315	12 842	-1 473	-111.5	-14 315	15 959	1 643	-89.7
Lithuania	1997	2 800	16 200	19 000	17.3	2 800	22 542	25 342	12.4
Luxembourg	1995	-295	9 545	9 250	-3.1	-284	10 212	9 928	-2.8
Monaco	1997		143	143			147	147	

Table 6 *(continued)*:

Netherlands	1996	-1 700	184 870	183 170	-0.9	-1 700	232 071	230371	-0.7
New Zealand	1997	-17 008	30 284	13 276	-56.2	-16 855	75 235	58380	-22.4
Norway	1997	-16 499	41 430	24 931	-39.8	-16 499	53 740	37241	-30.7
Poland	1997	-40 521	361 626	321 105	-11.2	-40 516	426 215	385699	-9.5
Portugal	1994	-1 152	50 841	49 689	-2.3	-1 152	72 579	71427	-1.6
Romania	1994	-6 590	125 597	119 007	-5.2	-6 590	164 026	157436	-4.0
Russian Federation	1996	-840 000	1495 920	655 920	-56.2	-830 670	1916 934	1086264	-43.3
Slovakia	1996	-5 281	46 105	40 824	-11.5	-5 260	55 127	49867	-9.5
Slovenia	1990	-2 293	13 935	11 642	-16.5	-2 279	19 198	16919	-11.9
Spain	1995		247 703	247 703			325 530	325530	0.0
Sweden	1997	-31 774	56 428	24 654	-56.3	-31 774	69 328	37554	-45.8
Switzerland	1997	-5 400	43 370	37 970	-12.5	-5 400	51 701	46301	-10.4
Ukraine	1998	-68 708	314 445	245 737	-21.9	-68 708	454 934	386225	-15.1
United Kingdom	1997	15 518	540 643	556 161	2.9	15 518	657 435	672953	2.4
USA	1997	-764 683	5455 553	4690 870	-14.0	-764 683	6513 874	5749191	-11.7
Total		**-2 035 301**	**13 578 920**	**11 543 618**	**-15**	**-1 999 452**	**16 563 558**	**14 564 105**	**-12**

Note: All figures in this table are rounded off to the nearest integer.

[a] Calculated as follows: (LUCF net CO_2 emissions) / (total CO_2 emissions excluding LUCF) x 100.

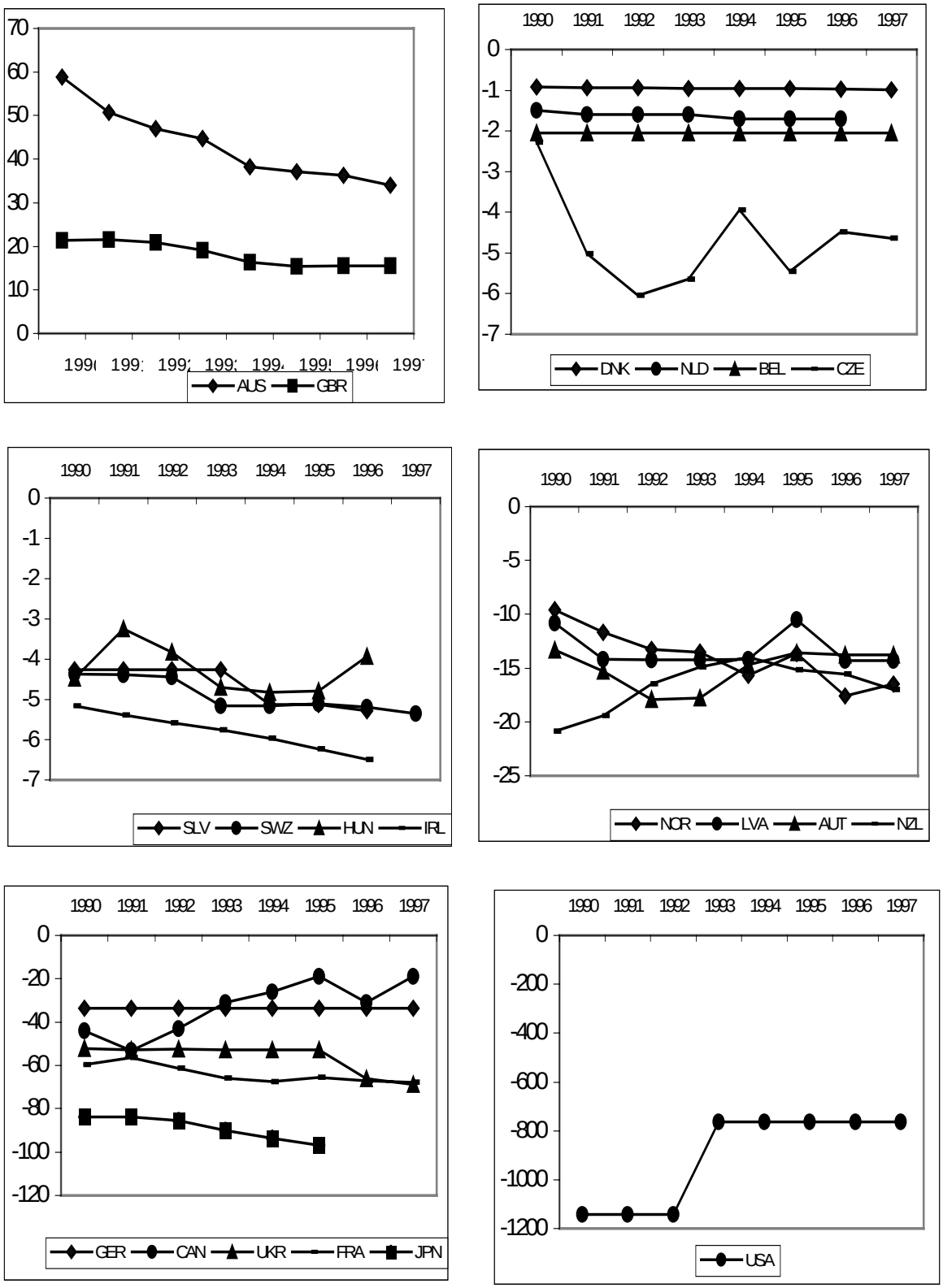
[b] The total CO_2 and CO_2 equivalent emissions from all sectors include data on the LUCF sector for the years 1995 and 1997 for the remaining sectors. Therefore, these totals may deviate from the national emissions reported for 1997 in the 1999 annual inventories.

[c] Negative values in percentages indicate a decrease in total emissions whilst positive values in percentage indicate an increase.

E. CO_2 emission trends in the LUCF sector during the period 1990 to 1997

34. Not all Parties reported CO_2 emissions and removals for all years between 1990 and 1997. Data for a selection of Parties are presented in figure 3. These data indicate that for some Parties, the LUCF sector is removing GHGs from the atmosphere, but at a decreasing rate. For other Parties the reverse is occurring: the removal capacity of the LUCF sector is increasing. Estonia and Lithuania have changed during this period from being a net sink to being a net source, whilst in other countries the sink capacity of the LUCF sector has been reasonably stable (see also appendix I).

Figure 3. Trends in CO_2 emissions and removals in the LUCF sector in selected Annex I Parties, 1990 - 1997 (Tg)



IV. GREENHOUSE GAS EMISSIONS AND REMOVALS IN THE AGRICULTURAL SOILS CATEGORIES

35. The main gas reported in this category is N_2O. Emissions of this GHG were reported by 32 Parties. Seven Parties also reported emissions of CH_4. [10] Two Parties reported emissions of CO_2. Only one Party reported removals in this category, namely of CH_4.

36. According to the IPCC Guidelines (Volume 3. Reference Manual, pp. 4.2, 4.87), CO_2 emissions from agricultural soils are to be included under LUCF. Hence, the IPCC reporting guidelines do not facilitate the reporting of CO_2 emissions and/or removals in the *sectoral* tables (table 4: sectoral report for agriculture) under the agricultural soils category 4D. At the same time, table 7A (summary report for national GHG inventories in volume 1: IPCC Reporting Instructions) allows for reporting CO_2 emissions or removals from agricultural soils, either in the agriculture sector (under D: agricultural soils) or in the LUCF sector (under D: emissions and removals from soil). This section of the report only focuses on the emissions and/or removals reported under category 4D: agricultural soils.

37. All Parties, except for Liechtenstein, Lithuania, Monaco, Romania and Ukraine, reported emissions and removals from agricultural soils for some years. Liechtenstein and Monaco did not report on emissions, while Romania and Ukraine did not provide sectoral or summary reports (tables 1 and 7 and appendix II).

38. CO_2 emissions from agricultural soils were only reported by Canada and Iceland. Emissions of N_2O from agricultural soils were reported by 32 Parties although not for all years, whereas data on CH_4 were provided by seven Parties. Only Switzerland reported a *removal* for CH_4 due to soil oxidation.

39. N_2O is the dominant GHG in the agricultural soils category for the majority of Parties. It accounts for 100 per cent of the CO_2 equivalent emissions for 71 per cent of all Parties that reported on agricultural soils, and from 90 to 100 per cent for an additional 19 per cent of the Parties.

40. Sixteen Parties reported N_2O emissions for every year from 1990 to 1997, but in different submissions. All other Parties did not report consistently for all years. In order to obtain an approximate estimate of the importance of this gas, the N_2O emissions for the latest years reported were aggregated. The aggregate N_2O emission is estimated to be 1,832 Gg, or 567,985 Gg CO_2 equivalent.

41. N_2O emission trends for the period 1990-1997 for selected countries are presented in figure 4 (and supporting data are presented in appendix II).

42. Emissions from the agricultural soils category are decreasing in some countries and increasing in others. These emissions fluctuate substantially in some countries. None of the Parties reported data indicating a net sink in this source category (see figure 4 and appendix II). Canada and Norway reported the same value for all the reported years.

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[10] The seven Parties that reported CH_4 all use CORINAIR to prepare their national inventories. Whilst the 1990 version of CORINAIR provided emission factors for CH_4 emissions from agricultural soils, the new version does not.

Table 7: CO_2, CH_4 and N_2O emissions from agricultural soils (Gg)

Party	Year	CO_2 emissions [Gg]	CH_4 [Gg]	N_2O [Gg]	NO_x [Gg]	NMVOC [Gg]	CO_2 equivalent emissions [a] [Gg]	Share of N_2O in aggregate emissions of agricultural soils [both in CO_2 equivalent]
Australia	1997		NA	49.83	NA	NA	15 447	100
Austria	1997		34.97	3.26	6.07	2.18	1 745	58
Belgium	1997		14.39	9.36		1.09	3 204	91
Bulgaria	1997			2.46			763	100
Canada	1997	1 000.00	NA	100.00			32 000	97
Czech Republic	1997	NE	NE	11.31	NE		3 506	100
Denmark	1997			24.05		1.27	7 456	100
Estonia	1997			0.03			9	100
Finland	1997	NE		8.80			2 728	100
France	1997		22.98	167.62	0.00	20.37	52 445	99
Germany	1997	NO	NE	76.00	NO	NO	23 560	100
Greece	1997		99.30	19.60		30.70	8 161	74
Hungary	1996			1.68			521	100
Iceland	1995	4.5		0.50			160	97
Ireland	1996		29.34	18.98			6 500	91
Italy	1995			63.50			19 685	100
Japan	1997			1.04			310	100
Latvia	1997			3.13			970	100
Liechtenstein	1990							
Lithuania	1997							
Luxembourg	1996			0.48		0.162	149	100
Monaco	1997							
Netherlands	1996			26.70		0.20	8 277	100
New Zealand	1997			36.10			11 191	100
Norway	1997	NO	NO	4.00	NO	NO	1 240	100
Poland	1997			31.15		33.90	9 657	100
Portugal	1994	NA	NE	7.16	NE	NE	2 220	100
Romania	1994							
Russian Federation	1996			105.00			32 550	100
Slovakia	1996			5.50			1 705	100
Slovenia	1990			4.57			1 417	100
Spain	1995		78.77	58.38		71.22	19 752	92
Sweden	1997			14.00			4 340	100
Switzerland	1997		-3.20 [b]	8.50			2 568	103
Ukraine	1997							
United Kingdom	1997		NE	93.87	NE	NO	29 100	100
USA	1997	NE	NE	876.17	NE	NE	271 613	100
Total		1 004.9	276.55	1 832.21	6.07	160.93	574 800	

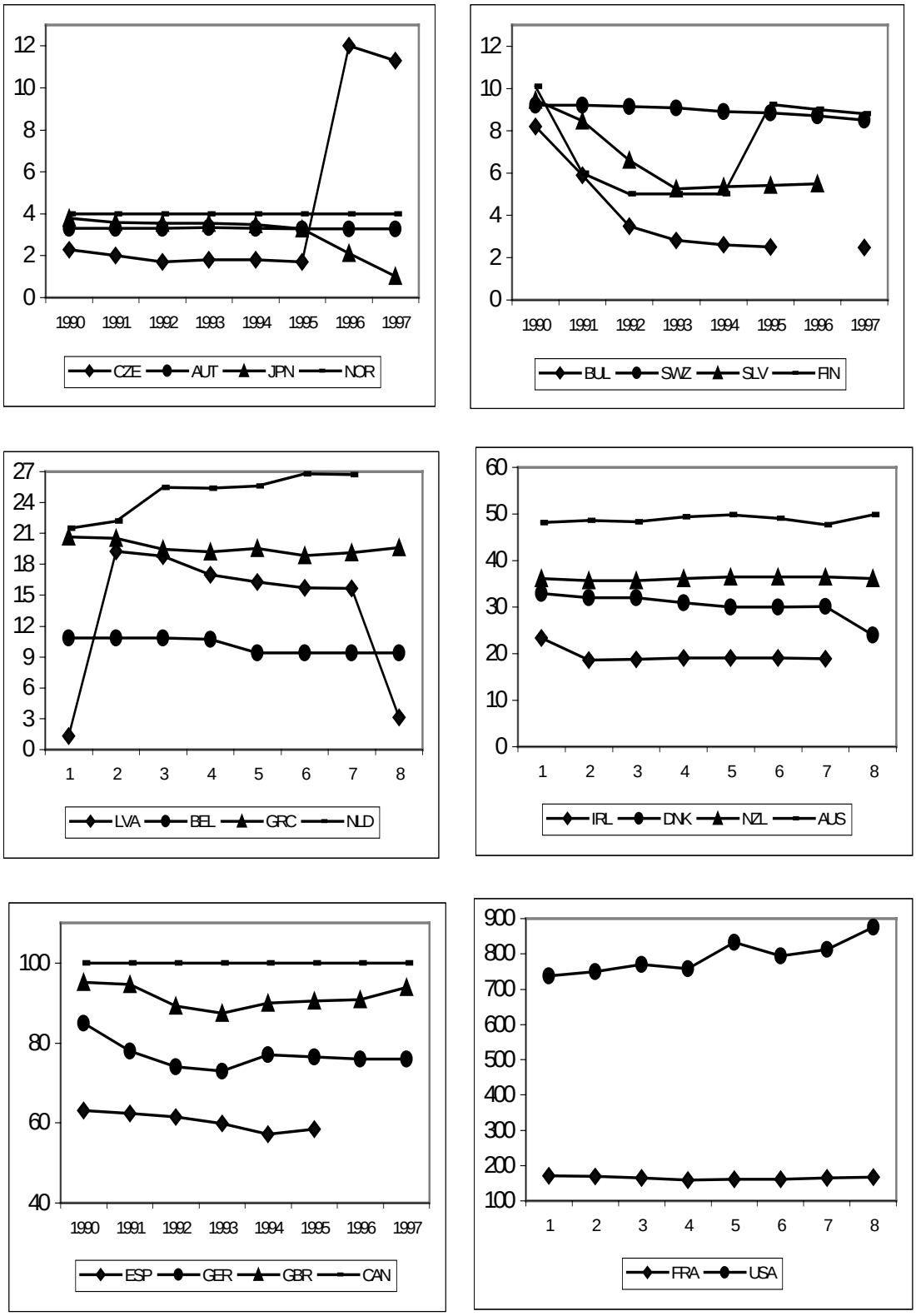
Notes:

Notation keys: NO: not occuring; NE: not estimated; NA: not applicable to source category
The emissions are as reported in the summary table of the respective parties. Empty cells or notation keys are reflected as reported.

[a] 1995 IPCC global warming potential values were used to convert CH_4 and N_2O emissions into CO_2 equivalent emissions: 21 and 310 respectively.

[b] CH_4 removal for Switzerland due to CH_4 oxidation from agricultural soils.

Figure 4. Trends in N_20 emissions in the agricultural soils category in selected Annex I Parties, 1990 - 1997 (Gg)



V. BASE YEAR EMISSION AND REMOVAL ESTIMATES AND THEIR RECALCULATION

A. Base year emission and/or removal estimates as of the first national communications

43. In their first NCs, 29 Parties provided CO_2 estimates of emissions and/or removals from LUCF for the base year. Eight Parties (Austria, Canada, Greece, Iceland, Ireland, Luxembourg, Monaco and Romania)[11] did not provide estimates. According to the first NCs, estimated total net CO_2 emissions from the LUCF sector in 1990 amounted to approximately - 1,374,000 Gg for all Annex I Parties together.

44. Base year N_2O emissions from the agricultural soils category were reported by 32 Parties in their first NC. However, in some cases only an aggregate N_2O estimate for the agricultural sector as a whole was provided and reference to the agricultural soils source category was only made in the respective texts of the NCs. Five Parties (Liechtenstein, Luxembourg, Monaco, Romania and Russian Federation) did not provide estimates for this source category.[12] According to the first NCs, total N_2O emissions from agricultural soils from all reporting Annex I Parties amounted to approximately 790 Gg in 1990.

45. Estimates for CO_2 emissions from agricultural soils were reported by Iceland (4.5 Gg) and Norway (200 Gg) in their first NCs.

B. Base year emission and/or removal estimates as of the latest annual inventory submissions

46. The latest base year estimates for LUCF and agricultural soils were taken from the annual GHG inventories submitted in 1999, or, where not available, from the inventories submitted in 1998 (see table 1). However, for consideration of base year estimates it was necessary to use the second NCs for approximately half of the Parties, as the latest annual inventory submissions did not include base year estimates.[13] For the LUCF sector no base year estimates are available for three Parties (Greece, Iceland and Monaco)[14]. For four Parties (Hungary, Liechtenstein, Lithuania, and Slovenia) base year estimates for LUCF are as of first NCs. For the agricultural soils category, no base year estimates are available for three Parties (Liechtenstein, Monaco and Russian Federation), and for another four Parties (Hungary, Lithuania, Slovenia and Ukraine) [15] the latest base year estimates are from the first NCs. Total net CO_2 emissions for all Annex I Parties amounted to approximately -1,966,000 Gg CO_2 in 1990 according to the latest estimates available. Total N_2O emissions from agricultural soils amounted to approximately 1,713 Gg N_2O in 1990.

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[11] However, Greece provided an estimate of –4,200 Gg CO_2 in its first NC which was based on average activity data gathered during several decades prior to 1990, and Luxembourg provided an estimate of 105 Gg CO_2 from nature according to the CORINAIR methodology. Ireland reported "zero".

[12] Liechtenstein, Luxembourg and the Russian Federation reported N_2O emissions from agriculture as a whole.

[13] Parties for which the latest base year estimates are available from the second NCs are given in *italics* in tables 8 and 9.

[14] Iceland reported its 1991 net emissions instead of reporting 1990 estimates. Greece placed the number "zero" in its IPCC tables and Monaco reported that methodologies available are not applicable to their national conditions.

[15] Hungary stated it has the same base year emissions as given in its first NC. The Russian Federation reported emissions from agricultural soils together with N_2O emissions from animal waste.

47. CO_2 emissions from soils were included in the agricultural soils category by Canada in the latest inventory submission and by Iceland in the second NC. For Canada, this was not the case for the first NC[16]. All the other Parties reported CO_2 emissions from soils under the LUCF sector, if estimated.

C. Recalculation of base year estimates

48. Information related to recalculation of base year estimates is provided in this paper to illustrate the magnitude of the changes in the estimates that have taken place since the first NCs. Base year inventories are recalculated under the current practice of inventory preparation as Parties seek to improve the quality and accuracy of their inventories when new inventory information becomes available.[17] These changes in estimates arise from the fact that Parties changed methods, emission factors, assumptions and activity data and/or added new sources. In addition, changes in base year estimates were due to the fact that the Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories were applied.

49. In their first NCs, 29 Parties provided estimates of emissions and/or removals from LUCF for the base year. Of these, 20 Parties revised their estimates in their second NC and/or latest annual inventory submission. The magnitude of changes in LUCF base year estimates between the first NCs and the latest inventory available is shown in table 8. Nine Parties reported larger removals after base year inventory recalculation, the largest increase in removals being reported by the Netherlands, whose removals according to the latest estimates were more than 12 times higher than those reported in the first NC (1,150 per cent). For the remaining 11 Parties, recalculation of base year estimates led to estimates up to 80 per cent lower in the latest inventory compared to estimates from the first NCs. The United Kingdom is the only Party for which LUCF constituted a net sink according to the first NC and a net source of emissions in more recent inventories. This was mainly due to the inclusion of additional sources of emissions in the LUCF inventory.

50. N_2O emission estimates from agricultural soils were recalculated by 26 Parties. The magnitude of changes in estimates between the first NCs and the latest inventory available is shown in table 9. Seventeen Parties revised their base year N_2O estimates upwards, the largest change being reported by the United Kingdom, whose estimates according to the latest inventory were more than 23 times higher than those reported in the first NC (2,277 per cent).

51. Changes in N_2O emissions leading to 10-fold increases or more were also noted for Canada and Latvia. In the case of Canada this was attributed to the inclusion of more sources of nitrogen: in previous inventories only nitrogen from synthetic fertilizer was considered. In most cases, changes in the emissions from agricultural soils could be attributed to the use of the Revised 1996 IPCC Guidelines, which included additional sources. Eight Parties revised their estimates downwards, by amounts ranging between 3 per cent and 66 per cent.

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[16] Canada started to report on CO_2 emissions from agricultural soils as of its second NC.

[17] Information on base year inventory recalculation from sectors other than land-use change and forestry can be found in working paper no.6 “Effects of recalculations of greenhouse gas inventories on assigned amounts and on emission limitation and reduction commitments of Annex I Parties”, which was prepared for the workshop on issues related to Articles 5, 7 and 8 of the Kyoto Protocol held in Bonn from 14 to 16 March 2000. The document can be found at http://www.unfccc.de/sessions/workshop/000314/.

D. Key reasons for changes in the base year inventories

52. Only some Parties cited reasons for the changes in their base year estimates (see tables 8 and 9). The main reasons for the modification of LUCF estimates were as follows:[18]

(a) Adoption 1996 IPCC Revised Guidelines (Germany, Japan, Latvia, Poland);

(b) Increased use of land-clearing rates from remote sensing, updated statistics on new plantings (Australia);

(c) Availability of new data on land conversion, new planting, restocking and harvesting; modification of existing models, and change in biomass conversion ratio (New Zealand);

(d) Availability of new data (Italy);

(e) Advances in knowledge; in-depth review of first NC (Japan);

(f) Inclusion of data on agricultural land-use change, inclusion of all land-use transition and inclusion of Northern Ireland (UK);

(g) Use of new data and a revised model (Russian Federation);[19]

(h) Revision of CO_2 fluxes to include new sources, such as forest and non-forest soils, as well as wood harvested from public lands (USA).

53. France indicated that the details of the change are contained in a report produced by a third party. For the remaining Parties no indication related to base year recalculation of the LUCF sector was made.

54. The main reasons cited for modification of agricultural soils estimates are:

(a) Use of 1996 IPCC Revised Guidelines (Australia, Finland, Germany, Latvia, Norway, Sweden, Switzerland, USA);

(b) Use of most recent findings (Austria - no further details);

(c) New methods (Canada - no further details);

(d) Inclusion of new sources of emissions (Australia, Canada, Denmark);

(e) Estimates updated (Slovakia - no further details);

(f) More reliable data and update of methodology (Greece);

(g) Revision to account for the application of additional quantities of animal manure applied to soils (USA).

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[18] Information on revision of base year LUCF estimates between annual inventories submitted in 1998 and second NCs can be found in document FCCC/SBI/1999/5, page 11.

[19] This information was provided during the in-depth review of the second NC.

55. Japan and Spain cited general reasons for the change in estimates, not specifically for agricultural soils. France indicated that the details of the change are contained in a report produced by a third party. For the rest of the Parties no indication as to the reason for changes made to the agricultural soils base year estimates was provided.

Table 8. Differences in base year (1990) net CO_2 emission estimates from LUCF between first NCs and most recent inventory submissions

Party	Base year estimates of net CO_2 emissions according to [a]		Percentage change in net CO_2 emissions estimates (B-A)/A*100 [per cent]	Explanation for recalculation provided
	First NCs [Gg]	Latest estimates [Gg]		
	A	B	C	D
Australia	130 843	69 436	- 47	Yes
Austria	NR	- 13 300		
Belgium	- 2 057	- 2 057		
Bulgaria [b]	- 4 657	*- 4 657*		
Canada	NR	- 44 000		
Czech Republic	- 2 280	*- 2 281*		
Denmark	- 2 600	*- 924*	- 64	No
Estonia	- 7 950	*- 11 317*	42	No
Finland	- 31 000	*- 31 000*	-	
France	- 32 168	- 59 617	85	No
Germany	- 20 000	- 33 719	69	Yes
Greece	NR			
Hungary [b]	- 3 097			
Iceland	NR	NR		
Ireland		*- 5 160*		
Italy	- 36 730	*- 24 929*	- 32	Yes
Japan	- 90 000	- 83 903	- 7	In second NC
Latvia	- 14 300	*- 10 826*	- 24	Yes
Liechtenstein	- 22			
Lithuania	- 8 848			
Luxembourg	NR	*- 295*		
Monaco	NR			
Netherlands	- 120	- 1 500	1 150	
New Zealand	- 16 716	- 20 888	25	Yes
Norway [c]	- 12 200	- 9 590	- 21	No
Poland [b]	- 18 280	*- 34 746*	90	Yes
Portugal [d]	- 70 400	*- 14 353*	- 80	No
Romania [b]	NR	*- 2 925*		
Russian Fed.	- 587 200	*- 392 000*	- 33	Yes
Slovakia	- 4 451	*- 4 257*	- 4	No
Slovenia [e]	- 2 293			
Spain	- 4 178	*- 28 970*	593	
Sweden	- 34 368	- 34 368	-	
Switzerland	- 5 200	*- 4 360*	- 16	No.
Ukraine	- 51 976	- 52 107	0.3	
UK [f]	- 6 137	21 412	- 449	Yes
USA	- 436 000	- 1 142 200	162	Yes

Note: Parties that did not provide recalculated estimates were included in this table for the purpose of illustrating reported base year estimates.

Values in *italics* indicate that the estimates are from the second NCs.

[a] A negative value indicates removals and a positive one indicates emissions.

[b] According to decision 9/CP.2, the following EIT Parties use base years other than 1990: Bulgaria (1988), Hungary (average 1985-1987), Poland (1988) and Romania (1989).

[c] Estimate from the first NC refers to the year 1992.

[d] Estimate from the first NC reflects the total removal, therefore the estimate given in the second NC refers also to the total removal. Net emissions were reported to be -1,152 Gg in the second NC.

[e] According to decision 11/CP.4, Slovenia uses the year 1986 as base year. However, data given in this table are for 1990, as no base year data were provided.

[f] Data provided under the first NC were taken from an update to the United Kingdom's climate change programme: *Climate change, the UK programme, progress report on carbon dioxide emissions*, 1995

Table 9. Differences in base year (1990) N_2O emission estimates from agricultural soils between first NCs and most recent inventory submissions

Party	Base year estimates of N_2O emissions according to		Percentage change in N_2O emissions estimates (B-A)/A*100 [per cent]	Explanation for recalculation provided
	First NCs [Gg]	Latest estimates [Gg]		
	A	B	C	D
Australia	28.6	48.2	68.6	Yes
Austria	2.0	3.3	65.0	Yes
Belgium	10.9	10.9		
Bulgaria [a]	13.4	*13.4*		
Canada	11.0	100.0	809.1	Yes
Czech Republic	2.0	*2.3*	15.0	
Denmark	8.5	*33.0*	288.2	Yes
Estonia [b]	1.0	*0.9*	-5.3	
Finland	10.0	10.1	0.8	Yes
France	61.1	171.3	180.4	In NC2
Germany	69.0	85.0	23.2	In NC2
Greece	7.4	20.6	178.4	In NC2
Hungary [a]	4.6			
Iceland	0.5	*0.2*	-57.4	No
Ireland	39.5	*23.3*	-40.9	No
Italy	56.6	*62.1*	9.7	No
Japan	4.0	3.8	-5.0	In NC2
Latvia	1.4	*22.0*	1528.4	Yes
Liechtenstein	NR			
Lithuania [b]	10.8			
Luxembourg	NR	*0.5*		
Monaco	NR	NR		
Netherlands	22.1	21.5	-2.7	No
New Zealand	1-37***	36.1		
Norway	6.0	4.0	-33.3	Yes
Poland [a, c]	72.0	*43.0*	-40.3	No
Portugal	3.6	*7.4*	104.2	No
Romania [a]	NR	*25.1*		
Russian Federation	NR	*IE*		
Slovakia	8.8	*9.5*	8.0	Yes
Slovenia [d]	4.6			
Spain	63.0	63.2	0.3	
Sweden	7.9	15.0	89.9	Yes
Switzerland	26.7	*9.2*	-65.5	Yes
Ukraine	10.2	NR		
United Kingdom	4.0	95.1	2276.8	
USA	200.0	773.0	286.5	Yes

Note: Parties that did not provide recalculated estimates were included in this table for the purpose of illustrating reported base year estimates.

Values in *italics* indicate that the estimates are from the second NCs.

[a] According to decision 9/CP.2, the following EIT Parties use base years other than 1990: Bulgaria (1988), Hungary (average 1985-1987), Poland (1988) and Romania (1989).

[b] Estimates provided by the Party refer to the agriculture sector as a whole, but information provided in the national communication or inventory submission indicates that these emissions mainly stem from agricultural soils.

[c] A range, 0-144 Gg was also provided in the first NC.

[d] According to decision 11/CP.4, Slovenia uses the year 1986 as base year. However, data given in this table are for 1990, as no base year data were provided.

IE: Included elsewhere

VI. REPORTING OF METHODS AND SOURCES OF DATA USED FOR ESTIMATING GHG INVENTORIES

A. Reporting on methods used for estimating GHG emissions and removals

56. In the latest GHG inventories, 15 Parties reported the methods used for estimating GHG emissions and removals from the LUCF sector and the agricultural soils category (table 10). Six Parties used the Revised 1996 IPCC Guidelines default method without any qualification, and four Parties used methods *based* on the Revised 1996 IPCC Guidelines default methods. Two Parties used their own methods which conform to IPCC methods, and another 12 Parties used the IPCC reporting format, but did not specify the methods. One Party used the IPCC methodology, but did not report data in the standard IPCC tables, as the relevant activity data were only available as an average of information gathered during several decades prior to 1990.

57. In their second national communications, 20 Parties reported the use of methods for estimating emissions and removals for the LUCF sector and agricultural soils category. Nine Parties reported the use of "IPCC Guidelines", "IPCC methodology" or "1995 IPCC Guidelines". Three Parties used the 1996 Revised IPCC Guidelines while two Parties reported methods based on IPCC guidelines. Four Parties in Europe used the CORINAIR method. Australia, the United Kingdom and the USA reported the methods they used in separate reports. Details are provided in table 10 for those Parties for which information is available.

Table 10: Reporting of methods used for GHG inventories and/or second national communications[a]

Party	Methods used for estimates in LUCF sector	Methods used for estimates in agricultural soils category
Australia	INV99: methods that conforms to 1996 IPCC.[b] NC2: 1997 Workbook in LUCF	INV99: methods that conforms to 1996 IPCC.[b] NC2: based on IPCC methodology
Austria	INV99: CORINAIR NC2: CORINAIR	INV99: CORINAIR NC2: CORINAIR
Belgium	INV99: NR NC2: IPCC	INV99: NR NC2: IPCC and CORINAIR
Bulgaria	INV99: 1996 IPCC NC2:1995 IPCC	INV99: 1996 IPCC NC2: 1995 IPCC
Canada	INV99: Based on 1996 IPCC 2nd: Based on 1995 and 1996 IPCC[c]	INV99: Based on 1996 IPCC NC2: Based on 1996 IPCC[c]
Czech Republic	INV99: NR NC2: 1995 IPCC	INV99: NR NC2: 1995 IPCC
Denmark	INV99: NR NC2: CORINAIR	INV99: NR NC2: CORINAIR; 1996 Revised IPCC
Estonia	INV99: NR NC2: IPCC	INV99: NR NC2: IPCC
Finland	INV99/NC2: NE	INV99/NC2: IPCC
France	INV99: NR NC2: CORINAIR	INV99: NR NC2: CORINAIR
Germany	INV99: method based on 1996 IPCC NC2: NR	INV99: NR NC2: 1996 IPCC
Greece	NE	INV99: CORINAIR NC2: CORINAIR
Hungary	1999 GI: IPCC NC2: IPCC	INV99: IPCC NC2: IPCC

Table 10 ***(continued)***

Iceland	INV99: NR NC2: NR	INV99: NR NC2: 1995 IPCC
Ireland	INV99: NR NC2: CORINAIR	INV99: NR NC2: CORINAIR
Italy	1999G/NCI2: 1996 IPCC	INV99/NC2: 1996 IPCC
Japan	INV99: NR NC2: 1996 IPCC	INV99: NR NC2: 1996 IPCC
Latvia	INV99: NR NC2: 1996 IPCC	INV99: NR NC2: 1996 IPCC
Netherlands	INV99: Based on 1996 IPCC NC2: Based on IPCC	INV99: Based on 1996 IPCC NC2: Based on IPCC
New Zealand	INV99: NR NC2: IPCC	INV99: NR NC2: IPCC
Norway	INV99: Partly based on 1996 IPCC; country specific emission factors NC2: IPCC	INV99: Partly based on 1996 IPCC; country-specific emission factors NC2: IPCC
Poland	INV99: NR NC2: 1995 IPCC	INV99: NR NC2: 1995 IPCC
Portugal	INV99: IPCC NC2: NR	INV99: IPCC NC2: NR
Romania	INV99: IPCC NC2: IPCC	INV99: IPCC NC2: IPCC
Russian Federation [d]	INV99: based on recent forest inventory plus IPCC NC2: "the Carbon and Climate in Boreal Forests" model.	
Slovakia	INV99: 1996 IPCC NC2: IPCC	INV99: 1996 IPCC NC2: IPCC
Spain	INV99: NE NC2: Based on IPCC	INV99: NR NC2: CORINAIR
Sweden	INV99: 1996 IPCC NC2: NE	INV99: 1996 IPCC NC2: IPCC
Switzerland	INV99: 1996 IPCC NC2: IPCC for LUCF, 1996 IPCC for agricultural soils	199GI/NC2: 1996 IPCC
United Kingdom	INV99: NR NC2: Details in the "UK Greenhouse Gas Inventory 1999 to 1994"	INV99: NR NC2: Details in the "UK Greenhouse Gas Inventory 1999 to 1994"
USA	INV99: NR NC2: Methods similar to 1995 IPCC	INV99: NR NC2: Methods similar to 1995 IPCC

Notation keys: NR- not reported; NE- not estimated; NO- not occurring; IE- estimated but included elsewhere. Blank - Party did not report a value, but left cell "blank".

[a] In this table the 1996 Revised IPCC Guidelines are referenced as 1996 IPCC, and the 1995 IPCC Guidelines as 1995 IPCC. If the version used was not specified, the term "IPCC" is used.

[b] Australia used the "Australian Methodology for the Estimation of Greenhouse Gas Emissions and Sinks" which conforms to the 1996 IPCC Guidelines

[c] Details are provided in *Canada's Greenhouse Gas Inventory – 1997 Emissions and Removals with Trends*

[d] Information derived from in-depth review

B. Reporting on sources of activity data and/or emission factors

58. Seven Parties reported the specific source of activity data for LUCF that was used in the latest GHG inventory, and 11 Parties reported sources of activity data in their second NC. Table 11 lists the origin of the activity data. Parties for which no information was available have not been included in the table.

Table 11: Sources of activity data for the LUCF sector as reported in the latest submission

Party	Area converted	Biomass (before conversion)	Annual growth rate	Area of forest
Australia [a]	NR in NC2. INV99: Updated statistics from Bureau of Resource Sciences (1999)	NR	NR	NR in NC2 INV99: Updated statistics on new plantings and area established (Bureau of Resource Sciences, 1999)
Bulgaria	NE	NE	Forest inventory data	Forest inventory data
Denmark	National Environmental Research Institute			
Germany [a]	NE	NE	Federal Forest Inventory Forest Fund Database	Federal Ministry of Food, Agriculture and Forestry (BML)
Italy [a]	Country data	Country data	Forest Inventory for Umbria region National Forest Inventory	National statistics
Japan	Statistical Handbook of Forestry, Forestry Agency			
New Zealand	National Exotic Forest Description (NEFD),			
Norway [a]	NE	NE	Norwegian Forest Research Institute (NISK)	
Poland	Directorate General (State Forests Enterprise)			
Portugal	NE	NE	National Forest Inventory	
Russian Federation	Federal Forest Service [b]			
Switzerland [a]	NE	NE	Swiss National Forest Inventory (Inventaire forestier national Suisse, 1988)	Swiss National Forest Inventory (Inventaire forestier national Suisse, 1988)
USA	Details in "1995 Inventory of US Greenhouse Gas Emissions and Sinks: 1990-1994" (United States Environmental Protection Agency, 1995)			

[a] Activity data source also reported in 1998/1999 GHG inventory.
[b] Information derived from in-depth review.

59. For the agricultural soils category, five Parties reported the source of activity data and/or emission factors in their latest GHG inventory, whilst the others did not. In the second NC, six Parties provided the source of activity data and/or emission factors. Four Parties referred to separate reports containing information on activity data and/or emission factors. More detail is provided in table 12. Parties for which no information was available have not been included in the table.

Table 12: Sources of activity data and emission factors for agricultural soils from the latest submissions

Party	Source of activity data and emission factors
Canada	NR, instead reference to Canada's Greenhouse Gas Inventory- 1997 Emissions and Removals with Trends
Denmark	National Environmental Research Institute
Finland [a]	Data from standard statistics Emission factors from IPCC Guidelines (from Mosier, 1994) Ammonia emissions model by VTT energy N_2O emissions from peatlands taken from Finnish Research Programme on Climate Change (SILMU)
Greece [a]	National Statistical Service of Greece; Ministry for the Environment, Physical Planning and Public Works; Emission factors from CORINAIR and IPCC
Hungary	IPCC emission factors
Ireland	Factors based on research by the Irish Agricultural Research Institute (Teagasc)
Italy [a]	ISTAT (1991); FAO database; Erdman, 1959 in Agronomia Generale p.205; ad hoc survey; Agricultural and Agri-Industrial By-Products, Vol. 1 (Cestaat); CNR-CRPA survey; Carta Pedalogica, 1961; emission factors IPCC values modified
Japan	Amount of fertilizer from "Pocket Handbook of Fertilizers" (MAFF) Emission factors from studies of MAFF
Netherlands	NR, instead reference to Spakman *et al*, 1996.
Sweden [a]	IPCC emission factors
Switzerland [a]	Swiss Farmers Association data base Dry biomass content from Souci et al. (1981) Area of histosols from Presler and Gysi (1989) IPCC default emission factors except for crop fraction burned on fields
United Kingdom	NR, instead reference to "UK Greenhouse Gas Inventory, 1990 to 1994" NETC(1996)
USA	NR, instead reference to "1995 Inventory of US Greenhouse Gas Emissions and Sinks: 1990-1994" (US EPA, 1995)

[a] Reported activity data source also in 1998/1999 GHG inventory.

C. Reporting of uncertainty

60. In the latest GHG inventory, three Parties reported quantitative estimates of uncertainty for both LUCF (Australia, Belgium, Canada) and agricultural soils (Australia, Canada, Switzerland). Belgium reported 50 per cent uncertainty for N_2O emissions in general.

61. The following Parties described uncertainty in the LUCF sector qualitatively:
- Finland: uncertainties for N_2O are very large for the agricultural soils category;
- Germany: "considerable uncertainties" in emission estimates in general;
- Greece: considerable uncertainty for emission factors of gases other than CO_2;
- Hungary: the effect of political and economic changes in the country on the increased unreliability of LUCF estimates is discussed;
- Norway: a third party conducted an uncertainty study. Details for the LUCF sector and the agricultural soils category are not provided. The main weaknesses of the inventory include nitrous oxide from agriculture, and;
- Switzerland: uncertainty in the LUCF sector is considerable but no quantitative estimate is provided.

62. In the second NC, four Parties reported a quantitative estimate of uncertainty for the LUCF sector. Canada reported 4 per cent uncertainty for CO_2 emissions in general, and five Parties reported uncertainty qualitatively (low, medium or high) based on IPCC table 8A.

63. For the agricultural soils category, five Parties reported quantitative estimates of uncertainty. Canada reported 40 per cent uncertainty for N_2O in general. Estonia estimated uncertainty at 10-25 per cent depending on the sector, but did not specify the values for the LUCF sector or the agricultural soils category. Four Parties reported the quality of estimates (L, M, H) based on IPCC table 8A. Two Parties provided a qualitative description of uncertainty. The information on uncertainty is summarized in table 13. Parties for which no information was available have not been included in the table.

Table 13: Reporting of uncertainty for LUCF and agricultural soils by Annex I Parties

Party	1998/1999 GHG inventory		Second national communication	
	LUCF	Agricultural soils	LUCF	Agricultural soils
Australia	20-70 per cent	20-80 per cent	> 80 per cent	20-80 per cent
Belgium	25 per cent	50 per cent for N_2O		
Bulgaria	NR	NR	H[b]	M[b]
Canada	>100 per cent	40 per cent	4 per cent for CO_2[a]	40 per cent for N_2O[a]
Czech Republic	NR	NR	CO_2 emissions = 8-10 per cent	80-100 per cent
Estonia	NR	NR	NR[c]	NR[c]
Finland	Not applicable	"Very large"	Not applicable	NR
Greece	Not applicable	NR[d]	NR	NR
Hungary	NR[e]	Not applicable	NR	NR
Iceland	Not applicable	Not applicable	NR	"High degree"
Italy	Not applicable	Not applicable	Not available	Not available
Japan	NR	NR	CO_2: M; others: L[b]	L[b]
Latvia	NR	NR	Not available	Not available
Liechtenstein	Not applicable	Not applicable	Not applicable	Not applicable
Lithuania	NR	NR	Not available	Not available
Luxembourg	Not applicable	Not applicable	Not applicable	Not applicable
Monaco	Not applicable	Not applicable	Not applicable	Not applicable
Netherlands	NR	NR	CO_2= M[b]	Emission factors: 50-100 per cent Overall: ca. 50 %
New Zealand	NR	NR	CO_2: 20,571 ±5,143 CH_4: 5.0 ± 2.5	44.9 ± 26.9
Norway	Consultancy study conducted.		NR	"Large degree"
Portugal	Not applicable	Not applicable	NR	M[b]
Romania	Not applicable	Not applicable	NR	NR
Slovakia	NR	NR	30 per cent	100 per cent
Slovenia	Not applicable	Not applicable	Not applicable	Not applicable
Spain	Not applicable	NR	From M to one order of magnitude [f]	
Sweden	NR	NR	M[b]	L[b]
Switzerland	Considerable	-80 to 130 per cent	H[b]	NR
Ukraine	NR	NR	Not available	Not available

Notes: Not applicable = LUCF or agricultural soils not estimated; 1998/1999 inventory or NC2 not submitted.

[a] For CO_2 and N_2O in general; not specific for LUCF and agricultural soils.
[b] Based on quality of estimates ranking of IPCC table 8A.
[c] 10-25 per cent depending on the sector.
[d] Considerable uncertainty for emission factors of gases other than CO_2.
[e] The effect of political and economic changes in the country on the increased unreliability of LUCF estimates discussed.
[f] In accordance with the CORINAIR approach of reporting quality of the data.

VII. SUMMARY

A. Issues related to reporting GHG emissions and removals in the LUCF sector and agricultural soils category

64. CO_2 emissions and removals from the LUCF sector are reported in the latest submission by 32 Parties. The data are for different years: 22 Parties reported for 1997, two for 1998,[20] and others for earlier years. Similarly, GHG emissions and removals for agricultural soils are reported by 32 Parties, 21 of which have reported for 1997.

65. The revised guidelines for the preparation of national communications by Parties included in Annex I to the Convention, request Parties to report inventories using the formats recommended in the IPCC Guidelines (decision 9/CP.2), which includes summary tables, sectoral tables, overview tables, and worksheets or equivalent information, including activity data and emission factors. The worksheets for LUCF and agricultural soils are explicitly requested. Until the adoption of decision 3/CP.5 on UNFCCC reporting guidelines for annual inventories of Annex I Parties, no specific guidance existed on how annual inventories should be reported. These newly adopted UNFCCC guidelines explicitly request Parties to report emission factors and activity data through the national inventory report and the common reporting format. This lack of specific guidance for annual inventories may have caused Parties to submit different information and individual Parties to submit reports which varied from year to year.

66. In the latest submissions, all reporting Parties provided summary tables, and a further:

(a) Twenty-one Parties provided sectoral tables for the LUCF and agriculture sector (this includes those that did not follow the IPCC format);

(b) Seven Parties provided worksheets;

(c) Fifteen Parties reported overview tables, some with data quality indicators;

(d) Eight Parties provided information on activity data and emission factors; and

(e) Twelve Parties used notation keys.

67. Thirty-one Parties reported estimates of CO_2 emissions or removals from the LUCF sector: 30 Parties reported removals, of which 12 reported both CO_2 emissions and removals. One Party reported emissions only.[21]

68. The LUCF sector constitutes a net sink primarily due to the category “changes in forest and other woody biomass stocks” (category 5A). Three of the 11 Parties reporting emissions and/or removals for “forest and grassland conversion” (category 5B), did not provide estimates for both N_2O and CH_4, even though the IPCC Guidelines provide default methods for estimating

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[20] 1998 data are not included in the analysis. Instead, for these Parties 1997 data were used as for the majority of other Parties.

[21] Attention is drawn to the footnotes to tables 5, 7A and 7B in volume 1 of the IPCC Guidelines. The IPCC Guidelines request Parties not to provide an estimate of both CO_2 emissions and CO_2 removals. Instead Parties are requested to provide an estimate of net CO_2 emissions and to place a single number in either the CO_2 emissions or CO_2 removals column, as appropriate. Sixteen Parties estimated N_2O and/or CH_4 emissions.

these gases on the basis of category 5B. The majority of the Parties did not report emissions from soils (category 5D). [22] It is not clear whether emissions are, or are not occurring. CO_2 emissions from soils were reported by five Parties while CO_2 removals were reported by two Parties. In addition, Canada and Iceland reported emissions from agricultural soils under category 4D.

69. Twenty-seven Parties reported that CO_2 removals from LUCF were higher than their CO_2 emissions. Australia, Estonia, Lithuania, and the United Kingdom indicated that the LUCF sector is a net source of CO_2 emissions. The LUCF sector offset approximately 15 per cent of the total CO_2 emissions from all sectors (excluding LUCF). In comparison, CO_2 equivalent emissions from all other sectors (excluding LUCF) offset approximately 12 per cent of the aggregate CO_2 equivalent emissions.[23]

70. Thirty-two Parties reported N_2O emissions from agricultural soils. N_2O accounted for 90 per cent of the CO_2 equivalent GHG emissions from agricultural soils. Seven Parties reported emissions of CH_4 and one Party removals of this GHG. Two Parties reported CO_2 emissions from this category. No removals of CO_2 were reported.

71. Synthesizing information reported by Parties is complicated by the following factors:

(a) Time-series of reported data are incomplete for many years for a number of Parties;

(b) Worksheets, including activity data and emission factors, are not always provided;

(c) The real meaning of "cells with no values" or "zero" is not clear in some cases;

(d) Different methods of reporting were used by different Parties, and in different years for the same Party.

72. Another factor influencing the level of detail of reporting and the frequency, may be the technical capacity of some Parties to estimate emissions from sources and removals by sinks in the LUCF sector and agricultural soils category.

B. Reporting and recalculation of base year emissions

73. A great majority of the Parties reported base year CO_2 emission and removal estimates for the LUCF sector and N_2O emission estimates for the agricultural soils category (78 and 86 per cent, respectively) in their first national communications. Similarly, more than 80 per cent of the Parties provided base year estimates for LUCF and agricultural soils in a later GHG inventory (second NC and/or annual inventory submission). For approximately half of the reporting Parties, the latest base year estimates available are from the second NCs, because base year inventories were not provided in recent annual inventory submissions.

74. Two-thirds of the Parties reporting LUCF estimates in their first NC revised their estimates in their second NC and/or annual inventory; changes ranged from minus 80 per cent to

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[22] According to the IPCC Guidelines (Volume 3. Reference Manual, pp. 4.2, 4.87), CO_2 emissions from agricultural soils are to be included under LUCF. At the same time, table 7A (summary report for national GHG inventories in volume 1: IPCC Reporting Instructions) allows for reporting CO_2 emissions or removals from agricultural soils, either in the agriculture sector (under D: agricultural soils) or in the LUCF sector (under D: emissions and removals from soil).

[23] The percentages in this paragraph are approximations only, derived from reported values for different years. These values should therefore be seen as indicative only.

a 10-fold increase compared to the originally reported estimates. Base year N_2O emission estimates from agricultural soils were revised by more than 80 per cent of the Parties that provided estimates in their first NC. For this category large changes in the estimates were found, ranging from minus 66 per cent to more than a 23-fold increase when compared to the original estimates from the first NCs.

75. Only some Parties reported the reasons why base year estimates from LUCF and agricultural soils had been recalculated. The most common reason was the use of the Revised 1996 IPCC Guidelines, which influenced particularly the agricultural soils category, by including additional sources. The availability of improved data was also mentioned. In general, recalculations are the current practice in preparing GHG inventories when new inventory information becomes available and as Parties seek to improve the quality and accuracy of their estimates.

C. Reporting of methods and sources of data

76. Fifteen Parties reported the methods used for estimating removals and emissions from the LUCF sector in the latest GHG inventory and second national communication, and 20 Parties for the agricultural soils category. Of these, only six Parties indicated the use of the IPCC Guidelines without any qualification, whilst four reported that the methods used were based on the IPCC Guidelines, and two Parties used their own methods which conform to IPCC reporting format.

77. Only seven and five Parties reported the sources of their activity data and emission factors in both the LUCF sector and agricultural soils category respectively. Most Parties did not report methods for estimating uncertainty. In the LUCF sector, only three Parties reported uncertainty quantitatively and 10 Parties qualitatively in the latest GHG inventory and the second national communication. Three Parties reported uncertainties associated with emissions from the agricultural soils category in their latest GHG inventory, and 13 Parties in their second national communication.

Appendix I : Net CO_2 emissions from LUCF sector, 1990-1997 (Gg)

Party	1990	1991	1992	1993	1994	1995	1996	1997
Australia	69 436	42 399	39 166	44 672	35 263	33 800	37 454	34 050
Austria	-13 300	-15 301	-17 893	-17 775	-14 726	-13 576	-13 753	-13 753
Belgium	-2 057	-2 057	-2 057	-2 057	-2 057	-2 057	-2 057	-2 057
Bulgaria [b]	-5 801	-7 880	-7 636	-7 022	-6 974	-7 520		-5 852
Canada	-44 000	-53 000	-43 000	-31 000	-26 000	-19 000	-31 000	-19 000
Czech Republic	-2 281	-5 027	-6 041	-5 643	-3 943	-5 454	-4 479	-4 639
Denmark	-924	-932	-940	-948	-956	-964	-981	-997
Estonia	-11 317				-11 125	-13 266		7 993
Finland [a]	-30 600							
France	-59 617	-56 488	-61 246	-65 865	-67 495	-65 615	-67 197	-67 772
Germany	-33 719	-33 719	-33 719	-33 719	-33 719	-33 493	-33 493	-33 493
Greece								
Hungary [b]	-4 467	-3 239	-3 823	-4 697	-4 820	-4 797	-3 931	
Iceland								
Ireland	-5 160	-5 390	-5 580	-5 760	-5 970	-6 230	-6 497	
Italy	-24 949				-24 831	-24 507		
Japan	-83 903	-83 865	-85 568	-90 084	-93 545	-96 706		
Latvia	-10 826	-14 186	-14 235	-14 228	-14 206	-10 484	-14 320	-14 315
Liechtenstein	-22							
Lithuania	-8 848					2 800	2 800	2 800
Luxembourg	-295				-295	-295	-295	
Monaco								
Netherlands	-1 500	-1 600	-1 600	-1 600	-1 700	-1 700	-1 700	
New Zealand	-20 888	-19 443	-16 469	-14 877	-13 991	-15 145	-15 549	-17 008
Norway	-9 590	-11700	-13 250	-13 510	-15 680	-13 640	-17 611	-16 499
Poland [b]	-44 663		-40 815		-41 953		-42 617	-40 521
Portugal	-1 152	-1 152	-1 152	-1 152	-1 152			
Romania [b]	-5 646	-6 590	-6 590	-6 590	-6 590			
Russian Fed.	-392 000				-568 000	-840 000	-840 000	
Slovakia	-4 257	-4 257	-4 257	-4 257	-5 118	-5 116	-5 281	
Slovenia [b]	-2 294							
Spain [a]	-28 970	-28 970	-28 970	-28 970	-28 970			
Sweden	-34 368						-31 774	-31 774
Switzerland	-4 360	-4 380	-4 430	-5 160	-5 150	-5 100	-5 200	-5 355
Ukraine	-52 107	-52 964	-52 658	-52 917	-52 721	-52 940	-66 151	-68 806
United Kingdom	21 413	21 479	20 938	19 048	16 410	15 366	15 609	15 518
USA	-1 142 200	-1 142 200	-1 142 200	-764 700	-764 700	-764 700	-764 700	-764 683
TOTAL	-1 995 232	-1 490 462	-1 534 025	-1 108 811	-1 764 714	-1 950 339	-1 912 723	- 1 046 163

Source: INV 99, INV 98, NC1, NC2 and FCCC/SBI/1999/12.

[a] Finland and Spain did not provide any values in their most recent submissions but had provided data in earlier submissions or second NC.

[b] Bulgaria, Hungary, Poland, Romania and Slovenia have base years other than 1990 (see decisions 9/CP.2 and 11/CP.4) which are respectively: 1989, an average of the years 1985-1987, 1988, 1989, and 1986. The first four of these Parties reported net CO_2 emissions from the LUCF sector for those years to be: –4657 Gg, –3097 Gg, –34746 Gg, and –2925 Gg.

Appendix II: N_2O emissions from agricultural soils (4D) for the period 1990-1997 (Gg) as reported in the latest submissions of annual inventories and national communications

Parties	1990	1991	1992	1993	1994	1995	1996	1997
Australia	48.21	48.62	48.24	49.31	49.77	49.10	47.70	49.83
Austria	3.30	3.31	3.32	3.33	3.30	3.26	3.26	3.26
Belgium	10.89	10.89	10.86	10.73	9.38	9.38	9.36	9.36
Bulgaria [c]	8.2	5.9	3.5	2.8	2.60	2.50		2.46
Canada	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Czech Republic	2.3	2.0	1.7	1.8	1.8	1.7	12.0	11.31
Denmark	33	32	32	31	30	30	30.2	24.05
Estonia								0.03
Finland [a]	10.10	6.0	5.0	5.0	5.0	9.25	9.00	8.80
France	171.33	169.73	164.83	159.57	160.86	161.73	164.53	167.62
Germany	85.00	78.00	74.00	73.00	77.00	76.60	76.00	76.00
Greece	20.64	20.52	19.48	19.24	19.53	18.84	19.11	19.62
Hungary [c]	4.6	1.68	1.63	1.46	1.80	1.61	1.68	
Iceland	0.22	0.21	0.2	0.19	0.19	0.19		
Ireland [a]	23.34	18.66	18.70	19.01	19.11	19.11	18.98	
Italy	62.1				63.50	63.50		
Japan	3.78	3.57	3.56	3.55	3.49	3.27	2.10	1.04
Latvia [a]	22	19.3	18.8	17	16.3	15.73	15.64	3.13 [e]
Liechtenstein								
Lithuania [b]	10.8							
Luxembourg	0.475				0.482	0.475	0.482	
Monaco								
Netherlands	21.50	22.20	25.50	25.40	25.60	26.80	26.70	
New Zealand	36.1	35.7	35.7	36.1	36.4	36.5	36.4	36.10
Norway	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
Poland [c]	41		32		30		30.4	31.15
Portugal	7.35	7.39	7.20	7.08	7.16			
Romania [b, c]	20.5	6.512						
Russian Federation							105.00	
Slovakia	9.46	8.47	6.61	5.26	5.35	5.40	5.50	
Slovenia [c]	4.57							
Spain	63.16	62.40	61.55	59.81	57.25	58.38		
Sweden	15.00						15.00	14.00
Switzerland	9.2	9.2	9.15	9.06	8.92	8.82	8.7	8.50
Ukraine [b]								
United Kingdom	95.07	94.63	89.18	87.53	89.89	90.43	90.90	93.87
USA [d]	738	750	771	758	833	795	812	876.17
TOTAL [f]	1685	1521	1548	1489	1662	1592	1645	1540

[a] Data from earlier submissions have been included to obtain a more complete time series.

[b] These Parties did not provide sectoral tables for the agriculture sector. Lithuania combined its information with the LUCF sector.

[c] As per decision 9/CP.2, Bulgaria is allowed to use 1989 as a base year, Hungary the average of the years 1985-1987, Poland 1988, and Romania 1989. As per decision 11/CP.4, Slovenia is allowed to use 1986 as a base year.

[d] Inventory data submitted in 1998 have been used for the sake of a complete time series.

[e] This value was not reported in the summary table but in the sectoral background table in the 1999 submission.

[f] Figures rounded to the nearest integer.

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