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Item 3 (d) of the provisional agenda
Methodological issues
Issues relating to greenhouse gas inventories

Estimation of emissions and removals in land-use change and forestry and issues relating to projections

Note by the secretariat

Summary

This note includes a synthesis of the methods used by Parties included in Annex I to the Convention (Annex I Parties) to estimate and report greenhouse gas emissions and removals from the land-use change and forestry (LUCF) sector before the adoption of decision 13/CP.9. and the application of the Intergovernmental Panel on Climate Change (IPCC) good practice guidance for land use, land-use change and forestry (LULUCF). This analysis focuses on category 5.A (Changes in forest and other woody biomass stocks) of the common reporting format because most of the data belong to this category. The data indicate that many Annex I Parties have had problems in estimating emissions and removals in these categories because, for example, of difficulties in applying the Revised 1996 IPCC guidelines for national greenhouse gas inventories to national circumstances.

The paper also contains information on methods used to develop projections. Although the application of IPCC good practice guidance for LULUCF is expected to improve inventory data, more focused reviews could help improve inventories of Parties having LULUCF as key sector. The exchange of information on methods used for projections is also important to facilitate improvements.

With the adoption of decision 13/CP.9, reporting is expected to improve. This note identifies future actions that may facilitate the transition to the new reporting system, taking into account the problems some Parties have experienced with the reporting of emissions and removals from the LUCF sector.

CONTENTS

I. Introduction

A. Mandate

1. Article 4, paragraph 1 (a) of the Convention requires Parties to develop, periodically update, publish and make available to the Conference of Parties (COP), in accordance with Article 12, national inventories of anthropogenic emissions by sources and removals by sinks of all greenhouse gases (GHGs) not controlled by the Montreal Protocol, using comparable methodologies to be agreed upon by the COP.

2. The Subsidiary Body for Scientific and Technological Advice (SBSTA), at its nineteenth session, requested the secretariat to continue cooperating with the Intergovernmental Panel on Climate Change (IPCC) on its work relating to the development of the *2006 IPCC Guidelines for national greenhouse gas inventories* (2006 IPCC guidelines) and to provide more detailed information based on the latest available GHG inventory submissions by Parties.

3. The COP, by its decision 13/CP.9, welcomed the report of the IPCC entitled Good Practice Guidance for Land Use, Land-Use Change and Forestry (IPCC good practice for guidance LULUCF), decided that Parties included in Annex I to the Convention (Annex I Parties) should use this report when preparing annual inventories under the Convention, and encouraged (Parties not included in Annex I to the Covention (non-Annex I Parties) to use it when preparing GHG inventories for this sector.[1] This decision also requests Annex I Parties to use, for a trial period of one year, the new tables of the common reporting format (CRF) of the UNFCCC Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories" (here in after referred to as the UNFCCC reporting guidelines). annexed to decision 18/CP.8 (FCCC/CP/2002/8).

B. Scope of the note

4. This note includes a synthesis of the methods and sources of information used by Annex I Parties to estimate and report GHG emissions and removals from the land-use change and forestry (LUCF) sector using the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (Revised 1966 IPCC Guidelines) and the UNFCCC reporting guidelines adopted by decision 3/CP.5. This note presents inventory data and summarizes some of the difficulties faced by Annex I Parties in estimating these data. Although the note focuses on the methodologies applied by Annex I Parties, data on anthropogenic emissions and removals from LUCF by non-Annex I Parties are included in annex IV to this note. Given that Parties have provided most data and information for category 5.A (Changes in forest and other woody biomass stocks), this note will focus on this category. It excludes any information relating to harvested wood products.

5. The information contained in this note is limited to the use of the Revised 1996 IPCC Guidelines and the UNFCCC reporting guidelines before the adoption of decision 13/CP.9. The secretariat expects that the information presented in this note will be useful in the revision of the IPCC guidelines and in following the new guidance for preparing and reporting GHG inventories in LULUCF sector adopted by decision 13/CP.9.

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[1] IPCC good practice guidance for LULUCF introduces a new system of categories and provides new methodologies for estimating changes in carbon stocks and emissions of greenhouse gases. These were considered in the preparation of the common reporting format contained in the annex to decision 13/CP.9 (see annex VII to the document).

6. The note also includes a synthesis of projections relevant to the LUCF sector as reported by Annex I Parties in their national communications.

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

7. The SBSTA may wish to take note of the information contained in this document, consider its relevance for the ongoing discussions on the use of good practice guidance for LULUCF, on harvested wood products and on other LULUCF reporting issues, and provide guidance as appropriate.

8. The SBSTA may wish to call the attention of the IPCC to particular issues relevant for the preparation of the 2006 IPCC Guidelines. It may also wish to consider the information contained in this note in conjunction with the experience of Parties in applying the new IPCC good practice guidance for LULUCF at the end of the trial period as a means of working towards improving reporting on LULUCF.

II. Technical background

A. Methodological guidance to estimate and report greenhouse gas emissions and removals in the land-use change and forestry sector

1. Guidance provided by the Revised 1996 IPCC Guidelines

9. Guidance on methodologies to estimate GHG emissions and removals for the LUCF sector is provided by the Revised 1996 IPCC Guidelines. The basic methodology rests upon two linked assumptions: that the flux of CO_2 to or from the atmosphere is equal to the changes in carbon stocks in biomass and soils; and that changes in carbon stocks can be estimated by establishing rates of change in land use and applying some assumptions about their impact on carbon stocks and the biological response to a given land use.

10. The Workbook (Volume 2) of the Revised 1996 IPCC Guidelines contains suggestions on the preparation of national GHG inventories. For the LUCF sector, this Workbook provides methodological guidance and step-by-step instructions for calculating emissions of carbon dioxide (CO_2), methane (CH_4), and other trace gases. Guidance for these calculations is provided for the most important land-use changes and land-use practices that result in CO_2 emissions and removals on a global scale (see figure 1):

(a) Changes in forest and other woody biomass stocks

(b) Forest and grassland conversion

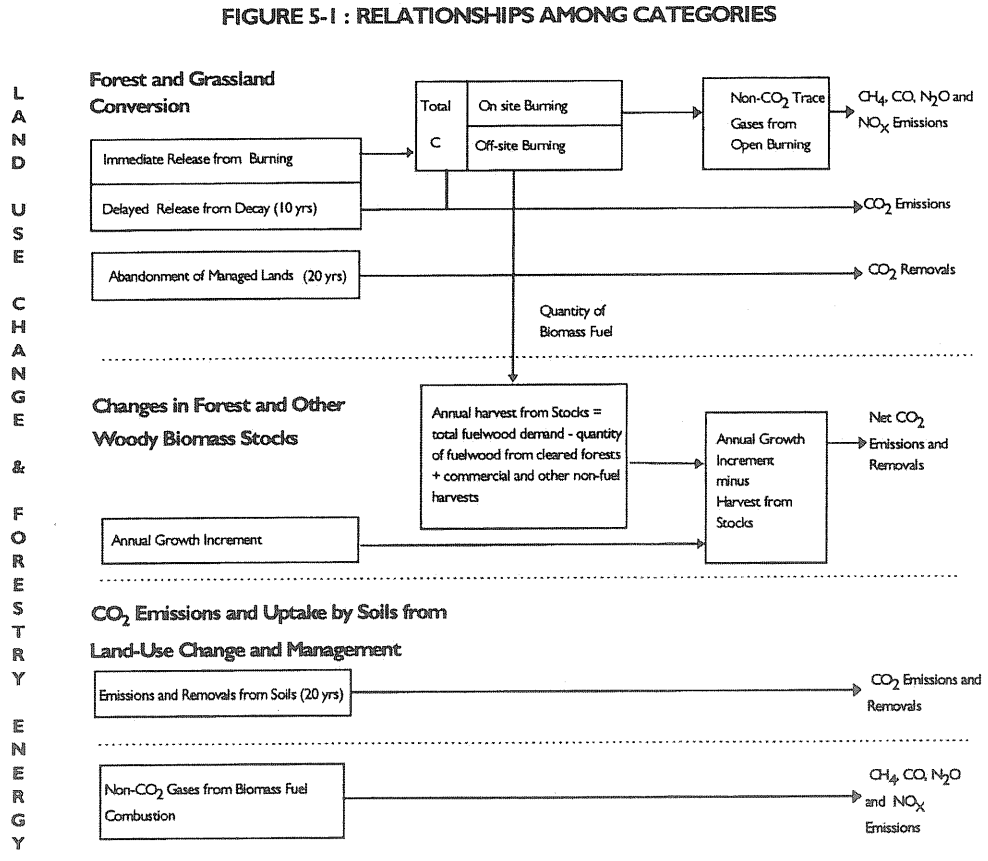
(c) Abandonment of croplands, pastures, plantation forests, or other managed lands

(d) Changes in soil carbon.

11. The Revised 1996 IPCC Guidelines include three levels of calculations which differ in the methods and sources of data and, hence, in the accuracy of estimates. The first level, called **the IPCC default method,** is based on predefined processes for calculating GHG emissions and removals using **IPCC default data**. This method can be used by Parties with limited resources and data. The second level is based on these predefined processes, but uses **country-specific data,** based on national data sources, such as forest inventories and are the third level applies the same assumptions as the IPCC default method but does not necessarily use the predefined processes, equations or calculation steps; the predetermined processes are replaced with calculations, procedures or models applicable to country-specific conditions and data sources. This level requires that local data are used as far as practicable.

12. Country specific methods, for the purpose of this paper, are divided into two groups: **initial country specific methods**, which contain some features of the default method; and **fully developed country specific methods**.

Figure 1. Relationship between inventory categories in the land-use change and forestry sector



Source: Revised 1996 IPCC Guidelines, Volume 2, Workbook, figure 5-1.

2. UNFCCC reporting guidelines and common reporting format

13. The COP, by its decisions 3/CP.5 and 6/CP.5, adopted guidelines for the preparation of national communications, including annual GHG inventories, and guidelines for the technical review of GHG inventories. The COP, by its decision 18/CP.8, adopted the revised UNFCCC reporting guidelines (see paragraph 3 above). Annex I Parties have to submit, by 15 April each year, an annual GHG inventory covering the period between base year and the year prior to the year of submission.

14. The UNFCCC reporting guidelines cover the estimation and reporting of GHG emissions and removals in annual inventories and in inventories included in national communications. The objectives of these reporting guidelines are to assist Parties to report in a transparent, consistent, complete, comparable and accurate manner, to facilitate the process of verification, technical assessment and expert review of the inventory information. The annual inventory submission shall consist of:

(a) A National Inventory Report (NIR), which should contain detailed information to facilitate the review of the inventory. For example, this information may include references and sources of information on the specific methodologies, assumptions,

emission factors and activity data used in compiling the NIR, as well as the rationale for their selection

(b) A CRF, which is a standardized format for reporting estimates of GHG emissions and removals and other information

15. The review of national GHG inventories comprises three phases. First, the secretariat checks that the inventory submission is complete and in the correct format. Then the secretariat prepares a synthesis and assessment compiling and comparing basic inventory information and providing a preliminary assessment of the inventory of individual Parties. In the third phase, an international team of experts examines the data, methodologies and procedures used to prepare the national inventory.

16. Guidelines for the preparation of national communications from non-Annex I Parties, as specified in decision 17/CP.8, are more generic and provide more flexibility with regard to the information to be reported. Non-Annex I Parties are not required to submit annul GHG inventories, but can provide, within their national communications data on emissions by sources and removals by sinks of GHG.

B. Guidance relating to projections

17. The COP, by its decision 4/CP.5, adopted "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part II: UNFCCC reporting guidelines on national communications". Those guidelines to Annex I Parties on national communications cover the preparation of projections. Projections should be presented on a sectoral basis, to the extent possible, and should be calculated for the same sectoral categories section on policies and measures. Policies and measures include these in the energy, transport, industry, agriculture, forestry and waste management but not necessarily land-use change for which annual GHG inventory estimates are prepared. Parties should include in their national communications projections for years 2005, 2010, 2015 and 2020. National communications should also include methodological information on the models and approaches used.

III. Reporting of greenhouse gas emissions by sources and removals by sinks from the land-use change and forestry sector

A. Status of reporting and periods covered

18. The UNFCCC reporting guidelines require Annex I Parties to submit data and information on GHG emissions and removals in the LUCF sector in NIRs, CRFs and national communications. Explanations of qualitative information should mainly be provided in the NIR. The CRF includes a sectoral report for LUCF (table 5) and sectoral background data tables for the same categories as the Revised 1996 IPCC Guidelines, namely: changes in forest and other woody biomass (table 5.A), forest and grassland conversion (table 5.B), abandonment of managed lands (table 5.C) and CO_2 emissions and removals from soils (table 5.D). Parties may also report additional GHG emissions and removals under category 5.D Other. The UNFCCC reporting guidelines allow Parties to choose to report CO_2 emissions and removals from agricultural soils either in the agriculture sector, under 4.D Agricultural soils, or in the LUCF sector under 5.D CO_2 emissions and removals from soils.

19. Twenty-nine NIRs and 35 CRFs were received from Annex I Parties in their 2003 submissions (see annex I). Thirty of the CRFs submitted covered LUCF data for the period 1990–2001, two covered 2001 and two covered various years from the period 1990–2001. The CRF submitted by Monaco did not contain information on LUCF, and the CRF prepared by Luxembourg contained only summary tables. National communications were available from 39 Annex I Parties. The third national communication was available from 31 Parties.

B. Emissions by sources and removals by sinks in the land-use change and forestry sector

20. Almost all Annex I Parties have reported emissions and removals for the LUCF sector. Most Parties provide estimates for category 5.A. The coverage of 5.B, 5.C and 5.D was sparse and not well documented.

21. Net anthropogenic CO_2 removals from LUCF sector in Annex I Parties for 1990 were equal to 1,421,722 Gigagrams of CO_2, (9 per cent of the total GHG emissions excluding LUCF). For 2001, net CO_2 removals from the LUCF sector were 1,226,443 gigagrams of CO_2. The magnitude of LUCF sector varies considerably between Annex I Parties. Most Annex I Parties reported a net removal from the LUCF sector for all years covered in their inventories (see table 1 and annexes II and III).

Table 1. Anthropogenic CO_2 emissions and removals from LUCF in Annex I Parties

Party	Total anthropogenic CO_2-equivalent emissions in 1990 (or in base year excluding LUCF)	CO_2 emissions and removals from LUCF (Gg)					
		1990	1997	1998	1999	2000	2001
Australia	425 175	85 370	30 319	38 275	25 446	16 542	7 320
Austria	78 073	–9 215	–7 633	–7 633	–7 633	–7 633	–7 633
Belarus	133 555	–12 720	–18 310	–18 520	–19 298	–18 981	–16 882
Belgium	141 125	–1 600	–1 867	–1 845	–1 823	–1 822	–1 814
Bulgaria[a, b]	144 398	–4 657	–5 852	–6 233	–6 608	–8 976	–9 467
Canada	607 589	–106 988	–49 143	–34 584	–29 496	–53 343	–36 378
Croatia	31 944	–6 505					
Czech Republic	192 019	–2 128	–4 639	–3 757	–3 401	–4 016	–4 363
Denmark	69 217	–3 118	–3 142	–3 152	–3 161	–3 517	–3 531
Estonia	43 494	–6 320	–9 107	–8 522	–8 107	–8 365	–739
Finland	77 233	–23 798	–12 637	–9 713	–10 821	–11 953	–16 851
France	568 152	–55 702	–68 158	–67 680	–69 345	–63 096	–66 370
Germany	1 213 520	–33 689	–33 400	–33 400	–33 400	–23 695	–23 695
Greece	104 895	1 441	–400	2 538	66	3 840	–1 328
Hungary[a, c]	101 633	–1 348	–4 205	–4 411	–4 500	–4 377	–4 542
Iceland	2 838	–5	–80	–94	–112	–131	–145
Ireland	53 239	–66	–31	–161	–122	–47	–629
Italy	508 629	–23 532	–17 764	–17 426	–17 712	–15 633	–18 655
Japan	1 187 108	–83 903					
Latvia	29 181	–18 948	–11 152	–9 332	–8 208	–8 222	–9 256
Liechtenstein	218						
Lithuania	50 933	–8 848		–9 593			
Luxembourg	13 448	–295			–295	–295	–295
Monaco	100						
Netherlands	210 004	–1 422	–1 180	–1 380	–1 236	–1 413	–1 413
New Zealand	61 754	–21 769	–17 363	–20 288	–22 033	–23 706	–23 859
Norway	52 013	–9 765	–16 499	–17 588	–17 767	–18 743	–18 968
Poland[a, d]	564 419	–34 746	–40 521	–29 821	–43 464	–43 094	–53 639
Portugal	61 441	–3	–2 179	–2 258	–2 359	–2 152	–2 152
Romania[a, e]	264 281	–2 925	–7 713	–10 069	–8 946	–8 174	–9 031
Russian Federation	72 181	141 100	–131 557	–3 900	–211 742		
Slovakia	20 206	–2 427	–1 411	–1 936	–1 651	–2 443	–5 264
Slovenia[a, f]	287 609	–4 336					

Party	Total anthropogenic CO_2-equivalent emissions in 1990 (or in base year excluding LUCF)	CO_2 emissions and removals from LUCF (Gg)					
		1990	1997	1998	1999	2000	2001
Spain	72 756	–29 252	–29 252	–29 252	–29 252	–29 252	–29 252
Sweden	53 056	–20 292	–27 288	–24 331	–27 305	–27 306	–33 083
Switzerland	919 189	–3 188	–4 637	–4 571	–4 226	–1 821	–1 529
Ukraine	744 139	–52 107	–68 806	–68 708			
United Kingdom	6 139 636	8 791	4 773	5 027	4 856	3 380	3 220
United States	425 175	–1 072 807	–840 622	–830 478	–841 054	–834 637	–838 137
Total	**15 725 575**	**–1 277 153**	**–1 401 456**	**–1 234 796**	**–1 404 709**	**–1 203 081**	**–1 226 443**
European Community	4 199 608	–191 943	–200 325	–191 082	–199 413	–180 560	–203 481

Note: - net removals, + net emissions

22. Non-Annex I Parties have reported data for the LUCF sector in their national communications (see annex III). Most non-Annex I Parties highlighted the relatively high degree of uncertainty associated with activity data in the LUCF sector; these data are difficult to obtain and, in some cases, are not applicable for performing time series calculations. In some cases, large differences were reported between internationally available activity data and national activity data for forestry activities.

IV. Synthesis and analysis of methods used by Parties in the preparation of greenhouse gas inventories for the land-use change and forestry sector

A. Methods

23. The methods used by Annex I Parties to estimate GHG emissions and removals for LUCF inventory categories are summarized in table 2.

Table 2: Methods used by Annex I Parties to estimate greenhouse gases emissions and removals in land-use change and forestry by inventory category

Party	Category 5.A	Category 5.B	Category 5.C	Category 5.D
Australia	Country-specific method, described in the Workbook for CO_2 from the Biosphere 4.2 and its 1996 and 1997 supplements	Country-specific method (a model-based accounting system supported by resource inventories, field studies and extensive multi-temporal remote sensing methods)	Not reported.	Country-specific method, described in the Workbook for CO_2 from the Biosphere 4.2 and its 1996 and 1997 supplements
Austria	A country-specific method based on the IPCC default method.	Indirectly included in category 5.A	Indirectly included in category 5/A	Not reported
Belarus	IPCC default method	IPCC default method	IPCC default method	A country-specific method based on the IPCC default method

Party	Category 5.A	Category 5.B	Category 5.C	Category 5.D
Belgium	A country-specific method based on the IPCC default method	Not reported. Only non-CO_2 GHGs are reported using statistical information combined with emission factors of CITEPA[a]	Not reported	Not reported
Bulgaria	IPCC default method	Not reported	Not reported	Not reported
Canada	Country-specific method based on the IPCC default method	Based on the IPCC default method	IPCC default method	Based on the IPCC default method. Agricultural soils are covered by the Agriculture sector
Croatia	IPCC default method	Not reported	Not reported	Not reported
Czech Republic	IPCC default method	Not reported	Not reported	Not reported
Denmark	IPCC default method	Not reported	Not reported	Not reported
Estonia	IPCC default method	Not reported	IPCC default method	IPCC default method
Finland	A country-specific method	Category 5 B is indirectly included in the figures of category 5 A	Category 5 C is indirectly included in the figures of category 5 A	Agricultural soils are reported under Agriculture
France	Country-specific method based on the IPCC default method	Country-specific method based on the 1996 IPCC	Country-specific method based on the IPCC default method.	Country-specific method; a land-change matrix is used for the calculations of emissions/removals due to all land-use changes . Cultivation of organic soils not reported.
Germany	IPCC default method	Not reported	Not reported	Not reported
Greece	Partly reported, but numerical estimates are provided	Not reported	Not reported	Partly reported
Hungary	IPCC default method	IPCC default method	Not reported	IPCC default method
Iceland	Country-specific method	Not reported	Not reported	Not reported
Ireland	Methodology in line with the IPCC Guidelines	Not reported	Not reported	IPCC default method for liming only
Italy	IPCC default method	Not reported	IPCC default method	IPCC default method
Japan	The methodology given in the Revised 1996 IPCC Guidelines	IPCC default method	Not reported	Not reported
Latvia	Used 1996 IPCC Revised Guidelines, IPCC default method	IPCC default method	IPCC default method	IPCC default method
Netherlands	IPCC default method	Not reported	Not reported	Not reported
New Zealand	National methodology for estimating emissions and carbon uptake by planted forests	Country-specific method.	Not reported	IPCC default method for liming only

[a] Centre Interprofessionnel Technique d'Etudes de la Polliton Atmosphérique <www.citepa.org>

Party	Category 5.A	Category 5.B	Category 5.C	Category 5.D
Norway	Country-specific method is applied for constructing the national forest balance	Not reported	Not reported	Not reported
Poland	IPCC default method	IPCC default method	Not occurring	IPCC default method
Portugal	IPCC default method	Categories 5 B and 5 C (with respect to changes in forest areas) included in category 5.A	Categories 5 B and 5 C (with respect to changes in forest areas) included in category 5.A	Not reported
Romania	IPCC default method	IPCC default method	Not reported	Not reported
Russian Federation	Based on IPCC default method	Not reported	Not reported	Not reported
Slovakia	Above and below-ground pools covered; using D,CS based on IPCC default method	Country-specific method based on the IPCC default method	Not reported	IPCC default method for liming, country-specific method (CS/D) based on IPCC default method for cultivation of mineral soils
Slovenia	IPCC default method	Not reported	Not reported	IPCC default method for liming only
Spain	Country-specific method	Not reported	Not reported	Not reported
Sweden	IPCC default method	Not reported	Not reported	IPCC default method for liming only
Switzerland	Country-specific method	Not reported	Included elsewhere	Not reported
Turkey	Not reported	Not reported	Not reported	Not reported
Ukraine	IPCC default method	A method similar to the IPCC for forest clearing was used to estimate CO_2 emissions from forest fires	IPCC default method	Not reported
United Kingdom	Country-specific method	Forest and grassland conversion is assumed negligible, not reported	Abandonment of managed land is assumed negligible; not reported	Country-specific method but only part of the net uptake by litter and soils is reported under category 5D
United States	Country-specific method	Included in category 5.A.	Included in category 5.A.	Modified version of the IPCC method and a Monte Carlo uncertainty analysis

24. Most Annex I Parties have reported data for category 5.A and have indicated that this sub-category is the most important with regard to GHG emissions and removals in the LUCF sector. Fully developed country-specific methods were applied by 10 Parties (Australia, Finland, France, Iceland, New Zealand, Norway, Spain, Switzerland, the United Kingdom, and the United States), and five Parties (Austria, Belgium, Canada, Russian Federation and Slovakia) applied an initial country-specific method. Available information was not specific enough to distinguish methods used by some Parties (Greece, Lithuania and Luxembourg). The remaining Annex I Parties used the IPCC default method.

25. Country-specific methods were frequently used in countries with well established forest inventories (Austria, Finland, New Zealand and Norway) or in large countries with diversified and decentralized forest/land-use data collection systems (Australia, Canada and the United States).

26. Twelve Annex I Parties used different methods to provide numerical estimates for category 5.B. A country-specific method was applied by Australia, France and New Zealand. The initial country-specific approach was used by Canada and Slovakia, and the IPCC default method was used by Belarus, Hungary, Latvia, Poland, Romania and Ukraine. Greece did not specify the approach used. Five Parties (Belgium, Czech Republic, Japan, Switzerland and the United Kingdom) reported that forest and grassland conversion does not occur in their territories.

27. Seven Parties reported data for category 5.C. France reported the use of a country-specific method. Six Parties (Belarus, Canada, Estonia, Italy, Latvia and Ukraine) used the IPCC default method and five Parties (Austria, Finland, Portugal, Switzerland and the United States) reported removals from abandonment of managed lands elsewhere (in most cases, under category 5A). Australia reported that removals from abandonment of managed lands are not applicable, and six Parties (Belgium, Czech Republic, Hungary, Poland, Slovakia and the United Kingdom) stated that the abandonment process did not occur within their national territories.

28. Under the category 5.D Parties report CO_2 emissions and removals from cultivation of mineral soils, cultivation of organic soils, and liming of agricultural soils as follows:

(a) Cultivation of mineral soils: Estonia, Hungary, Italy and Poland used the IPCC method to report CO_2 emissions and the United Kingdom followed a country-specific method. Canada, Finland and the United States reported that the emissions are included elsewhere. With regard to removals, Poland followed the IPCC default method and the United States used a country-specific method to do so. Finland and the United Kingdom reported that removals were included elsewhere;

(b) Cultivation of organic soils: Estonia and Latvia used the IPCC default method, Belarus used an initial country-specific method and the United States used country-specific methods to report CO_2 emissions from cultivation of organic soils. Canada, Finland and the United Kingdom have included these emissions elsewhere. No Party reported numerical data on removals from cultivation of organic soils. Finland reported that these removals are included elsewhere;

(c) Liming of agricultural soils: France, Hungary, Ireland, Latvia, New Zealand, Slovakia, Slovenia, Sweden, the United Kingdom and the United States reported numerical data on CO_2 emissions from liming using the IPCC default method. Canada and Finland reported that the emissions were included elsewhere. Poland reported numerical estimate for CO_2 emission from forest soils, and the United States reported that emissions are included elsewhere;

(d) Twenty-four Parties did not report numerical data for category 5.D.

B. Changes in forest and other woody biomass

1. Sources of primary data

29. Most Annex I Parties used in their estimation of forest and other woody biomass stocks the following primary data: forest area, standing wood volume at the beginning and at the end of calculation period, annual volume growth rate, commercial harvest volume, fuelwood volume and other wood use and annual changes in volume of non-forest trees.

30. The most frequently used source of primary data on area was the national forest inventory (NFI). The Netherlands used several data sources, and Australia, Belgium, Canada, New Zealand and the United States explicitly mentioned the use of remote sensing as primary or supplementary data source. Five Parties did not report on sources of data on forest area (see annex IV).

31. Twenty-six Parties used the NFI as a source of data on forest stocks and annual volume growth rate while Australia, Ireland, New Zealand, and the United Kingdom reported the use of models and Slovenia used expert guess.

32. With regard to data on forest harvest, Austria, Czech Republic, Denmark, Finland, Hungary, Spain and the United States used the NFI as a primary source of data. Data on commercial harvest volume were collected from national statistics by Estonia, Germany, Italy, Japan, Latvia, Norway, Poland, Portugal, Romania and Spain, from forest industry reports by Canada, Croatia and Poland, from models by Australia, New Zealand, United Kingdom and United States and from questionnaires by New Zealand. National statistics included national or regional forestry databases, official databases of ministries, forestry census and others. Forest industry reports included reporting systems of various companies, agencies and associations of timber industries. Canada used also the Food and Agriculture Organization (FAO) Forest Data Base as one of the sources of data on national harvest. Austria estimated the amount of harvest using permanent sample plots. Ten Annex I Parties did not provide information on their sources of data for commercial harvest volume.

33. Depending on national circumstances, data on commercial harvest may or may not incldue information on fuelwood and other wood consumption. Fuelwood was often included in harvest data, for example by Bulgaria, Czech Republic, Netherlands and Poland. Portugal assumed that forest biomass used in heat production (domestic and industrial) is a "forest sub-product". Sweden used a constant proportion (7 per cent) to calculate fuelwood from commercial harvest. Norway estimated harvest of fuelwood from energy balance. Austria, Canada, Hungary and the United States estimated fuelwood volume from NFI. Nine Annex I Parties did not estimate fuelwood harvest and 10 Parties did not report on data sources.

34. Different methods may also be used to collect data on forest harvest from different land ownership groups. For the state sector reports are usually obligatory and for the private sector estimates, especially for small-scale harvest for selling or for household use, are mostly based on enquires, questionnaires or cutting permits. This has an impact on the consistency and accuracy of data, for example, Hungary and Poland reported lower accuracy for the estimates from the private sector. Likewise, various assumptions and expert judgements were used to estimate unregistered wood felling, for example, the Netherlands used a factor of 1.1 and the Czech Republic a factor of 1.15 to expand the registered harvest into total harvested volume.

35. Numerical data for other wood use were reported by five Parties (Austria, Hungary, Norway, Russian Federation and Sweden). Data sources included the NFI, agricultural census and expert judgment. Five Parties reported on data sources for non-forest trees: Australia used land cover maps, and the Czech Republic used the so-called ÚHÚL data;[2] Poland applied expert judgment based on national statistical data, Sweden used the NFI and the United States used scientific literature.

36. The NFI data on area are often aggregated by forest site types (as defined by national forest typology), species or groups of species, age classes, damage zones and various units of area division (zoning) applied in a country. In the practice, the level of detail in data taken from NFIs is usually not

[2] ÚHÚL: The Forest Management Institute (FMI), a governmental organization estalished by the Ministry of Agriculture of the Czech Republic.

the most significant limiting factor as the data are further aggregated to meet limitations imposed by availability of conversion/expansion factors.

37. National forest inventories are prepared using various frequencies of field measurements. Twenty-two Annex I Parties reported that their NFIs are periodical, the periods ranging from one to 20 years (see Table 3).

Table 3: Frequency of national forest inventory and year of the most recent data available from Annex I Parties

Country	Forest inventory frequency	Most recent data available
Austria	5 years	1996
Belgium	10 year	1994, 1998
Bulgaria	5 years	1999
Canada	Non-periodical	1986
Croatia	Forest management plan	1996
Czech Republic	5 years	2000
Denmark	10 years	2000
Finland	5 years	1994
Germany	Periodical	1986-90
Greece	Periodical	1992
Hungary	5 years, updated annually	
Ireland	Periodical	State forest 1995 Private forest 1973
Italy	Multiple sources	From 1985 to 2000
Japan	NR	1995
Latvia	5 years	1998
Netherlands	5 years, updated annually	2000
New Zealand	Annual	2001
Norway	5 years	1998
Poland	10 years, updated annually	1998
Portugal	Periodical	1995
Russian Federation	5 years	1998
Slovenia	10 years	1996
Spain	10 years	1995
Sweden	5 years (in principle)	2001
Switzerland	NR	1995
United Kingdom	15-20 years	2000
United States	10 years	1997

NR = Not reported by a Party.

38. The frequency of measurements may have an effect on both the accuracy and the inter-annual variability of estimates in the various inventory years. Even if the monitoring is continuous and measurements are taken each year, only a fraction, for example, one-fifth in Austria and Finland, or one-tenth in Hungary, of all the forests is measured in a single year. Therefore, GHG inventories data from previous years to cover those forests that were not measured. Many Parties estimated forest increment for the whole country once in a decade, and linear interpolation was used to get estimates for intermediate years.

39. The definition of forest may have a significant impact on the area included in GHG inventories and, thus, on the GHG emissions and removals. Ten Parties have reported a definition for forest (See Table 4). Most Parties have mentioned that GHG estimates deal only with managed forests or biomass stocks.

Table 4: Parameters used for thresholds for forest definition as reported in NIRs. (Note that Parties which have not reported their definitions may still have applied specific definitions and thresholds)

Party	Parameters for thresholds					Remarks
	Area	Crown cover	Height	Productivity	Other	
Australia	>2000 m^2	>=20 per cent	>2 m			
Denmark		Closed canopy	High forest			
Germany	>1000 m^2				Width >10 m	Land forested with forest plants
Ireland						Forest definition not specified but forest area includes forest roads
Netherlands	>5000 m^2	>20 per cent			Width >30 m	
Norway				>1 m^3/ha/year		Under favourable stand conditions
Poland	>1000 m^2					Covered with tree species typical for forest
Portugal	>5000 m^2	>10 per cent	>2 m		Width >20 m	Vegetation formations constituted by woody trees
Spain		>5 per cent				Tree-forested areas
Sweden	>2500 m^2			>1 m^3/ha/year		All land which is not protected or primarily used for other active land-use than forestry
United States					All land that is at least 10 percent stocked with trees of any size. Timberland is forest land, growing at a rate of 20 cubic feet per acre per year or more.	

40. Most Parties considered only managed forests in the GHG inventory assessment; natural, protected and unmanaged forests were excluded. However, the term "managed forests" was interpreted by Parties in different ways. For example, Canada reported GHG emissions and removals from only one third of all its forests, while the Russian Federation considered all its forests as "managed". Parties with mixed public and private forests reported ownership structure because the method, availability of data and accuracy of may be affected by differences due to ownership structure.

2. Specification of wood volume (growth and harvest)

41. Wood volume is most frequently understood by Annex I Parties as the volume of merchantable parts of the trees. Eighteen Annex I Parties provided their definitions for wood volume in their NIRs (see Table 5).

Table 5: Definition of wood volume used by Annex I Parties (as reported)

Country	Definitions and numerical parameters for wood volume
Austria	Harvest and growth: volume overbark dbh>5 cm
Belarus	Merchantable wood
Belgium	Solid wood
Canada	Harvest - green volume without bark, bark estimated separately
Czech Republic	Trunk and branches with bark dbh>7cm
Denmark	Coniferous: Stem volume Deciduous: Total above-ground biomass
Finland	Tree stem volume
Germany	Trunk volume
Hungary	Volume of all above-ground parts of the trees
Ireland	Stem volume overbark
Netherlands	Stem volume overbark
New Zealand	Merchantable stemwood volume
Norway	Volume underbark dbh ≥ 5 cm
Poland	Stock: stem volume over bark - dbh ≥ 5 cm Harvest: stem volume underbark - dbh ≥ 5 cm
Portugal	Volume overbark dbh ≥ 7.5 cm
Spain	Merchantable timber with bark
Sweden	Stem volume with bark for trees with height >1.3 m
United States	Volume of trees greater than one-inch (2.5 cm) diameter at breast height

dbh = diameter at breast height (usually measured at 1.3 m)

42. The specifications for wood volume are country-specific and they may vary even within a country (for example, Canada). Merchantable wood may imply that only trees with a breast height diameter (BHD) above a specified threshold are included (Austria, Czech Republic, Norway, Poland, Portugal and the United States). Merchantable referred to stem volume in Finland, Germany, Ireland, Netherlands, Poland, Portugal and Sweden, to stem and branches volume and in the Czech Republic, to total above-ground volume including leaves in Hungary. Merchantable volume could have been defined as overbark, (as in Austria, Czech Republic, Ireland, Netherlands, Poland, Portugal, Spain and Sweden) or underbark (Canada, Norway and Poland).

43. The threshold of BHD ranged from 1 inch (2.5 cm) (United States) to 7.5 cm (Portugal). Austria, Norway and Poland apply 5 cm, the Czech Republic 7 cm. Sweden used threshold for tree height (1.3 m) instead of diameter.

44. The IPCC default values or country-specific biomass expansion factors were often available only for aggregated forest ecosystem types. Most often wood volume data was aggregated by species groups, for example, between coniferous and deciduous species.

3. Carbon pools

45. Changes in carbon stocks may occur in living biomass (above-ground and below-ground biomass), dead organic matter (dead wood and litter) and in soil organic matter. Many Parties were not

specific on the inclusion or exclusion of carbon pools from their GHG inventory. The above-ground biomass pool was the most frequently measured (see Table 6).

Table 6: Carbon pools reported by the Annex I Parties according to their NIRs

	Pools reported				
	Living Biomass		Dead Organic Matter		Soils
Party	Above-ground[a]	Below-ground	Dead wood	Litter	Soil organic matter
Australia	Yes	Yes	Yes	Yes	Yes
Austria	Yes	Yes	?	?	Yes
Belarus	Yes	?	?	?	Yes
Belgium	Yes	Yes	?	?	No
Bulgaria	Yes	?	?	?	?
Canada	Yes	No	No	No	No
Croatia	Yes	No	No	No	No
Czech Republic	Yes	No	No	No	No
Denmark	Yes	Yes	No	Yes	No
Estonia	Yes	?	?	?	?
Finland	Yes	Yes	No	No	No
France	Yes	Yes	?	?	?
Germany	Yes	No	No	No	No
Greece	Yes	?	?	?	?
Hungary	Yes	No	?	?	Yes
Iceland	Yes	?	?	?	?
Ireland	Yes	No	No	No	No
Italy	Yes	?	?	?	Yes
Japan	Yes	No	No	No	No
Latvia	Yes	?	?	No	No
Lithuania	Yes	?	?	?	?
Luxembourg	Yes	?	?	?	?
Netherlands	Yes	Yes	?	No	No
New Zealand	Yes	Yes	No	Yes	No
Norway	Yes	Yes	No	No	No
Poland	Yes	No	No	No	Yes
Portugal	Yes	Yes	No	No	No
Romania	Yes	?	No	No	No
Russian Federation	Yes	?	?	?	?
Slovakia	Yes	Yes	?	Yes	Yes
Slovenia	Yes	?	No	No	No
Spain	Yes	?	No	No	No
Sweden	Yes	Yes	Yes	No	No
Switzerland	Yes	?	No	No	No
Ukraine	Yes	?	?	?	?
United Kingdom	Yes	Yes	Yes	Yes	Yes
United States	Yes	Yes	Yes	Yes	Yes
Total	Yes: 37	Yes: 14 No: 8	Yes: 4 No: 16	Yes: 6 No: 17	Yes: 7 No: 19

[a] It is assumed that if a Party reports changes in carbon stocks, the estimate includes at least the above-ground carbon pool.

Yes = Pools is reported.

No = Pool is not reported.

? = Information available in the NIR does not specify whether a pool is included or excluded.

46. Nineteen out of 37 Parties used the IPCC default method to report on aboveground biomass. The other pools were reported mostly by using country-specific methods.

4. Expansion and conversion factors

47. Biomass growth is derived from tree volume increment data by applying expansion or conversion factors which depend on primary data. In the simplest case, total tree volume is converted to total woody biomass by using dry wood density values. If volume is defined as the merchantable volume of stem, then one way is to expand the volume first to total tree volume and then convert it to total woody biomass. It also possible that merchantable stem volume is first converted to biomass of the merchantable sections, which is then expanded to total biomass including all other tree compartments. The use of and values for biomass expansion factors (BEF) and carbon conversion factors by Parties are presented in annex VI.

48. Twenty-two Annex I Parties reported the use of biomass expansion factors. Australia and the United Kingdom used models to transform primary data into activity data, while Japan used dry biomass as primary data source. Norway and Portugal used the IPCC default values, and Poland used educated guess. The IPCC default values are also applied in models (Australia). Austria, Belgium, Czech Republic, Denmark, Estonia, Germany, Hungary and Poland used different BEFs for coniferous and deciduous species. The Czech Republic and Austria use different BEFs for increment and harvest. New Zealand reported the use of allometric equations and Sweden and the United States used biomass functions because these Parties considered these practices to be more accurate than the use of BEFs.

49. Country-specific values may be available only for certain species or groups of species (for example, conifers or deciduous), or for older forests (for example, Denmark used a fixed conservative value used for recently afforested areas and in Canada BEFs were developed only for mature stands). Belarus, Ireland, Latvia, Norway, Portugal and Switzerland reported one single value for all species within the country.

50. Five Parties reported explicitly the use of BEFs to estimate below-ground parts of trees. Spain used BEFs to estimate not only tree biomass but also biomass of surrounding shrubs.

51. BEFs were often taken from literature or from research projects. The values reported by the Parties could have been derived in the past; for example, Ireland reported that conversion factors were developed in 1975. In cases where management methods have changed, BEF values may also need to be changed. BEF values taken from literature or research studies may not well represent the entire aggregate for which the BEF values were applied. As BEFs depend on forest management and other local parameters such as soil fertility and climate, individual numerical values were not always directly applicable among Parties.

52. Biomass estimates expressed as dry mass were converted into carbon units using the carbon fraction in dry mass. Carbon fractions were obtained from scientific investigations or scientific literature. Annex I Parties used factors to convert changes in biomass to changes in carbon stocks. These factors ranged from 0.40 to 0.52. The IPCC default value (0.5) for the whole tree was applied by 20 Parties. Australia reported different carbon fractions for stems, branches, bark, leaves, twigs, coarse roots and fine roots. Austria and the Netherlands reported different fractions for coniferous and deciduous trees, while Ireland used species-specific carbon fractions.

C. Forest and grassland conversion

53. Net CO_2 emissions in Annex I Parties resulting from forest and grassland conversion[3] in 1990 were equal to 142,021 gigagrams of CO_2 and 58,950 gigagrams of CO_2 in 2001 (or latest reported year reported), representing 11 percent and 5 per cent of entire GHG removals in LUCF sector respectively. However, emissions were higher in countries such as Australia and France where land-use change is reported as part of forest management

54. GHG inventory estimates on forest and grassland conversion require data on area converted and/or biomass converted. The sources of primary data on area converted annually (both current and historical) were NFIs (used in Australia and Poland), various kinds of agricultural censuses (Canada, France and New Zealand) and remote sensing (for example, the use in Australia of Landsat satellite images). Five Parties have not reported on the sources of numerical data used in their GHG inventories.

55. Different sources of data on biomass stocks were also used to estimate biomass before and after the conversion. Australia and Poland used NFIs and New Zealand scientific literature as primary sources of data on biomass stocks before conversion. Six Parties did not report the source of data even when they provided estimates. Primary data on biomass after conversion were taken from scientific literature Australia, Belarus and New Zealand or the IPCC default data were used, as in Canada and Poland. Five Parties did not report on primary data sources on biomass after conversion. Four Annex I Parties provided no information on any primary data source (see Table 7).

56. Parties used country-specific methods for the estimation of GHG emissions from forest and grassland conversion when land-use change is a part of forest management as in Australia and France or when available data sources lead to the use of such methods, as in Canada, New Zealand and Slovakia. These methods were similar to the IPCC default method combining activity data and emission factors. However, country-specific methods allowed greater differentiation in primary data, thus enabling coverage a variety of land-use changes occurring in these countries. Emission factors used included changes in the biomass, for example in Australia, Canada, France, New Zealand and Slovakia, and soil carbon, as in Australia, Canada and New Zealand. New Zealand reported emissions resulting from clearing land in preparation for new forest planting and non-CO_2 emissions from scrub and forest wildfires.

57. Hungary and Poland reported GHG emissions from burning harvest residues (total or those related to land-use change if preceded by harvest) under category 5.B. The fractions suggested by the IPCC default method were adjusted to proportions of the harvest residues burnt, oxidized or left to decay.

D. Abandonment of managed lands

58. Reported net CO_2 removals due to abandonment of managed lands in Annex I Parties were negligible, only 16,243 gigagrams of CO_2 in 1990 and 5,489 gigagrams of CO_2 in 2001, approximately 1 per cent in comparison to removals from the entire LUCF sector. This seems to be a consequence of the level of economic development in the Annex I Parties, which resulted in land areas being transferred to another system of land management and then left unmanaged. On the other hand, Parties may not have had monitoring systems in place, emissions under this category were included under other inventory categories (for example in Austria, Finland, Portugal, Switzerland and the United States), or the Revised 1996 IPCC Guidelines did not provide sufficient guidance for Parties to allow GHG reporting for this category.

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[3] According to the Revised 1996 IPCC Guidelines Parties are requested to report CO_2 and non-CO_2 GHG emissions under forest and grassland conversion, but the synthesis of non-CO_2 gas emissions reported by Parties is presented in chapter IV.F of the note.

Table 7: Primary data sources for selected activity data used in reporting on forest and grassland conversion

Party	Reporting on forest and grassland conversion	Area converted annually	Biomass before conversion	Biomass after conversion
Australia	Yes	NFI, Remote sensing (mainly Landsat)	NFI	Scientific literature
Austria	IE			
Belarus	Yes	NR	NR	Scientific literature
Canada	Yes	Census of Agriculture	Canadian Forest Service	IPCC default data
Finland	IE			
France	Yes	Land-use change matrix produced by the TERUTI programme	NR	NR
Greece	Yes	NR	NR	NR
Hungary	Yes	Emissions from harvest residues are reported here		
Latvia	Yes	NR	NR	NR
New Zealand	Yes	Ministry of Agriculture and Forestry, National Rural Fire Authority	Scientific literature	Scientific literature
Poland	Yes	NFI	NFI	IPCC default data
Romania	Yes	NR	NR	NR
Slovakia	Yes	NR	NR	NR
United States	IE			

IE = Included elsewhere
NR = Not reported

59. France reported the use of a country-specific method for estimating GHG emissions and removals from abandonment of managed lands.

E. CO_2 emissions and removals from soils

1. Reporting on CO_2 emissions and removals from soils

60. The Revised 1996 IPCC Guidelines and its Volume 2 Workbook provides a methodology to estimate CO_2 emissions and removals from three processes: (i) changes in carbon stock in soil and litter of mineral soils due to changes in land-use practices, (ii) CO_2 emissions from organic soils converted to agriculture or plantation forestry, and (iii) CO_2 emissions from liming of agricultural soils. Parties may also provide estimates for forest soils and other source categories.

61. The share of reported net CO_2 emissions from the inventory category 5.D (CO_2 emissions and removals from soils) in Annex I Parties were 15,699 gigagrams of CO_2 in 1990 and net CO_2 removals of 21,039 gigagrams of CO_2 in 2001 representing about one per cent of total removals from the entire LUCF sector. Sixteen Parties provided some numerical data on CO_2 emissions and removals from soils, including liming (see Table 8). Finland informed that forest soils are not reported and CO_2 emissions from agricultural soils are covered under the Agriculture sector. Fifteen countries informed that emissions and removals from soils are not estimated.

Table 8: Methods used by Parties to estimate and report individual source and sink categories for CO_2 emissions and removals from soil

	Mineral soils		Organic soils		Liming of agricultural soils	Forest soils		Other	
Party	Emission	Removal	Emission	Removal	Emission	Emission	Removal	Emission	Removal
Australia									CS
Belarus			CS/D						
Canada	IE	NA	IE	NA	IE			CS/D	CS/D
Estonia	IPCC		IPCC						
Finland	IE	IE	IE	IE	IE				
France					IPCC			CS	CS
Greece		NR	NA		NA	NA			
Hungary	IPCC		NO	NO	IPCC				
Ireland					IPCC				
Italy	IPCC								
Latvia			IPCC		IPCC			NO	NO
New Zealand					IPCC			NA	NA
Poland	IPCC	IPCC	NO	NO	NO	IPCC	IPCC		
Slovakia		CS/D	NO	NO	IPCC	NO	NO	NO	NO
Slovenia					IPCC				
Sweden					IPCC				
United Kingdom	CS	IE	IE	IE	IPCC	NO	CS	CS	CS
United States	IE	CS	CS	NA	IPCC	IE	CS		

NA = Not applicable
NO = Not occurring
IPCC= IPCC default approach
CS/D = Initial country-specific approach
CS = Country-specific approach
IE = Included elsewhere
NR = Not reported

62. A few Parties provided an explanation for non-reporting the CO_2 emissions and removals from soils, for example, lack of data and possible inapplicability of the IPCC default approach to countries' specific conditions, as in Germany, Japan, New Zealand, Romania or changes in soil carbon were assumed to be small with respect to other pools so they are omitted in the NIR as in Austria.

2. Primary data and methods used

63. Eleven Parties (Australia, Belarus, Canada, France, Hungary, Ireland, Italy, Poland, Sweden, the United Kingdom and the United States) used national statistics as a primary source of data. Six Parties (Australia, Belarus, Canada, Hungary, the United Kingdom and the United States) used national and/or international scientific publications. Ireland, Italy, Poland and Sweden used IPCC default data. Italy, Poland and the United States used expert guess and Australia and Belarus reported models as sources of primary data. Estonia, Latvia, New Zealand, Slovakia and Slovenia did not provide information on sources of primary data. Five Parties reported use of at least three data sources; while three Parties reported use of two data sources (national statistics and scientific literature) (see Table 9).

Table 9: Primary data and methods for estimating CO_2 emissions and removals from soils

Party	Primary data and methods
Australia	Most data were taken from other countries. National data sets were available from a total of 41 studies on 197 sites. The Roth-C Soil Carbon Model was used to predict changes in soil carbon caused by shifts in agricultural practice and to provide estimates for the National Carbon Accounting System (NCAS).
Belarus	National and departmental statistical reports, handbooks, methodical guidelines, different archives and publications. The bog area data were obtained from the Inventory Handbook Peat Reserves of the Byelorussian SSR (1979), Arrangements of Efficient Management and Protection of Peat Resources of the Republic of Belarus up to 2010 and the data from the Ministry of Natural Resources and Environmental Protection. Data and simulation system Biogeocenosis Diversity of Belarus. Data published by foreign scientists were used also.
Canada	Census of Agriculture, the NFI and scientific publications.
France	Land-change matrix (produced by the TERUTI programme for the years 1992 to 1996) is used for the calculations of soil carbon emissions/removals due to all land-use changes.
Hungary	Data from the Ministry of Agriculture, Hungarian Central Statistical Office, Research and Information Institute for Agricultural Economics, Research Institute for Soil Science and Agricultural Chemistry, and St. Stephen University.
Ireland	Data on lime application are obtained from the Department of Agriculture and the CO_2 emissions are calculated using the IPCC default data.
Italy	The data used for land area were those provided by the National Statistics Institute. The carbon content of one hectare was assessed using expert guess. IPCC default data were used when no national data were available.
Poland	Land area data: Central Statistical Office. IPCC default data were used when no national data were available. Some default data were adjusted to local conditions using expert guess.
Sweden	Lime use data were taken from the yearly sales statistics produced by Statistics Sweden (Na/Mi 30 SM "Sales of lime for agricultural and horticultural purposes and for lakes and woodlands")
United Kingdom	Land area matrices from the Monitoring Landscape Change (MLC) data from 1947 & 1980 and the DETR/ITE Countryside Surveys (CS) of 1984 & 1990 were used. Information on soil carbon density for the United Kingdom was provided by the Soil Survey and Land Research Centre, the Macaulay Land Use Research Institute and Queen's University Belfast. Data on the use of limestone, chalk and dolomite for agricultural purposes was taken from BGS (2002). (See box 1 below)
United States	Climate data were obtained from the National Weather Service. Reference carbon stocks, representing estimates from conventionally managed cropland, were computed for each of the mineral soil types across the various climate zones, based on data from the National Soil Survey Characterization Database (NRCS 1997). Land use and management data for 1982, 1992, and 1997 were obtained from the 1997 National Resources Inventory (NRCS 2000). Data on tillage practices have been collected by the Conservation Technology Information Center (CTIC 1998). The USDA National Agricultural Statistics Database (NASS 2002) provided information on the amount of land planted to each crop, for estimating the cropland area receiving manure and sewage sludge. Improved pastures were identified in the 1997 National Resources Inventory as pastures that were irrigated or seeded with legumes. Scientific literature and expert guess (assumptions) were also used.

Box 1: An example - estimation of CO_2 emissions and removals from soils in the United Kingdom

The inventory of the United Kingdom covers GHG emissions and removals resulting from changes in soil carbon due to land-use change, from setting aside cropland, as well as the emissions from the application of limestone, chalk and dolomite for agricultural purposes.

Land use matrixes are developed separately for Scotland, England and Wales for (semi-) natural lands, farming lands, woodland and urban lands. The Northern Ireland land-use matrix is not yet available and changes in soil carbon are estimated using the IPCC default approach. The numerical data needed to construct the land use matrix were taken from various sources and these data are interpolated between survey years.

A database of soil carbon density for the United Kingdom includes information on soil type, land cover and carbon content of soil cores. These include carbon densities to a depth of 1 m or to bedrock, whichever is the shallower, for mineral and peaty/mineral soils. Deep peatlands in the North of Scotland are identified separately and depths to 5 m are included but these play a minor role in relation to land-use change

A simple model (based on a matrix derived from surveys of land) is used to estimate change in the soil carbon density. The model assumes that the carbon density changes in time in an exponential way from initial to final states. Both states are assumed to be the equilibrium. The total change of carbon is the sum of annual changes. The model equation requires numerical values for the changes in equilibrium carbon densities separately for each possible pairs of initial and final land-use categories. These changes are calculated as averages separately for Scotland, England and Wales.

In order to account for variation in carbon density and land-use change in different soil types, these averages are weighted by the area of soil groups.

The rates of exponential change in the soil carbon density in the model equation are further divided into slow and fast, depending on the direction of the carbon change (for example, slow accumulation but fast emission) separately for England, Scotland and Wales. The uniform probability distributions based on these ranges were applied into the Monte Carlo method to obtain mean values and their confidence ranges.

F. Non-CO_2 gases and other emissions

64. The IPCC Guidelines provide methodological guidance to report emissions of non-CO_2 gases from burning associated with forest and grassland conversion. The methods are very similar to those used to estimate non-CO_2 gas emissions from burning of savannas and agricultural residues under the agricultural sector. Non-CO_2 emissions from biomass fuel combustion are estimated under the energy sector. According to the IPCC Workbook, all burning of biomass is a significant source of CH_4, N_2O, CO and NO_X. Methane and CO emissions from on-site burning are estimated as ratios to carbon fluxes emitted during burning. Total nitrogen content is estimated based on the nitrogen – carbon ratio, and N_2O and NO_X emissions are estimated as ratios to total nitrogen. In addition, human activities and land disturbance have an influence to non-CO_2 gas emissions; for example, clear-cutting releases N_2O emissions and the loss of forest area may result in increased CH_4 emissions. Given that the Revised 1996 IPCC Guidelines does not provide specific guidance, Parties can report non-CO_2 gas emissions associated with flooding and wetland drainage under category 5E.

65. Eleven Parties (Australia, Belarus, Belgium, France, Greece, Hungary, Latvia, New Zealand, Poland, Romania, and Slovakia) followed the IPCC default method to report non-CO_2 gases under the LUCF sector. CH_4, N_2O, NO_X and CO were estimated from the amount of biomass using IPCC default values.

66. Most Annex I Parties reported non-CO_2 emissions resulting from the use of fertilizers under the Agriculture sector. The United Kingdom reported non-CO_2 emissions resulting from drainage of peatlands and from peat extraction under the category 5.E. Belarus reported nitrogen loss from peatlands but its NIR did not specify if it was included in the estimation of non-CO_2 GHG emissions.

G. Integration of data and methodologies

67. The preparation of the annual GHG inventory for an entire country may require the integration of methods, data and methodologies between and within different inventory categories, from various institutions and in diverse time periods. In many cases, country-specific approaches enable the integration such data.

68. Austria integrated data on biomass increment and harvest using a country-specific method. Data provided by the NFI covered all changes in biomass stock over area covered by the forest inventory, and included data such as biomass increment in existing forests and the biomass increments due to abandonment of managed land and regrowth by forests. Data on harvest included all possible biomass losses in forests, traditional fuel wood consumption, biomass losses by forest conversion, forest fires and losses due to other damages. Reporting under inventory categories 5.B and 5.C was not carried out separately as all biomass changes were included in category 5.A.

69. New Zealand also used a country-specific method to integrate forest increment and harvest data on the level of yield tables. These tables are the product of a model called FOLPI (Forest Oriented Linear Programming Integrator) which is a linear programming model that optimizes the management of the forest state across time, while maximizing the discounted harvest volume. The model simulated actual rates of planting and harvesting where historic data exists. For planted production forest, harvest and average levels of mortality and harvesting waste were built into the yield tables, but the tables did not include impacts of unexpected losses caused e.g. by cyclones, fire, disease or insect attack. These losses had to be estimated separately on individual basis.

70. The United Kingdom applied a country-specific method consisting of a model that integrates harvest data and forest volume increment. The model was applicable to even-aged plantations and it assumed that plantations are clear-felled and then replanted at the optimum time by using Maximum Annual Increment (MAI). The MAI also reflected wood volume increment.

71. The Australian GHG reporting system used land cover change as a basis for the determination of changes in carbon stocks and subsequent fluxes of GHGs. The main source of data was the Australian Land Cover Change Program, which provided a continent-wide assessment of land cover change over time. It is based primarily on Landsat data covering the period from 1972 to 2000 and it was repeated about every third year. Data on the land cover change in Australia were further transferred to the Full Carbon Accounting Model (FullCAM).

Box 2. An example of an integrated system – the FullCAM integrated model in Australia

The National Carbon Accounting System (NCAS) has been established by the Australian Government to provide a complete carbon accounting and projections capacity for land based (agricultural and forestry) activities at continental level. The FullCAM integrated model was developed to deliver the GHG emission and removals estimates. The model described both the stock and changes in all carbon pools for each monthly time step.

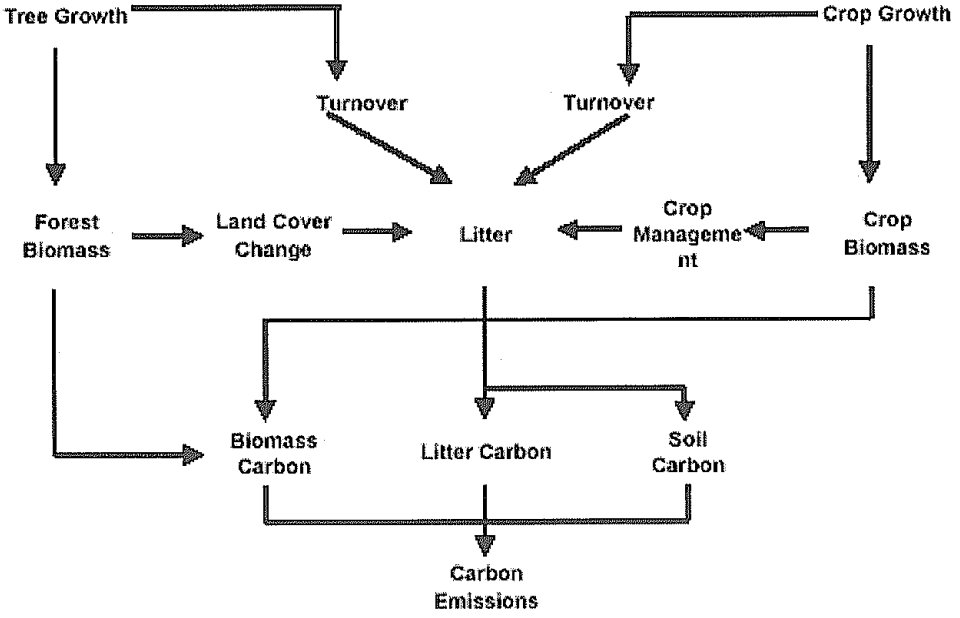

Figure: Major carbon pools and processes covered by the FullCAM integrated model.

The FullCAM has components that dealt with the biological and management processes that affect carbon pools and the transfers between pools in forest, agricultural, transitional (afforestation, reforestation, deforestation) and mixed (e.g. agroforestry) systems.

H. Uncertainties

72. Estimated carbon stock changes, emissions and removals arising from the LUCF sector have uncertainties associated with assumption, area and other activity data, biomass exchange rates (increment, harvest, and other losses), expansion factors and other coefficients and models used. Most Annex I Parties have not reported uncertainties for the LUCF sector. In some cases, Parties provided numerical estimates of uncertainties for inventory categories 5.A and 5.B for individual activity data or parameters.

73. Fifteen Annex I Parties reported uncertainties in the estimates of GHG fluxes for some inventory categories (see Table 10). Canada, Finland, Hungary and Poland reported only qualitative estimates of uncertainties.

Table 10: Uncertainties reported by the Annex I Parties in the LUCF sector among inventory categories

Party	Changes in forest and other woody biomass stocks	Forest and grassland conversion	Abandonment of managed lands	CO_2 emissions and removals from soil	Other
Australia	± 20-60 per cent	± <20 per cent	NR	± 60 per cent	± 20-60 per cent
Austria	± 30 per cent	IE	IE		
Belarus	Emissions: 10 per cent, Removals: 7 per cent	Emissions: 10 per cent, Removals: 7 per cent	Emissions: 10 per cent, Removals: 7 per cent	Emissions: 10 per cent, Removals: 7 per cent	Emissions: 10 per cent, Removals: 7 per cent
Canada	High	NR	NR	NR	
Croatia	± 50 per cent				
Finland	Emissions: very low	IE	IE	IE	
France	Emissions: ± 50 per cent	NR	NR	NR	NR
Hungary	Low	High		High	
New Zealand	Carbon sequestration : ± 25 per cent	NR		NR	
Norway	± 40 per cent				
Poland	Medium	Medium		High	
Russian Federation	± 20 per cent				
Slovakia	± 30 per cent	± 30 per cent		± 30 per cent	
Sweden	± 10 per cent			NR	
United States	± 15 per cent (80 per cent confidence level)	IE	IE	± 40 per cent	NR

IE indicates that numerical data and, probably, the estimate of uncertainty provided under category 5.A cover GHG fluxes from all the relevant categories. NIRs are not specific if IE pertains only to GHG flux estimates or to measures of uncertainty as well.
NR means that numerical data are reported but the uncertainties are not reported.

74. Most Parties reported uncertainties in a numerical way even if the uncertainty estimates were based on an expert guess. Parties using country-specific methods applied the Monte Carlo method to estimate uncertainties; these were expressed as a percentage error of the average value or a range containing the "true" value. The confidence level was reported only by United States (80 per cent for uncertainties related to GHG fluxes from changes in forest and other woody biomass stocks). Numerical estimates of uncertainties were more often used by Parties that used country-specific or country-specific methods compared to those Parties that used the IPCC default method.

75. Eleven Parties provided numerical estimates and four Parties qualitative estimates for category 5.A. For the category 5.B, three Parties provided numerical estimates and two Parties qualitative estimates of uncertainties. Belarus submitted a quantitative estimate of uncertainty uncertainties for category 5.C. Three Parties provide numerical estimate and two Parties qualitative estimates for uncertainty under category 5.D.

76. Uncertainties for categories 5.B–5.D were seldom reported. Hungary and Poland mentioned that the most important source of uncertainty is the aggregation of procedures from national soil classification

systems to the IPCC default classification. The aggregation was necessary to apply the IPCC default data on soil carbon under native vegetation. Another source of uncertainties was the possible differences in soil classification systems in the reporting year and those 20 years before. These differences required transformation procedures from the old to the new classification. Errors in these procedures, apart from introducing numerical uncertainties, may also challenge the applicability of equilibrium assumption inherent in the IPCC default approach.

77. Data originating from NFIs (forest area, increment, harvest) were reported to be among the most certain ones used in the preparation of GHG inventories for LUCF sector (see Table 11). Reported uncertainty was often lower then 5 per cent, with exception of data from State Census of Forest Stock in Russia, which was estimated to have an uncertainty of about ± 20 per cent. Most Parties, with the exception of United States, did not explicitly report on the definition of the percentage error and significance level at which it was estimated. However, not reporting on the significance level may suggest that the most common confidence level (95 per cent) was used.

78. Austria reported uncertainties in the estimation of conversion factors to be between 6.5 per cent to 11 per cent. New Zealand reported carbon allocation which closely related to conversion factors; its percentage uncertainty was estimated at ± 15 per cent. Slovenia reported ± 20 per cent as an estimate of uncertainty in the input data and ± 30 per cent in the emission factors but these estimates were based on expert guess.

Table 11: Uncertainties reported for individual data and parameters used in preparation of NIRs by the Annex I Parties

Party	Uncertainties of individual data and parameters
Austria	Forest inventory: Increment 2 per cent, Harvest 3.5 per cent Conversion factor m^3 --> t dm 11 per cent, BEF dm stemwood --> t dm whole tree 6.5 per cent, Conversion factor t dm --> t C 2 per cent
Finland	Volume increment 0.8 per cent
Germany	Area measurements in NFI <1 per cent
New Zealand	Area: ± 5 per cent Yield tables are assumed to be accurate to within ± 5 per cent Wood density ± 3 per cent Carbon allocation ± 15 per cent Carbon content ± 5 per cent
Norway	Forest inventory: gross increment ± 1 per cent
Russian Federation	Estimation error for parameters of State Census of Forest Stock should not be higher than ± 20 per cent
Slovenia	Input data: 20 per cent Emission factors: 30 per cent

t dm = ton of dry matter

V. Synthesis of projections

A. Reporting on projections and period covered

79. Twenty five Annex I Parties provided numerical data on projections of GHG emissions and removals from the LUCF sector in their latest national communication. Some projections were based on the effects of policies and measures, such as afforestation programmes or national forest programmes. In other cases, Parties provided projections for the entire LUCF sector. Six Annex I Parties (Croatia,

Denmark, Italy, Liechtenstein, Slovakia and the United States) did not include information on the approach used; thus the analysis and synthesis below was limited to 19 Parties. Of these, only five (Belarus, Hungary, New Zealand, Sweden and the United Kingdom) reported a relatively detailed description of the method applied for making projections for LUCF sector.

80. Periods covered by the projections of GHG fluxes range from 2000-2010 to 2000-2100 (See Table 12). In particular, 12 Annex I Parties reported projections covering the period 2000-2020 (Australia, Belarus, Czech Republic, Estonia, Finland, Greece, Italy, Latvia, Poland, Switzerland, the United Kingdom and the United States) and four Parties (Belgium, Croatia, Norway and Romania) reported projections from 2000 to 2010. Hungary and Sweden reported the longest projection period (one hundred years).

Table 12: Periods covered by LUCF projections.

Country name	Period covered by the projection
Australia	2000-2020
Belarus	2000-2020
Belgium	2000-2010
Bulgaria	2000-2035
Croatia	2000-2010
Czech Republic	2000-2020
Denmark	2000-2030
Estonia	2000-2020
Finland	2000-2020
Greece	2000-2020
Hungary	2000-2100
Ireland	2000-2030
Italy	2000-2020
Latvia	2000-2020
Liechtenstein	2000-2010
New Zealand	2000-2030
Norway	2000-2010
Poland	2000-2020
Romania	2000-2010
Slovakia	2000-2015
Sweden	2000-2100
Switzerland	2000-2020
Ukraine	2000-2015
United Kingdom	2000-2020
United States	2000-2020

81. Annex I Parties have not reported whether climate change has been taken into consideration in the models when making projections, even though climate change and other long term changes may have an impact on GHG emissions and removals in LUCF sector. However, Belarus reported the change in species composition as the initial approximation of the climate change influence on forest ecosystem.

B. Methods used

82. Projections of GHG emissions and removals from the LUCF sector as reported in national communications were prepared for the purposes of the UNFCCC. However, in cases when Parties provided projections for afforestation and deforestation activities, projections were also relevant to the Kyoto Protocol.

83. The most frequently used method was based on a simple equilibrium approach to extrapolate past trends into the future. Some Parties used this approach to estimate specific parameters, for example, growth trends from the current NFIs (Belarus, Hungary, New Zealand, Norway, Poland, and Switzerland) or the trends in land-use change (Australia and the United Kingdom).

84. Eleven Parties used projections from national forest policies, for example, the Forestry Strategy in Estonia, the National Forest Programme in Finland, the Program of the Development of Forestry and Forest Industry in Ukraine, and the National Afforestation Programme in Poland. Some Parties (Australia, Belgium, Bulgaria, Hungary, Romania, Switzerland and the United Kingdom) mentioned the inclusion of other projections of LUCF development but offered no detailed information on them.

85. Afforestation programmes were taken into consideration for estimating future changes in the LUCF sector by a number of Annex I Parties (Belgium, Bulgaria, Estonia, Hungary, Ireland, New Zealand, Poland, Romania and Ukraine). Data on areas of afforested land in future were usually taken from studies in land-use change options or national afforestation strategies. In many European countries land suitable for afforestation is currently subject to agricultural practices. However, no Party mentioned the relation between afforestation rates and the policies and economical conditions in the agricultural sector.

86. Forest management (including harvest and regeneration) and land-use change (including afforestation, reforestation and deforestation) are dependent on the development of national economy and legal systems, thus projections on GHG emissions and removals in LUCF should be considered in the context of national macroeconomic strategies and forecasts. Four Annex I Parties reported that their projections on GHG fluxes from LUCF included results of other national development projections or strategies. Australia included the influence of the prognosis of wood demand. Belarus and Ukraine included results from several national development prognoses.

87. For most Annex I Parties projection estimates on LUCF were related to GHG inventory category 5.A (Changes in forest and other woody biomass stocks). The same activity data and emission factors, as well as similar types of models and calculation procedures, have often been applied for GHG inventories and for projections under the LUCF sector. Table 13 summarizes driving variables and describes methods or models used by Annex I Parties in the preparation of projections for LUCF.

Table 13: Summary of driving variables and a description of methods and models used by Annex I Parties for the preparation of projections on LUCF

Party	Driving variables (or processes) in projection method	Description of method (or model)
Australia	Growth, harvest, deforestation, afforestation	Extrapolation of the current trend
Belarus	Increment (assumed constant increase 0.35 per cent/annum), changes in age and species structures	Model: input NFI 2001 data, output carbon pools estimates
Belgium	Deforestation, afforestation	Linear trend
Bulgaria	Harvest rotation, deforestation, afforestation	NR

Party	Driving variables (or processes) in projection method	Description of method (or model)
Czech Republic	Harvest below 1999 level afforestation	NR
Estonia	Harvest, afforestation, annual increment	NR
Finland	Harvest, increment	NR
Greece	Area of forest fires	NR
Hungary	Species composition, afforestation, growth, harvest	Linear model CASMOFOR
Ireland	Afforestation, harvest	Constant net removals from 2006 onwards
Latvia	Afforestation, harvest	NR
New Zealand	Prices for wood, tax system, afforestation, land use change	Same model used for reporting emissions and removals from the LUCF sector
Norway	Age structure, constant harvest	Extrapolation of NFI
Poland	Afforestation	Extrapolation of NFI
Romania	Changes in species composition, afforestation, changes in forest management	NR
Sweden	Harvest, nitrogen deposition, afforestation, drainage of forest soil	Scenario analysis (SKA9928) – no further details
Switzerland	Forest area, harvest	Linear extrapolation of trend 1985-95
Ukraine	Afforestation	NR
United Kingdom	Afforestation (coniferous and deciduous), set-aside area data (land-use data derived from periodic surveys, supplemented by an annual census of agricultural land uses)	Spreadsheet model: Assumed continuation of the prevailing pattern of land-use change

NR = Not reported by a Party.

88. In making projections for LUCF the most frequently used variables are afforestation rates and biomass increment and harvest. Other variables included changes in age and species structures. These main variables used in projections were typically associated with the estimation of changes in forest biomass stocks. Other key findings include:

(a) Information on forest harvest was a driving variable for many Parties and its value was frequently based on potential future harvest (for example, in Australia, Bulgaria, Estonia, Finland, Hungary, Ireland, Latvia, Norway, Sweden and Switzerland). New Zealand mentioned prices for wood and expected tax reform as a possible driving variable influencing future afforestation activities and forest harvest rates.

(b) Future wood increment per area was assumed not to be significantly different from the most recent one in Australia, Belarus, Hungary, New Zealand, Poland and Switzerland. Some Parties, including Belarus and Hungary, mentioned the importance of future changes in species composition but did not provide a clear indication of how these changes would influence the wood increment.

(c) Sweden included nitrogen deposition and drainage of forest land, Greece forest fires, and Australia land-use change as variables in making their projections. Australia and

Belgium mentioned deforestation as a variable. No country explicitly included changes in frequency of extreme events or climate change.

(d) Ireland reported constant net removals in the LUCF sector beginning from 2006.

89. Five Parties reported on uncertainties in the projections. Australia and Hungary assessed the uncertainty as high, Poland as medium and New Zealand as low. Hungary and Poland used expert judgement to estimate uncertainties for their projections. The United Kingdom reported use of the Monte Carlo method in estimation of the uncertainty.

90. To estimate uncertainties associated with projections, the United Kingdom used different scenarios that lead to high, mid and low values for net emissions, which enable estimation of a range for the future net emission values. In Australia, uncertainties associated with models used could be estimated using an in-built Monte-Carlo analysis. But overall quantitative uncertainty estimates were not possible as the uncertainty in projected land areas estimates (such as future rates of deforestation or plantation establishment was not quantified. For this reason overall quantitative uncertainty reporting was not possible and Australia provided only qualitative estimates for uncertainty.

VI. Summary and issues for consideration

91. Greenhouse gas inventories that are complete, transparent, accurate, consistent and comparable are needed to support the development and assessment of policy. Annex I Parties have prepared and submitted to the COP annual greenhouse gas inventories since 1996. Given the complexity of and the problems experienced with the reporting of LUCF information, the COP, by its decision 11/CP.7, invited the IPCC to elaborate methods to estimate, measure, monitor and report changes in carbon stocks and anthropogenic greenhouse gas emissions by sources and removals by sinks resulting from land use, land-use change and forestry. It also invited the IPCC to prepare a report on good practice guidance and uncertainty management for LULUCF. In response to this invitation, the IPCC adopted in November 2003 its good practice guidance for LULUCF.

92. Almost all Parties have reported emissions and removals under the LUCF sector. The majority provided estimates for category 5.A (Changes in forest and other woody biomass stocks) and used the national forest inventories as the main source of data. Most Parties used the IPCC default method; country-specific methods are reported by those Parties with greater net changes in biomass stocks. Reporting of emissions and removals from other LUCF categories was sparse and generally not well documented. Some key problems included:

(a) In some cases, Parties have not been able to apply the categories included in the Revised 1996 IPCC Guidelines to their national circumstances

(b) Many Parties have had difficulties in applying the IPCC default method, in particular for categories 5.B (Forest and grassland conversion), 5.C (Abandonment of managed lands), 5.D (CO_2 emissions and removals from soils) and 5.E (Other GHG emissions and removals)

(c) The lack of activity data, emission factors, models and methods applicable to specific conditions has inhibited reporting by many Parties

(d) Some Parties have not yet addressed the development of a national inventory system for the LUCF sector, leading to an incomplete reporting, for example, on assumptions and methods used

(e) Guidance for the preparation of uncertainty estimates has been insufficient in the LUCF sector.

93. The data indicate some inherent problems experienced by Parties when reporting information for the LUCF sector and show the differences between Parties in terms of the availability of data and use of methods. In order to ensure better reporting, Parties will need to provide complete CRFs, consistent time series and additional information in the NIRs, and identify methods for such purposes.

94. Most Parties provided numerical data on projections of GHG emissions and removals from the LUCF sector. Some projections were prepared for the effects of policies and measures, and others for LUCF inventory categories. However, in many cases, information on assumptions and methods used was incomplete, thus making comparison of projections difficult.

95. It is expected that, with the use of the IPCC good practice guidance for LULUCF and the adoption of the new CRF, the estimation, measurement, monitoring and reporting of changes in carbon stocks and anthropogenic GHG emissions and removals by sinks, will improve in the future. This methodological guidance may also help Parties in strengthening National Communications, in particular, for assessing policies and measures, and in the development and reporting of projections for the LULUCF sector.

96. However, the transition to the new guidelines may impose challenges to some Parties. Problems may accrue when adapting the new methodological guidance to national circumstances. Therefore, Parties may wish to consider how to enhance the exchange of information, experiences and tools among Parties as a means to facilitate this transition. Parties lacking data or adequate methods, may wish to take note of the methods used by other Parties referred to in the present document. This exchange of information, including of lessons learned, may also be relevant for the development of the 2006 IPCC guidelines for national greenhouse gas inventories currently under way.

97. Adjustments may also be needed to the inventory review process of national GHG inventories of Annex I Parties. In particular, it may be necessary to have the LULUCF sector undergo a more focused review for Parties having LULUCF as a key sector.

98. Parties may wish to consider the levels of accuracy and comprehensiveness that are needed to support discussions relating to the treatment of LULUCF in the future. The information contained in this paper is relevant to other SBSTA agenda items, for example, harvested wood products and the effects of indirect human-induced and natural effects, such carbon dioxide fertilization and nitrogen deposition, and effects due to past practices in forests.

Annex I

Latest LUCF data submitted by Annex I Parties

Party	Latest national communication	National inventory report	Common reporting format	LUCF data; Period covered
Australia	3rd	NIR 2003	CRF 2003	1990-2001
Austria	3rd	NIR 2003	CRF 2003	1990-2001
Belarus	1st	NIR 2003	CRF 2003	1990-2001
Belgium	3rd	NIR 2003	CRF 2003	1990-2001
Bulgaria	3rd	NIR 2003	CRF 2003	1990-2001
Canada	3rd	NIR 2003	CRF 2003	1990-2001
Croatia	1st	NIR 2003	CRF 2003	1990-2001
Czech Republic	3rd	NIR 2003	CRF 2003	1990, 1994, 1996-2001
Denmark	2nd	NIR 2003	CRF 2003	1990-2001
Estonia	3rd	NIR not provided	CRF 2003	1990-2001
Finland	3rd	NIR 2003	CRF 2003	1990-2001
France	3rd	NIR 2003	CRF 2003	1990-2001
Germany	3rd	NIR 2003	CRF 2003	1990-2001
Greece	3rd	NIR not provided	CRF 2003	2001
Hungary	3rd	NIR 2003	CRF 2003	1990-2001
Iceland	3rd	NIR not provided	CRF 2003	1990-2001
Ireland	3rd	NIR 2003	CRF 2003	1990-2001
Italy	3rd	NIR 2003	CRF 2003	1990-2001
Japan	3rd	NIR 2003	CRF 2003	1990-2001
Latvia	3rd	NIR 2003	CRF 2003	1990-2001
Liechtenstein	3rd	NIR not provided	No CRF	No CRF
Lithuania	2nd	NIR not provided	No CRF	No CRF
Luxembourg	1st	NIR not provided	CRF 2003[a]	2001
Monaco	3rd	NIR not provided	CRF 2003[b]	Not Reported
Netherlands	3rd	NIR 2003	CRF 2003	1990-2001
New Zealand	3rd	NIR 2003	CRF 2003	1990-2001
Norway	3rd	NIR 2003	CRF 2003	1990-2001
Poland	3rd	NIR 2003	CRF 2003	1990-2001
Portugal	3rd	NIR 2003	CRF 2003	1990-2001
Romania	2nd	NIR 2003	CRF 2003	1990-2001
Russian Federation	3rd	NIR not provided	No CRF	1990 - 1999[c]
Slovakia	3rd	NIR 2003	CRF 2003	1990-2001
Slovenia	1st	NIR 2003	No CRF	No CRF
Spain	3rd	NIR 2003	CRF 2003	1990-2001
Sweden	3rd	NIR 2003	CRF 2003	1990-2001
Switzerland	3rd	NIR not provided	CRF 2003	1990-2001
Turkey	No	NIR not provided	No CRF	No CRF
Ukraine	1st	NIR not provided	No CRF	No CRF
United Kingdom	3rd	NIR 2003	CRF 2003	1990-2001
United States	3rd	NIR 2003	CRF 2003	1990-2001

[a] CRF prepared by Luxemburg contains only summary tables.
[b] CRF submitted by Monaco did not contain information on LUCF.
[c] Russia provided IPCC summary tables for 1997-1999 in the third national communications. During the in-depth review Russia provided additional detail information for the years 1990-1996 (IPCC summary tables for LUCF)

Annex II

Anthropogenic CO_2 emissions and removals from LUCF in Annex I Parties, 1990 or base year (gigagrams)

Party	Changes in forest and other woody biomass stocks	Forest and grassland conversion	Abandonment of managed lands	CO_2 emissions and removals from soils	Other	Total
Australia	–24 598	114 192		–4 224		85 370
Austria	–9 215					–9 215
Belarus	–35 095	8 412	1 348	2 517	10 098	–12 720
Belgium	–1 600					–1 600
Bulgaria	–4 657					–4 657
Canada	–108 687	1 419	–3 245	3 525		–106 988
Croatia	–6 505					–6 505
Czech Republic	–2 128					–2 128
Denmark	–3 118					–3 118
Estonia	–7 463	75	–1 985	3 053		–6 320
Finland	–23 798					–23 798
France	–68 079	8 753	–48	3 672		–55 702
Germany	–33 689					–33 689
Greece	–18	1 423				1 441
Hungary	–3 906	1 764		794		–1 348
Iceland	–2				–3	–5
Ireland	–450			384		–66
Italy	–28 605		–102	5 175		–23 532
Japan	–84 482	579				–83 903
Latvia	–19 714	631		134		–18 948
Lichenstein						
Lithuania	–10 375	2 803	–1 276			–8 848
Luxembourg	–295					–295
Monaco						
Netherlands	–1 422					–1 422
New Zealand	–22 985	870				–21 769
Norway	–9 765			346		–9 765
Poland	–24 990	959	–10 715	217		–34 746
Portugal	–3					–3
Romania	–2 925					–2 925
Russian Federation						141 100
Slovakia	–1 753	141		–815		–2 427
Slovenia	–3 038		–220	–1 078		–4 336
Spain	–29 252					–29 252
Sweden	–24 100			3 808		–20 292
Switzerland	–3 188					–3 188
Ukraine						–52 107
United Kingdom	–7 304			16 404	–308	8 791
United States	–803 000			–18 213	–18 213	–1 072 807
Total	**–1 410 204**	**142 021**	**–16 243**	**15 699**	**–8 426**	**–1 277 153**
European Community	–231 103	10 176	–150	29 442	–308	–191 943

Annex III

Anthropogenic CO_2 emissions and removals from LUCF in Annex I Parties for 2001 or most recent year reported (gigagrams)

Party	Changes in forest and other woody biomass stocks	Forest and grassland conversion	Abandonment of managed lands	CO_2 emissions and removals from soils	Other	Total
Australia	–22 669	34 213		–4 224		7 320
Austria	–7 633					–7 633
Belarus	–35 795	5 268	886	780	11 979	–16 882
Belgium	–1 814					–1 814
Bulgaria	–9 467					–9 467
Canada	–39 271	3 762	–3 300	2 431		–36 378
Czech Republic	–4 363					–4 363
Denmark	–3 531					–3 531
Estonia	2 095		–2 835	0.99		–739
Finland	–16 851			1 946		–16 851
France	–79 309	9 881	–48	3 106		–66 370
Germany	–23 695					–23 695
Greece	–1 796	637		–169		–1 328
Hungary	–6 264	1 426		296		–4 542
Iceland	–43				–102	–145
Ireland	–1 007			378		–629
Italy	–27 113		–154	8 612		–18 655
Japan	–141					
Latvia	–10 368	1 059	–38	91		–9 256
Luxembourg	–295					–295
Netherlands	–1 413					–1 413
New Zealand	–26 149	1 549		741		–23 859
Norway	–18 968			113		–18 968
Poland	–48 260	58		–5 437		–53 639
Portugal	–2 152					–2 152
Romania	–10 014	982				–9 031
Slovakia	–4 760	115		–619		–5 264
Spain	–29 252					–29 252
Sweden	–33 220			137		–33 083
Switzerland	–1 529					–1 529
United Kingdom	–8 144			11 609	–245	3 220
United States	–792 000			–40 831	–5 306	–838 137
Total	**–1 265 191**	**58 950**	**–5489**	**–21 039**	**6 326**	**–1 226 443**
European Community	–237 225	10 518	–202	23 673	–245	–203 481

Annex IV

Anthropogenic CO_2 emissions and removals from LUCF in non-Annex I Parties, for most recent year reported (gigagrams)

Party	Reference Year	Total anthropogenic CO_2 Emissions excluding LUCF	Changes in Forest and other woody biomass stocks	Forest and grassland conversion	Abandonment of managed lands	CO_2 emissions and removals from soils	Other	Total
Albania	1994	5 550	1 511	160	–286	125		1 510
Algeria	1994	92 508	–4 331	4 723		7 443		–7 836
Antigua and Barbuda	1990	388	–219	123	–0.9			–97
Argentina	1997	280 986	–14 890	14 673	–30 414	–17 987		–48 617
Armenia	1990	25 312	–617					–617
Azerbaijan	1994	42 748	–253	–822				–1 075
Bahamas	1990							–3 600
Bangladesh	1994	45 925	7 838					7 838
Barbados	1997	4 058			–11			–11
Belize	1994	6 485	–5 751	1 667	–415	325		–4 174
Benin	1995	39 690	–62 084	14 219				–47 865
Bhutan	1994	1 292	–3 506		–44			–3 550
Bolivia	1994	24 790	5 629	32 988	–4 537			34 080
Botswana	1994	9 292	–39 646	190		722		–38 734
Burkina Faso	1994	6 062	5	1.2	–5	–2		–1.48
Burundi	1998	1 996	–3 067	9		58		–3 000
Cambodia	1994	14 494	–64 850	45 214				–19 636
Cape Verde	1995	302						27
Chad	1993	8 240	–56 707	15 703	–5 437			–46 441
Chile	1994	57 178	10 469	20 823	–50 917		7 856	–29 709
Colombia	1994	137 583	13 314	3 226	–2 035	0.4		14 505
Congo	1994	1 634	–79 596	10 817	–3 790	2 449		–70 120
Cook Islands	1994	80	–154					–154

Party	Reference Year	Total anthropogenic CO_2 Emissions excluding LUCF	Changes in Forest and other woody biomass stocks	Forest and grassland conversion	Abandonment of managed lands	CO_2 emissions and removals from soils	Other	Total
Costa Rica	1996	10 751	–2 318	3 366	–2 020			–971
Cote d Ivoire	1994	27 124	–22 245	73 332	–73 333			–22 246
Cuba	1996	40 170	–24 703	2 750		23		–21 703
D. Rep. of Congo	1994	51 024	–279 683	248 331	–317 896	165 917		–183 331
Djibouti	1994	590	–2 443	1 764				–679
Dominica	1994	152	–355	26	–44	0.37		–372
Ecuador	1990	32 179	17 380	16 177	–20 362			13 196
Egypt	1990	116 608	–9 900					–9 900
El Salvador	1994	11 728	4 068	581	–719			3 931
Eritrea	1994	4 136	1 657	19				1 676
Ethiopia	1994	48 005	–27 573	12 510				–15 063
Georgia	1997	13 107	–11 452	9 836				–1 616
Ghana	1996	13 813	–22 324	5 738	–3 292			–19 878
Grenada	1994	1 606	–92					–92
Guatemala	1990	14 856	–37 872	3 245	–2 968	–2 064		–39 659
Guinea	1994	8 812	–69 011	80 046	–32 519			–21 483
Guyana	1998	3 235	–33 565	2 531				–31 034
Haiti	1994	5 105	435	368		152		954
Honduras	1995	13 786	–22 564	36 683	–30 199	17 428		1 348
Indonesia	1994	342 671	–135 245	303 237	–69 607		57 240	155 624
Iran (Islamic Rep. of)	1994	385 595	19 517	12 375	–476			31 417
Israel	1996	63 097	–374					–370
Jamaica	1994	116 430	–167					–167
Jordan	1994	21 996	–249	374	–832	–2 841		–3 548
Kazakhstan	1994	270 145	–6 627					–6 627
Kenya	1994	21 728	–26 417	6 404	–8 250			–28 262
Kyrgyzstan	2000	15 062	–903	4	–80	0		–979
Lao Peop Dem Rep	1990	7 066	–121 614	16 629				–104 985

Party	Reference Year	Total anthropogenic CO_2 Emissions excluding LUCF	Changes in Forest and other woody biomass stocks	Forest and grassland conversion	Abandonment of managed lands	CO_2 emissions and removals from soils	Other	Total
Lebanon	1994	15 674	142	58				200
Lesotho	1994	1 820	–289	1 630	–2 750	2 670		1 261
Malaysia	1994	136 365	–68 717	7 636				–61 081
Mali	1995	9 747	–24 603	20 820	–13 644	6 598		–10 829
Mauritania	1995	4 330	–634	0.3	–6			–640
Mauritius	1995	2 060	–221					–221
Mexico	1990	528 816	–31 552	217 734	–50 325			135 857
Mongolia	1998	15 932	2 585	3 884	–6 802			–333
Morocco	1994	44 373	–4 553	42				–4 511
Namibia	1994	5 681	–6 370	655				–5 716
Nauru	1994	36						–9
Nicaragua	1994	9 379	–59 219	57 633	–13 211	13		–14 784
Niger	1990	4 880		6 082	0			6 082
Panama	1994	12 073	–1 360	26 319	–4 758	2 129		22 330
Papua New Guinea	1994	5 012	–413					–413
Paraguay	1994	142 148						17 812
Peru	1994	61 604	–4 122	82 488	–37 345	–3 823		37 197
Philippines	1994	103 514	–68 323	65 549				–2 774
Republic of Korea	1990		–26 235					–26 235
Republic of Moldova	1998	10 516	–1 729	278				–1 173
Saint Kitts and Nevis	1994	165	–86	3	–7			–90
Saint Lucia	1994	893	–516	68		96		–352
Samoa	1994	562	–240	125	–27	60		–82
Senegal	1994	9 896	–25 820	19 245				–6 576
Seychelles	1995	256						–833
Sri Lanka	1995	29 107	14 814	35 659		328 606		379 079

Party	Reference Year	Total anthropogenic CO_2 Emissions excluding LUCF	Changes in Forest and other woody biomass stocks	Forest and grassland conversion	Abandonment of managed lands	CO_2 emissions and removals from soils	Other	Total
St. Vincent and the Grenadines	1997	412	–134					–134
Swaziland	1994	2 641	–4 346	864	–29	253		–3 258
Tajikistan	1994	4 286	–447			–1 601		–2 048
Thailand	1998	225 368						
The former Yugugoslav Republic of Macedonia	1998	15 070	–2 243	27		–62		–2 277
Togo	1997	6 108						27 303
Trinidad and Tobago	1990	16 538	–2 494	1 080	–213	103		–1 524
Tunisia	1994	25 140	–1 817			44		–1 773
Turkmenistan	1994	52 310	159	222				381
Uganda	1994	42 734	–1 354	9 477				8 123
Uruguay	1998	33 566	–3 945			–1 662		–5 607
Uzbekistan	1994	163 167	–399					–399
Vanuatu	1994	299						–1.15
Yemen	1995	17 866	–9 641	186	–216			–9 671
Zimbabwe	1994	27 624	–64 769	2 500				–62 269
Total		4 429 380	–1 509 985	1 560 303	–789 821	505 172	65 096	–152 441

Annex V

Sources of primary data for area, forest stock/growth and harvest used by Annex I Parties under inventory category 5A

Party	Reporting on 5.A	Primary Data					
		Area	Forest stock / Annual volume growth rate	Commercial harvest volume	Fuelwood	Other wood use	Non-forest trees
Australia	Yes	NFI, Remote sensed land cover data	NFI, productivity and land cover change maps, models	Tenure maps for State forests (public forestry), remote sensing, models	NR	NE	Land cover maps
Austria	Yes	NFI	NFI	NFI	NFI	NFI	NR
Belarus	Yes	NFI	NFI	NR	NR	NR	NR
Belgium	Yes	NFI, remote sensing	NFI	NR	NR	NR	NR
Bulgaria	Yes	NFI	NFI	NR	NR	NR	NR
Canada	Yes	NFI	NFI	National Forestry Database, Pulp and Paper Products Council, FAO Forest Data Base	NFI	NE	NR
Croatia	Yes	Forest Management Area Plan (NFI)	Forest Management Area Plan (NFI)	The Croatian Forests Corporation.	NE	NE	NE
Czech Republic	Yes	ÚHÚL (NFI), Ministry of Agriculture	ÚHÚL (NFI)	ÚHÚL (NFI)	NE	NE	ÚHÚL data
Denmark	Yes	Forestry Census, Danish Forest and Nature Agency	Forestry Census	Forestry Census	NE	NE	NE
Estonia	Yes	Forest Survey Centre	Forest Survey Centre	Statistical Office of Estonia.	NR	NE	NE
Finland	Yes	Finnish National Forest Inventory	Finnish National Forest Inventory	Finnish Forest Research Institute	NR	NR	NR
France	Yes	NFI	NFI	NR	CEREN	NE	NE

Party	Reporting on 5.A	Primary Data					
		Area	Forest stock / Annual volume growth rate	Commercial harvest volume	Fuelwood	Other wood use	Non-forest trees
Germany	Yes	Federal Forest Inventory for the old Federal Länder and the Forest Management Database for the new Federal Länder	Federal Forest Inventory for the old Federal Länder and the Forest Management Database for the new Federal Länder	Felling statistics	NE	NE	NE
Greece	Yes	NR	NR	NR	NR	NE	NE
Hungary	Yes	National Forest Database (NFI)	National Forest Database (NFI)	National Forest Database (NFI)	National Forest Database (NFI)	Expert judgement	NE
Iceland	Yes	NR	NR	NE	NE	NE	NE
Ireland	Yes	Forest Inventory and Planning System (FIPS), Forest Service (NFI)	Irish yield models	Coillte records	Coillte records	NE	NE
Italy	Yes	NFI	NFI	National Statistics	National Statistics	NE	NE
Japan	Yes	Forest Status Survey (NFI)	Forest Status Survey (NFI)	Forestry Agency, Handbook of Forestry Statistics	NE	NE	NE
Latvia	Yes	NFI	NFI	Central Statistical Bureau of Latvia	NR	NR	NR
Luxembourg	Yes	NR	NR	NR	NE	NE	NE
Netherlands	Yes	Various data sources	NFI and other data sources	RIVM/CBS	Included in estimates of commercial harvest	NE	NR
New Zealand	Yes	Annual surveys (National Exotic Forest Description - NFI) and models (C-Change and FOLPI)	Annual surveys (National Exotic Forest Description - NFI) and models (C-Change and FOLPI)	Annual surveys (National Exotic Forest Description - NFI) and models (C-Change and FOLPI), Ministry of Agriculture and Forestry			

Party	Reporting on 5.A	Primary Data					
		Area	Forest stock / Annual volume growth rate	Commercial harvest volume	Fuelwood	Other wood use	Non-forest trees
Norway	Yes	Norwegian Institute of Land Inventory (NFI)	Norwegian Institute of Land Inventory (NFI) and SFT	Statistics Norway: Commercial roundwood removals (published annually) and the Agricultural Census	Energy consumption data (Statistics Norway) - Energy Balance	Agricultural Census	NE
Poland	Yes	NFI	NFI	State Forest Harvest Reports, Central Bureau of Statistics (private forests)	Included in estimates of commercial harvest	Included in estimates of commercial harvest	Expert judgement and data from Central Bureau of Statistics
Portugal	Yes	NFI	NFI	Statistical data on wood consumption	NE	NE	NE
Romania	Yes	National Institute for Statistics Yearbooks, Forest Research and Development Institute (ICAS)	National Institute for Statistics Yearbooks, Forest Research and Development Institute (ICAS)	National Institute for Statistics Yearbooks, Forest Research and Development Institute (ICAS)	National Institute for Statistics Yearbooks, Forest Research and Development Institute (ICAS)	NE	NE
Russian Federation	No CRF	State Censuses of Forest Stock	State Censuses of Forest Stock	Ministry of Nature Resources of the Russian Federation	Center for Ecology and Forest Productivity Problems	Center for Ecology and Forest Productivity Problems	
Slovakia	Yes	NR	NR	NR	NR	NR	NO
Slovenia	No CRF	NFI	Expert judgement for growth rate	NR			
Spain	Yes	NFI	NFI	NFI, Agricultural Statistics Yearbook	NE	NR	NE
Sweden	Yes	NFI	NFI	National Board of Forestry	National Board of Forestry	National Board of Forestry	NFI (?)
Switzerland	Yes	NFI	NFI	NR	NR	NE	NE

Party	Reporting on 5.A	Primary Data					
		Area	Forest stock / Annual volume growth rate	Commercial harvest volume	Fuelwood	Other wood use	Non-forest trees
United Kingdom	Yes	UK Forestry Commission (NFI), Northern Ireland Department of Agriculture	Yield Tables, Carbon Accounting Model	Implemented in carbon accounting model			
United States	Yes	USDA Forest Service, Forest Inventory and Analysis (NFI)	USDA Forest Service, Forest Inventory and Analysis (NFI)	USDA Forest Service, Forest Inventory and Analysis (NFI), models	USDA Forest Service, Forest Inventory and Analysis (NFI), models		Scientific literature

CRF = Common reporting format
NFI = National forest inventory
NE = Not estimated (reported by the country as not estimated)
NR = Not reported (by the country in available submissions)

Annex VI

Expansion/conversion factors and carbon fractions reported by Annex I Parties in their NIR

Party	Definitions and numerical parameters	
	Expansion and/or conversion factor	**Carbon fraction in dry mass (unless defined otherwise)**
Australia	Model	Stems: 0.5 Branches: 0.47 Bark: 0.49 Leaves and twigs: 0.52 Coarse Roots: 0.5 Fine Roots: 0.48
Austria	Stemwood t dm/m^3 over bark: coniferous 0.39; deciduous 0.53 Whole tree (incl. also below ground biomass) t dm whole tree /t dm stemwood: increment: coniferous 1.45; deciduous 1.54 harvest: coniferous 1.46; deciduous 1.50	Coniferous:0.49 deciduous:0.48
Belarus	0,7 t dm/m3	Whole tree: 0.5
Belgium	Above-ground biomass/total solid wood: Deciduous 1.4; Coniferous 1.3 Below-ground biomass/ above-ground biomass: Deciduous 0.26; Coniferous 0.26 Above-ground biomass t dm/ aboveground biomass m^3: Deciduous 0.37-0.55; Coniferous 0.35-0.42 Below-ground biomass t/ below ground biomass m^3: Deciduous 0.5; Coniferous 0.4	Whole tree: 0.5
Canada	Developed only for mature stands but no details available	Whole tree: average 0.4
Croatia	NR	Whole tree: 0.5
Czech Republic	Mass of timber with bark/mass of timber without bark 1.1 t/t Dry mass per content of wood with bark: standard timber removal 0.465 t/m3 major harvest 0.41 t/m3 Dry mass per content of wood with bark: coniferous 0.45 t dry matter/m3 non coniferous 0.65 t dry matter/m3 Topwood mass per mass of timber with bark: thinning 0.1782 major harvest 0.0686	Whole tree: 0.45
Denmark	Coniferous 1.8 m^3/m^3; deciduous 1.2 m^3/m^3 – conversion to total (including roots) biomass	Whole tree: 0.5

Party	Definitions and numerical parameters	
	Expansion and/or conversion factor	**Carbon fraction in dry mass (unless defined otherwise)**
Estonia	The volume data were converted to biomass using default factors (0.65 t dm/m^3 for deciduous trees and 0.45 t dm/m^3 for coniferous trees) suggested by IPCC Guidelines (1994). Part of tops, branches and stumps was taken as 35 per cent and was added to volume data of growing stock increment.	Whole tree: 0.45
Finland	NR	NR
France	NR	Whole tree: 0.5
Germany	Coniferous 1.14 m^3/VfmD; Deciduous 1.24 m^3/VfmD	Whole tree: 0.5
Greece	NR	Whole tree: 0.5
Hungary	Species specific - on average: 0.704 t/m3 for hardwoods, 0.437t/m^3 for broadleaved softwoods, and 0.5 t/m^3 for conifers	Whole tree: 0.5
Ireland	1.3 m3/m3	Whole tree: 0.40 to 0.45 species specific
Italy	NR	Whole tree: 0.5
Japan	Primary data are increment of biomass DM	Whole tree: 0.5
Latvia	Biomass expansion factor: 1.62 m^3/m^3	Whole tree: 0.5
Netherlands	Volume addition for branches, tree tops and roots – 20 per cent of stem volume including bark	Whole tree: coniferous 0.25 tC/m^3; deciduous. 0.30 tC/m^3
New Zealand	Allometric equations	Whole tree: 0.5
Norway	IPCC default ratio of 1.9 m^3/m^3	Whole tree: 0.5
Poland	Separately for coniferous and deciduous, age dependent (based on expert guess, no numerical data included in NIR)	Whole tree: 0.5
Portugal	IPCC default ratio of 1.9 m^3/m^3	Whole tree: 0.5
Romania	NR	Whole tree: 0.5
Russian Federation	NR	Forest: 0.5; Leaves, needles, shrub 0.45
Slovakia	NR	Whole tree: 0.49
Slovenia	NR	Whole tree: 0.5
Spain	Merchantable timber volume to total tree living biomass volume (with the part of its surrounding shrub vegetation also incorporated) - 1.6 m^3/m^3. Fresh biomass to tonne of dry biomass - 0.5 t/m^3	Whole tree: 0.45
Sweden	Biomass functions	Whole tree: 0.49
Switzerland	1.45 m^3/m^3	Whole tree: 0.5
United Kingdom	Model	Whole tree: 0.5
United States	Equations that convert forest tree volumes to total live tree dry biomass	Whole tree: 0.5

Annex VII

Relation between the new and the existing reporting categories for the LULUCF sector

99. The good practice guidance for LULUCF introduced new land-based inventory categories under the Convention. These categories are forest land, croplands, grasslands, wetlands, settlements and other lands. The relationship between land-use categories in the good practice guidance for LULUCF, the inventory categories in the Revised 1996 IPCC Guidelines and the new inventory categories for LULUCF, as adopted by decision 13/CP.9, is illustrated by the following table.

Final land use[a] / Initial land use	Forest land		Cropland		Grassland		Wetlands		Settlements		Other land	
	1996 IPCC Guidelines	CRF for LULUCF	1996 IPCC Guidelines	CRF for LULUCF	996 IPCC Guidelines	CRF for LULUCF	1996 IPCC Guidelines	CRF for LULUCF	1996 IPCC Guidelines	CRF for LULUCF	1996 IPCC Guidelines	CRF for LULUCF
Forest land	5.A	5.A.1	5.B 5.D	5.B.2.1	5.B, 5.D	5.C.2.1	5.B	5.D.2.1	5.B	5.E.2.1	5.B	5.F.2.1
Cropland	5.A, 5.C, 5.D	5.A.2.1	5.A 5.D	5.B.1	5.C, 5.D	5.C.2.2	5.E	5.D.2.2	5.E	5.E.2.2	5.E	5.F.2.2
Grassland	5.A, 5.C, 5.D	5.A.2.2	5.B, 5.D	5.B.2.2	5.A, 5.D	5.C.1	5.B	5.D.2.3	5.B	5.E.2.3	5.B	5.F.2.3
Wetlands	5.A, 5.C, 5.D	5.A.2.3	5.D	5.B.2.3	5.C, 5.D	5.C.2.3	5.A, 5.E	5.D.1	5.E	5.E.2.4	5.E	5.F.2.4
Settlements	5.A, 5.C, 5.D	5.A.2.4	5.D	5.B.2.4	5.C, 5.D	5.C.2.4	5.E	5.D.2.4	5.A	5.E.1	5.E	5.F.2.5
Other land	5.A, 5.C, 5.D	5.A.2.5	5.D	5.B.2.5	5.C, 5.D	5.C.2.5	5.E	5.D.2.5	5.E	5.E.2.5	5.A	5.F.1

[a] Final land use refers to the reporting year.

Note: The inventory categories in the 1996 IPCC Guidelines and in UNFCCC reporting guidelines on annual inventories are: 5.A Changes in Forest and Other Woody Biomass Stocks; 5.B Forest and Grassland Conversion; 5.C Abandonment of Managed Lands; 5.D Emissions and Removals from Soils, and 5.E Other.
