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REPORT ON THE INDIVIDUAL REVIEW OF THE GREENHOUSE GAS INVENTORY OF FRANCE SUBMITTED IN THE YEAR 2001[1]

(In-country review)

I. OVERVIEW

A. Introduction

1. According to decision 6/CP.5, the secretariat was requested by the Conference of the Parties (COP), to conduct, during a trial period, individual reviews of greenhouse gas (GHG) inventories for a limited number of Parties included in Annex I to the Convention (Annex I Parties) on a voluntary basis. These individual reviews should use different approaches, such as desk reviews, centralized reviews and in-country reviews, in accordance with the UNFCCC guidelines for the technical review of GHG inventories, hereinafter referred to as the review guidelines.[2]

2. Within this framework, France volunteered for an individual, in-country review of its national GHG inventory, which was submitted in February 2001 and covered the period from 1990 to 1999. This review took place in Paris from 21 to 25 January 2002 and was carried out by a team of nominated experts from the UNFCCC roster. Experts participating in this review were Mr. Moussa Kola Cisse (Mali) – generalist, Ms. Branca Bastos Americano (Brazil) – energy, Ms. Karen Treanton (International Energy Agency (IEA)) – energy, Mr. Klaus Radunsky (Austria) – industrial processes, Mr. Antonio Ferreiro (Spain) – agriculture, Ms. Dominique Blain (Canada) – land-use change and forestry (LUCF) and Mr. Oscar Paz Rada (Bolivia) – waste. The in-country review was coordinated by Mr. Vitaly Matsarsky and Mr. Dominique Revet (UNFCCC secretariat). The lead authors of this report were Mr. Moussa Kola Cisse and Mr. Klaus Radunsky.

3. During the in-country review, the expert review team (ERT) members benefited from the support and hospitality of the French officials. They would like to express their gratitude for all the facilities and arrangements at their disposal. They greatly appreciated fruitful and instructive discussions on the French inventory, as well as the availability and openness of the host country officials.

4. The ERT members, in their discussions, focused on the general overview of the inventory preparation, including the national emission inventory system, trends and key sources, quality assurance/quality control (QA/QC), and uncertainties related to the GHG inventory of France. The general overview was followed by presentations by sector according to the Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories (hereinafter referred to as the IPCC Guidelines). Some of these presentations were conducted in parallel. They provided an opportunity for clarifying some key issues related to the institutional framework, the source categories of a given sector, data sources (activity data, emission factors), methods used, uncertainty estimates and recalculations.

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[1] In the symbol for this document, 2001 refers to the year in which the inventory was submitted, and not to the year of publication. The number (2) indicates that for France this is an in-country review.

[2] For the UNFCCC review guidelines and decision 6/CP.5, see document FCCC/CP/1999/7, pages 109 to 114 and 121 to 122, respectively.

5. In accordance with the UNFCCC review guidelines, a draft version of this report was communicated to the Government of France, which provided comments that were considered and incorporated, as appropriate, in this final version of the report.

B. Inventory submission and other sources of information

6. France submitted its national inventory report (NIR) in February 2001, including the common reporting format (CRF) for the years 1990 to 1999. Both a hard copy and an electronic copy of the NIR were supplied to the UNFCCC secretariat.

7. The ERT was provided with a number of supporting documents prior to and during the visit. These are referenced at the end of this report.

C. Emission profiles, trends and key sources

8. The French GHG emission profile shows a clear domination by the energy sector, and consequently of carbon dioxide (CO_2). No key source analysis was submitted by France prior to the review. However, during the in-country visit the ERT received a preliminary key source analysis prepared by France. The sector analysis indicates the number of key source categories identified by France in each sector. France is encouraged to provide a key source analysis in future submissions.

9. According to the 1999 inventory, total GHG emissions amounted to 552 Tg of CO_2 equivalent (excluding LUCF). Net GHG emissions were estimated to be 483 Tg of CO_2 equivalent (including CO_2 emissions/removals from LUCF).

10. It was estimated that CO_2 accounted for 73% of total GHG emissions (excluding CO_2 emissions and removals from LUCF), followed by nitrous oxide (N_2O) (14%), methane (CH_4) (11%), hydrofluorocarbons (HFCs) (0.9%), sulphur hexafluoride (SF_6) (0.4%) and perfluorocarbons (PFCs) (0.3%).

11. The contributions of the different sectors to GHG emissions were as follows: energy (72%), agriculture (16%), industrial processes (7%), and waste (4%). The share of solvent and other product use was 0.4%.

12. The emission trends for the period 1990–1999 by gas and sector are shown in tables 1 and 2. Total GHG emissions with net CO_2 emissions/removals were 2.1% lower in 1999 than in 1990. However, net CO_2 emissions/removals were 3% higher. The emission trends for the other GHGs were as follows: 9% decrease for CH_4, 17% decrease for N_2O, 40% decrease for PFCs; whereas SF_6 and HFCs increased by 10% and 114%, respectively.

Table 1. GHG emissions by gas, 1990–1999 (Gg CO_2 equivalent)

GHGs	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Net CO_2 emissions/removals	325,873	352,611	339,764	313,795	308,215	316,845	328,661	321,489	342,660	335,700
CO_2 emissions (without LUCF)	385,490	409,099	401,010	379,660	375,710	381,996	395,858	389,579	410,684	404,695
CH_4	65,288	66,466	66,752	67,399	67,461	68,574	67,611	62,312	61,722	59,652
N_2O	94,838	94,683	91,277	87,112	88,878	90,598	91,392	92,449	84,398	78,721
HFCs	2,253	1,514	1,061	804	818	1,302	2,186	3,095	3,752	4,815
PFCs	3,195	2,469	2,147	1,650	1,390	1,350	1,410	1,471	1,661	1,915
SF_6	2,195	2,216	2,238	2,262	2,288	2,314	2,387	2,444	2,405	2,411
Total (with net CO_2 emissions/removals)	493,642	519,959	503,240	473,023	469,050	480,983	493,649	483,260	496,598	483,214
Total (without CO_2 from LUCF)	553,259	576,447	564,486	538,888	536,545	546,134	560,846	551,350	564,622	552,209

Table 2. GHG emissions by sector, 1990–1999 (Gg CO_2 equivalent)

GHG SOURCE AND SINK CATEGORIES	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
1. Energy	374,243	400,762	393,991	373,522	367,871	374,005	388,879	381,658	402,731	397,507
2. Industrial processes	56,725	53,536	49,421	45,167	47,132	49,016	48,245	49,654	42,522	37,483
3. Solvent and otherproduct use	2,448	2,370	2,336	2,221	2,226	2,244	2,226	2,234	2,261	2,230
4. Agriculture	90,403	89,037	86,659	85,024	85,476	86,118	86,934	87,252	86,888	86,493
5. LUCF	–52,020	–48,849	–53,550	–58,171	–59,845	–57,488	–59,508	–60,396	–60,330	–61,301
6. Waste	21,843	23,105	24,382	25,260	26,190	27,088	26,872	22,858	22,527	20,802
7. Other	0	0	0	0	0	0	0	0	0	0

D. General assessment of the inventory

1. Completeness of reporting and conformity with the UNFCCC reporting guidelines

The national inventory system

13. The French GHG inventory is compiled in accordance with the UNFCCC reporting guidelines and the IPCC Guidelines, although it is noted that, initially, it was prepared for other purposes. In fact, France, like other European countries, prepares a comprehensive Air Emission Inventory comprising all air pollutants, as required under its various national and international obligations. The inventory is based on EMEP/CORINAIR,[3] a common European system that uses the very detailed SNAP[4] nomenclature, which, since 1995, has been further developed by the European Centre on Air Emissions.

14. Once the EMEP/CORINAIR database for France is complete, it is used in the preparation of the GHG inventory. For that purpose, the EMEP/CORINAIR source categories are converted into IPCC source categories. In order to facilitate this conversion, all activities by EMEP/CORINAIR have an IPCC code assigned to them, which in turn, relate to specific cells in the CRF tables.

Completeness

15. France provided an NIR as well as CRF tables. Some missing information was identified in the NIR such as: calculation sheets or equivalent information on detailed inventory calculations, disaggregated national emission factors, information on planned and future improvements, a description of specific methodologies and assumptions, uncertainty analysis or quantified uncertainty estimates for the source categories, verification and quality assurance/quality control (QA/QC). In addition, the 1999 energy balance was not available at the time the inventory was compiled.[5]

16. France provided the CRF tables for the years 1990 to 1999 in electronic form. However, for some years some tables are missing and others are incomplete. (For details, see the sector analysis). The ERT found an inconsistency between the paper copy and the electronic copy of the 2001 NIR submission. In table 1.A(c) of the paper copy, the figures for solid fuels and "other fuels" do not correspond to the figures in table 1.A(a). When asked about this inconsistency, France said that it was due to an editorial problem that had occurred during printing. The electronic copy of the NIR is correct.

[3] EMEP: Co-operative Programme for Monitoring and Evaluation of the Long Range Transmission of Air Pollutants in Europe; CORINAIR: Core Inventory for Air Emissions (see Joint EMEP/CORINAIR Atmospheric Emissions Inventory Guidebook).

[4] SNAP: Selected Nomenclature for Air Pollution.

[5] France informed the ERT that a more comprehensive NIR, including a detailed description of methodologies used, will be available by the end of 2003.

17. Notation keys were not used in the CRF tables to explain why some key issues had not been covered in the NIR (i.e., sectoral background data for agriculture and LUCF). During the visit, the ERT was provided with details of the methodology and emission factors used. The review team appreciated the ongoing work for preparing a more detailed description of the methodologies by 2004 in accordance with the UNFCCC reporting requirements, as well as the improvements that had been carried out in addressing uncertainties and QA/QC.

Transparency

18. An overview of EMEP/CORINAIR emissions estimation methods was provided in annex 3 of the NIR. In general, the methods and the rationale for selecting activity data and emission factors were not adequately described and documented in the NIR; neither did the information provided in the NIR sufficiently back up the data provided in the CRF tables. However, the ERT were provided with the relevant references during the visit. Oral presentations and written descriptions clarified some of the missing information on data sources, inputs to models, calculation procedures and complete data series.

19. It was the view of the ERT that France might consider reporting some additional data, such as energy balances and documentation on methods, emission factors and the activity data used, in order to improve the transparency of the NIR in the future.

Consistency with the IPCC Guidelines and the UNFCCC reporting guidelines

20. In general, the approach used in the preparation of the GHG inventory is broadly consistent with the IPCC Guidelines and the UNFCCC reporting guidelines. For large point sources, priority was given to emissions data reported by the operators responsible for those emission sources. International data or emission factors, either regional or those suggested by the IPCC, were used when national data were not of a high enough quality. However, given the high quality of France's metropolitan area data, the default data could be substituted by the national data. The quality of the DOM/TOM[6] data is not good enough to develop country-specific emission factors representative for those regions. Although conditions in the metropolitan area and the DOM/TOM are different, the same emission factors were applied.[7]

21. The ERT noted that the CRF as reported is not very consistent with the reporting guidelines due to several tables not having been completed.

Methodologies, emission factors and activity data

22. The EMEP/CORINAIR method was used to obtain most of the emissions data. In some cases (HFCs, PCFs and SF_6), country-specific methods were used.

23. Country-specific emission factors were mostly used. For activity data, production or energy consumption data were mainly provided for the respective sectors.

2. Cross-cutting issues

Institutional arrangements

24. The national GHG emissions inventory system includes many institutions and partners. The Ministère de l'Aménagement du Territoire et de l'Environnement (MATE) has the overall responsibility of compiling the inventory and is also responsible for providing the resources needed to obtain the required data. MATE is also responsible for disseminating the inventory to the public and providing funding for key studies and research on ways of improving the inventory.

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[6] DOM/TOM: Départements/Territoires d'Outre-Mer.

[7] It is noted that in 2000, DOM/TOM represent 1.8% of the net GWP of France.

25. The Mission Interministérielle de l'Effet de Serre (MIES) is the national focal point for UNFCCC and is responsible for the submission of the GHG emissions inventory to the UNFCCC.

26. The Centre Interprofessionnel Technique d'Etudes de la Pollution Atmosphérique (CITEPA) is contracted by MATE to deal with the technical aspects of preparing the GHG inventory. CITEPA has regular consultations with the various institutions and experts involved in the relevant field activities. CITEPA's responsibilities include: methods development, data collection and processing, preparation of reports, database development and dissemination of the inventory in collaboration with MATE. However, MIES occasionally provides technical information, e.g., parameters and emission factors, to CITEPA. It is not clear, however, whether MIES always forwards information produced by others to CITEPA, or whether it generates the information itself. Clarification would be appropriate as to the source and nature of technical information that MIES communicates to CITEPA.

27. MATE has set up a validation and approval process in which representatives of the ministries and institutions involved in the preparation of the inventory participate. All the reports are reviewed before being disseminated at international level, and the methodologies are assessed before they are used in the national inventory system.

Record keeping and archiving

28. The CITEPA keeps a systematic archive in both electronic and hard copy form of all information used to calculate the inventory. The documentation is maintained in Microsoft EXCEL files organized by source category. Each file contains the sources of the basic data, any studies or related correspondence, notes on the calculation methods, a list of any revisions made to the source category with an explanation of the change, and the calculation sheets for the entire time series.

29. A complete copy of the CRF and NIR for each year is stored in electronic format by the CITEPA. Hard copies of the CRF and NIR, and some supporting documentation are also stored.

30. It is worth noting that this centralized record keeping and archiving system allows for a high level of harmonization in the work of compiling the inventory, as well as for easy internal verification and checking. It also greatly facilitates any external review process.

Verification and QA/QC approaches

31. The QA/QC approach has not been addressed by France in its 2001 GHG inventory submission. However, the ERT was informed that an entire QA/QC programme was being developed with the aim of obtaining a formal ISO 9001 accreditation for the inventory preparation process by 2003.

32. Verification of emissions from some large point sources (especially in the industrial sector), for emissions tax purposes, is currently the responsibility of the regional offices at DRIRE (Direction Régionale de l'Industrie, de la Recherche et de l'Environnement).

33. It is the view of the ERT that the QA/QC system under preparation should contribute to a significant qualitative improvement in France's inventory.

34. The ERT also noted that France is assessing the added value of independent verification by inverse modeling with the help of research projects.

Recalculations and changes in relation to previous years

35. The NIR included a comprehensive section on recalculations made for previous inventory submissions. These recalculations were necessary mainly because of revisions related to the energy sector.

36. The errors detected in the synthesis and assessment (S&A) report had been corrected. The ERT was informed that updating the NIR is a regular procedure.

Uncertainties

37. The NIR recognized the uncertainties in the estimates, but no uncertainty analysis or quantified uncertainty estimates were included. During the review, the results of a preliminary uncertainty analysis were presented, as well as a sensitivity analysis for the input parameters of the COPERT[8] model for road transport uncertainty estimates. Uncertainties in activity data or emission factors had not been considered for road transport. Uncertainty estimates based upon the tier 2 approach are planned for the future, provided the necessary resources are made available to CITEPA by MATE.

38. France has started working on uncertainties for aviation. Uncertainty estimates based on the tier 2 approach are planned for the future.

3. Issues related to previous reviews

39. No review of the French inventory submission has been previously carried out.

4. Areas for further improvement

Issues identified by the ERT

40. The ERT appreciates France's efforts in preparing the NIR, as well as the new improvements either undertaken or planned. The ERT noted the following areas for further improvement:

(a) *Verification*: the ERT would encourage France to implement the QA/QC and verification systems effectively at the interface between the databases and the calculations for UNFCCC reporting;

(b) France is encouraged to allocate all emissions to their appropriate sources in order to improve international comparability;

(c) The ERT would also encourage a more appropriate use of the notation keys;

(d) *Completeness*: in future inventories, France is encouraged to consider including the missing sources and information identified in the various sectors.

II. ENERGY

A. Sector overview

41. In 1999, energy accounted for 72% of France's total GHG emissions (excluding LUCF). Energy represented 95% of CO_2 emissions, 13% of CH_4 emissions and 8% of N_2O emissions. Although total GHG emissions in France declined by 2% between 1990 and 1999, emissions from energy increased by 6% over the same period. About 80% of France's electricity is generated by nuclear power and, as a result, CO_2 emissions from fuel combustion per capita are about half the average for Annex I Parties. The most important key source in the energy sector is CO_2 from road transport, accounting for 24% of total GHG emissions. Emissions from this source category are also growing rapidly and have increased by 16% between 1990 and 1999.

[8] COPERT: Computer Programme to Calculate Emissions from Road Traffic.

1. Institutional arrangements

42. CITEPA is responsible for calculating the national inventory on the basis of information provided by the various institutions detailed below, complemented by the national energy balance supplied by the Observatoire de l'Energie.

2. Completeness

43. Coverage in France's NIR is good, with emissions from all major sources and fuels estimated. Owing to the quantity of information used in calculating the energy inventory, it is not possible to trace a specific estimate using the NIR alone.

44. The energy balance from the Observatoire de l'Energie does not include inputs of waste (e.g., tyres) for heat production in its energy balance, so emissions from this source have not been included in the energy sector. Instead, they have been included in the waste sector.

45. Since the energy balance for 1999 was not available at the time the inventory was compiled, a comparison between the reference approach and the sectoral approach was only provided for 1990 and 1998. Furthermore, France did not provide CRF tables 1.A(b) and 1.A(d) which should contain energy background data for the calculation of the reference approach and feedstocks/non-energy use of fuels for the years 1991 to 1997.[9]

3. Methodologies, emission factors and activity data

46. In general, France has used tier 3 calculations for most sectors, specifically the EMEP/ CORINAIR methodology.

47. For CO_2, country-specific emission factors have been assigned to the various fuels on the basis of a study carried out by CITEPA in 1992. In general, these factors are slightly higher than the default values proposed by the IPCC.

48. For the other gases, EMEP/CORINAIR emission factors were applied for the various types of combustion units. In certain industrial subsectors, CH_4 and N_2O emission factors based on production statistics were used.

49. Activity data were collected from various sources (official institutions, professional organizations and research institutes) and although they are well documented at CITEPA, they are not fully documented in the NIR.

4. Recalculations

50. France carried out recalculations that affect total emissions by small amounts. In 1990, CO_2 emissions for energy decreased by 0.5%, CH_4 increased by 2.8% and N_2O decreased by 1.6%. The revisions were made to the entire time-series from 1990 to 1998 and are documented in the NIR.

51. Recalculations were made for several reasons:

(a) Revision of the energy balance data by the Observatoire de l'Energie;

(b) New information received from a survey on district heating;

[9] France indicated in its response to the S&A report that it had understood that the UNFCCC guidelines do not require these tables to be submitted for all years.

(c) Revision of the biomass data on the basis of a study by the the Centre d'Etudes et de Recherches Economiques sur l'Energie (CEREN);

(d) Revision of fleet characteristics by the Commission des Comptes des Transports de la Nation;

(e) Refinement of the calculation for distinguishing between domestic and international emissions in the aviation sector;

(f) Revision of SO_2 emission factors for maritime transport.

52. The ERT note that one of the recalculations is due to the shading of cells in the CRF tables, which does not foresee the reporting of N_2O fugitive emissions from certain sub-categories under the oil and natural gas (1.B.2) sector.

5. Confidentiality

53. For the most part, this sector is not much affected by confidentiality constraints owing to some very strong statistical legislation which makes it possible to collect all the information needed for calculating the inventory. The legislation on electricity and gas statistics is especially effective. On the other hand, there is no specific legislation on the collection of coal statistics.

54. Energy use by the military is considered confidential and emissions have been aggregated with those from boilers in commercial/institutional. This does not affect the national total.

55. Emissions from the tobacco industry have not been included in the inventory because there is only one plant and the information is considered commercially sensitive. The UNFCCC reporting guidelines, however, include provisions for such cases that allow the reporting in an aggregate manner in order to ensure that confidential business information is protected.

6. Uncertainty estimates

56. See corresponding chapter in the Overview section.

7. Verification and QA/QC approaches

57. See corresponding chapter in the Overview section.

B. Conformity with the UNFCCC reporting guidelines and the IPCC Guidelines

58. The estimation of emissions and presentation of information in the CRF and NIR broadly follows the IPCC Guidelines and are consistent with the UNFCCC reporting guidelines, although the information provided in the NIR would not allow a complete recalculation of the inventory. Emissions from municipal waste incineration are included in IPCC source category 6 even when it is used for energy purposes, which does not accord with IPCC methodology. This is due to the fact that energy production from waste incineration counts as secondary production. Thus, in France's statistics it has been put under the waste sector.

C. Reference and sectoral approach

1. Comparison with other international data

59. For apparent consumption, the French reference approach energy data for 1998 are 5.7% higher than those reported to the IEA and the CRF is 7.1% higher for liquid fuels, 6.4% higher for solid fuels and 1.5% higher for natural gas. The Observatoire de l'Energie has explained that one of the differences in the two data sets is due to the increasing difficulty of collecting information on petroleum products with the

liberalization of energy markets and the lack of customs data in Europe. However, the main differences between the two sets are due to the fact that the energy data are communicated to the IEA by the Ministère de l'Industrie (DIMAH) and not by the Observatoire de l'Energie. As a result of these discrepancies, France has made an effort to reconcile the data and has determined that in future the Observatoire de l'Energie will supply data to both CITEPA and to the IEA.

2. Comparison between reference and sectoral approaches

60. France provided reference approach calculations for 1990 and 1998. In 1998, the difference between the national approach and the reference approach was 1.9%. Comparison by fuel is more problematic since the national approach includes large emissions from "other fuels" because some of the industrial energy consumption in sectors such as iron foundries, lead production, flat glass, etc., is not split by primary fuel. CITEPA informed the ERT that in the 2002 NIR submission most of the "other fuels" have been disaggregated into liquid, solid and gaseous fuels as recommended by the IPCC Guidelines. The question of the allocation of oxygen steel furnace gas is still outstanding and needs to be clarified with the Observatoire de l'Energie.

61. There is a small difference in the coverage of the two data sets since the energy balance (and therefore the reference approach) does not include the DOM/TOM, whereas the sectoral approach does. France indicated that emissions in the DOM/TOM represent about 2% of its GHG emissions.

3. Treatment of feedstocks and non-energy use of fuels

62. In table 1.A(d) on feedstocks, negative fuel quantities have been included with "other fuels" in the table. These quantities are backflows to oil refineries and should not be included in the stored carbon calculation.

63. For "other oil" products (i.e., wax, paraffins, white spirit and other), no carbon stored is shown in reference approach table 1.A(b). If the tables had been filled in correctly, the emissions calculated using the reference approach would have been slightly lower.

64. Also in table 1.A(d), the fraction of carbon stored has been given as 100% for all fuels, which is not the same as the default fractions given in the IPCC Guidelines. If the default values had been used, the emissions calculated using the reference approach would be higher. Such an increase would mean that the difference between the reference approach and the sectoral approach is greater than 2%. France would then need to explain the difference by calculating how much of its emissions had been accounted for under tables 1.B.1 Fugitive emissions from solid fuels, 3 Solvents and other product use, and 6 Waste.

4. International bunker fuels

65. For international marine bunkers, CITEPA carried out a study on port authorities to obtain information on types and sizes of boats. The study estimates that 4% of French marine bunker consumption is allocated to domestic consumption. This was added to the available information on small motorboats and inland navigation.

66. For aviation, energy consumption for domestic LTO[10] and cruise are calculated using information from the International Civil Aviation Organization (ICAO), the Direction Générale de l'Aviation Civile (DGAC) and Methodologies for Estimating Air Pollutant Emission from Transport (MEET). Consumption for international LTO is calculated using information from ICAO, and consumption for international cruise is estimated as the difference between the energy balance and the above elements. Emissions are calculated using the estimated fuel consumption and applying the EMEP/CORINAIR methodology. This

[10] LTO: Landing/Take-off cycle.

method of calculation should be relatively accurate for France, although it may underestimate that part of the aviation emissions which is included in the national total as domestic.

D. Key sources

67. According to the key source analysis undertaken by France, 13 key source categories were identified in the energy sector. Energy key sources represent 71% of total GHG emissions.

68. As indicated in the IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories (hereinafter referred to as the IPCC good practice guidance), the analysis has been performed at the level of IPCC source categories using the CO_2 equivalent. The energy key sources for all GHG emissions are:

Table 3. Key sources, energy sector (1999, level assessment)

Emission Source	Gas	Level assessment %	Cumulative total %
Road transportation	CO_2	23.78	23.78
Manufacturing industries and construction	CO_2	14.18	37.96
Residential	CO_2	11.32	49.28
Public electricity and heat production	CO_2	7.57	56.85
Commercial/institutional	CO_2	5.56	62.41
Petroleum refining	CO_2	2.85	65.26
Agriculture/forestry/fisheries	CO_2	1.88	67.14
Civil aviation	CO_2	1.11	68.25
Manufacture of solid fuels and other energy industries	CO_2	0.85	69.10
Fugitives emissions from fuels – oil	CO_2	0.58	69.68
Road transportation	N_2O	0.58	70.26
Residential	CH_4	0.50	70.76
Coal mining	CH_4	0.43	71.19

69. Using the trend analysis from the IPCC good practice guidance, railways are identified as another key source. However, they only contributed 0.41% to the increase in total emissions.

1. Road transportation – CO_2 and N_2O

70. Combined CO_2 and N_2O emissions from road transport represented 24.4% of total GHG emissions in 1999. Of this, 23.8% came from CO_2 and 0.6% from N_2O. Diesel consumption accounts for the largest share (15.3%), followed by gasoline (9.0%), and other fuels (0.1%).

Trends

71. Between 1990 and 1999, CO_2 emissions from road transport increased by 16%. Over the same period, N_2O emissions grew by 167%, mostly due to the introduction of catalytic converters. Given the large contribution of road transport to total emissions and its relatively high growth rate, its contribution to total emissions is therefore growing in France.

Methodologies and activity data

72. France uses a model called OPALE[11] to determine the fleet characteristics which are then used as input to the European COPERT model (version II) to estimate emissions from road transport. Many different institutions supply inputs into the OPALE model and the data sources are well documented in the NIR; the original documents were also shown to the ERT during the in-country review. To ensure that the fuel consumption total fed into the model corresponds to fuel sold in the energy balance, adjustments are made to the average speed of vehicles on motorways and regional and urban roads.

[11] OPALE: Ordonnancement du Parc Automobile en Liaison avec les Emissions.

Emission factors

73. The CO_2 and N_2O emission factors for this sector come from the COPERT model. The latter are specific to European fleet characteristics.

2. Manufacturing industries and construction – CO_2

74. CO_2 emissions from industry represented 14.2% of total GHG emissions in 1999. CO_2 emissions from gaseous fuels accounted for 4.6% of total emissions, liquid fuels 3.7%, and solid fuels 1.9%. "Other fuels" (4.0%) include industrial energy consumption that is not split into solid, liquid and gaseous fuel. (See discussion under comparison of the reference and sectoral approach).

Trends

75. Between 1990 and 1999, emissions from industry remained constant, with an increase of only 0.4%.

Completeness

76. In the 2001 NIR submission, no detailed split was provided for manufacturing industry and construction: all emissions were shown under one subsector, "other". The ERT was informed that for the 2002 NIR submission, France would use various data from different statistics i.e. from the Observatoire de l'Energie, SESSI, SCEES, LCP[12] inventory, in order to split the industry emissions at the level required by the CRF.

Methodologies

77. For CO_2, the energy balance data are adjusted to incorporate autoproducers and then multiplied by an emission factor.

Activity data

78. Activity data come from: the Observatoire de l'Energie (energy balance), an annual survey on energy consumption in industry from the Ministry of Industry and Agriculture (EACEI), and the annual LCP survey on large point sources.

79. In the energy balance, gases used in industry (e.g., coke oven gas or blast furnace gas) are assigned the same net calorific value as natural gas.

Emission factors

80. In the industry sector, country-specific CO_2 emission factors are applied to fuel consumption statistics.

3. Residential – CO_2 and CH_4

81. Combined CO_2 and CH_4 emissions from the residential sector represented 11.8% of total GHG emissions in 1999. Of this, 11.3% came from CO_2 and 0.5% from CH_4. CO_2 emissions from liquid fuels consumption (5.7%) and gaseous fuels consumption (5.5%) represent the largest share.

Trends

82. Between 1990 and 1999, CO_2 emissions from the residential sector increased by 7.9%. Over the same period, CH_4 emissions declined by 7.5%, mainly due to a decrease in biomass consumption, essentially wood, for which CH_4 emissions are high.

[12] LCP: Large Combustion Plant.

Methodologies

83. The general approach used for this sector is fuel consumption multiplied by an emission factor using the EMEP/CORINAIR methodology. An adjustment to the basic energy data is made to incorporate emissions from autoproducers.

Activity data

84. Residential sector data are provided by the Observatoire de l'Energie and CEREN. The fuel breakdown for oil products is supplied by the Comité Professionnel du Pétrole (CPDP). It was noted that collecting information on biomass use in the residential sector can be challenging because of the large share of non-commercial wood.

Emission factors

85. The CO_2 emission factors for this sector are country specific by fuel. Machines such as generators, lawn mowers, etc., have specific emission factors for CH_4.

4. Public electricity and heat – CO_2

86. CO_2 emissions from the public electricity and heat sector represented 7.6% of overall French GHG emissions in 1999. This share is low compared with most other countries since about 80% of French electricity is generated by nuclear power. Solid fuels contributed 5.8% of total emissions, liquid fuels 1.3% and gaseous fuels 0.4%.

Trends

87. Between 1990 and 1999, CO_2 emissions from the electricity and heat sector decreased by 9.6%.

Activity data

88. Each year France collects information on fuel characteristics and emissions from all the 60 public power generators in the country in the LCP survey. The only installations not included in this survey are gas turbines and stationary motors, for which data are collected on an individual basis.

89. For district heating, about 600 plants exist. Annual surveys are carried out for 87 large installations, which contribute about 40% of the total emissions from this sector. Fuel consumption data for the remainder of the plants comes from the professional trade union, Syndicat National du Chauffage Urbain (SNCU).

Methodologies

90. France uses the EMEP/CORINAIR methodology to calculate emissions in this sector.

91. As recommended by the IPCC Guidelines, emissions from autoproducers have not been included here, but have been allocated instead to the consuming sectors. However, emissions from municipal waste incineration are included in IPCC sector 6 Waste even when it is used for energy purposes, which does not accord with the IPCC methodology.

Emission factors

92. The CO_2 emission factors for this sector are country-specific by fuel.

E. Areas for further improvement

1. Planned or ongoing work by the Party

93. France indicated that the following improvements would be incorporated for the 2002 NIR submission:

(a) The COPERT version III model, which incorporates some refinements to emission factors, will be used for road transport emissions;

(b) CITEPA will use the energy balance to split industry emissions by sub-sector and to allocate "other fuels" to the correct categories;

(c) Eurostat is funding a project to reconcile the energy data supplied to CITEPA by the Observatoire de l'Energie with the data supplied to the IEA by the DIMAH. When this has been completed, revised time-series will be supplied to both organizations.

2. Issues identified by the ERT

94. The ERT recommend the following modifications to the French energy balance supplied by the Observatoire de l'Energie in order to improve the quality of the NIR:

(a) Include waste used as fuel in the energy balance so that all the emissions are not allocated to IPCC source category 6;

(b) Refine the net calorific values (NCVs) of gas used in industry (e.g., coke oven gas and blast furnace gas) instead of using the NCV of natural gas;

(c) Provide balances for the DOM/TOM.

95. The ERT recommend that France look at the stored carbon calculation for the reference approach more closely and that they consider using the default stored carbon fractions from the IPCC Guidelines.

III. INDUSTRIAL PROCESSES

A. Sector overview

96. Emissions from the industrial processes sector (37,483 Gg CO_2 equivalent) represented about 7% of total GHG emissions for 1999 (according to the data supplied in table 10, sheet 5 of the CRF, which cover the French territory in Europe (Métropole) plus the DOM/TOM). The contribution of the individual GHGs to emissions from the industrial processes sector were as follows: CO_2 (46%), N_2O (29.6%), HFCs (12.8%), SF_6 (6.4%), PFCs (5.1%) and CH_4 (0.15%).

97. France identified the following 11 key sources which belong to the industrial processes sector (the key source analysis provided by the secretariat also resulted in 11 key sources for the industrial processes sector, which closely match those identified by France):

(a) CO_2 from cement production (2.A.1), which contributes 1.5% of total GHG emissions;

(b) CO_2 from ammonia production (2.B.1), which contributes 0.5% of total GHG emissions;

(c) CO_2 from iron and steel industry (2.C.1), which contributes 0.5% of total GHG emissions;

(d) N_2O from adipic acid production (2.B.3), which contributes 0.8% of total GHG emissions;

(e) N_2O from nitric acid production (2.B.2), which corresponds to 0.7% of the total GHG emissions;

(f) N_2O from the chemical industry (others; 2.B.5), which contributes 0.5% of total GHG emissions;

(g) HFCs from refrigeration and air conditioning equipment (2.F.1), which contribute 0.4% of total GHG emissions;

(h) HFCs from by-product emissions (2.E.1), which contribute 2% to the trend;

(i) HFCs from aerosols/metered dose inhalers (2.F.4), which contribute 2% to the trend;

(j) PFCs from aluminium production (2.C.3), which contribute 1.4% to the trend;

(k) PFCs from fugitive emissions (2.E.2), which contribute 0.6% to the trend.

98. Total GHG emissions from the industrial processes sector decreased by 34% between 1990 and 1999 according to the NIR (table 10, sheet 5 of the CRF). The largest decrease, 60%, was in N_2O and was due mainly to emission reductions in adipic acid production. Contrary to the general trend for CH_4, emissions of CH_4 increased by 4% over the same period. Between 1990 and 1999, emissions of HFCs increased significantly, by 114%, mainly due to their use in refrigeration and aerosols/metered dose inhalers, whereas emissions of PFCs decreased by 40% and emissions of SF_6 showed a slight increase (10%).

Table 4. GHG emissions from industrial processes, 1990 and 1999

Year	Sector	CO_2	CH_4	N_2O	HFCs	PFCs	SF_6	Total GHGs
		Gg CO_2 equivalent						
1990	Industrial processes	21,254	53,34	27,776	2,253	3,198	2,195	56,725
1999	Industrial processes	17,194	55,44	11,095	4,815	1,915	2,411	37,483

1. Institutional arrangements

99. According to information provided during the review, the institutional arrangements differ for the individual categories in the industrial processes sector. For example, for iron and steel production, plant specific information, as well as information from industry associations, official statistical data, and data provided by the administrative bodies at the local and regional level, are used by CITEPA to produce the emissions data. For subsector 2.F.1, the emissions data are based on a model calculation from the Ecole des Mines in Paris; for cement, nitric acid, ammonia and aluminium production, CITEPA uses information from industry associations to calculate emissions.

2. Completeness

100. The ERT noted the following reporting gaps and invites France to improve completeness by providing the following additional information in the CRF tables:

(a) In table 2(I), data on limestone and dolomite use, soda ash use, asphalt roofing, carbide production, ferroalloys production and the pulp and paper industry;

(b) In table 2(I) A-G, activity data, implied emission factors (IEFs) and emissions for limestone and dolomite use, soda ash use, asphalt roofing, carbide production and ferroalloys production;

(c) In table 2(II), sheet 2, potential emissions of halocarbons and SF_6;

(d) In table 2(II), C,E, sheet 1, the IEFs for fugitive emissions, in table 2(II).F sheet 1, activity data concerning the remaining HFCs in products at decommissioning and emissions from disposal, and information related to foam blowing (according to information supplied to the ERT by CITEPA, this activity did not occur in France before 1999);

(e) In table 2(II).F, sheet 2, the IEFs for manufacturing in addition to those for electrical equipment, and disposal loss factors as well as emissions data from disposal.

3. Transparency

101. See Overview.

4. Methodologies, emission factors and activity data

102. The EMEP/CORINAIR method was applied to obtain emissions data from industrial processes (table Summary 3) with the exception of emissions of HFCs, PFCs and SF_6 for which country-specific methods were used.

103. Country-specific emission factors were mainly used, and in one case (N_2O for the chemical industry) plant specific factors (table Summary 3). For activity data, production quantities have mainly been provided.

5. Recalculations

104. Recalculations of estimated emissions from the industrial processes sector have been made and the results reported (table 8(a)), together with explanatory information (table 8(b)).

105. After recalculation of the inventory year 1998, the differences between the estimates submitted in 2001 and those submitted in 2000 amounted to approximately 3% for N_2O and CH_4 but only 0.2% for CO_2. However, there were significant changes in the individual sub-sectors, as well as in CO_2 emissions from solvent and other product use (–16%).

106. The relative changes in emissions data for 1990 were similar to those for 1998 and were due either to changes in the methodology used or to an update of the activity data for the whole period (1990 to 1999). Explanations have been provided for all recalculations.

6. Uncertainty estimates

107. During the visit, France provided provisional estimates on uncertainty in the activity data and emission factors calculated according to the tier 1 approach for key sources. Relative uncertainty in the industrial processes sector is greatest in the case of CO_2 emissions from subsector 2.D Other production (104%) and with regard to N_2O emissions from sub-sector 1.A.2 Manufacturing industries and construction (50%). However, for the uncertainty of the total GHG emissions the uncertainties in subsectors 2.A Mineral products and 2.F Consumption of halocarbons and SF_6 are most relevant, due to the higher emissions of those subsectors compared to subsectors 2.D and 1.A.2.

7. Verification and QA/QC approaches

108. Verification of the emissions from the industrial process sector is usually the task of the regional offices of the state environmental authority (DRIRE – Direction Régionale de l'Industrie, de la Recherche et de l'Environnement) which is directly linked to MATE. This arrangement has a legal basis in the 1976 law on "Installations classées" and the "Arrêté du 2 Février 1998". During the 1990s, some plants had to pay emissions taxes in accordance with Décrêt n° 90-389 of 11 May 1990 and Décrêt n° 95-515 of 3 May 1995, based on the TGAP (Taxe Générale sur les Activités Polluantes – n° 98–1266 of 30 December 1998). An emissions tax has to be paid by operators of combustion plants larger than 20 MW, incineration plants with a capacity larger than 3 t/h, and plants with yearly emissions of SO_2, NO_x, N_2O, HCl and NMVOC larger than 150 t/year.

109. The ERT noted that some production data which are relevant for verification are not available, even to CITEPA, for reasons of confidentiality.

B. Conformity with the UNFCCC reporting guidelines and the IPCC Guidelines

110. See Overview.

C. Key sources

111. The following key sources were identified by CITEPA, either because of their emission levels or their contribution to the trend.

1. Cement production – CO_2

Trends

112. CO_2 emissions from cement production have decreased by approximately 20% over the period 1990 to1993 (due to changes in production) and have remained fairly constant since then.

Activity data

113. Activity data in terms of production data are presented in table 2(I).A-G. The ERT were informed that the activity data had been provided by the Syndicate of French cement industries (ATILH) and that they related to clinker production.

Emission factors

114. The emission factor (the same one has been used since 1990) was 0.50 t CO_2/t clinker, which corresponds to the value given in both the IPCC Guidelines and the CORINAIR Guidebook.

115. The ERT team was informed that this emission factor had been updated on the basis of country-specific data with respect to the percentage of CaO (65%), and that in future, a value of 0.525 t CO_2/t clinker would be used for the whole time-series.

2. Ammonia production – CO_2

Trends

116. CO_2 emissions from ammonia production have decreased slightly over the period 1990 to1999 (by 9%) in the wake of changes in the quantities produced.

Methodologies

117. The EMEP/CORINAIR method was applied to obtain data, according to table Summary 3. However, the ERT noted that the Atmospheric Emission Inventory Guidebook does not include a specific methodology for this activity. The ERT was informed that the emissions had been calculated on the basis of production data and a country-specific emission factor.

Activity data

118. Activity data in terms of production quantities are provided in table 2(I).A-G. The ERT was informed that the activity data had been provided by the Union des Industries Chimiques (UIC).

Emission factors

119. Country-specific emission factors were used. The ERT was informed that the emission factor used was 1.56 t CO_2/t NH_3 and that this factor was based on a 1992 study prepared by CITEPA.

3. Iron and steel production – CO_2

Trends

120. CO_2 emissions from the iron and steel industry varied over the period 1990 to 1999, between about 2,500 and 4,000 Gg per year. This fluctuation can be attributed mainly to fluctuations in CO_2 emissions

from pig iron tapping, which contributes about 50% of the processing emissions from iron and steel production. According to information provided during the visit, the fluctuation in emissions was mainly due to fluctuations in the emission factor for pig iron tapping.

Methodologies

121. The CORINAIR method was applied, but no details have been provided in the NIR. The ERT were provided with some detailed information, as well as the calculation basis for the emission factors used. The methodology allows for the calculation of emissions from the following sub-activities: blast furnace charging, pig iron tapping, basic oxygen furnace steel plant and rolling mills. The ERT recommend including a detailed description of the methodology in future NIRs.

Activity data

122. Activity data in terms of production quantities are presented in table 2(I).A-G. The ERT were informed that the activity data had been provided by, *inter alia*, the Commission Européenne du Charbon et de l'Acier (CECA) and the Fédération Française de l'Acier (FFA) (for the basic oxygen furnace steel plant), and the Service des Statistiques Industrielles (SESSI) (for electric furnace steel plants).

Emission factors

123. Country-specific emission factors were used. The implied emission factor (IEF) varied during the period, from 0.08 to 0.13 t CO_2/t steel, but there was no specific trend. No explanation was given in the NIR for the variation in the emission factor. The ERT were informed by CITEPA that the variation in the emission factor is mainly due to variation of the ratio of blast furnace gas captured versus not captured.

4. Adipic acid production – N_2O

Trends

124. N_2O emissions from adipic acid production remained constant during the period 1990 to 1997. In 1998 and 1999, N_2O emissions decreased noticeably. In 1999, N_2O emissions from adipic acid production were 74% lower than in 1990 even though the quantity produced was 7% higher in 1999 than in 1990. According to information provided by France, the reduction in emissions was due to the introduction of emission control technology.

Methodologies

125. According to information provided by France, from 1990 to 1995, emissions were calculated on the basis of emission factors and production data, whereas from 1996 to 1999, the emission data were directly submitted by the industry.

Activity data

126. Activity data in terms of production quantities are presented in table 2(I).A-G. However, the ERT was informed by CITEPA that, in the future, no production data would be submitted because of confidentiality concerns (there is only one plant in France).

Emission factors

127. A plant-specific emission factor (0.07 t N_2O/t adipic acid in 1999 versus 0.31 t N_2O/t adipic acid from 1990 to 1997) was used, but no details (data source, method of estimation) were provided in the NIR. With respect to confidentiality concerns, in future, only emissions data will be provided but no emission factors.

Verification and QA/QC

128. With respect to estimation of the emissions data, no information related to verification was included in the NIR. The ERT were informed that verification was carried out as part of the process of implementating the Décrets on emissions taxes.

5. Nitric acid production – N_2O

Trends

129. N_2O emissions from nitric acid production decreased by 50% during the period 1990 to 1994 and have remained fairly constant ever since, whereas production decreased by only 10% over the same period. It was explained to the ERT that the reduction in emissions was due mainly to the closure of some plants and changes in technology in other plants.

Methodologies

130. No change in the methodology used was indicated in table Summary 3 of the CRF.

Activity data

131. Activity data in terms of production quantities are presented in table 2 (I).A-G. The ERT was informed that the activity data had been provided by the Union des Industries de la Fertilisation (UNIFA).

Emission factors

132. According to information supplied to the ERT, in 1990 an emission factor of 8 kg N_2O/t nitric acid produced had been used which was based on the literature (EMEP/CORINAIR default emission factors handbook, 1992). From 1994 to 1995, country-specific emission factors (4.529 and 4.696 kg N_2O/t nitric acid produced, respectively) were estimated. The latter value was applied for the period 1995 to 1999. The emission factors for the years 1991 to 1993 were estimated by linear interpolation. No additional information was available to support the approach chosen by France to ensure a consistent time series.

6. Chemical industry (other) – N_2O

Trends

133. According to information provided by CITEPA, N_2O emissions from this sector came from the production of glyoxyl acid and glyoxal and have fluctuated between 6 and 10 Gg per year from 1990 to1999.

Methodologies

134. According to information provided by CITEPA, the emissions data are reported by the industry to CITEPA. According to information included in table 7 of the CRF, the EMEP/CORINAIR methodology was applied.

Activity data

135. Activity data in terms of production quantities are presented in table 2(I).A-G. However, the ERT were informed by CITEPA that, in future, no production data will be submitted due to confidentiality concerns (prior to 2001 there were only two sites in France, since then, however, there has only been one).

Emission factors

136. No information related to emission factors was included in either the NIR or CRF. Neither was any provided during the in-country visit due to confidentiality concerns.

7. Fluorinated gases (HFCs, PFCs and SF_6)

Trends

137. There were significant variations in the total emissions of HFCs, PFCs and SF_6 over the period 1990 to 1999. In terms of CO_2 equivalent, emissions decreased by 40% prior to 1994 and increased by 18% between 1994 and 1999 relative to 1990. From 1990 to 1994 the trend was driven by HFCs and PFCs, whereas the increase after 1995 was driven mainly by HFCs. SF_6 emissions remained fairly constant throughout the period 1990 to 1999. In 1999, HFCs contributed 53%, PFCs 21% and SF_6 26% to total HFC, PFC and SF_6 emissions.

138. The following subsectors contribute to the emissions: 2.C Metal production, 2.E Production of halocarbons and SF_6, and 2.F Consumption of halocarbons and SF_6. Aluminium and magnesium production were included in category 2.C. According to information provided to the ERT, emissions from aluminium production declined considerably from 1990 to 1999 (by 63% for CF_4 and by 61% for C_2F_6), whereas emissions of SF_6 from magnesium production remained constant throughout the period 1990 to 1999. According to information supplied to the ERT, emissions of HFC-23 from the production of HCFC-22 declined significantly (by 94%) from 1990 to 1996, but showed an increase thereafter, until 1999 (83% relative to 1990). Production of HFCs resulted in fairly constant emissions from 1990 to 1999, whereas emissions from the production of PFCs showed a significant decline (by 85%) from 1990 to 1999. In 1999, metal production contributed 26%, production of HFCs and PFCs 8% and consumption 68% to total emissions of HFCs, PFCs and SF_6.

Methodologies

139. According to information supplied to the ERT, the methodologies used were as follows:

(a) Production of aluminium (method developed by Pechiney);

(b) Production of magnesium (methodology based on the consumption of SF_6);

(c) Production of HCFC-22, HFCs and PFCs (no information available; emissions are reported directly by the producer);

(d) Consumption of HFCs as solvents (national methodology with an assumption of 50% emissions in the year of consumption and 50% in the following year);

(e) Consumption of HFCs, PFCs and SF_6 in the semiconductor industry (methodology with an assumption of 72% emission in the year of consumption);

(f) Consumption as refrigerants (national model developed by the Ecole des Mines in Paris);

(g) Consumption in fire extinguishers (methodology with an assumption of a release of 1% in the year of consumption);

(h) Consumption as aerosols/metered dose inhalers (IPCC methodology – 50% emission in the year of consumption and 50% in the following year);

(i) Consumption in electrical equipment (national methodology that takes into account emissions from leakage and filling).

Activity data

140. According to information supplied to the ERT, the sources of activity data for the subsectors mentioned above are as follows:

(a) Production of aluminium (Pechiney, the only producer in France);

(b) Production of magnesium (consumption data of SF_6 from industrial producers);

(c) Production of HCFC-22, HFCs and PFCs (no information available due to confidentiality concerns);

(d) Consumption of HFCs as solvents (communication from the main distributor in France);

(e) Consumption of HFCs, PFCs and SF_6 in the semiconductor industry (Syndicat des producteurs – SITELESC);

(f) Consumption as refrigerants (independent bottom-up (market survey) and top-down estimate (based on information from producers));

(g) Consumption in fire extinguishers (GIFEX);

(h) Consumption as aerosols/metered dose inhalers (Aerosols pharmaceutiques (MDI) and CFA (Comité Français des Aérosols));

(i) Consumption in electrical equipment (EDF, GIMELEC).

Emission factors

141. According to information supplied to the ERT, the following emission factors for the subsector mentioned above have been used:

(a) Production of aluminium (947 g CF_4/t Al in 1990; 348 g CF_4/t Al in 1999; 95 g C_2F_6/t Al in 1990; 35 g C_2F_6/t Al in 1999);

(b) Production of magnesium (100% in the year of consumption of SF_6);

(c) Production of HCFC-22, HFCs and PFCs (no information available due to confidentiality concerns; information on emissions from ATOFINA);

(d) Consumption of HFCs as solvents (see above);

(e) Consumption of HFCs, PFCs and SF_6 in the semiconductor industry (see above);

(f) Consumption as refrigerants (model, see above);

(g) Consumption in fire extinguishers (see above);

(h) Consumption as aerosols/metered dose inhalers (see above);

(i) Consumption in electrical equipment (leakage: 26 to 30 kg/t; filling: 50 kg/t).

Verification

142. The ERT would encourage France to provide potential emissions as well to facilitate verification.

D. Non-key sources

143. Lime production, soda ash production and use, aluminium production and food and drink production are reported as sources of CO_2 emissions from the industrial processes sector. Their contribution to total GHG emissions was 0.6% in 1999.

E. Areas for further improvement

1. Planned or ongoing work by the Party

144. No specific planned or ongoing work on improvements was reported in the NIR for the industrial processes sector. However, the ERT was informed by CITEPA that a process had been started that would improve adherence to the UNFCCC reporting guidelines and IPCC Guidelines. The focus would be on describing the methodologies used in more detail.

2. Issues identified by the ERT

145. The ERT recommended that France should further implement the UNFCCC reporting guidelines and IPCC Guidelines, so that, in future, both the CRF and NIR would be more consistent with the requirements.

146. With respect to the methodologies, emission factors and activity data used, the ERT recommended that the information already supplied, as well as information that is still missing, should be included in an updated version of the NIR (see for example recommendation on iron and steel in paragraph 121).

147. With respect to recalculations, the ERT recommend that the rationale for any changes in the methodology or update of emission factors and activity data should also be included (e.g. for source category 2.C.1).

148. The ERT would encourage France to submit more detailed information on uncertainties.

149. The ERT recommend that the notation keys be used to explain, for example, the missing data in the CRF tables identified above (see paragraph 100).

150. Despite the additional resources needed, the ERT would also encourage France to estimate potential emissions of HFCs, PFCs and SF_6 to facilitate verification and increase comparability.

151. Further implementation of the IPCC good practice guidance is also recommended. For example, information on the rationale behind the choice of methodology and emission factors or activity data should be provided in order to demonstrate that for key sources the methodologies with the lowest uncertainty were used.

3. Questions and issues from previous review stages

152. The ERT were informed by CITEPA that the activity data included in the CRF related to clinker production; additional information was provided to explain the trend in emissions from nitric acid production (see above).

IV. AGRICULTURE

A. Sector overview

153. This sector contributes the largest share of CH_4 and N_2O emissions, contributing 54% to total CH_4 and 69% to total N_2O emissions, respectively, in 1999. In terms of CO_2 equivalent, absolute emissions from the agriculture sector show a steady decrease of 4.3% over the period 1990 to 1999, while its share of the total inventory, excluding LUCF, dropped from 16.5% in 1990 to 15.9% in 1999.

1. Institutional arrangements

154. The CITEPA compiles, uses and maintains the National Inventory System, which is used in the preparation of the NIR and CRF tables for submission to the UNFCCC. Basic data on agriculture are taken from AGRESTE, the official magazine of the French Ministry of Agriculture and Fishing. Some country-specific parameters and estimating algorithms are supplied to the CITEPA by specialized technical institutes, namely: the Institut National de la Recherche Agronomique (INRA), the Association Générale des Producteurs de Blé (AGPB), the Institut Technique des Céréales et Fourrages (ITCF) and the Union des Industries de la Fertilisation (UNIFA).

2. Completeness

155. Concerns about completeness mainly centred on the following issues: i) indirect N_2O emissions from soils from atmospheric NO_x and NH_3 deposition; and ii) field burning of agricultural residues. With respect to i), this had been estimated although it had not been included in the inventory; the ERT consider its inclusion essential. In the case of ii), this activity occurs to some extent, but requires special permits.

156. Two other activities that might be included are: i) cultivation of histosols; and ii) lime application for acid-soils.

3. Transparency

157. The ERT consider that providing explicit references to country-specific parameters and estimating algorithms, as well as traceable references to their supporting studies/reports/papers, would be a significant advance. This important information should be incorporated in the NIR.

158. With regard to the CRF tables, the "additional information" and "documentation boxes" should be filled in as fully as possible, and the IEFs made more clearly traceable from the country-specific emission estimates used.

4. Methodologies, emission factors and activity data

159. The methodologies used are mainly based on the IPCC Guidelines, complemented by country-specific parameters and estimating algorithms recommended by the cooperating research institutions mentioned above (see: E. Rivière-CITEPA (1999) for the methodology used for estimating N_2O emissions in this sector). Most activity data have been taken from the official statistics published in AGRESTE.

5. Recalculations

160. For agriculture, the revisions resulting from recalculations are of minor importance.

6. Uncertainty estimates

161. Qualitative estimates were provided in table 7 of CRF.

7. Verification and QA/QC approaches

162. No special QC procedures have so far been implemented in this sector.

B. Conformity with the UNFCCC reporting guidelines and the IPCC Guidelines

163. See Overview section.

C. Key sources

164. The number of key sources identified depends on the level at which the source categories have been split:

(a) *Level*: the six key sources identified in the secretariat's analysis, with their contributions to the 1999 inventory, are reported in table 5 below. France identified the same sources, but grouped them under one of the three sources related to N_2O emissions from soils;

(b) *Trend*: France reported the following: 4.A Enteric fermentation – CH_4 (2.6%) and 4.D Agricultural soils – N_2O (2.0%), whereas the UNFCCC secretariat reported: 4.A Enteric fermentation – CH_4 (2.0%) and 4.D Direct soils emissions – N_2O (1.1%).

Table 5. Key sources, agriculture (1999, level assessment)

Emission source	Gas	Level assessment %	Accumulation total %
Enteric fermentation	CH_4	5.1	5.1
Agricultural soils, direct N_2O emissions	N_2O	5.1	10.2
Agricultural soils, indirect N_2O emissions	N_2O	3.3	13.5
Agricultural soils, N_2O emissions from animal production	N_2O	1.1	14.6
Manure management	CH_4	0.7	15.3
Manure management	N_2O	0.6	15.9

1. Enteric fermentation – CH_4

165. Emissions from this source decreased by 7% over the period 1990 to 1999 (from 1,431 Gg to 1,331 Gg). Cattle contributed 94% of CH_4 emissions and, therefore, deserve particular attention.

166. Concern was expressed in the S&A report over the apparently low IEF (82 kg/hd/year) for dairy cattle. Nevertheless, it should be noted that the emission factor had been weight averaged for the following two animal sub-categories: a) milk producing dairy cows; and b) dairy heifers.[13]

167. In future, France plans to revise the emission factors for cattle. In the case of dairy cows, the ERT is aware of the proposed formula, which includes milk production plus a daily constant, but its is not clear how it could be compared, in a transparent manner, with the IPCC tier 2 approach, which, in addition, mentions maintenance and pregnancy, which also influence animal emissions. For non-dairy cattle, France intends to calculate the emission factor as a weighted average of the default emission factors for each animal sub-category. The reference given for these proposed emission factors is "Vermorel-INRA", but access to this report is necessary in order to be able to compare its rationale with that of the IPCC tier 2. Therefore, the ERT suggest that consideration should be given when applying the IPCC tier 2, possibly enhanced through input from INRA, with country-specific parameters (animal weights, digestibility parameters, feed intake, etc.).

2. Manure management – CH_4 and N_2O[14]

168. Emissions remained relatively stable during the period 1990 to 1999: CH_4 increased from 168.5 Gg in 1990 to 173.5 Gg in 1999 (3% increase), and N_2O from 10.5 Gg in 1990 to 10.0 Gg in 1999 (4.8% decrease). Comments on the estimation procedures for both gases follow.

169. CH_4: France used the IPCC Guidelines Equation 16 as the emissions estimating algorithm for CH_4 for the following animal classes: Dairy cows (including dairy heifers which are to be transferred to the non-dairy sub-category as mentioned above), other cattle, swine, and poultry. For the values of the B_0 parameter in the equation, France adopted the IPCC default values (per animal class). For the three remaining parameters, namely, VS, MS, and MCF, France used values provided by MIES (no precise report/paper references were provided to enable their basis and rationale to be ascertained). In any case, the result, which could be detected in the S&A report, is that the derived country-specific IEFs are apparently almost one order of magnitude lower than the corresponding IPCC default emission factors (kg/hd/year) for: i) Dairy cattle (country 5.8 vs. IPCC 44), ii) for Other cattle (country 3.8 vs. IPCC 20). For Swine[15] and Poultry the figures are closer but France's figures are still lower: Swine (country 7.6 vs. IPCC 10) and Poultry (country 0.085 vs. IPCC 0.117). The ERT consider that the whole process of these estimations should be revised,[16] and France has agreed to this in its reply to the S&A report.

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[13] The IEFs corresponding to these two categories (dairy (110 kg/hd/year), and non-dairy (47.2 kg/hd/year) seem reasonable compared with the IPCC recommended default emission factors for cattle in Western Europe.

[14] The data in table 4.B(b) do not appear to be internally consistent with reference to the animal classes of sheep, swine, poultry and others for which the sum of N excretion through the various management systems is several times higher than the product of the animal numbers times their respective annual excretion rates. This flaw was already mentioned in the S&A report, but only for sheep. The ERT were provided with a revision of the table which deals with the inconsistency already mentioned.

[15] Referring to the swine segment of weight in the range (20 kg to 50 kg) that was identified in the S&A report as a possible source of incompleteness, the ERT believe that it should be included as a separate sub-category, as there is no risk of double counting with sows, pending country experts verification that only the piglets (up to 20 kg) are with their mother sows.

[16] For the remaining animal classes contributing to this emitting category, it is only necessary to mention that France aggregated the emission factors for sheep and goats (0.28 kg/hd/year), instead of differentiating these two animal classes as in the IPCC default (0.28 for sheep and 0.18 for goats). This aggregation of emission factors was also adopted for equines (2.1 kg/hd/year), whereas the IPCC default differentiates: horses (2.1) from mules-asses (1.14).

170. N_2O: For N excretion rates by animal class, as well as for the allocation of total N excreted by animal class to the various manure management systems, default IPCC values were used. This was not always the case with emission factors as indicated by the IEFs shown in table 4.B(b). For: i) Liquid systems, an emission factor of 0.0007 was used instead of the IPCC default value of 0.001 (one possible explanation for this is that in table 4-22 of the IPCC Guidelines the factor is given as <0.001); and ii) Other (for which no explanation is given regarding the management systems to which it refers) an IEF of 0.002 was reported which does not correspond to the IPCC suggested emission factors. The ERT suggests that, in future, France considers the information provided in the new IPCC good practice guidance 4.12 and 4.13 tables.

3. Agricultural soils – N_2O

171. Emissions remained relatively stable in the period 1990–1999: i) CH_4 increased from 22.9 Gg in 1990 to 23.0 Gg in 1999 (0.4% increase), and N_2O decreased from 170.6 Gg in 1990 to 165.0 Gg in 1999 (3.3% decrease). Comments follow for each of the three source subcategories.

Direct soils emissions

172. It should be noted that under the IPCC source category 4.D, France reports CH_4 emissions from the following types of cultivation: permanent crops, arable crops, market gardening, grassland and fallow. As the ERT does not see any good reason for including these estimated emissions (supposedly anaerobic conditions do not prevail), it is suggested that, pending evidence to the contrary from country experts, France should omit these CH_4 emissions in future submissions. The proposed IPCC common default emission factor is 0.0125 kg N_2O-N/kg input N for the sub-activities synthetic fertilization, animal manure applied to soils, N-fixing crops and crop residues, all of which are responsible for direct N input on soils. Although concern was expressed in the S&A report over the comparatively low IEFs, France replied that the emission factors used were those proposed by the IPCC, and the ERT were given a demonstration of this approach which had been prepared for the next submission.

173. With regard to the activity variables, the data come from the following sources:

(a) *Synthetic fertilizers*: fertilizers data on chemical N-compound are provided by UNIFA. It appears that the figures correspond to sales data (possibly differing according to apparent consumption, if adjustments for stock changes and external trade (imports – exports) have not been introduced). The country experts are checking this to ensure that the most accurate proxy for fertilizer application is used;

(b) *Manure applied to soil*: the activity data correspond to all N manure excreted, net of: i) N in manure excreted volatized as NO_x or NH_3; ii) N in manure excreted in pasture (which is included in the sub-category "Animal production" referred to below). Problems with the internal consistency and transparency of these data, which were given in table 4.B(b), have already been mentioned, but it seems that the errors detected will no longer be a problem in future submissions;

(c) *N-fixing crops*: the activity data, in terms of product dry biomass, are taken from the AGRESTE series. Types of cultivation included are: soybean, crimson clover, cultivated grasslands, leguminous crops;

(d) *N in Crop residues*: the basic activity data come from AGRESTE statistics and are as follows:

(i) N-fixing crops, in mass of product dry biomass, which leave residues in the soil (in this report, not all the N-fixing cultures mentioned above are considered to leave residues in the soil);

(ii) Potatoes, beetroot and cereals, in units of ha cultivated. For each of these crop types, a specific conversion ratio from ha of surface cultivated to mass of dry residue was provided by: ITCF (for potatoes), INRA (for beetroot) and AGPB

(for cereals). A possible disadvantage in using surface cultivated as the basic activity variable (and, as a result, the companion conversion ratio mentioned above) is that annual yield fluctuations cannot be taken into account, although they must influence the amount of N inputting into the soil. So the ERT suggest that this decision should be reconsidered and that product crop masses should be used as the basic variables for these categories. This would also enhance comparability with the IPCC approach parameters, which is not possible with the ITCF, INRA, and AGPB ratios.

Animal production

174. The activity data correspond to all N manure excreted while in pasture net, of the N fraction that volatilizes as NO_x or NH_3.

Indirect soil emission

175. In this sub-category, France reported emissions of N leaching and runoff from agricultural soils. Nevertheless, France left blank the CRF cells corresponding to N_2O emissions as a result of NO_x and NH_3 atmospheric deposition. The reason given for not incorporating these N_2O emissions in the inventory was that they could lead to double counting, but in the opinion of the ERT, France should include these emissions in order to achieve completeness in this source category.

D. Non-key sources

176. The CH_4 emission factor chosen for rice cultivation needs to be revisited as the reference is to another country (Italy) and may not be representative of the French situation. Rice fields may also require a differentiated (metropolitan versus non-metropolitan) approach which takes account of the characteristics of rice cultivation in the DOM/TOM, and the non-negligible share it represents of the French national total because of that.

E. Areas for further improvement

1. Planned or ongoing work by the Party

177. France is moving towards a more transparent presentation of the sources of basic activity data, emission factors, estimating algorithms and additional or derived comparison indicators, and estimated emissions.

2. Issues identified by the ERT

178. The ERT suggest that France might wish to convene its team of inventory compilers (CITEPA) and agricultural experts (supporting institutes) to design and draw up an overall agricultural methodological framework and calculation procedures manual which would: i) ensure transparency and coherence in the application of the country-specific estimation algorithms; and ii) provide both the necessary information to the NIR and comparability with IPCC methods.

179. In addition, there is a need to apply the good practice recommendation of consistently using the same totals for animal manure produced and its distribution across the animal waste management systems (AWMS) for the applicable activity variables for both CH_4 and N_2O emissions estimating algorithms in source category 4.B and, where relevant, in source category 4.D.

180. The ERT were given a large amount of information on procedures that would be applied in future submissions. When the approach followed was that of the IPCC, in many cases the references given were to the IPCC Guidelines. The ERT suggest that in this respect France should also revise those procedures in accordance with the extensively upgraded references for agriculture in the IPCC good practice guidance. See also comments under “Transparency”.

V. LAND-USE CHANGE AND FORESTRY

A. Sector overview

181. France's LUCF sector accounts for a net removal of 61,000 Gg of CO_2 equivalent, corresponding to approximately 11% of total national emissions.

182. During the 1990 to 1999 period, net LUCF removals tended to increase, with minor annual fluctuations. Net removals in 1999 represented an increase of almost 18% over the 1990 value.

1. Institutional arrangements

183. The LUCF inventory is prepared by CITEPA. Regular consultations are held with experts from various agencies and institutions in relevant areas: ENGREF, SCEE, INRA, IFN and ONF.[17] MIES ensures that all the necessary information is available for the preparation of the inventory, and facilitates collaborative initiatives that will provide the technical expertise in methodological development.

2. Completeness

184. France filled in CRF tables 5 (sectoral report), 5.A and 5.B. Notation keys were not used. In its response to the S&A report, France made it clear that the formats of tables 5.C and 5.D are not appropriate to its national circumstances. Aggregated emissions data for these two activities are provided in the sectoral report, however, there are no substitute tables containing data or information on abandoned managed lands or changes in soil C stocks.

185. The sectoral report also contains emission and removal data associated with LUCF activities in the DOM/TOM.

186. Above-ground C sequestration on abandoned managed lands reverting to forests is not documented, although it could implicitly be incorporated into 5.A through the forest inventory data. A further explanation on this issue would be appropriate in the NIR and appropriate notation keys should be used in table 5.C.

187. The ERT was informed that France does not estimate C emissions associated with the cultivation of organic soils and the use of lime as a fertilizer. They recommend that these gaps be addressed through the use of appropriate notation keys in the CRF tables, and additional explanations provided in the NIR on the rationale behind these omissions.

188. Emissions of non-CO_2 gases are estimated under 5.B. as they come from burning during temperate and tropical forest conversion, and in the "Other" category.

3. Transparency

189. The NIR contains a very brief overview of results. A separate document outlines the general methodological aspects, but it is not sufficiently detailed to assess to what extent the LUCF inventory complies with the IPCC Guidelines. During the visit, the ERT was provided with thorough oral and written descriptions of the LUCF methodology and data sources, including a key methodological document referred to in the documentation box in table 5.D, hereafter referred to as Rivière, (1999).[18]

190. During the visit, all requests for information were quickly and satisfactorily answered by the French experts. The ERT would have welcomed additional information on the characteristics of the French National Forest Inventory, a key LUCF data source.

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[17] ENGREF: Ecole Nationale de Génie Rural des Eaux et Forêts; SCEES : Service Central des Enquêtes et Etudes Statistiques (Department of Agriculture); INRA: Institut National de la Recherche Agronomique; IFN: Institut National Forestier; ONF: Office National des Forêts.

[18] Rivière, E. 1999 Evaluation des puits de CO_2 suivant la nouvelle méthode préconisée par le GIEC. CITEPA, Convention n° 9/98, Paris.

4. Methodology, emission factors and activity data

191. France indicates in CRF table Summary 3 that both methods and factors are country-specific. In fact, the methodological approaches are generally those proposed by the IPCC Guidelines, while parameters and data are generally national, with some exceptions. Due to the lack of data for overseas departments and territories, the methodology for DOM/TOM LUCF is based on an assessment of "typical" annual LUCF activities, resulting in identical values over the last decade. LUCF activities in the DOM/TOM seem to have made a minor contribution to France's total emissions/removals of GHG in the LUCF sector.

192. The calculations of C stock changes in forest biomass include above and below-ground biomass and all forests and parks, with the probable exception of small urban forests. The determination of C sequestration is based on the annual increment of merchantable wood volume multiplied by conversion and expansion factors to account for whole tree biomass. The SCEES provides areas of forested lands and annual increments in merchantable wood volume either orally to CITEPA, or through its regular publication of agricultural statistics (AGRESTE). These data are derived from the French National Forest Inventory and TERUTI,[19] a high resolution land-use change monitoring programme. CEREN data are used to estimate residential fuelwood consumption.

193. Specific parameters and factors are obtained from studies conducted by various technical agencies, e.g., specific wood gravities (ENGREF). Some parameters are communicated to CITEPA through MIES, such as the expansion factor from merchantable wood biomass to total tree biomass. In several instances the ultimate data sources (authors and studies) are not properly referenced in the NIR or in Rivière (1999), although the ERT was able to consult specific source documents upon request.

194. The ERT has concerns over the derivation of the expansion factor. If, as indicated in Rivière (1999), the non-merchantable biomass (roots and crown) represents 60% of the total tree biomass, stem biomass should account for 40% and the expansion factor from stemwood to total tree biomass should be 2.5, not 1.6. This expansion factor should be multiplied by the conversion factor from stemwood volume to biomass to give a total conversion/expansion factor – from stemwood volume to total tree biomass. Based on the specific wood gravity provided in Rivière (1999), the conversion/expansion factor varies between 0.88 and 1.4, depending on species group. These values differ from that available in the literature.[20] Moreover, the ERT has reservations regarding the application to annual volume increment of an expansion factor directly derived from biomass allocation to non-commercial tree components at maturity, since the biomass allocation pattern changes significantly during tree growth. The IPCC Guidelines recommend the use of such an expansion factor for the calculation of forest biomass removals through harvest or forest conversion. Using France's data, rough calculations of the resulting annual increment in total biomass for commercial forests give a value of 3.3 tonnes of dry matter per ha for deciduous forests, and 1.5 for evergreen forests, compared to the Guidelines default values of 2.0 and 3.0 respectively. However, France informed the ERT that there is a mistake in the Report "Riviere (1999)". The percentage of non-merchantable biomass (60%) refers to the stem biomass and not to the total biomass.

195. Table 5.A does not provide space for non-CO_2 emissions associated with forest management activities. In France, an estimated 70% of tree crown biomass is burned on site after harvest, resulting in non-CO_2 emissions which should be accounted for under forest management activities (footnote 14, p. 5.22 of the IPCC Guidelines Reference Manual).

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[19] TERUTI: Territoire utilization.

[20] See: Löwe H., S. Günther & F. Raes 2000. Comparison of methods used within Member States for estimating CO_2 emissions and sinks according to UNFCCC and EU Monitoring Mechanism: forest and other wooded land *Biotechnol. Agron. Soc. Environ.* 4(4), 315-319. The conversion/expansion factor reported for France in this article is 1.6.

196. Detailed calculations and checks are conducted for the estimation of emissions resulting from biomass removals, including additional CEREN data on residential fuelwood consumption. There may be a possible double-counting of CO_2 emissions due to the application of an expansion factor to the estimated fuelwood consumption derived from energy data.

197. The ERT was not satisfied that direct emissions caused by forest fires are captured by the calculations in 5.A; it is recommended that the issue be further examined by French experts.

198. Emissions associated with above-ground biomass removals due to land-use changes are estimated based on a complex land-use change matrix produced by the TERUTI programme for the years 1992 to 1996. The area of forest converted for this period was annualized and applied to the entire decade 1990 to 1999. The same land-change matrix is used to assess areas of forest conversion required for table 5.B calculations and for the calculations of soil C emissions/removals due to all land-use changes (section 5.D in the sectoral report), providing a coherent framework for all land-use change activities.

199. The equations and factors describing C dynamics of agricultural soils affected by land-use changes were developed by scientific INRA staff. The ERT recommends that the calculation methods described in Rivière (1999) be documented and properly referenced in the NIR. It is also further recommended that a table be included in the NIR to provide the comparable information to that which should appear in tables 5.C and 5.D.

5. Recalculations

200. The S&A report had detected large apparent errors in tables 5.A and 5.B which had been identified by France as errors in data transposition, and were immediately corrected. These corrections did not modify aggregated values in the sectoral table. The ERT was provided with the revised tables 5.A and 5.B. The ERT was also informed that these errors had occurred at the interface between the CITEPA databases and the spreadsheets that compile data for UNFCCC reporting. Efforts are on-going to address these weaknesses.

201. Minor recalculations appear in the 1999 inventory in table 5.A for 1998, which the NIR presents as data updates. The ERT was informed that this update is a regular procedure due to the fact that forest inventory data are typically not available on time for incorporation in the GHG inventory.

6. Uncertainty estimates

202. No uncertainty estimates were provided for the LUCF sector. French experts acknowledge the high uncertainty surrounding estimates of emissions and removals in the DOM/TOM; in light of their relatively insignificant contribution to the national GHG budget, this item is not given a high priority for improvement.

7. Verification and QA/QC approaches

203. In addition to the comprehensive QA/QC programme being developed and which was described to the ERT (see Overview chapter of this report), France has already implemented some quality control procedures under the form of calculation checks. The ERT would recommend as a priority, the implementation of additional quality control procedures at the interface between the databases and the calculations for UNFCCC reporting.

B. Conformity with the UNFCCC reporting guidelines and the IPCC Guidelines

204. In general, the French LUCF methodology is in conformity with the IPCC Guidelines. Indeed, the guidelines strongly recommend the use of national data when they are of a good enough quality. The quality of France's data for the metropolitan area clearly warrants its substitution by default data. IPCC default values are largely used for the GHG budget of the DOM/TOM.

205. Inventory reporting in the CRF is not quite consistent with the reporting guidelines, inasmuch as several CRF tables are incomplete or not filled in at all, and substitute tables are not provided. However, in light of the recent, on-going and planned improvements described during the visits, the ERT are satisfied that all possible efforts are being made to comply with the UNFCCC reporting requirements. The rate at which improvements are implemented seems to be related to the availability of resources.

C. Specific source and sink categories

1. Changes in forest and other woody biomass stocks

206. Changes in forest stocks accounted for a net removal of almost 85,000 Gg CO_2 in 1999, showing an increase in removals of 9,500 Gg CO_2, or 13%, over the decade (CRF table 10, although there seems to be a discrepancy in the NIR, which reports a 14,000 Gg increase in net CO_2 removals).

207. According to the NIR, this trend is due both to a significant increase in C sequestration in the biomass (equivalent to 14,000 Gg CO_2) and a slight reduction in the size of harvests. French experts also clarified that the enhanced sequestration rate is related to the age-class structure of the French forests and the re-planting of large forest tracts (2 million ha) during extensive post-war reforestation programmes which created forest stands and which, in many cases, are now reaching a stage of maximum growth rates.

2. Forest and grassland conversion

208. Forest and grassland conversion resulted in CO_2 emissions of between 11,700 Gg (1990) and 12,500 Gg (1999). The slightly increasing trend in emissions may be a result of the aggregated increase in the overall standing volume per ha, since the estimated area deforested annually is constant. France may wish to consider disaggregating the input data (forest conversion and average standing biomass) in order to refine its estimation procedures.

209. As noted above, C sequestration in abandoned lands is not reported, with the exception of a very minor fixed annual quantity of carbon (equivalent to 48 Gg CO_2) sequestered by abandoned agricultural lands in the DOM/TOM.

3. Emissions and removals from soil – CO_2

210. This category includes all emissions from above-ground biomass and soils due to land-use change activities in the DOM/TOM, as well as soil C stock changes associated with all LUCF activities in metropolitan France. Total emissions have tended to decrease, from approximately 4,000 Gg CO_2 in 1990 to 3,400 Gg in 1999. These aggregated values are not broken down in the NIR, nor is there further analysis of the underlying processes.

D. Areas for further improvement

1. Planned or ongoing work by the Party

211. French experts very explicitly stated that their approach to inventory development relies on continuous improvement. The ERT noted that priority areas targeted for improvements in the LUCF inventory are:

(a) Incorporation of recent scientific findings in calculation methods;

(b) Updating conversion and expansion factors used in the estimation of total annual biomass increments in forest;

(c) Implementation of QA/QC procedures, including proper referencing of data and information sources.

212. Improvements in these complex areas will require a long-term commitment. The ERT appreciate the efforts of the French LUCF team and encourage France in these activities.

2. Issues identified by the ERT

213. Many of the weaknesses identified by the ERT in the LUCF inventory were already known to French experts and some have already been partially addressed. This final section of the LUCF report simply summarizes elements outlined in the body of the text, acknowledging that the French inventory team is already aware of most of them, and in some cases has undertaken corrective action.

214. It is recommended that efforts be made to:

(a) Improve the transparency of the reporting, especially through a better documentation of calculation methods in the NIR, the production of tabulated data, where appropriate (C stock changes in soils), and more appropriate referencing of data and methodological sources (conversion/expansion factors);

(b) Document and provide a rationale for omissions (C stock changes in agricultural soils);

(c) Improve the interface between the databases and the calculating tools (spreadsheets);

(d) Verify to what extent direct emissions from forest fires are implicitly included in the inventory.

VI. WASTE

A. Sector overview

215. In 1999, the waste sector contributed 4% to France's total GHG emissions in terms of CO_2 equivalent. During the period 1990 to 1999 total CO_2 equivalent emissions from the waste sector decreased by 5%.

216. CH_4 emissions from the waste sector represented 29% of total methane emissions in France in 1999. CH_4 emissions from solid waste disposal sites (SWDS) in 1999 were the major source of GHGs in this sector (94%). During the period 1990 to 1999, methane emissions from SWDS decreased by 8% due to the implementation of gas capture measures.

217. According to the assessment level methodology, the waste sector includes two key source categories: solid waste disposal on land and waste incineration. However, according to the trend level methodology, solid waste disposal on land was the only key source (ref. CITEPA). The S&A report refers to only one key source in this sector (SWDS), and its contribution to total emissions in terms of CO_2 was 3%, which corresponds to CITEPA's analysis.

1. Institutional arrangements

218. According to information provided during the review, the waste sector inventory is prepared by CITEPA utilizing the data base provided by ADEME for SWDS and waste incineration, and IFEN (Institut Français de l'Environnement) for waste water handling.[21]

219. Data processing, emissions estimation and compilation of the CRF were performed by CITEPA; the NIR was prepared by CITEPA, and reviewed and approved by the French government. ADEME deals with the data bases for SWDS and waste incineration; there is no centralized data for wastewater handling, which complicates compilation of the inventory.

[21] ADEME: Agence de l'Environnement et de la Maîtrise de l'Energie.

2. Completeness

220. Both the NIR and CRF include estimations of all gases and sources of emissions from the waste sector recommended by the IPCC Guidelines (CO_2, CH_4 and N_2O), with the exception of N_2O emissions from human sewage, which is not reported. All the CRF tables for the waste sector from 1990 to 1999 are complete, with minor omissions and/or inconsistencies. The information provided in the documentation boxes is limited.

3. Transparency

221. The information presented in both the CRF and NIR is not fully transparent. More information on the methodology used and underlying assumptions should be provided in the NIR and the CRF in order to allow the calculations to be replicated. Further clarification is needed since country-specific methodologies and data are derived from many different studies. The CRF background tables are not complete.

4. Methodologies, emission factors and activity data

222. For the waste sector excluding SWDS, the CORINAIR (SNAP 97) methodology was used for estimating GHG emissions. With regard to SWDS, the tier 2 method (First Order Decay) recommended by the IPCC good practice guidance was applied.

223. For the wastewater handling sector, the methodology used is country-specific, but no detailed information is provided on the emission factors applied. Regarding waste incineration, the emission factors used are also country-specific; more detailed information needs to be provided.

5. Recalculations

224. Recalculations in the waste sector resulted in major changes in the emission estimates for CH_4 (increases in the SWDS sector in the order of 9% in 1990 and 73% in 1998), while for CO_2 and N_2O these changes are not significant. The CRF provides all the recalculated estimates and summarizes the changes made for the period 1990 to1999. It explains the recalculations using the new method (First Order Decay) for SWDS. The NIR explains the recalculations by referring to the most up-to-date source of activity data for the waste incineration subsector. With regard to wastewater, no recalculations are provided.

6. Uncertainty estimates

225. The NIR does not contain an uncertainty analysis; CITEPA intends to carry out such an analysis in the future.

7. Verification and QA/QC approaches

226. More comprehensive verification procedures and QA/QC have still to be introduced for emission estimates for the waste sector. However, a QA/QC system is being implemented which was described by French experts. The system is not described in detail in the document given to the ERT.

B. Conformity with the UNFCCC reporting guidelines and IPCC Guidelines

227. The estimation of emissions and presentation of information in the CRF and NIR broadly follow the IPCC Guidelines (tier 2 approach for SWDS) and is consistent with the UNFCCC reporting guidelines.

228. The IPCC good practice guidance was not followed in the wastewater handling and waste incineration subsectors, since no explanation of the methodologies, emission factors and data sources used was provided. The CRF tables were not correctly filled in.

C. Key sources

229. The S&A report established that SWDS constitute a key source. During the visit France provided information on evaluation of key sources[22] which was fully in line with the one in the S&A report.

230. CH_4 emissions per capita from SWDS decreased by 13.6% between 1990 and 1999 due to enactment of the 1997 Decree,[23] the aim of which was to close unmanaged waste disposal sites and promote the capture of biogas in managed waste disposal sites.

231. The solid waste disposal percentage in managed sites in metropolitan France was 100% in 1999; the real level of recovered gas amounted to 53% (CITEPA).

1. Solid waste disposal sites – CH_4

Trends

232. CH_4 emission trends from SWDS are provided for the period 1990 to 1999. The recalculation was processed using the tier 2 method of the IPCC good practice guidance.

Completeness

233. Both the NIR and CRF include an estimation of methane emissions from SWDS as recommended by the IPCC Guidelines. All CRF tables relating to SWDS are complete for the period 1990 to 1999, with minor omissions and/or inconsistencies. The information in the documentation box is limited. The ERT recommend completing the additional information box.

Methodologies,

234. The methodology used was the EMEP/CORINAIR (SNAP 090401 and 090402). It is consistent with the IPCC good practice guidance.[24]

Activity data

235. The amount of "residual waste" was obtained from different sources: surveys in local municipalities and statistics data supplied by ADEME. In 1999, the total quantity of solid waste disposed of in managed sites was 24.8 Mt (23.2 Mt from the metropolitan area and 1.6 Mt from the DOM/TOM). Total solid waste (domestic and industrial solid waste) was used to estimate emissions. It is strongly recommended that the percentage of solid waste composition and the values of per capita production are established.

Emission factors

236. The main parameter for calculating CH_4 generation was the degradable organic carbon (DOC) content, which was obtained from ADEME and is considered to be constant (200 kg/t). This value is not explained in either the NIR or the CRF. The CH_4 oxidation factor was 20% (RIVM, The Netherlands). This value is considered very high in relation to the IPCC good practice guidance references. The CH_4 fraction for landfill gas was 50% (IPCC reference). The CH_4 generation rate constant is based on studies conducted by ADEME.[25]

Confidentiality

237. The information for emissions from SWDS is not confidential.

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[22] Tier 1 level and trend assessment. IPCC good practice guidance.

[23] Arrêté du 9 septembre 1997 relatif aux décharges existantes et aux nouvelles installations de stockage de déchets ménagers et assimilés.

[24] Tier 2, (First Order Decay Method).

[25] k1=0.7, k2=0.14 and k3=0.04 for 1 year, 5 years and 15 years, respectively.

D. Non-key sources

1. Waste-water handling

238. EMEP/CORINAIR methodology was used, as well as a country-specific methodology based on data from a local study that was not identified. The emission factors used are country-specific, but no details are supplied in the references. The IPCC Guidelines were not followed in this sector.

239. The statistics for waste-water handling were not provided. For its next submission, France is going to develop an information management system to deal with treatment systems, type of treatment, percentage of domestic water treated and industrial water treated.

240. The information contained in CRF table 6.B is not complete in terms of additional information, and the analysis of wastewater handling provided in the NIR could be improved.

241. N_2O emissions from human sewage were not estimated, but France is planning to provide this information in future submissions.

2. Waste incineration

242. EMEP/CORINAIR (SNAP 090201 and SNAP 090202) methodology was used. The IPCC good practice guidance was not applied. Activity data were obtained from surveys conducted by ADEME and the emission factors used were country-specific (CITEPA and EMEP/CORINAIR Guidebook). These emission factors are bigger than those of the IPCC. The industrial waste emission factors were obtained from the IPCC and Swiss studies (according to CITEPA).

243. The NIR and CRF documented the CO_2, CH_4 and N_2O emissions from the waste incineration sector. CO_2 emissions from non-biogenic waste are included in total CO_2 emissions.

E. Areas for further improvement

1. Planned or ongoing work by the Party

244. N_2O emissions from human sewage will be estimated for the 2002 submission using the IPCC default methodology:

(a) To improve the data management system for the waste sector, especially waste-water handling and waste incineration;

(b) To apply the IPCC good practice guidance when determining emissions from waste-water handling and waste incineration;

(c) To develop uncertainty analysis in the waste sector;

(d) To determine the solid waste composition so that it can be included in future GHG inventory submissions;

(e) To develop a QA/QC system for the waste sector;

(f) To strengthen the institutional arrangements in order to establish a data system.

2. Issues identified by the ERT

245. Some reporting problems were identified, which should be improved in future reports:

(a) All methodologies, parameters and activity data used in the report should be clearly referenced, since many different studies provide the sources of information;

(b) The ERT would encourage France to fill in the CRF background tables as far as possible, in each case analysing the information available in the databases and specialized studies. With the studies and database available, most of the cells could be filled in.

SUPPORTING REFERENCES

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6. Web site of the Chambre Syndicale Nationale du Motocycle.

7. Pétrole 2000: Eléments statistiques, Comité Professionnel du Pétrole.

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