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BELGIUM

REPORT OF THE INDIVIDUAL REVIEW OF THE GREENHOUSE GAS INVENTORY SUBMITTED IN THE YEAR 2003¹

(In-country review)

EXECUTIVE SUMMARY

1. This inventory review covers the 2003 inventory submission of Belgium, coordinated by the United Nations Framework Convention on Climate Change (UNFCCC) secretariat in accordance with decision 19/CP.8 of the Conference of the Parties. Belgium submitted its annual inventory on 15 April 2003, consisting of common reporting format tables for the years 1990–2001 and the national inventory report. The review took place from 1 to 5 September 2003 in Brussels, Belgium, and was conducted by the following team of nominated experts from the roster of experts: Generalist – Mr. Mario Contaldi (Italy), Energy – Ms. Branca Americano (Brazil), Industrial Processes – Mr. Manfred Ritter (Austria), Agriculture – Mr. Ayite-Lo Ajavon (Togo), Land-use Change and Forestry – Mr. Richard Volz (Switzerland), Waste – Mr. Philip Acquah (Ghana). Mr. Mario Contaldi and Mr. Ayite-Lo Ajavon were the lead reviewers. The review was coordinated by Ms. Astrid Olsson and Mr. Javier Hanna Figueroa (UNFCCC secretariat).

2. In accordance with the UNFCCC “Guidelines for the technical review of greenhouse gas inventories from Parties included in Annex I to the Convention”, a draft version of this report was communicated to the Government of Belgium, which provided comments that were considered and incorporated, as appropriate, in this final version of the report.

3. In the year 2001, the most important greenhouse gas in Belgium was carbon dioxide (CO₂), contributing 84.2 per cent to total² national greenhouse gas (GHG) emissions expressed in CO₂ equivalent, followed by nitrous oxide (N₂O), contributing 8.0 per cent, and methane (CH₄), contributing 6.9 per cent. Perfluorocarbons (PFCs), hydrofluorocarbons (HFCs) and sulphur hexafluoride (SF₆) accounted for 0.9 per cent of overall GHG emissions in the country. The Energy sector accounted for 79 per cent of total GHG emissions, followed by Industrial Processes (10 per cent), Agriculture (8 per cent) and Waste (3 per cent).

4. Total GHG emissions (excluding Land-use Change and Forestry) amounted to 150,516 Gg CO₂ equivalent and increased by 6.7 per cent from 1990 to 2001. Tables 1 and 2 provide data on emissions by gas and by sector from 1990 to 2001. Over that period, CO₂ emissions increased by 7.7 per cent, driven largely by increased emissions from road transport. CH₄ emissions decreased during the same period by 7.2 per cent, mainly because of increased flaring of landfill gas from solid waste disposal sites and a reduction of organic waste to landfills as a result of increased composting. N₂O emissions decreased by 1.5 per cent over the same period due to the closure of a coke plant. Emissions from HFCs and SF₆ increased between 1995 and 2001 by 262 per cent and 2 per cent, respectively. The

¹ In the symbol for this document, 2003 refers to the year in which the inventory was submitted, and not to the year of publication. The number (2) indicates that this is an in-country review report.

² In this report, the term total emissions refers to the aggregated national GHG emissions expressed in terms of CO₂ equivalent excluding Land-use Change and Forestry, unless otherwise specified.

trend is consistent with increasing substitution of ozone depleting substances in refrigeration equipment and foam products, particularly air conditioning in cars. No emissions are reported for PFCs.

5. The inventory for the year 2001 is fairly complete, with the exception of some sectoral background data tables and a few sources in the Industrial Processes, Land-use Change and Forestry, and Waste sectors. For previous years (1990–1999) sectoral background data tables are not filled in. Moreover data on HFCs, PFCs and SF₆ are not available before 1995.

6. Under Belgium's federal structure, the greater part of responsibility for environmental matters lies with the regions (Flanders, Walloon and Brussels–Capital). Each region implements its own programme in the preparation of a regional emission inventory in accordance with the UNFCCC reporting guidelines. The emissions inventories of the three regions are subsequently combined to form the national greenhouse gas emissions inventory. The expert review team found during its visit that the three regions cooperate fully in the preparation of the inventory, but even so the system currently in place does not produce a consistent and transparent national inventory. The 2003 submission thus does not reflect the valuable work done at the regional level, where detailed and reliable estimates are available. The expert review team welcomes the new Cooperation Agreement between the regions that is due to enter into force next year and establishes a national system to ensure consistency of reporting in accordance with the UNFCCC reporting guidelines and the *Revised 1996 Intergovernmental Panel on Climate Change (IPCC) Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC Guidelines). The Belgian representatives are confident that the permanent commission (National Climate Commission) foreseen by the new agreement will help the regions to harmonize reporting.

Table 1. Greenhouse gas emissions by gas, 1990–2001

| GHG emissions | Gg CO ₂ equivalent | | | | | | | | | | | | Change from 1990–2001 % |
|---|-------------------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|-------------------------|
| | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | |
| Net CO ₂ emissions/removals | 116 149 | 121 910 | 120 896 | 119 011 | 121 872 | 125 543 | 128 344 | 123 861 | 127 477 | 124 649 | 124 509 | 124 989 | 7.61 |
| CO ₂ emissions (without LUCF) ^a | 117 749 | 123 510 | 122 714 | 120 887 | 123 805 | 127 454 | 130 233 | 125 728 | 129 322 | 126 472 | 126 331 | 126 803 | 7.69 |
| CH ₄ | 11 212 | 11 293 | 11 336 | 11 286 | 11 428 | 11 261 | 11 182 | 11 108 | 11 175 | 10 919 | 10 716 | 10 401 | -7.24 |
| N ₂ O | 12 164 | 11 860 | 11 500 | 11 771 | 12 306 | 12 959 | 12 472 | 12 009 | 12 511 | 12 382 | 12 122 | 11 980 | -1.51 |
| HFCs | NE | 0 | 0 | 0 | 0 | 339 | 418 | 527 | 631 | 804 | 1 014 | 1 227 | |
| PFCs | NE | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| SF ₆ | NE | 0 | 0 | 0 | 0 | 103 | 206 | 206 | 96 | 96 | 109 | 105 | |
| Total (with net CO₂ emissions/removals) | 139 525 | 145 063 | 143 732 | 142 068 | 145 606 | 150 206 | 152 623 | 147 711 | 151 890 | 148 850 | 148 469 | 148 702 | 6.58 |
| Total (without CO₂ from LUCF) | 141 125 | 146 663 | 145 550 | 143 944 | 147 539 | 152 117 | 154 512 | 149 578 | 153 735 | 150 673 | 150 291 | 150 516 | 6.65 |

^a LUCF = Land-use Change and Forestry

Table 2. Greenhouse gas emissions by sector, 1990–2001

| GHG source and sink categories | Gg CO ₂ equivalent | | | | | | | | | | | | Change from 1990–2001 % |
|--------------------------------|-------------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|-------------------------|
| | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | |
| Energy | 112 663 | 116 840 | 116 002 | 114 140 | 117 467 | 120 311 | 122 140 | 117 467 | 122 042 | 118 951 | 118 200 | 118 682 | 5.34 |
| Industrial Processes | 11 267 | 12 770 | 12 540 | 12 862 | 13 030 | 14 566 | 15 003 | 14 921 | 14 718 | 14 633 | 15 131 | 15 197 | 34.88 |
| Solvent Use | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Agriculture | 12 700 | 12 633 | 12 550 | 12 699 | 12 632 | 12 782 | 12 582 | 12 431 | 12 510 | 12 533 | 12 232 | 12 146 | -4.36 |
| LUCF ^a | -1 256 | -1 256 | -1 474 | -1 536 | -1 595 | -1 574 | -1 553 | -1 533 | -1 513 | -1 491 | -1 474 | -1 467 | 16.75 |
| Waste | 4 152 | 4 077 | 4 115 | 3 902 | 4 072 | 4 121 | 4 452 | 4 425 | 4 134 | 4 224 | 4 379 | 4 143 | -0.20 |
| Other | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |

^a LUCF = Land-use Change and Forestry

7. The expert review team noted during the review that full recalculations had not been undertaken yet because of limited resources. Given the changes in methodology over the period, the lack of a full recalculation does introduce inconsistencies in the time series. Belgium is well aware of the lack of consistency in time series and therefore assures to give high priority to this matter in future submissions.

8. Road transport sector emissions are estimated using different detailed models and methodologies. Models estimate emissions according to fuel combustion in vehicles that travel within the country's territory but not the emissions corresponding to fuel sales in the country.

9. The Party is well aware of the shortcomings of the inventory. Major improvements were made in the last couple of years and others are planned. The effectiveness of the institutional arrangements for the preparation of the inventory is being improved. Detailed planning for the coordinated preparation of the inventory has allowed the timely submission of the 2001 inventory common reporting format and the national inventory report. The sectoral background data tables have been partially filled in with activity data and implied emission factors in all cases where the regional methodologies for emissions estimation were close enough to allow a harmonized presentation. Belgium indicated that a number of studies and research activities are presently ongoing in cooperation with research institutions and industries to improve the quality of the inventory in many sectors such as Land-use Change and Forestry.

10. The expert review team found full cooperation from the Party during the visit. The host country provided the review team with additional information upon request and where available.

I. OVERVIEW

A. Inventory submission and other sources of information

11. Belgium submitted a national inventory report (NIR) on 15 April 2003.

12. In its 2003 submission, Belgium submitted common reporting format (CRF) tables for the years 1990–2001.

13. During the review the host country provided the expert review team (ERT) with additional information sources. These documents are not part of the inventory submission, but are in many cases referenced in the NIR. A full list of materials used during the review is provided in annex 1 to this report.

B. Key sources

14. Belgium has reported a key source tier 1 analysis, both level and trend assessment, as part of its 2003 submission. The key source analysis performed by the Party and the secretariat³ produced similar results. The key source analysis was performed this year for the second time and it will be a driving factor for the improvements planned for the inventory. The key sources are similar, but differ in the level of disaggregation. The secretariat splits the key source analysis based on fuels while the Belgian key source analysis is based on the sub-sources in the Energy sector.

C. Cross-cutting topics

Completeness

15. The inventory for the years 2000 and 2001 are fairly complete, with the exception of a few sources (asphalt roofing, road paving and food industries) in the Industrial Processes, Land-use Change and Forestry (LUCF), and Waste sectors. Even in the more complete inventory, in the CRF for year 2001, some sectoral background data tables have not been provided (1.B.1, 1.B.2, 1.C, 2(I).A-G, 2(II).C,E, 2(II).F, 3.A-D, 4.B(b), 4.D, 4.E, 4.F, 5.B, 5.C, 6.A, 6.B and 6.C); and Summary 3, 7 (incomplete), 8(b) and table 9, which essentially provide transparency and completeness of the inventory, are not filled in because of lack of harmonization of regional approaches and lack of resources. Notation keys are used, but in some sectoral background data tables they are used in a limited way.

16. For previous years (1990–1999) sectoral background data tables are not filled in. Moreover data on HFCs, PFCs and SF₆ are not available before 1995. Biomass consumption is reported only partially from 1990 to 2000.

17. The NIR provides quite useful information but is lacking in details about the activity data (AD) underlying the estimates, links to national statistical data and some national emission factors (EFs) used to calculate emissions (e.g., HFCs, PFCs and SF₆). Also is lacking in details on which default IPCC EFs have been used. Moreover in many cases the methodological descriptions are not detailed enough.

Transparency

18. Transparency has improved compared to previous submissions, and references to basic regional data are much more clear. However, the inventory is still not fully transparent because of the lack of full CRF tables for the base year; the fact that the CRF tables on quality of estimates have not been filled in; the lack of explanatory information on recalculations and completeness for the period 1991–1999; and the lack of details in the NIR. The in-country review, however, helped the assessment of the inventory in more detail as the team was provided with adequate documentation. For instance, relevant regional energy balances and other detailed publications for the Agriculture, LUCF and Waste sectors were provided to the team. The ERT noted that, because the national inventory is to a large extent a compilation of three independent regional estimates, in some cases it received multiple answers to technical questions, which may have confused matters instead of clarifying them.

19. The ERT noted that notation keys are not used by Belgium in an extensive way in the CRF tables. During the review it was explained that, in cases where it was not possible to get approved data from all the three regions, the sectoral background data table was left empty and the sectoral report table was completed with the relevant emissions. Sectoral background data tables for the years 2000 and 2001, at regional level, are included in the annexes in the NIR. The ERT encourages Belgium to improve the use of notation keys in accordance with the UNFCCC reporting guidelines.

³ The secretariat had identified, for each individual Party, those source categories which are key sources in terms of their absolute level of emissions, applying the tier 1 level assessment as described in the IPCC good practice guidance. Key sources according to the tier 1 trend assessment were also identified for those Parties providing a full CRF for the year 1990. Where the Party has performed a key source analysis, the key sources presented in this report follow the Party's analysis. However, they are presented at the level of aggregation corresponding to a tier 1 key source assessment conducted by the secretariat.

20. In general, the NIR gives more information on EFs than the CRF. The ERT encourages Belgium to fill in all the relevant CRF tables and make references to the relevant section of the NIR in the CRF documentation boxes.

Recalculations and time-series consistency

21. Belgium provided recalculated estimates (table 8(a)) for the years 1990–2000. The ERT noted during the review that full recalculations had not been undertaken yet because of limited resources. Given the changes in methodology that have occurred over the years, incomplete recalculation introduces inconsistencies in the time series. Belgium is well aware of the lack of consistency and high priority is therefore being given to preparing a consistent time series. In its next submission, Belgium plans to complete the recalculations, including the base year.

Uncertainties

22. Neither quantitative nor qualitative (expert judgement) information on uncertainty estimates has been provided in table 7 of the CRF. In its NIR Belgium explains that some work on estimating uncertainties has been initiated but further development is needed, and this has been planned.

Verification and quality assurance/quality control approaches

23. No formal quality assurance/quality control (QA/QC) procedure is in place. Data are collected on a regional basis and each region has its own methodologies for data collection and verification. The entities responsible for data collection/verification are the regional environmental protection agencies and routine checks are performed on the data submitted by the operators.

24. The Party is well aware of the need to improve and harmonize the QA/QC procedures. External consultant companies carried out an audit during 2003 to check the accuracy and completeness of the inventory in the three regions. This audit carried out by Belgium has shown that parts of the data are quite accurate and reflect standards at European Union level, while other data do require improvement for example at the collection level. The preliminary results suggest a series of improvements that will be implemented in the next few years. In the NIR a brief report illustrated the improvements already planned. Belgian experts are thinking about the development of an inter-regional QA procedure, internally performed, and possible external audits for QC of the data and the process in the future. The ERT encourages the Party to carry out QA/QC procedures as recommended in the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC good practice guidance).

Institutional arrangements

25. Under Belgium's federal structure, the greater part of responsibility for environmental matters lies with the regions (Flanders, Walloon and Brussels–Capital). Each region compiles its own GHG emission inventory in accordance with the UNFCCC reporting guidelines (i.e., they prepare regional CRFs and NIRs). The emission inventories of the three regions are subsequently combined to produce the national GHG emission inventory. The Interregional Environment Unit (CELINE–IRCEL) is responsible for integrating the emission data from the inventories of the three regions and for compiling the national inventory.

26. Since 1980, as a result of various external factors, the three regions have been developing different methodologies for compiling their atmospheric emission inventories. The Party is well aware of the differences in methodological choices and of some inconsistencies in reporting between the regional inventories. At present improvement of the inventory data is possible only on a voluntary basis. The Federal Government does not have higher authority than the three regions to ensure complete regional reporting and harmonization. There are three entities at the national level responsible for different aspects of the inventories:

(a) The Working Group (WG) on emissions is, beside other activities, responsible for the technical aspects of setting up atmospheric emission inventories (EFs and methodologies) and for the agreements/engagements between the different regions concerning international reporting obligations. Regional and federal representatives are participating in this working group, which has the mandate to approve the national inventory. This WG is directly under the Coordination Committee for the International Environmental Policy (CCIEP). The challenge of this WG on emissions is to improve the consistency of methodologies used by the regional authorities in the different mandatory submissions;

(b) The agency CELINE–IRCEL, created by the three regions (under a Coordination Agreement that is not limited to climate change) is also one of the representatives in the WG on emissions. It has responsibility to compile the national inventory in a cooperative effort with the regional agencies, to fill in the national CRF tables and to help prepare the NIR for Belgium. The ERT noticed that, where one region did not deliver its data, the CELINE–IRCEL does not have a mandate to force it to deliver, which can influence the results in the Belgian CFR tables. The ERT also noticed that in some cases data from one region only are reported in the summary tables without any indication of the extent of national coverage. This is particularly so in instances where the sources are not significant in the other regions;

(c) The national focal point, which is the representative of the Federal Government on the WG on emissions, has the same level of authority as the regional representatives.

27. The ERT recognizes the full cooperation it received from the different entities during the review. Notwithstanding, the ERT notes that the system currently in place cannot ensure a consistent and transparently harmonized national GHG inventory. For example, the 2003 submission did not reflect the valuable work done at regional level where detailed and reliable estimates are available. During the visit the same question generally received three different answers from the regional representatives, with a rather confusing outcome. The ERT therefore welcomes the new Cooperation Agreement between the regions that is due to enter into force next year in order to establish a national system that will ensure correct reporting in accordance with the UNFCCC reporting guidelines and the IPCC Guidelines. The Belgian representatives are confident that the permanent secretariat foreseen by the new agreement will ensure that the reports of the three regions are harmonized.

Record keeping and archiving

28. The ERT enquired about the way information is collected and archived. The answers from the three regions illustrated a generally satisfactory framework of standard procedures for data collection and storage. The energy balance in one of the three regions is certified under International Standard (ISO 9001). However, the relevant institutions for record keeping and archiving are located in different cities, so that the ERT was not able to visit them and check the information received.

Follow-up to previous reviews

29. The sector-specific recalculations carried out and the methodological changes due to improvements achieved since the last submission are presented in the respective sections of this report. The following general issues have been addressed since the last submission:

(a) The institutional arrangements for the preparation of the national inventory have been modified;

(b) A national audit report to identify the gaps to be filled to improve the national inventory has been completed and adopted;

(c) The sectoral background data tables have been filled in only in such cases where the regional methodologies were close enough to allow a harmonized presentation.

D. Areas for further improvement

Identified by the Party

30. The Party has identified areas for improvement in its NIR:

- (a) Additional human resources are needed for the compilation of a consistent and transparent national inventory;
- (b) A method for consolidated planning for the preparation of the annual inventory needs to be established;
- (c) A QA/QC procedure for the national inventory needs to be developed;
- (d) A working group was established in order to improve the consistency of the energy balances available at different levels (regional, national, Eurostat). The National Climate Commission will deal with this subject in the future. This work should result in more accurate calculation of the reference approach.

Identified by the ERT

31. The ERT identifies the following cross-cutting issues for improvement:

- (a) Improve transparency by including adequate methodological descriptions, including information on AD and EFs in the NIR as well as references to statistical data;
- (b) Improve transparency and consistency by:
 - (i) Filling in all the CRF tables as well as all cells in the tables;
 - (ii) Providing a full time series of CRF tables for the base year and for the period 1991–1999;
- (c) Continue the work on harmonized reporting efforts between the three regions to ensure a complete submission;
- (d) Develop and implement QA/QC procedures in line with the IPCC good practice guidance.

32. The ERT took note of the importance of providing the additional resources needed for preparing the inventory, which was emphasized by the inventory experts during the visit. Belgium is encouraged to consider this matter further.

33. Recommended improvements relating to specific source categories are presented in the relevant sector sections of this report.

II. ENERGY

A. Sector overview

34. The Energy sector contributed 79 per cent of Belgium's overall GHG emissions in 2001. These emissions come mainly from combustion (99.3 per cent), and CO₂ represents 97.1 per cent of the total Energy sector emissions. N₂O emissions (1.9 per cent) and CH₄ emissions (0.3 per cent) from fuel combustion, and fugitive emissions (0.7 per cent) are not significant.

35. The key source analysis performed by the Party shows that the Energy sector is important for both the level and the trend assessment. The level assessment identified 11 key sources, contributing 75.5 per cent of total emissions, and for the trend assessment 14 key sources were identified, contributing 74.2 per cent.

Completeness

36. The CRF does not include estimates of all gases and sources of emissions from the Energy sector to the adequate level of disaggregation, recommended by the IPCC Guidelines. Some tables from the Energy sector are not completely filled in. In table 1.A(a), emissions of CH₄ and N₂O from some manufacturing industries and construction subsectors are missing. In tables 1.B.1 and 1.B.2 data on fugitive emissions are also missing. In table 1.C background data for international bunkers and multilateral operations are also missing. During the in-country review it was verified that the Party has information with which to fill in these tables. The ERT welcomes the Party's intention to present the missing information in the next submission.

Transparency

37. Regional AD, EFs and methodologies are usually well described in the NIR. However, the criteria used to aggregate regional AD, EFs and methodologies are not transparent, and the ERT suspects that sometimes they may not be consistent.

38. The use of notation keys does not conform to the UNFCCC reporting guidelines. The information reported is partial in the sense that it is not reported from all regions, and the criteria by which it is selected are not clear.

39. By comparison with previous submissions, the transparency of the report has been enhanced and the ERT encourages Belgium to continue this effort.

40. During the in-country review supplementary documentation was made available to the ERT, including regional energy balances and detailed transport statistics. Some of this information was not available at the time when the national inventory was compiled owing to statistical data coming in late. The ERT encourages Belgium to improve the timeliness of its compilation and distribution of information within different regional and national institutions in order to improve the completeness and transparency of the inventory.

Recalculations and time-series consistency

41. The trend in manufacturing industries and construction N₂O emissions presents an important decrease between 1995 and 1996 (66 per cent). This is the result of a CORINAIR EF being used in the Walloon region until 1995 and an IPCC EF from 1996 onwards. This will be corrected in the next submission.

42. In manufacturing industries and construction, CH₄ emissions show an important increase between 1999 and 2000 (70 per cent). In transport, CH₄ emissions show an important increase between 1997 and 1998 (33 per cent).

43. During the in-country visit some of the reasons for the unexpected trends were identified. Some of them are explained by the use of different methodologies for different years and regions, and others by lack of data for some years. The ERT welcomes Belgium's intention to conduct a careful check of the recalculations and the time series to ensure their consistency.

Verification and quality assurance/quality control

44. No specific QA/QC procedures were reported for the compilation of Energy sector emissions. The regional energy balances have a QA/QC procedure but it does not cover the calculation and compilation of emissions in the national inventory.

B. Reference and sectoral approaches

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

45. The reference approach has been provided for only two years, 2000 and 2001.
46. The reference approach is based in the national energy balance, which covers only the supply side. The sectoral approach is based on regional energy balances, which cover the demand side and are not completely consistent with the national energy balance. The Belgian authorities have found inconsistencies between the national and regional balances and conducted studies to identify and minimize them. The ERT encourages Belgium to continue its work to minimize the differences between balances and make them completely consistent.

International bunker fuels

47. No sectoral background data for international bunkers were provided. During the in-country review it was explained that the Party did not have time to complete table 1.C of the CRF for the year 2001.
48. CH₄ and N₂O emissions from international bunkers are reported as “included elsewhere” (“IE”) in table 1. Belgium explained that Flanders calculates N₂O and CH₄ emissions without separating national and international fuel consumption and allocates them to domestic emissions, while the Walloon region calculates international bunker emissions separately from domestic emissions. As it is therefore not possible to establish a total for Belgium, they reported those emissions as “IE”. Following the IPCC methodology, non-CO₂ gases could have been estimated by using AD and default EFs, as Belgium did for CO₂ emissions. The ERT encourages Belgium to complete the international bunker background data and estimate international CH₄ and N₂O emissions separately from the domestic.

Feedstocks and non-energy use of fuels

49. For the reference approach Belgium uses the national energy balance and the fraction of carbon stored recommended by the IPCC, which is in line with the UNFCCC reporting guidelines. For the sectoral approach specific company information are used. The difference between the two estimations is well known by the Belgian experts and is explained as due to differences in the regional (Flanders) and national energy balances and the fraction of carbon stored. Nevertheless the Flanders region is participating in the "International network on non-energy use and CO₂ emissions (NEU-CO₂)" to establish local estimates for carbon stored. Belgian officials informed the ERT that studies will be conducted to obtain fractions of carbon stored that are more appropriate to the national circumstances.

C. Key sources

Manufacturing industries and construction – N₂O

50. N₂O emissions from subsectors of manufacturing industries and construction are reported as “IE” in table 1.A(a). Only total emissions for manufacturing industries and construction are reported, which is not consistent with the IPCC good practice guidance and is a limitation on the analysis of the sector. In its 2003 submission Belgium included CO₂ emissions by subsector for manufacturing industries and construction and the ERT encourages Belgium to include N₂O emissions as well in its next submission.

Road transportation – CO₂ and N₂O

51. The Belgian officials informed the ERT during the review that gasoline consumption for road transportation should be 107,464.43 TJ instead of 113,634.72, while diesel should be 213,154.09 TJ instead of 218,154.77 TJ. There is no consumption of other fuels. Total transport consumption is overestimated by 7 per cent, and the implied emission factors (IEFs) are wrong as a consequence; however, this has no implications for the emissions estimates.

52. Belgium estimates CO₂ and N₂O emissions from road transportation by using different models and methodologies (COPERT II, COPERT III, TEMAT and the IPCC Guidelines) depending on the gas and the region. The ERT welcomes Belgium's intention to unify the approach to estimating road transport emissions using only the COPERT III model in the three regions.

53. The models referred to in the previous paragraph estimate emissions according to fuel combustion in vehicles that travel within the country's territory and not the emissions that correspond to fuel sales in the country. In other words, "tank tourism", freight vehicles travelling across the country without refuelling and other variables of road transport are taken into account. The ERT encourages Belgium to adjust the model to be used in the future to be in line with the IPCC good practice guidance and to estimate emissions that correspond to the fuel sold in the national territory.

Fugitive emissions: oil and natural gas – CH₄

54. According to the UNFCCC secretariat key source analysis, CH₄ fugitive emissions from oil and gas operations is a key source, contributing 0.6 per cent to the overall emissions for the year 2001, but it is not reported in table 1.B.2 and no notation keys are used to explain this.

55. CH₄ emissions from venting and flaring were not reported.

D. Non-key sources

Manufacturing industries and construction – CH₄ and N₂O

56. CH₄ emissions from subsectors of manufacturing industries and construction are reported as "IE" in table 1.A(a). Only total emissions for the manufacturing industries and construction sector are reported, which is not consistent with the IPCC good practice guidance and is a limitation on the analysis of the sector. In its 2003 submission Belgium included CO₂ emissions by subsector for manufacturing industries and construction and the ERT encourages Belgium to include CH₄ emissions as well in its next submission.

57. Non-CO₂ emissions from biomass are reported in manufacturing industries and construction at sectoral level but not at subsectoral level. The ERT encourages Belgium to complete table 1.A(a) with estimates for non-CO₂ emissions from biomass for all subsectors.

Civil aviation – CH₄ and N₂O

58. Emissions corresponding to aviation international bunkers in the Flanders region have been allocated in the national aviation total.

Road transportation – CH₄

59. Belgium estimates CH₄ emissions from road transportation by using different models and methodologies (COPERT II, COPERT III, TEMAT and the IPCC Guidelines) depending on the gas and the region. The ERT welcomes Belgium's intention to unify the approach to estimate road transport emissions using only the COPERT III model in the three regions.

Other transportation – CH₄ and N₂O

60. CH₄ and N₂O emissions from combustion in other transportation (pipelines) were not reported. Belgium indicates that this will be corrected in the next submission.

Fugitive emissions: oil, natural gas and other sources – CO₂ and N₂O

61. CO₂ fugitive emissions from oil operations and from solid fuel transformation are not estimated.

62. N₂O emissions from venting and flaring were not reported.

E. Areas for further improvement

Identified by the Party

63. Most issues in the Energy sector were already identified by the Party in the NIR and further explained during the visit. These issues are related in a certain way to the particular institutional arrangements that are in place in Belgium.
64. The Party recognizes the needed to improve completeness and transparency by filling in the tables of sectoral background data for Energy.
65. Inconsistencies within the different regional and national energy balances have been identified by the Party, which has established a working group to propose improvements in this area.
66. Some projects are being developed at regional level to deal with problems identified by the Party. One of the projects is related to the estimation of country-specific fractions of carbon stored from non-energy uses of fuels. Another is related to improvements in the estimation of CH₄ fugitive emissions from gas distribution. Both projects are being developed in the Flanders region. In the Walloon region, a revision of the inventory time series for 1990–1999 is to be undertaken in order to make the time series consistent.
67. The Party is making efforts to correct the allocation of some emission sources (e.g., venting and flaring in refineries).
68. The Party is making efforts to improve the completeness of the inventory by including all the missing estimates of emissions.

Identified by the ERT

69. The ERT encourages the Party to make efforts to calibrate the road transportation models to estimate the fuel combustion emissions that correspond to the fuel sold in the country.
70. The ERT recommends that the Party make the necessary efforts to ensure the timely availability of consistent energy balances as part of the national system.
71. The ERT recommends that the Party define criteria for dealing with incomplete data for the country when one region has no information and others have information. These efforts should also address improvements to make the inventory more complete by including the missing estimates of emissions. The criteria should be in accordance with the correct use of notation keys.

III. INDUSTRIAL PROCESSES AND SOLVENT USE

A. Sector overview

72. Industrial Processes accounted for 10 per cent of total Belgian GHG emissions in 2001 and is the fastest-growing sector (35 per cent from 1990, excluding fluorinated gases as data for these are available only from 1995 onwards). The increase is mainly due to CO₂ from mineral products and CO₂ and N₂O from the chemical industry.

Completeness

73. The CRF includes sectoral estimates of most sources of emissions from the Industrial Processes sector and includes all gases, except PFCs. CO₂ emissions from limestone and dolomite use, soda ash production and use, asphalt roofing, road paving with asphalt and food and drink were reported as “0.00”. The Industrial Processes chapter in the NIR has been organized according to the regions of Belgium, making it difficult to judge whether all sectors had been covered for all regions. The ERT recommends that the NIR be structured according to the IPCC sectors in future submissions.

Transparency

74. A detailed review of this sector and a reconstruction of the inventory were not possible, as the sectoral background data tables have not been filled in for Industrial Processes. The information provided in the NIR is limited but the transparency of the report has been enhanced considerably by giving methodological information and regional sectoral background tables in annex 2 of the NIR. Additional information was provided during the visit. The ERT recommends that Belgium include this information in the NIR and CRF together with nationally aggregated sectoral background data tables in future submissions.

Methodologies, emission factors and activity data

75. In general, as far as can be judged, the methodologies used are in line with the IPCC good practice guidance. However, the EFs and AD used are sometimes inconsistent across the regions of the country and the corresponding CRF table summary 3 (Methods and EFs used) has not been filled in. Future work foreseen in the NIR and mentioned during the in-country review includes steps to overcome the regional differences, and it is recommended that the Party complete these CRF tables next year and include additional background information in the NIR.

76. The NIR does not give an overview of institutional arrangements for AD collection, that is, whether plant-specific data are used or national/regional statistics. The ERT recommends that Belgium include an overview of the AD used in the next NIR.

Recalculations and time-series consistency

77. Recalculations and planned improvements are given in the NIR. HFC and SF₆ emissions are reported from 1995 to 2001, so that a full GHG trend assessment is not possible before 1995. However, information provided during the visit suggests very low emissions for these years. The ERT recommends that Belgium include more information on this in its future NIRs.

78. Some data in the Industrial Processes sector were not updated for year 2001 because some statistical data came in late. Instead data for the year 2000 are reported.

Uncertainties

79. There is no separate chapter dedicated to the uncertainties of emission estimates for Industrial Processes in the NIR.

Verification and quality assurance/quality control

80. A national QA/QC system for Industrial Processes is not yet in place. However, there are regional QA/QC procedures in place and the regional authorities check the plant-specific data. It is recommended that the QA/QC procedures be extended to the national level and a description included in the NIR.

B. Key sources

Cement production – CO₂

81. AD and EFs are given in the NIR. This is a significant improvement on reports from previous years. The IPCC good practice guidance is followed by using plant-specific data. The IEF is high compared with those of other countries. The ERT recommends that the Party include detailed information on the methods used by plants to estimate their emissions. Belgium explained during the review that the IEF reported refers to clinker production and not cement production as stated in the NIR.

Lime production – CO₂

82. AD and EFs are given in the NIR. This is a significant improvement on reports from previous years. The IPCC good practice guidance is followed by using plant-specific data. This leads to a

considerable range of EFs being used for estimating emissions from lime production for the latest inventory year. The Party explained that this is due to the fact that different types of limes are produced. The lower value of the reported EF range is lower and the higher value is higher than the IPCC default values. The ERT recommends that Belgium include in the NIR separate information on the EFs for dolomitic lime and high-calcium lime for the whole time series.

Ammonia production – CO₂

83. As outlined in the NIR, CO₂ emissions increased by 100.7 per cent between 1990 and 2001 (1,561.51 Gg in 2001), mainly driven by an increase in ammonia production (94.1 per cent). It is recommended that Belgium give more background on ammonia production in next year's NIR.

84. Emission factors and AD cover only part of the country and two different methods are used in Belgium, one of which is consistent with the IPCC good practice guidance. The ERT recommends that the Party revise these estimates using methods consistent with the IPCC good practice guidance.

Nitric acid production – N₂O

85. Emissions, AD and IEFs are not reported for the year 1997. The Party explained during the review that this is a mistake that will be corrected in the next submission. The ERT encourages this.

Other chemical industry – CO₂

86. CO₂ emissions for the subcategory other are reported only for the years 1995–2001. The trend of CO₂ emissions fluctuates and emissions increased by 1,342 per cent during this period (to 51.21 Gg in 2001). The following inter-annual changes are notable: 1996–1997 (an increase by 519 per cent) and 1999–2000 (an increase by 67.4 per cent). The Party explained during the review that this category includes emissions from production of maleic anhydride and the flaring in the chemical industry. As regards flaring, this is not in line with the IPCC Guidelines and the Belgian expert explained that in future submissions the emissions from flaring will be reported either in the Energy sector or in the Waste sector, following the IPCC Guidelines. The ERT welcomes the proposed reallocation of emissions from flaring.

87. CO₂ emissions for the subcategory other are not reported before 1995, although calculations are in the course of preparation. The ERT recommends that Belgium include calculations before 1995 in next year's CRF and NIR and revise the time series accordingly.

Iron and steel production – CO₂

88. AD and EFs are given in the NIR, and this is a significant improvement on reports from previous years. The IPCC good practice guidance is followed by using plant-specific data. Discussions with industry are under way to improve the methodology in relation to the split between energy and process-related emissions, as well as on the EFs used. The ERT encourages Belgium to continue this work and to include these findings in future NIRs.

Other – CO₂

89. CO₂ emissions from other increased by 49 per cent between 1990 and 2001. The trend fluctuates. The following inter-annual changes are notable: increases of 198 per cent over the period 1990–1991, of 22 per cent between 1994 and 1995, and of 44 per cent over 1996–1997; and decreases of 51 per cent over 1993–1994 and 39 per cent over 1997–1998. The Party explained that all emissions from the use of feedstocks (except feedstocks used for ammonia production which are allocated in 2.B.1 and the feedstocks included under 2.B.5) are included here, that is, emissions from four steamcrackers for naphtha. Fluctuations are production-related and discussions are still going on with industry to revise the estimates. A new project is under way to revise the methodology for non-energy use, and the results will be available by the end of this year. The ERT encourages further work on this and recommends that the results be included in future NIRs.

Consumption of halocarbons and SF₆

90. The methodology used is described briefly in the NIR but not fully transparent. PFC emissions are not estimated as they are considered to be very small. The Party explained during the visit that additional information on sources covered and EFs used is available in a background study. The Party explained that more of this methodological information will be included in next year's NIR and efforts will also be made to include an estimate of PFC emissions next year.

C. Non-key sources

Limestone and dolomite use, road paving with asphalt – CO₂

91. Emissions from these sources were not estimated but reported as "0.00". No information is provided in the CRF or the NIR. The ERT recommends that Belgium include these sources in next year's inventory report (either as emissions or by using notation keys).

Other mineral products – CO₂

92. The trend of CO₂ emissions from decarbonizing in glass production fluctuates. The following inter-annual changes are notable: a decrease by 27 per cent over 1990–1991; an increase of 34 per cent over 1991–1992; a decrease of 38 per cent over 1996–1997; and an increase of 84 per cent over 1999–2000. The Party explained during the visit that these fluctuations are production-related but that the EFs given in the NIR are still provisional and under discussion with industry. The ERT recommends that the Party revise these sources in next year's inventory submission.

Ferroalloys production, aluminium production and other metal production – CO₂

93. In the CRF the notation key "NA" (not applicable) is used for ferroalloys, aluminium and other metal production. The Party explained that Belgium has no aluminium production; most important emissions in this sector originate from the source category iron and steel. However, it is still not clear why "NA" has been applied for ferroalloys. The IPCC Guidelines have a default EF for ferroalloys production. The ERT recommends that Belgium include more information on the reasons for using "NA" in this sector in the future submissions. For the source categories that are not occurring (in this case aluminium production) the notation key "NO" should be used.

Food and drink – CO₂

94. CO₂ emissions from food and drink production were reported as "0.00". The ERT recommends that the Party use the notation key "NE" (not estimated) next year or include results from an inventory of the biogenic and non-biogenic origin of emissions in this source category.

Solvent and other product use – CO₂

95. Belgium only reports non-methane volatile organic compounds (NMVOC) emissions from Solvent and Other Product Use. CO₂ and N₂O emissions are reported as "NE". N₂O emissions from anaesthesia are only reported for the Walloon region. Belgium explained that it has not yet estimated CO₂ emissions from this sector as no methodology is provided in the IPCC Guidelines or the IPCC good practice guidance. During the visit the Party stated that it would make efforts to estimate CO₂ emissions from solvents by analysing methods used by other countries. Belgium also stated that it was investigating the AD for N₂O emissions from anaesthesia for Flanders and the Brussels–Capital regions (number of hospital beds). The ERT encourages Belgium to look into these matters.

D. Areas for further improvement

Identified by the Party

96. Work has started to identify areas where the completeness and consistency of the inventory at regional level should be improved. The methodology for ammonia production will be revised by using the same methodology for all regions.

97. The methodology used for estimating non-energy use will be revised by incorporating the results of a new study, to be completed by the end of the year. This includes a revision of categories 2.G and 2.B.5. The allocation of flaring will be changed to categories 1 and 6. Also the emissions originated from the production of caprolactam will be included in the next submission.

98. Discussions on methodology (in particular the EFs used) with industry are ongoing; the results will be included in future submissions. This concerns mainly the iron and steel and glass industries.

Identified by the ERT

99. The ERT welcomes the above-mentioned plans for the future by the Party and further encourages the Party to:

(a) Report emissions or use notation keys instead of reporting "0.00", and use the notation keys in the correct manner;

(b) Continue its work on harmonizing the reporting across the regions in order to have a complete inventory covering all sources and all regions.

IV. AGRICULTURE

A. Sector overview

100. Belgium has provided inventory data for the years 1990–2001 showing a significant improvement compared to the previous submissions. CH₄ emissions from enteric fermentation, manure management and agricultural soils, as well as N₂O from manure management and agricultural soils, were reported. Some source categories, such as 4.C rice cultivation, 4.E savannah burning and 4.F field burning of agricultural residues, do not occur in Belgium. According to the NIR, agriculture in the Brussels–Capital region is negligible.

101. Information provided in the NIR and the CRF, and during the visit, was based on data from the regions as well as national statistics, and was fairly disaggregated. According to the NIR the structure of the Agriculture sector is very different between the regions. Consequently, different methods have been developed and used to make the GHG inventory estimates. The IPCC methodology was used for N₂O from agricultural soils, and country-specific methodologies for CH₄ from enteric fermentation and manure management, but they were not harmonized yet to obtain a national figure. The Agriculture sector accounted for 8.1 per cent of total emissions and showed a decrease of 4.4 per cent between 1990 and 2001. In the year 2001, Agriculture was the major source of national CH₄ (66.7 per cent) and N₂O (43.5 per cent) emissions.

102. The analysis of key sources reported in the NIR for the Agriculture sector was conducted for the level and trend assessments and has a level of disaggregation that differs from that recommended by the IPCC good practice guidance. In some cases it is more disaggregated (e.g., CH₄ from enteric fermentation), but in others it is more aggregated (e.g., N₂O emissions from agricultural soils).

Completeness

103. The CRF includes estimates of most gases and sources from the sector. Some sectoral background data tables are not filled in (4.B(b), 4.D, 4.E and 4.F) and no notation keys are used. Sectoral background tables 4.A and 4.B(b) are provided only for the years 2000 and 2001. In the

category manure management, CH₄ emissions from cattle are not reported at disaggregated level. N₂O emissions from manure management are not reported at disaggregated level. CH₄ and N₂O emissions from agricultural soils are not reported at disaggregated level.

104. The ERT encourages Belgium to complete all the CRF tables and use notation keys as necessary. The NIR and the CRF should refer to the country in an integrated way with a complete description of and more detailed information about AD, EFs and methodologies. The ERT recommends that Belgium make the necessary efforts to report disaggregated emissions in source subcategories.

Transparency

105. The information contained in the NIR and CRF tables submitted by Belgium did not always provide a complete discussion on methodological issues, references and background data. The ERT recommends that Belgium improve the discussion on assumptions and methodologies used for the inventory in order to facilitate replication and assessment, and include more background information in the NIR.

106. In the CRF the cattle subcategory was disaggregated for enteric fermentation but not for manure management. Table summary 3 related to methods and EFs used was not filled in, while this information is available in the NIR for each region. The ERT encourages Belgium to improve the transparency of its reporting of the emissions inventory for the Agriculture sector.

Recalculations and time-series consistency

107. Recalculations have been performed following changes in methodologies and improvements in AD, but not for the whole time series. Compared to the previous submission the emissions of CH₄ from manure management have been recalculated from 1996 onwards, taking into account the real amounts of manure processed. Recalculations performed regionally did not cover the same time series in the Flemish and Walloon regions for CH₄ and N₂O. Little information was available in the NIR about the years for which recalculation has been done.

108. The methodology for the calculation of the emissions of N₂O from agricultural soils was optimized for this submission by using the results of a study set up by the University of Ghent and updated figures on the use of fertilizers from 1990 onwards.

109. CH₄ emissions in the Walloon region were grouped under enteric fermentation in the previous submission. The emissions are now allocated to each category (enteric fermentation, manure management and agricultural soils). For N₂O, the EFs for manure management have been revised and replaced by default IPCC EFs. This modifies substantially the figures for N₂O emissions from manure management in the Walloon region and Belgium as a whole. The ERT recommends that Belgium make efforts to apply recalculations to the whole time series and improve consistency between regions.

Uncertainties

110. No quantitative uncertainty analysis was performed and no qualitative assessment was reported in table 7 of the CRF. Some sector-specific information is available with methods developed by experts in the regions. However, these uncertainty analyses were not included in the NIR. The ERT encourages Belgium to implement fully an uncertainties analysis at national level.

Verification and quality assurance/quality control

111. Verification is performed at regional level and QA/QC procedures are available at this level. There is no indication as to whether a national self-verification process has been performed. The ERT recommends that Belgium use the verification and QA/QC procedures available at regional level more efficiently and focus efforts on improvement of its data on the key sources.

B. Key sources

Enteric fermentation – CH₄

112. The IEFs for sheep (5.6 kg/head/year) and swine (0.72 kg/head/year) are too low compared to the IPCC default values, and are among the lowest reported by the Parties. The IEFs for goats (9.32 kg/head/year) and horses (18.21 kg/head/year) are higher than the IPCC default value and among the highest of the reporting Parties.

113. Belgium has provided responses to the issues raised in the previous review stages, as well as providing additional information during the ERT's visit. For CH₄, EFs are adapted from studies conducted by the Institut National de la Recherche Agronomique (INRA) in France, where agricultural practices are comparable to those in Wallonia. For the Flemish region, the EFs came from the 1995 IPCC Guidelines and have not yet been updated; Belgium indicates that this will be updated in the next submission. For swine, the EFs will be further analysed and may be corrected in the future if needed. The ERT encourages Belgium to update and harmonize the EFs used in the estimations.

Manure management – CH₄

114. The CH₄ emissions from manure management from cattle were estimated without disaggregation in dairy and non-dairy cattle.

115. The IEFs for sheep (1.39 kg/head/year), goats (1.14 kg/head/year), and horses (26.29 kg/head/year) are higher than IPCC default values and among the highest of the reporting Parties. The Party explained that emissions from manure management for the Flemish region have been calculated on the basis of a country-specific method developed by the Flemish Institute for Technological Research. This method takes into account the average weight of the animals (using an integrator), the manure production and the methane emission potential. The EFs in the Walloon region are close to the IPCC default values. The ERT encourages Belgium to revise and harmonize the EFs used in the estimations.

Agricultural soils – N₂O

116. Emissions from this source are not reported at disaggregated level. The ERT recommends that Belgium make the necessary efforts to report disaggregated emissions in source subcategories and follow the recommendations of the IPCC good practice guidance in assessing and estimating this key source.

117. N₂O emissions from sludge spreading were estimated only for one region. A possible double counting with emissions from the Waste sector was identified and the Party should consider addressing this in the next submission.

C. Non-key sources

Agricultural soils – CH₄

118. The IEFs for emissions from this source are not reported at disaggregated level. Different methods were used to estimate the emissions in the two reporting regions. In both regions, this source is very small compared to enteric fermentation and manure management. The ERT recommends that Belgium make the necessary efforts to report disaggregated emissions in source subcategories and to harmonize the methodologies used in estimating emissions.

D. Areas for further improvement

Identified by the Party

119. The Party recognized that some sectoral background data tables were not filled in and that only regional tables were included in the annexes of the 2003 NIR, and is planning to produce these tables in the next submission.

120. Some recalculations applied in 2000 and 2001 still have to be applied to the entire time series, and this work is ongoing.

121. CO₂ emissions from agricultural soils were previously not estimated. A study to estimate these emissions is on going at national level, but will not be finalized before 2005.

122. Regional studies of ways to improve inventory quality are continuing for both the Flemish and the Walloon regions. Improvements are also foreseen related to the information and AD from N₂O surveys from farmers, nitrogen deposition studies from universities and thematic surveys of husbandry.

Identified by the ERT

123. The ERT recommends that Belgium make efforts to put in place an institutional arrangement that would facilitate internal data exchange, inter-regional comparison and review between regions in order to enable experts to reach agreement on AD, EFs and methodologies.

124. The ERT recommends that Belgium make efforts to complete all the CRF tables, fill in the documentation boxes and give more detailed methodological descriptions in the NIR.

125. The ERT recommends that Belgium make the necessary efforts to harmonize methods and EFs for the Agriculture sector.

V. LAND-USE CHANGE AND FORESTRY

A. Sector overview

126. Forests in Belgium cover an area of 682 kha, which corresponds to 22.3 per cent of the whole country. Of this 19.9 per cent belongs to the Flemish, 0.3 per cent to the Brussels–Capital and 79.9 per cent to the Walloon region. In the Walloon region forests constitute a net sink of 1,814 Gg CO₂ in the Belgian greenhouse gas inventory, offsetting about 1 per cent of total GHG emissions in 2001. There is a slight increase in the net sink between 1990 and 2001.

Completeness

127. Belgium reported on all subcategories in table 5 of the CRF for 2001. Data were provided for sectors 5.A and 5.B. In sectors 5.C and 5.D notation keys were used.

128. Only table 5.A, changes in forest and other woody biomass stocks, is used to provide sectoral background data. The NIR specifies that the estimates cover sources and sinks of the Walloon region only. It also indicates that emissions and removals of Flemish forests are almost in balance. The net sink of the Walloon forests is therefore equivalent to the net sink for the whole of Belgium.

129. No national sectoral background data are provided in tables 5.B to 5.D. The NIR indicates no significant land use change in the Walloon region. For the Flemish region, area data and EFs for CH₄ and N₂O emissions are provided in the NIR. During the in-country visit, these turned out to be wrongly reported. They do not represent emissions from forest conversion but from forests. This will be adjusted for the next inventory report.

130. The review team was informed that there is no significant land use change in Wallonia, whereas in Flanders the forested area decreased by 6,107 ha (4 per cent) between 1990 and 2000.

Transparency

131. In table 5.A, no information is provided to the effect that figures only cover the forests in Wallonia. Table 7 indicates for tables 5.A to 5.D “partly”, whereas “NA”, “NO” or even “IE” might be appropriate.

132. A short description of the Flemish forest inventory and its results, as well as publications on the methodology of the Walloon forest inventory, were provided to the review team. The results of the

Flemish forest inventory were published in 2001. The Walloon forest inventory started in 1994. The data set should be completed in 2004. The inventory covers the whole forest area each year, with a measurement on 10 per cent of the plots. In 1999, 50 per cent of the plots were measured (1 plot per 62.5 ha) and the increasing sampling density narrows the mesh from year to year.

133. Country-specific expansion and conversion factors for the calculation of changes in forest and other woody biomass stock in the Walloon region are provided in the NIR. Data source and references were not fully documented in the NIR, but additional information was provided during the review.

134. Estimates of yearly growth increment and of harvested wood in Walloon forests are calculated from forest inventory data. For this purpose, permanently 10 per cent of the Walloon forests are assessed each year.

Recalculations and time-series consistency

135. The NIR indicates that a recalculation was made. Conversion factors were slightly revised and are now species-specific. The annual growth increment was adapted to the last results of the forest inventory. The effect of the recalculation is shown for the year 2000 only but is lower than 0.1 per cent.

136. The review team was informed that, with the help of growth measurements in the forest, the inventory of harvested wood is no longer based on expert judgement and is calculated annually.

Uncertainties

137. Uncertainty information was provided for the Walloon forest inventory data, which lies within a range of 5.1 per cent. It will decrease with the increasing number of sampling points. No other information on uncertainty was available.

138. Uncertainties associated with inventory measurements, expansion factors and other coefficients should be combined on the category level. The uncertainty analysis should provide insight into how the different databases and factors contribute to uncertainty of the LUCF sector.

Verification and quality assurance/quality control

139. A QA/QC system has been established for the assessment and evaluation of the forest inventory. A QA/QC plan and a system for documentation and archiving the data on the federal level are not yet established.

B. Sink and source categories

Changes in forest and other woody biomass stocks – CO₂

140. Sources and sinks caused by changes in forest and other woody biomass stocks (table 5.A) are estimated from the forest inventory. No reliable statistics on forest harvesting are available in Belgium. Removed biomass is calculated from growth measurement and net growth increment of the forest. Yearly growth is assessed by tree ring measurement.

CO₂ emissions and removals from soils – CO₂

141. CO₂ emissions and removals from soils (table 5.D) are not estimated. Data are not yet available but are in preparation. Information on changes in the land-use management systems will be necessary to provide data according to the IPCC Guidelines.

Forest and grassland conversion – CH₄ and N₂O

142. CH₄ and N₂O emissions from forest and grassland conversion are estimated in table 5 using default EFs, which are indicated in the NIR. The sectoral background table 5.B is not provided but the area for which the factors are applied is indicated in the NIR. New EFs have been established for Flanders. Forest conversion does not occur in the Walloon region.

143. During the review it emerged that those estimates do not represent forest and grassland conversion. They indicate emissions of forested area in Flanders. Those data should be provided under category 5.E other.

C. Areas for further improvement

Identified by the Party

144. The ERT notes that Belgium is currently reassessing the Walloon forests and has already completed the Flemish forest inventory. These inventory data will give a sound database for estimating the change in woody biomass stocks. The new database is expected to be fully applied in the 2005 or 2006 submission and will also provide a basis for recalculation of the whole series.

145. In combination with the forest inventory, a survey of forest soils has been carried out. For agricultural soils different databases (e.g., Pedological service, University of Gembloux) are used to produce a soil carbon map of Belgium. It is expected that the soil database will provide data for estimations of emissions in 5.D CO₂ emissions and removals from soils in the 2006 submission.

146. The ERT also notes and acknowledges the Party's plans to investigate further the assessment of below-ground biomass and the improvement of conversion and expansion factors.

147. The ERT also notes that Belgium intends to further develop its uncertainty assessment for forest data using, inter alia, the Monte Carlo simulation.

148. The ERT further notes that new legislation has introduced strict rules on the conversion of forests since 2001 and that the area of converted forests since 1990 was assessed by aerial photography.

Identified by the ERT

149. The ERT encourages Belgium to provide all the existing information for the sectoral background tables 5.A to 5.D and to use notation keys, as well as to give specific explanations in the documentation box as appropriate.

150. The ERT was informed that for future submissions figures for changes in forest and other woody biomass stocks could be provided for both Wallonia and Flanders. The ERT appreciates the harmonizing of the methodologies used for the forest inventories of the two regions. However, the forest definitions used by the two regions are slightly different. The ERT would like to draw attention to the fact that in the future it would be good practice to have one common definition of forest.

151. Having no reliable statistics on forest harvesting, Belgium will need to continue a permanent forest inventory for the whole country like that established for Wallonia. Otherwise removed biomass from forests can only be estimated with a high degree of uncertainty.

VI. WASTE

A. Sector overview

152. The Waste sector (excluding LUCF) accounted for 2.8 per cent of national emissions in 2001. Emissions in the sector were 0.2 per cent lower in 2001 than in the base year 1990. The apparent stable trend is due to increasing organic waste recycling for compost production and methane recovery for flaring or use in energy generation plants, which reduce emissions, on the one hand, while on the other hand a substantial increase in incineration increases emissions. The major contributing source categories are CH₄ emissions from solid waste disposal on land (44.1 per cent) and CO₂ emissions from waste incineration (41.7 per cent). Both subcategories are identified as key sources.

Completeness

153. The CRF reports most sectoral gases and significant source categories in the Waste sector. CRF sectoral background tables 6.A, 6.B, and 6.C have not been completed for all source categories. The NIR provides some information at the regional level but the data are not aggregated at the national level.

Transparency

154. References on methodologies and some regional and/or country-specific EFs are provided in the NIR, but they are only briefly described. The lack of aggregated data for completion of the national sectoral background tables and other relevant CRF tables limits the information available for assessment of consistency with the UNFCCC reporting guidelines. The lack of information on the estimation methodologies for the aggregation of regional data reduces the transparency of the inventory.

Recalculations and time-series consistency

155. Recalculations have been done in some source categories but they are not documented in CRF table 8(b), and only some information is provided in the NIR, so that the rationale for the recalculations is not clearly explained. Differences in reporting biogenic emissions in the sector introduced large inter-annual changes and time-series inconsistencies. Belgium plans to harmonize the reporting in accordance with the IPCC Guidelines.

B. Key sourcesSolid waste disposal on land – CH₄

156. This source category contributed 1.2 per cent to total national emissions in 2001. Emissions from this source decreased by 37.5 per cent between 1990 and 2001 (to 61.44 Gg in 2001). Belgium explained that CH₄ recovery for flaring and utilization has increased under current waste management policy and legislation.

157. A country-specific methodology and EF based on the first order decay (FOD) model are used. The methodology is referenced but only briefly described in the NIR. However, additional information provided by the Belgian inventory experts indicates that the methodology is consistent with the IPCC good practice guidance. An adequate summary of the methodology should therefore be included in future submissions.

158. The ERT notes that one region reports biogenic CO₂ from solid waste disposal sites as part of national totals, while another considers it as biomass emissions in accordance with the IPCC Guidelines. Belgium should adopt the IPCC Guidelines and rationalize the reporting of CO₂ emissions for this sub-source.

159. The composition of waste sent to landfill sites is changing significantly as a result of the success of the national waste management plan, targeted at prevention, recycling (including composting), and the energy recovery systems used in order to minimize the ultimate amount of waste for disposal. The ratios of the emission parameters in the country-specific FOD model should therefore be modified periodically to improve accuracy.

160. CO₂ emissions from CH₄ recovery for utilization in energy generation are currently reported together with emissions from CH₄ flaring in this source category. Belgium plans to report the waste-to-energy emissions under the Energy sector in accordance with the IPCC good practice guidance based on the current data collection in annual surveys and CO₂ emissions from CH₄ flaring as a memo item.

161. The reporting of regional sectoral background tables for some source categories in the NIR is much improved compared with previous years. The ERT notes that a methodology for aggregating these regional data into national CRF sectoral data tables should be developed and documented in order to facilitate inventory preparation and reporting.

Waste incineration – CO₂

162. CO₂ emissions from waste incineration contributed 1.1 per cent to total national emissions in 2001. Emissions are estimated for incineration of domestic/municipal waste and hospital waste. Incineration of corpses is reported under 6.D other. Region-specific and plant-specific EFs that have been developed and default EFs based on EMEP/CORINAIR for the estimation of the respective sub-sources of non-biogenic CO₂ emissions are presented in the NIR. The methodologies are referenced but not adequately summarized in the NIR, and therefore lack transparency. CO₂ emissions for the period 1998–2001 have been recalculated by one region because more accurate data were obtained. This introduces time-series inconsistencies in the national emissions trends. The ERT recommends that the Party make efforts to improve consistency in the time series.

163. CO₂ emissions increased by 50.6 per cent from 1990 (1,084 Gg) to 2001 (1,632 Gg). Belgium attributed the trend to a considerable increase in waste incineration during the 1990s with increasing volumes of waste. This trend has been driven by a policy shift towards incineration as the preferred waste management option. Moreover, CO₂ emissions from biogenic/organic waste incineration and CH₄ flaring without energy recovery have been accounted for in the national totals by one region instead of being reported as memo items.

C. Non-key sourcesWaste-water handling – CH₄ and N₂O

164. Waste-water handling emissions are reported in regional sectoral table 6.B in the NIR by only one region and therefore may not represent national emissions. The region-specific methodology and EF for CH₄ emissions from septic tanks are summarized in the NIR. The methodology for municipal waste-water treatment plants is based on EMEP/CORINAIR methodology but not described in the NIR. The methodology and EF for N₂O emissions from human sewage are based on the IPCC default. The AD are obtained from protein consumption data from the Food and Agriculture Organization of the United Nations (FAO) and regional population data. The ERT notes that CH₄ and N₂O emissions from waste-water handling should be reported for the entire population at the national level.

165. CH₄ emissions from waste-water handling (domestic and commercial) increased by 383 per cent from 1990 to 2001 (1.28 Gg in 2001) with significant inter-annual changes, notably in 1990–1991 (an increase of 48.1 per cent) and 1999–2000 (an increase of 392 per cent). Belgium ascribed the trend to population increase and the fact that 1990 emissions are yet to be recalculated. CH₄ emissions from 6.B.1 industrial waste-water are not estimated because of lack of data. CH₄ emissions reported in subcategory 6.B.3 other cover emissions from sludge spreading. Belgium plans to verify whether there is any double counting of sludge spreading under the Agriculture sector.

166. CH₄ emissions decreased by 87.6 per cent between 1990 and 2001 (to 0.03 Gg in 2001), showing a large inter-annual change in 1999–2000 (a decrease by 89.7 per cent). Belgium explained that one region discontinued the estimating of CH₄ emissions from incineration in 2000–2001 without recalculating the entire time series. This will be harmonized in the next submission.

167. N₂O emissions increased by 43.5 per cent from 1990 to 2001 (to 0.33 Gg in 2001). Belgium explained that the change is due to the increased emissions from waste-water handling systems; also 1990 emissions of this source have not been recalculated.

168. Belgium reports in 6.D other CH₄ emissions from composting of organic waste and sludge application, as well as CO₂, CH₄ and N₂O emissions from the incineration of corpses. Belgium should implement plans to report biogenic emissions from corpse incineration as memo items.

D. Areas for further improvement**Identified by the Party**

169. A sectoral working group on waste inventories has been put in place to facilitate harmonization of regional approaches.

170. Belgium plans to fill in sectoral background tables 6.A, 6.B, 6.C and other relevant CRF tables, carry out recalculations for the entire time series where applicable, and allocate emissions from non-energy combustion of industrial waste to the Industrial sector. Biogenic CO₂ emissions from landfill gas combustion as well as biogenic emissions from waste incineration would also be reported as memo items and subtracted from national totals.

171. CH₄ recovered from solid waste disposal sites would be subtracted from the amount generated before applying the oxidation factor to avoid overestimation. New methane generation rate constants (k values) and other parameters that are waste composition-dependent (e.g., degradable organic carbon – DOC) would also be re-estimated for recent years to reflect increased recycling of organic waste for composting and its effect on the CH₄ generation potential of the sites.

Identified by the ERT

172. Belgium is encouraged to implement the new national system to develop and document procedures and methodologies as country inventory workbooks to facilitate harmonization of the regional sectoral data in order to follow the UNFCCC reporting guidelines. The documents when developed should also be reported in the NIR to improve transparency.

173. Belgium is encouraged to allocate emissions from waste-to-energy plants to the Energy sector in accordance with the IPCC good practice guidance and the IPCC Guidelines, and also implement QA/QC procedures.

174. The ERT encourages Belgium to provide relevant additional information in the CRF tables 6.A and 6.B. The latter will help to estimate the emissions with the IPCC default method for cross-comparison with other countries as part of Belgium's sectoral QA/QC in accordance with the IPCC good practice guidance. The sectoral QA/QC plan may be based on the quality management systems (QMS) of various institutions that develop methodologies.

ANNEX 1: MATERIALS USED DURING THE REVIEW

A. Support materials on the CD-ROM and the web page for the review

- 2003 GHG inventory submitted by Belgium, including the common reporting format (CRF) and the national inventory report (NIR) (available at http://ghg.unfccc.int/download/reviews2003/Belgium_Submission2003.ZIP)
- 2002 GHG inventory submitted by Belgium, including the common reporting format (CRF) and the national inventory report (NIR) (available at http://ghg.unfccc.int/download/reviews2003/Belgium_Submission2002.ZIP)
- UNFCCC secretariat. "2003 Status report of Belgium" (available at <http://unfccc.int/program/mis/ghg/statrep03/bel03.pdf>)
- UNFCCC secretariat. "Synthesis and assessment report of the greenhouse gas inventories submitted in 2003. Part I": FCCC/WEB/SAI/2003 (available at http://unfccc.int/program/mis/ghg/s_a2003.html) and Part II – the section on Belgium) (unpublished).
- Belgium's comments on the draft "Synthesis and assessment report of the greenhouse gas inventories submitted in 2003" (unpublished).
- UNFCCC secretariat. "Review findings for Belgium" (unpublished).
- UNFCCC secretariat. "Handbook for review of national GHG inventories". Draft 2003, (unpublished).
- UNFCCC secretariat. "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories." FCCC/CP/1999/7 (available at <http://www.unfccc.int/resource/docs/cop5/07.pdf>).
- UNFCCC secretariat. "Guidelines for the technical review of greenhouse gas inventories from Parties included in Annex I to the Convention." FCCC/CP/2002/8 (available at <http://unfccc.int/resource/docs/cop8/08.pdf>).
- UNFCCC secretariat. Database search tool – *Locator* (unpublished).
- IPCC. *IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories, 2000* (available at <http://www.ipcc-nggip.iges.or.jp/public/gp/gpgaum.htm>).
- IPCC/OECD/IEA. *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories, volumes 1–3, 1997* (available at <http://www.ipcc-nggip.iges.or.jp/public/gl/invs1.htm>).

B. Additional materials

- In Depth Review of Belgium first and second National Communications, FCCC/IDR.1/BEL, FCCC/IDR.2/BEL.
- Belgium Third National Communication (available at <http://unfccc.int/resource/natcom/nctable.html#a1>).
- Copies of presentations made during the in-country review.
- Energy Balance of Flanders region: K. Aernouts and K. Jaspers, *Energiebalans Vlaanderen 2001* (in Flemish).
- Energy Balance of the Brussels–Capital region: *Recueil de Statistiques Energetiques de la Region de Bruxelles-Capitale 1990–2001*.
- Transport, detailed statistics on mobility for Belgium: "Recensement de la circulation 2001" N° 20 edition provisoire.
- National institutional arrangements, copy of the Co-operation Agreement between the Federal state, the Flemish Region, the Walloon region and the Brussels–Capital region with regard to the drawing up and the implementation of a national Climate Plan as well as reporting in the framework of the UNFCCC, adopted from the Belgium Parliament 11 April 2003.
- Laitat E., Lebègue, C., Pissart, G. and Perrin D., 2003 " Séquestration du carbone par les forêts selon l'affectation des terres" Rapport de convention, Ministère Wallon de l'Agriculture et de la Ruralité, 2003.

- Lecomte, H et Rondeux, 1994 , J., L'inventaire forestier regional wallon : brève présentation méthodologique, Silva Belgica, 101, N°6.
- COSTE21 action "Contribution of Forests and Forestry to Mitigate Greenhouse Effects", Questionnaire about carbon stock inventory methods in the Forest / Wood products sectors, web site <http://www.bib.fsagx.ac.be/coste21/>.
- Perrin, D., Temmerman, M. and Laitat, E. (2000). "Calculation on the impacts of forestation, afforestation and reforestation on the C-sequestration potential in Belgian forests ecosystems." Biotechnology, Agronomy, Society & Environment 4(4): 259-262.
- Belgium waste and agriculture GHG emissions, Additional information on methodological issues. Guns A., Van Vynckt I., d'Heer M., 4-9-03.
