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Report of the individual review of the annual submission of Belgium submitted in 2012*

* In the symbol for this document, 2012 refers to the year in which the inventory was submitted, and not to the year of publication.

Contents

I. Introduction and summary

1. This report covers the in-country review of the 2012 annual submission of Belgium, coordinated by the UNFCCC secretariat, in accordance with decision 22/CMP.1. The review took place from 10 to 15 September 2012 in Brussels, Belgium, and was conducted by the following team of nominated experts from the UNFCCC roster of experts: generalist – Mr. Paul Duffy (Ireland); energy – Mr. Ricardo Fernandez (European Union); industrial processes – Mr. David Kuntze (Germany); agriculture – Mr. Duffy; land use, land-use change and forestry (LULUCF) – Mr. Walter Oyhantcabal (Uruguay); and waste – Mr. Hiroyuki Ueda (Japan). Mr. Duffy and Mr. Oyhantcabal were the lead reviewers. The review was coordinated by Mr. Tomoyuki Aizawa (UNFCCC secretariat).

2. In accordance with the "Guidelines for review under Article 8 of the Kyoto Protocol" (decision 22/CMP.1), a draft version of this report was communicated to the Government of Belgium, which provided comments that were considered and incorporated, as appropriate, into this final version of the report.

3. In 2010, the main greenhouse gas (GHG) in Belgium was carbon dioxide (CO_2), accounting for 87.1 per cent of total GHG emissions[1] expressed in CO_2 eq, followed by nitrous oxide (N_2O) (6.4 per cent) and methane (CH_4) (5.0 per cent). Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6) collectively accounted for 1.5 per cent of the overall GHG emissions in the country. The energy sector accounted for 81.6 per cent of total GHG emissions, followed by the industrial processes sector (10.0 per cent), the agriculture sector (7.4 per cent), the waste sector (0.9 per cent) and the solvent and other product use sector (0.2 per cent). Total GHG emissions amounted to 135,161.41 Gg CO_2 eq and decreased by 6.8 per cent between the base year[2] and 2010.

4. Tables 1 and 2 show GHG emissions from Annex A sources, emissions and removals from the LULUCF sector under the Convention and emissions and removals from activities under Article 3, paragraph 3, and, if any, Article 3, paragraph 4, of the Kyoto Protocol (KP-LULUCF), by gas and by sector and activity, respectively. In table 1, CO_2, CH_4 and N_2O emissions included in the rows under Annex A sources do not include emissions and removals from the LULUCF sector.

5. Tables 3–5 provide information on the most important emissions and removals and accounting parameters that will be included in the compilation and accounting database.

[1] In this report, the term "total GHG emissions" refers to the aggregated national GHG emissions expressed in terms of CO_2 eq excluding LULUCF, unless otherwise specified.

[2] "Base year" refers to the base year under the Kyoto Protocol, which is 1990 for CO_2, CH_4 and N_2O, and 1995 for HFCs, PFCs and SF_6. The base year emissions include emissions from Annex A sources only.

Table 1
Greenhouse gas emissions from Annex A sources and emissions/removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, by gas, base year to 2010[a]

			Gg CO_2 eq								*Change*
		Greenhouse gas	*Base year*[a]	*1990*	*1995*	*2000*	*2005*	*2008*	*2009*	*2010*	*Base year–2010 (%)*
Annex A sources		CO_2	118 784.29	118 784.29	124 092.15	124 944.25	125 268.17	120 082.51	108 572.75	117 709.15	–0.9
		CH_4	10 117.12	10 117.12	9 823.06	8 809.93	7 064.44	6 801.95	6 698.09	6 797.68	–32.8
		N_2O	11 114.97	11 114.97	11 974.52	11 445.71	9 728.55	7 844.50	8 039.46	8 655.65	–22.1
		HFCs	442.75	NA, NO	442.75	916.15	1 413.82	1 746.58	1 769.74	1 802.56	307.1
		PFCs	2 335.24	1 753.32	2 335.24	360.90	154.23	228.63	115.51	85.23	–96.4
		SF_6	2 205.16	1 662.49	2 205.16	111.52	85.97	88.76	97.03	111.15	–95.0
KP-LULUCF	Article 3.3[b]	CO_2						226.68	208.40	195.33	
		CH_4						NE, NO	NE, NO	NE, NO	
		N_2O						1.91	2.01	2.11	
	Article 3.4[c]	CO_2	NA					NA	NA	NA	NA
		CH_4	NA					NA	NA	NA	NA
		N_2O	NA					NA	NA	NA	NA

Abbreviations: KP-LULUCF = land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, NA = not applicable, NE = not estimated, NO = not occurring.

[a] "Base year" for Annex A sources refers to the base year under the Kyoto Protocol, which is 1990 for CO_2, CH_4 and N_2O, and 1995 for HFCs, PFCs and SF_6. The "base year" for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol is 1990.

[b] Activities under Article 3, paragraph 3, of the Kyoto Protocol, namely afforestation and reforestation, and deforestation. Only the inventory years of the commitment period must be reported.

[c] Elected activities under Article 3, paragraph 4, of the Kyoto Protocol, including forest management, cropland management, grazing land management and revegetation. For cropland management, grazing land management and revegetation, the base year and the inventory years of the commitment period must be reported.

Table 2
Greenhouse gas emissions by sector and activity, base year[a] to 2010

		Gg CO_2 eq								*Change*
	Sector	*Base year[a]*	*1990*	*1995*	*2000*	*2005*	*2008*	*2009*	*2010*	*Base year–2010 (%)*
Annex A	Energy	112 108.36	112 108.36	116 181.31	116 868.20	116 220.57	111 005.45	101 811.53	110 273.52	–1.6
	Industrial processes	17 358.79	15 791.45	19 230.49	15 650.03	15 721.06	14 421.82	12 084.94	13 466.78	–22.4
	Solvent and other product use	213.41	213.41	203.65	217.22	214.91	214.14	214.00	213.97	0.3
	Agriculture	11 856.88	11 856.88	11 983.38	11 051.30	9 983.96	9 879.93	9 979.92	10 042.06	–15.3
	Waste	3 462.10	3 462.10	3 274.05	2 801.71	1 574.69	1 271.59	1 202.18	1 165.08	–66.3
	LULUCF	NA	–1 246.62	–1 062.80	–1 014.90	–935.38	–862.60	–961.93	–1 015.04	NA
	Total (with LULUCF)	**NA**	**142 185.58**	**149 810.07**	**145 573.56**	**142 779.80**	**135 930.33**	**124 330.64**	**134 146.37**	**NA**
	Total (without LULUCF)	**144 999.53**	**143 432.19**	**150 872.88**	**146 588.46**	**143 715.18**	**136 792.93**	**125 292.57**	**135 161.41**	**–6.8**
	Other[b]	NO	NO	NO	NO	NO	NO	NO	NO	NA
KP-LULUCF	Article 3.3[c] Afforestation and reforestation						–291.93	–304.72	–317.55	
	Article 3.3[c] Deforestation						520.52	515.13	514.99	
	Total (3.3)						**228.59**	**210.41**	**197.44**	
	Article 3.4[d] Forest management						NA	NA	NA	
	Article 3.4[d] Cropland management	NA					NA	NA	NA	NA
	Article 3.4[d] Grazing land management	NA					NA	NA	NA	NA
	Article 3.4[d] Revegetation	NA					NA	NA	NA	NA
	Total (3.4)	**NA**					**NA**	**NA**	**NA**	**NA**

Abbreviations: KP-LULUCF = land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, LULUCF = land use, land-use change and forestry, NA = not applicable, NO = not occurring.

[a] "Base year" for Annex A sources refers to the base year under the Kyoto Protocol, which is 1990 for CO_2, CH_4 and N_2O, and 1995 for HFCs, PFCs and SF_6. The "base year" for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol is 1990.

[b] Emissions/removals reported in the sector other (sector 7) are not included in Annex A to the Kyoto Protocol and are therefore not included in the national totals.

[c] Activities under Article 3, paragraph 3, of the Kyoto Protocol, namely afforestation and reforestation, and deforestation. Only the inventory years of the commitment period must be reported.

[d] Elected activities under Article 3, paragraph 4, of the Kyoto Protocol, including forest management, cropland management, grazing land management and revegetation. For cropland management, grazing land management and revegetation, the base year and the inventory years of the commitment period must be reported.

Table 3
Information to be included in the compilation and accounting database in t CO_2 eq for the year 2010, including the commitment period reserve

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Commitment period reserve	606 595 975			606 595 975
Annex A emissions for current inventory year				
CO_2	115 093 692	117 709 147		117 709 147
CH_4	6 763 653	6 797 683		6 797 683
N_2O	8 609 657	8 655 647		8 655 647
HFCs	1 802 545	1 802 557		1 802 557
PFCs	84 770	85 228		85 228
SF_6	104 907	111 150		111 150
Total Annex A sources	**132 459 223**	**135 161 412**		**135 161 412**
Activities under Article 3, paragraph 3, for current inventory year				
3.3 Afforestation and reforestation on non-harvested land for current year of commitment period as reported	–284 229	–317 554		–317 554
3.3 Afforestation and reforestation on harvested land for current year of commitment period as reported	NO	NO		NO
3.3 Deforestation for current year of commitment period as reported	489 868	514 994		514 994
Activities under Article 3, paragraph 4, for current inventory year[c]				
3.4 Forest management for current year of commitment period				
3.4 Cropland management for current year of commitment period				
3.4 Cropland management for base year				
3.4 Grazing land management for current year of commitment period				
3.4 Grazing land management for base year				
3.4 Revegetation for current year of commitment period				
3.4 Revegetation in base year				

Abbreviation: NO = not occurring.

[a] "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).

[b] "Final" includes revised estimates, if any, and/or adjustments, if any.

[c] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

Table 4
Information to be included in the compilation and accounting database in t CO_2 eq for the year 2009

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Annex A emissions for 2009				
CO_2	108 552 424	108 572 749		108 572 749
CH_4	6 663 771	6 698 086		6 698 086
N_2O	7 989 047	8 039 460		8 039 460
HFCs	1 769 715	1 769 740		1 769 740
PFCs	115 094	115 508		115 508
SF_6	96 499	97 030		97 030
Total Annex A sources	**125 186 551**	**125 292 573**		**125 292 573**
Activities under Article 3, paragraph 3, for 2009				
3.3 Afforestation and reforestation on non-harvested land for 2009 as reported	–280 793	–304 723		–304 723
3.3 Afforestation and reforestation on harvested land for 2009 as reported	NO	NO		NO
3.3 Deforestation for 2009 as reported	490 074	515 134		515 134
Activities under Article 3, paragraph 4, for 2009[c]				
3.4 Forest management for 2009				
3.4 Cropland management for 2009				
3.4 Cropland management for base year				
3.4 Grazing land management for 2009				
3.4 Grazing land management for base year				
3.4 Revegetation for 2009				
3.4 Revegetation in base year				

Abbreviation: NO = not occurring.
[a] "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).
[b] "Final" includes revised estimates, if any, and/or adjustments, if any.
[c] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

Table 5
Information to be included in the compilation and accounting database in t CO_2 eq for the year 2008

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Annex A emissions for 2008				
CO_2	120 065 193	120 082 509		120 082 509
CH_4	6 785 993	6 801 949		6 801 949
N_2O	7 798 386	7 844 500		7 844 500
HFCs	1 746 560	1 746 576		1 746 576
PFCs	201 342	228 630		228 630
SF_6	88 764			88 764
Total Annex A sources	**136 686 239**	**136 792 929**		**136 792 929**
Activities under Article 3, paragraph 3, for 2008				
3.3 Afforestation and reforestation on non-harvested land for 2008 as reported	–277 395	–291 929		–291 929
3.3 Afforestation and reforestation on harvested land for 2008 as reported	NO	NO		NO
3.3 Deforestation for 2008 as reported	496 069	520 518		520 518
Activities under Article 3, paragraph 4, for 2008[c]				
3.4 Forest management for 2008				
3.4 Cropland management for 2008				
3.4 Cropland management for base year				
3.4 Grazing land management for 2008				
3.4 Grazing land management for base year				
3.4 Revegetation for 2008				
3.4 Revegetation in base year				

Abbreviation: NO = not occurring.
[a] "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).
[b] "Final" includes revised estimates, if any, and/or adjustments, if any.
[c] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

II. Technical assessment of the annual submission

A. Overview

1. Annual submission and other sources of information

6. The 2012 annual inventory submission was submitted on 15 April 2012; it contains a complete set of common reporting format (CRF) tables for the period 1990–2010 and a national inventory report (NIR). Belgium also submitted information required under Article 7, paragraph 1, of the Kyoto Protocol, including information on: activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, accounting of Kyoto Protocol units, changes in the national system and in the national registry, and the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol. The standard electronic format (SEF) tables were submitted on 15 April 2012. The annual submission was submitted in accordance with decision 15/CMP.1.

7. Belgium officially submitted revised emission estimates on 29 October 2012 in response to questions raised by the expert review team (ERT) during the course of the in-country visit. The values used in this report are those submitted by Belgium on 29 October 2012.

8. The ERT also used previous years' submissions during the review. In addition, the ERT used the standard independent assessment report (SIAR), parts I and II, to review information on the accounting of Kyoto Protocol units (including the SEF tables and their comparison report) and on the national registry.[3]

9. During the review, Belgium provided the ERT with additional information and documents which are not part of the annual submission. The full list of materials used during the review is provided in annex I to this report.

Completeness of inventory

10. The inventory generally covers all mandatory[4] source and sink categories for the period 1990–2010. The ERT noted that Belgium has reported some emissions for the first time in the 2012 annual submission, including emissions from off-road mobile machinery and HFC emissions from disposal of commercial refrigeration equipment. The ERT commends the Party for these improvements to the completeness of the inventory. However, the ERT noted that the following categories have been reported as not estimated ("NE"), owing to the lack of activity data (AD) and/or estimation methodologies: CO_2 emissions from asphalt roofing and road paving; N_2O emissions from fire extinguishers and aerosols; and CH_4 emissions from industrial wastewater and sludge. The ERT encourages the Party to continue its efforts to include, in its inventory, emission estimates for categories for

[3] The SIAR, parts I and II, is prepared by an independent assessor in line with decision 16/CP.10 (paras. 5(a), and 6(c) and (k)), under the auspices of the international transaction log (ITL) administrator using procedures agreed in the Registry System Administrators Forum. Part I is a completeness check of the submitted information relating to the accounting of Kyoto Protocol units (including the SEF tables and their comparison report) and to national registries. Part II contains a substantive assessment of the submitted information and identifies any potential problem regarding information on the accounting of Kyoto Protocol units and the national registry.

[4] Mandatory source and sink categories under the Kyoto Protocol are all source and sink categories for which the Intergovernmental Panel on Climate Change (IPCC) *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*, the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* and the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry* provide methodologies and/or emission factors to estimate GHG emissions.

which there are no estimation methodologies or emission factors (EFs) available in the Intergovernmental Panel on Climate Change (IPCC) *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC good practice guidance) or in the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Revised 1996 IPCC Guidelines).

11. The ERT also noted that the following categories have not been reported in the Party's 2012 annual submission: HFC emissions from manufacturing and disposal of fire extinguishers; SF_6 emissions from manufacturing of electrical equipment; and PFC emissions from other consumption of halocarbons and SF_6. In response to the list of potential problems and further questions raised by the ERT during the review week, Belgium submitted estimates for these categories and gases (see paras.75, 77 and 78 below).

12. The ERT further noted that, in the LULUCF sector, the emissions and removals from living biomass for the key subcategory cropland remaining cropland have not been estimated. Moreover, the ERT noted that the estimates of emissions from wildfires have not been updated since 2007 and have been reported as "NE" or not occurring ("NO"). The ERT recommends that the Party report the emissions and removals from living biomass for cropland remaining cropland and the emissions from wildfires in its next annual submission.

13. With regard to the completeness of the NIR, the ERT noted that Belgium provided an executive summary in the 2012 annual submission, following recommendations in previous review reports. The ERT commends the Party for this improvement, but reiterates the recommendation from previous review reports that Belgium provide information on the energy balance for Belgium and its regions in the NIR of its next annual submission.

2. A description of the institutional arrangements for inventory preparation, including the legal and procedural arrangements for inventory planning, preparation and management

Overview

14. The ERT concluded that the national system continues to perform its required functions.

Inventory planning

15. During the review, Belgium described the national system for the preparation of the inventory. The Interregional Cell for the Environment (IRCEL-CELINE) has overall responsibility for the national inventory. Other agencies and organizations are also involved in the preparation of the inventory. Belgium is a federal state comprising three regions: the Brussels-Capital region, the Flemish region and the Walloon region, each of which prepares its own regional inventory. The regional agencies responsible for methodological choice, the selection of AD and EFs, quality assurance/quality control (QA/QC) activities, and the archiving of all inventory-related information are: the Brussels Environment (BIM-IBGE), the Flemish Environment Agency (VMM) and the Walloon Agency for Air and Climate (AWAC). IRCEL-CELINE combines the three regional inventories into the national inventory using the CRF Aggregator software. The ERT noted that the AD that are mainly used and the land-use matrix for the LULUCF sector and the KP-LULUCF activities are prepared by Gembloux Agro-Bio Tech University. The ERT also notes that ECONOTEC consultants in collaboration with the Flemish Institute for Technological Research (VITO) prepare the Party's fluorinated gas (F-gas) emission estimates under the authority of the National Climate Commission.

16. The National Climate Commission is responsible for the formal approval of the inventory prior to its submission to the UNFCCC secretariat. The Working Group on

Emissions of the Coordination Committee for International Environmental Policy coordinates the preparation of the inventory to ensure the consistency of the reported data. The ERT noted that, owing to the federal structure of the country, Belgium has had difficulty resolving the issues identified during previous reviews in relation to: the methodological consistency between the three regional inventories; the consistency and transparency of the reporting at the sectoral level; and the coordination of the QA/QC activities at the regional and national levels. The ERT recommends that Belgium consider devolving or allocating responsibility for the consistency of methodological choice, the reporting in the NIR, and the QA/QC activities at the sectoral level, in accordance with the relevant expertise and national circumstances, in order to minimize inconsistencies in the reporting and to reduce the number of QA issues, such as those identified for the agriculture sector for the Brussels-Capital region (see para. 87 below).

Inventory preparation

Key categories

17. Belgium has reported a tier 1 key category analysis, both level and trend assessment, as part of its 2012 annual submission. The key category analysis performed by the Party and that performed by the secretariat [5] produced similar results. The main difference between the two analyses is that Belgium's analysis for road transportation includes gasoline and diesel use together, whereas the secretariat's analysis reports these two fuels separately. Belgium has included the LULUCF sector in its key category analysis, which was performed in accordance with the IPCC good practice guidance and the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF).

18. The ERT noted that the key category analysis presented in the NIR includes the LULUCF sector (NIR, annex 1), while there is no discussion provided of the key categories excluding LULUCF. The ERT recommends that the Party report the key category analyses (both excluding and including LULUCF) and the discussion of the results in its next annual submission. The ERT also notes that the NIR does not provide information on whether the key category analysis was used to prioritize future inventory improvements. The ERT reiterates the recommendation in the previous review report that Belgium include this information in its next annual submission.

19. Belgium has performed a qualitative key category analysis for the KP-LULUCF activities and has identified deforestation associated with land converted to cropland, grassland and settlements as a key category. The secretariat's analysis also identified afforestation and reforestation associated with land converted to forest land as a key category. The ERT encourages Belgium to perform a quantitative key category analysis for the KP-LULUCF activities and to report the results in CRF table NIR 3 in its next annual submission, in accordance with chapter 5.4.4 of the IPCC good practice guidance for LULUCF.

[5] The secretariat identified, for each Party, the categories that are key categories in terms of their absolute level of emissions, applying the tier 1 level assessment as described in the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry*. Key categories according to the tier 1 trend assessment were also identified for Parties that provided a full set of CRF tables for the base year or period. Where the Party performed a key category analysis, the key categories presented in this report follow the Party's analysis. However, they are presented at the level of aggregation corresponding to a tier 1 key category assessment conducted by the secretariat.

Uncertainties

20. Belgium has performed a tier 1 uncertainty analysis excluding and including LULUCF for both the level and trend assessment. The ERT commends the Party for providing an uncertainty analysis including the LULUCF sector for the first time in its 2012 annual submission. The overall level uncertainty of the Party's inventory (without LULUCF) is 8.1 per cent for 2010, while the trend uncertainty is 2.9 per cent for the period 1990–2010. These uncertainty values correspond very closely with the level and trend uncertainties reported in the Party's 2011 annual submission (7.9 per cent and 2.8 per cent, respectively). The overall level uncertainty of the Party's inventory (with LULUCF) is 8.2 per cent for 2010, while the trend uncertainty is 3.0 per cent for the period 1990–2010. Belgium has provided its uncertainty analysis in annex 2 to the NIR and in electronic format (Excel file). The ERT noted that the uncertainty estimates for the agriculture sector are not estimated at the same level as those for the other sectors. The ERT recommends that Belgium assess the uncertainty of the emissions from the agriculture sector at the same level as its key category analysis and at the same level as for the other sectors for its next annual submission (see para. 87 below).

21. The ERT noted that not all emissions and removals from the LULUCF sector are included in the Party's uncertainty analysis, such as emissions from biomass burning, liming and soil disturbance. The ERT recommends that Belgium include these categories in its uncertainty analysis for its next annual submission. The Party has provided uncertainty estimates for the emissions and removals from the KP-LULUCF activities in its 2012 annual submission. The uncertainty of the removals from afforestation and reforestation is 59.3 per cent, while the uncertainty of the emissions from deforestation is 48.5 per cent. The ERT commends Belgium for providing uncertainty estimates for the KP-LULUCF activities for the first time in its 2012 annual submission.

22. The ERT noted that, in response to questions raised by the ERT during the review, Belgium did not provide information on how it uses the results of the uncertainty analysis to prioritize inventory improvements. In particular, the ERT found that the uncertainty of the AD for the second largest key category according to the level assessment for 2010 (residential combustion: liquid fuels – CO_2) is relatively high (10.0 per cent). The ERT recommends that Belgium provide, in its next annual submission, information on how it uses the results of the uncertainty analysis to prioritize future inventory improvements.

Recalculations and time-series consistency

23. Recalculations have been performed and reported in accordance with the IPCC good practice guidance. The ERT noted that the recalculations reported by Belgium for the time series 1990–2009 have been undertaken to take into account the revision of AD, EFs and methodologies in all sectors, in particular: CO_2 emissions for all energy categories in the energy sector; CO_2 emissions from chemical industry in the industrial processes sector; N_2O emissions from agricultural soils in the agriculture sector; and CH_4 emissions from solid waste disposal on land in the waste sector. The major changes, and the magnitude of the impact, include the following: an increase in estimated total GHG emissions for the base year under the Kyoto Protocol (0.3 per cent), a decrease for 1990 (0.01 per cent) and an increase for 2009 (0.6 per cent). The rationale for these recalculations is generally provided in chapter 9 of the NIR and in CRF table 8(b). However, the ERT found that the level of detail of the information provided in the relevant sector chapters of the NIR on the recalculations and their impact on the national total emissions is not sufficient. The ERT recommends that Belgium provide additional information in a table or in a figure, by sector, outlining the impact of the recalculations on the sectoral and national total emissions in each sector chapter of the NIR in its next annual submission (see paras. 34, 84 and 137 below).

Verification and quality assurance/quality control approaches

24. Belgium has included information on its QA/QC procedures in the NIR and has provided its national QA/QC plan as a separate document in its 2012 annual submission, in accordance with the IPCC good practice guidance. The plan outlines the responsibilities for the QA/QC procedures at the national and regional levels and the types of tier 1 QC checks performed for the three regional inventories and for the national inventory. During the review week, the ERT had the opportunity to closely examine the documentation on some of the QC checks performed at the regional and sectoral levels and commends Belgium and its regional inventory compilers for their efforts in implementing these procedures. However, the ERT found that some of the efforts made at the regional level to improve the methods, EFs or AD are not always consistent with the approach used by the other regional inventory compilers, and are not always fully in line with the IPCC good practice guidance and the "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories" (hereinafter referred to as the UNFCCC reporting guidelines), in particular the revised methodologies used for the estimation of emissions from the agriculture sector for the Brussels-Capital region (see para. 87 below). The ERT recommends that Belgium implement, for its next annual submission, a QA procedure that ensures the consistency of the approaches used across the three regions, in particular when improvements are made at the regional level using a new methodological approach.

25. The ERT also finds that the overall quality of the federal energy balance would be improved if the compilers of the federal energy balance had access to all of the AD relating to the regional energy balances (see para. 38 below). The ERT recommends that Belgium facilitate effective access to, and the sharing of, all relevant data underpinning the GHG inventory between the regions and at the federal level for its next annual submission.

Transparency

26. The NIR and the CRF tables generally include information on the methods, AD and EFs used, as well as the key categories and uncertainty estimates, and a description of the QA/QC procedures carried out at the regional and national levels. In addition, the NIR and the CRF tables are generally transparent. However, the ERT found a number of transparency-related issues which could be improved in the next annual submission, including:

(a) The improvement of the structure of the NIR following the annotated outline of the NIR, in accordance with decision 14/CP.11 (see para. 87 below);

(b) The inclusion of a national energy balance and the improvement of the consistency between the regional and federal energy balances (see para. 38 below);

(c) The explanation of the impact of the recalculations on the sectoral and national total emissions (see para. 23 above);

(d) The improvement of the reporting on the differences between the sectoral and reference approaches (see para. 42 below);

(e) The provision, in the NIR, of methodological information on estimating emissions from semiconductor manufacture (see para. 76 below);

(f) The improvement of the documentation on the subcategories in the industrial processes sector (see paras. 63–81 below);

(g) The provision of additional information, in the NIR, on the methodologies used to estimate emissions from the LULUCF sector (see paras. 97–117 below);

(h) The provision of the same level of methodological detail for all three regions of Belgium at the sectoral level, especially where different methods are used (see paras. 87, 123 and 127 below);

(i) The provision of an import/export balance of animal manure for Belgium (see para. 96 below);

(j) The improvement of the methodological description of the different regional approaches used to estimate emissions from solid waste disposal on land (see paras. 122 and 124 below);

(k) The provision of an assessment of time-series consistency at the sectoral level.

27. Additional areas where transparency could be further improved are listed in the relevant sector chapters of this report. The ERT recommends that Belgium carry out these improvements in order to improve the transparency of the reporting in its next annual submission.

Inventory management

28. As noted in the previous review report, Belgium's archiving system is decentralized. The regions are responsible for archiving their own data sets, as well as all documentation related to their information sources, calculation methods, models, and QC procedures and checklists performed at the regional level. The national archives are maintained by IRCEL-CELINE and contain aggregated information on the national inventory, such as the official national inventory data sets, the recalculations performed and the results of the key category analysis. The ERT did not observe any functionality problems with the decentralized archiving system, given the timely manner in which the Party responded to the questions raised by the ERT during the review. However, the ERT reiterates the encouragement from previous review reports that Belgium establish a centralized archiving system.

3. Follow-up to previous reviews

29. The ERT found that Belgium has implemented some of the recommendations in the previous review report in its 2012 annual submission, although the final version of the previous review report was published on 30 April 2012, after the date of submission of the Party's 2012 annual submission. Detailed information relating to the recalculations has been provided in chapter 9 of the NIR and further information relating to the improvements carried out in response to the review process is outlined in section 9.1.2 of the NIR. The ERT commends the Party for providing this detailed summary in its NIR. The improvements made by Belgium since its previous annual submission include:

(a) The provision of an executive summary in the NIR;

(b) The inclusion of estimates of CH_4 and N_2O emissions from biomass fuels used in public electricity and heat production in the Flemish region for the years for which the data were identified as missing;

(c) The revision of the EF for electrodes used in electric arc furnaces in the Walloon region;

(d) The inclusion, for the first time, of estimates of off-road emissions for the complete time series;

(e) The revision of the estimates of N_2O emissions from animal manure applied to soils for the Flemish region;

(f) The revision of the amount of exported manure used to estimate the emissions from animal manure applied to soils and indirect soil emission estimates for the Flemish region.

30. The ERT found that the following recommendations from the previous review report have not been implemented by the Party (the final version of the review report was published on 30 April 2012, after the date of submission of the Party's 2012 annual submission), including:

(a) To provide an energy balance (see para. 13 above);

(b) To include, in the NIR, clear descriptions of the main reasons for recalculations, as well as a quantification of their effects on the AD, EFs and/or emission estimates (see para. 34 below);

(c) To provide explanations for differences between the regional and federal energy balances (see para. 38 below);

(d) To present the data for the agriculture sector for all three regions at a comparable level of detail to the information presented for the other sectors (see para. 89 below);

(e) To provide a nitrogen (N) mass balance in the agriculture chapter of the NIR (see para. 96 below);

(f) To provide the parameters used for each first order decay (FOD) model in a single table, using the same terminology, in the waste chapter of the NIR (see para. 122 below);

(g) To improve the clarity of the information provided in the NIR and to provide further information to satisfy the mandatory reporting element required by decision 15/CMP.1, annex, paragraph 6(a) (see para. 145 below);

(h) To disaggregate the reporting on afforestation and reforestation in the CRF tables according to the three regions, in order to improve the transparency of the regional methods and assumptions applied (see para. 146 below).

4. Areas for further improvement identified by the expert review team

31. During the review, the ERT identified a number of areas for improvement. These are listed in table 6 below. The ERT also reiterates a number of recommendations made in previous review reports in the relevant sector chapters of this report.

32. Recommended improvements relating to specific categories are presented in the relevant sector chapters of this report and in table 6 below.

B. Energy

1. Sector overview

33. The energy sector is the main sector in the GHG inventory of Belgium. In 2010, emissions from the energy sector amounted to 110,273.52 Gg CO_2 eq, or 81.6 per cent of total GHG emissions. Since 1990, emissions have decreased by 1.6 per cent. The key drivers for the decrease in emissions are the lower consumption of solid fuels in the iron and steel industry and the switch from basic oxygen furnaces to electric arc furnaces; the

improvements in the carbon intensity of public electricity and heat production (i.e. less coal and more natural gas and biomass); and the closure of four coke plants. Nuclear electricity production also increased significantly over the period. Within the sector, 29.6 per cent of the emissions were from other sectors (71.8 per cent of which were from residential), followed by 24.4 per cent from transport, 24.0 per cent from energy industries and 21.5 per cent from manufacturing industries and construction. The remaining 0.5 per cent was mainly from oil and natural gas systems.

34. Belgium has reported substantial recalculations of emissions from energy industries and other sectors for 2008 and 2009. CO_2 emissions from energy industries for 2009 were 648.78 Gg CO_2 eq (2.5 per cent) lower in the 2012 annual submission compared to the 2011 annual submission, while CO_2 and N_2O emissions from other sectors for 2009 were 595.92 Gg (2.1 per cent) and 47.00 Gg CO_2 eq (31.8 per cent) lower, respectively, in the 2012 annual submission compared to the 2011 annual submission. The magnitude of the recalculations in these categories was lower for 2008, although still fairly significant. The explanations provided by the Party in CRF table 8(b) and in the NIR are not sufficiently transparent. In response to questions raised by the ERT during the review, Belgium provided transparent and detailed explanations for these recalculations. The ERT reiterates the recommendation in the previous review report that the Party include, in next annual submission, clear descriptions of the main reasons underpinning the recalculations as well as a quantification of the effects on the AD, EFs and/or emissions in the NIR.

35. The inventory for the energy sector is generally transparent, although the ERT identified several instances where the transparency of the information reported could be significantly improved, in addition to the improvement of the descriptions of the recalculations mentioned above (see para. 34 above). For example, the choice of EFs is not always well documented in the NIR (e.g. the choice of default EFs from the Revised 1996 IPCC Guidelines, the IPCC good practice guidance and/or the use of country-specific EFs). In addition, annex 4 to the NIR on the net calorific values (NCVs) used in the estimation of emissions is incomplete for some fuels (e.g. hard coal, natural gas and gasoline). Although the Party provided transparent descriptions of the energy balances used by the three regions (but not the federal energy balance) in response to questions raised by the ERT during the review, copies of the regional and federal energy balances for 2010 have not been included in the NIR. To improve the transparency of the NIR of the Party's next annual submission, the ERT recommends that Belgium improve the transparency of the information provided on the choice of EFs used in the energy sector. The ERT also recommends that the Party include the full list of NCVs used in the energy sector (i.e. ensure that annex 4 to the NIR is complete) and differentiate, where applicable, by region. The average NCVs for specific fuels could be calculated where plant-specific data are used to estimate emissions. Finally, the ERT further recommends that Belgium include copies of the full regional and national energy balances for the latest reported year, outlining the final energy consumption by sector.

36. The ERT noted that the second largest key category for 2010 was CO_2 emissions from liquid fuels used in residential, contributing 9.8 per cent of total GHG emissions. The ERT also notes that the uncertainty of the AD is relatively high (10.0 per cent) for a well-established energy balance flow such as the Party's, and that this contributes significantly to the total uncertainty of the GHG inventory. The ERT identified the same relatively high uncertainties for the subcategories commercial/institutional and agriculture/forestry/fisheries. In response to a question raised by the ERT during the review, Belgium explained that the high uncertainty in the category other sectors is due to the use of outdated household surveys. The ERT noted that accurate and reliable AD are a prerequisite for the calculation of good-quality emission estimates. Emissions from the category other sectors represented 29.6 per cent of total sectoral emissions for 2010, and 44.6 per cent of the AD were accounted for by liquid fuels. The ERT recommends that

Belgium prioritize its inventory improvements for its next annual submission so as to obtain more reliable AD for the category other sectors, especially for liquid fuels used in the subcategory residential, in order to improve the accuracy of the inventory.

37. The ERT identified evidence of potential underestimations for the following four categories during the review: the AD for diesel consumption in road transportation; the N_2O and CH_4 emissions from road transportation; the CO_2 EF for natural gas used in commercial/institutional; and the AD for jet kerosene consumption in civil aviation. These potential underestimations are discussed in the relevant paragraphs below (see paras. 48, 50, 52 and 56 below).

38. Belgium uses both regional energy balances and the federal energy balance to estimate GHG emissions from the energy sector. The ERT noted that while similar methodologies are used to estimate emissions from the energy sector, there is a general lack of consistency between the regional and federal energy balances. For example, the sum of the regional energy balances does not equal the federal energy balance. This apparent independence leads to very significant differences in energy consumption. The ERT also notes that good-quality energy balances are essential for good-quality GHG emission estimates. The ERT expects that the sum of the regional energy balances should be as consistent as possible with the figures in the federal energy balance. The ERT strongly recommends that Belgium improve the consistency between the regional and federal energy balances and reiterates the recommendations in previous review reports that the Party clearly document, in the NIR, any remaining differences and provide explanations for these differences in its next annual submission.

39. The choice of AD is generally well documented in the NIR. Plant-specific AD from the European Union emissions trading system (EU ETS) are extensively used to estimate emissions from energy industries and manufacturing industries and construction. However, the category-specific QA/QC procedures performed are not adequately described in the NIR. During the review, the ERT found that both the energy balance compilers and the GHG inventory compilers in each region have effective access to plant-specific AD. However, this is not the case at the federal level. The ERT considers that the overall QA of the inventory would be strengthened if the federal energy balance compilers also had access to all plant-specific AD, which in turn would improve the consistency between the regional and federal energy balances. The ERT recommends that Belgium facilitate effective access to, and the sharing of, all relevant data underpinning the GHG inventory between the regions and at the federal level. The ERT also recommends that, in order to improve transparency, the Party improve the description in the NIR of the category-specific QA/QC activities performed, by explaining the links between the plant-specific AD from the EU ETS, the regional energy balances and the AD reported in the CRF tables, in its next annual submission.

40. The ERT found that the Party's reporting is generally comparable with that of other Parties included in Annex I to the Convention (Annex I Parties) and that its annual submission has been prepared in accordance with the UNFCCC reporting guidelines, the Revised 1996 IPCC Guidelines and the IPCC good practice guidance.

41. Estimates of emissions from off-road mobile machinery have been included for the first time in the Party's 2012 annual submission for the complete time series. The ERT commends Belgium for this improvement. However, the ERT noted that the Party's reporting of emissions from off-road mobile machinery does not follow the guidance contained in the Revised 1996 IPCC Guidelines. The Party has reported emissions from machinery used in the building industry, defence, harbours, airports and transhipment companies under the subcategories commercial/institutional and residential. The ERT recommends that, in its next annual submission, Belgium report: off-road emissions from industrial activities under other (manufacturing industries and construction); ground

activities in airports and harbours, and any off-road activities not otherwise reported under agriculture/forestry/fisheries or manufacturing industries and construction, under other transportation; and military transport under other (fuel combustion activities).

2. Reference and sectoral approaches

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

42. The reference approach is based on the federal energy balance, whereas the sectoral approach is based on the regional energy balances of the Flemish, Walloon and Brussels-Capital regions. Although there are large differences between the reference approach and the sectoral approach at the level of individual fuels, the overall difference between the two approaches for 2010 was 2.0 per cent for energy consumption and 0.3 per cent for CO_2 emissions. In 2010, CO_2 emissions from liquid fuels calculated using the reference approach were 13.0 per cent higher than those calculated according to the sectoral approach. For solid fuels, CO_2 emissions calculated using the reference approach were 13.9 per cent lower than those calculated according to the sectoral approach. CO_2 emissions from gaseous fuels were 5.8 per cent higher according to the reference approach than those calculated using the sectoral approach. These differences vary significantly from year to year, but appear to be fairly systematic (i.e. emissions from liquid and gaseous fuels are significantly higher according to the reference approach and emissions from solid fuels are higher according to the sectoral approach for all years of the time series). In response to questions raised by the ERT during the review, Belgium explained that some of these differences may be explained by the reporting of the non-energy use of fuels in the CRF tables and in the energy balances. The NIR also describes additional reasons for the differences, such as the effect of different NCVs and EFs for liquid fuels, and the variations in the reporting of process emissions from solid fuels. The ERT reiterates the recommendations in previous review reports that Belgium, in its next annual submission, improve the transparency of its reporting of the differences between the reference and sectoral approaches and describe, as accurately as possible, the reasons underpinning these differences in CRF table 1.A(c) and in the NIR, by fuel group and for all years of the time series.

43. During the review, Belgium explained that the federal energy balance, used for the reference approach, serves as the basis for meeting the Party's international reporting obligations to the International Energy Agency and the Statistical Office of the European Union (Eurostat). A comparison of the energy data reported by Belgium to Eurostat under European Union Regulation (EC) No 1099/2008 on energy statistics and the data reported by Belgium in its GHG inventory for 2010 shows, however, large discrepancies in absolute terms between both energy balances. The ERT recommends that Belgium improve the consistency of the national energy balance and the energy balances reported to meet its international reporting obligations, and that the Party transparently describe any remaining differences in the NIR of its next annual submission.

44. The ERT is of the view that the differences between the federal and regional energy balances will continue to have an impact on the consistency between the AD in the CRF tables and the energy balances reported to meet the Party's international reporting obligations, which are the basis for the reference approach. In 2003, Belgium set up a working group on energy balances under the National Climate Commission with the objective of improving the harmonization of the regional and federal energy balances. The ERT agrees with the Party that this working group has not been very active and has not delivered any significant results in the last 10 years. The ERT recognizes Belgium's efforts to improve the consistency of the national and regional energy balances, as demonstrated by recent developments within the consultative body ENOVER/CONCERE (Concertation Etat-Régions pour l'Energie/Energieoverleg) in terms of continuing the work on the

harmonization of the energy statistics between the regions and the federal authorities. The ERT strongly recommends that the Party make reasonable efforts to speed up this work in order to improve the consistency of the regional and federal energy balances.

3. Key categories

Stationary combustion: all fuels – CO_2, CH_4 and N_2O

45. Belgium uses plant-specific data from the EU ETS to report the majority of emissions from energy industries and manufacturing industries and construction. To facilitate the review, the ERT asked Belgium to provide details of the coverage of EU ETS combustion activities in individual categories of the CRF tables, differentiating between combustion and process-related emissions, for the year 2010. In response to questions raised by the ERT during the review, Belgium provided transparent information on the coverage of EU ETS emissions in its GHG inventory. The ERT considers that this information greatly increases the transparency of the reporting and recommends that Belgium include, to the extent possible, the relevant aggregated EU ETS plant-specific data, at the national level, in the NIR of its next annual submission. The ERT also recommends that the Party improve the transparency of its NIR with regard to the consistency of the reporting of the EU ETS data and the emission estimates provided in the GHG inventory, including by providing information on the scope of activities and installation boundaries and the determination of the tier methods, EFs, NCVs and oxidation factors used, as appropriate.

46. In the NIR, Belgium explains that the emissions from petroleum refining, which only occur in the Flemish region, are completely in line with the emissions reported under the EU ETS. The ERT noted, however, that the emission estimates reported in the NIR are significantly lower than those reported under the EU ETS (4,776.50 Gg CO_2 eq and 6,361.61 Gg CO_2 eq, respectively). During the review, the ERT asked Belgium to explain the relationship between the EU ETS emissions from "mineral oil refineries" and the emissions from "petroleum refining" reported in the CRF tables. In response to the questions raised by the ERT during the review, the Party provided the ERT with very transparent information and explained that the difference between the emissions reported under the EU ETS and those reported in the CRF tables is mainly caused by three factors: the emissions from a naphtha-cracking installation are included under oil refineries under the EU ETS, whereas these emissions are reported under chemicals (manufacturing industries and construction) in the CRF tables; the emissions from combined heat and power installations are included under oil refineries under the EU ETS, but are reported under public electricity and heat production in the CRF tables; and the emissions from flaring in oil refineries reported under the EU ETS are reported under venting and flaring in the CRF tables. The ERT recommends that the Party include the relevant explanations provided to the ERT during the review in the NIR of its next annual submission.

47. Belgium has reported a relatively low CO_2 implied emission factor (IEF) for solid fuels in iron and steel (53.22 t CO_2/TJ for 2010 compared with the IPCC default range of 94.60 t/TJ–106.70 t/TJ). In response to questions raised by the ERT during the review, the Party explained that the AD reported by the Flemish region should be corrected as the blast furnace gas (BFG) sold to the electricity sector should be excluded from the AD for iron and steel. The ERT noted that this does not affect the reported CO_2 emissions from iron and steel, because those data are obtained from the EU ETS. The ERT recommends that, in its next annual submission, Belgium report the AD for the BFG sold to electricity producers under public electricity and heat production and not under iron and steel in order to improve the comparability of the EFs used across Annex I Parties.

48. Belgium has reported a CO_2 IEF of 55.61 t CO_2/TJ for natural gas used in commercial/institutional for 2010. For the period 1990–2009, the Party used the default EF from the Revised 1996 IPCC Guidelines of 55.8 t CO_2/TJ (considering a default oxidation factor of 0.995). The ERT noted that the IEF for 2010 is not consistent with the IEF value used for the period 1990–2009. In response to questions raised by the ERT during the review, Belgium explained that there was an error in the CO_2 EF used in the Walloon region for 2010. The ERT found that the Walloon region applied a value of 55.0 t CO_2/TJ, instead of 55.8 t/TJ, for 2010. The ERT considered that the CO_2 emissions from natural gas used in commercial/institutional for 2010 had been potentially underestimated and included this issue in the list of potential problems and further questions raised by the ERT during the review week. The ERT recommended that Belgium revise its estimates of CO_2 emissions from natural gas used in commercial/institutional for 2010 using the same CO_2 EF as that used for the other years of the time series (55.8 t CO_2/TJ). In response to the list of potential problems and further questions raised by the ERT during the review week, Belgium submitted revised CO_2 emission estimates for natural gas consumption in commercial/institutional using the EF of 55.8 t CO_2/TJ. The ERT considers that the potential underestimation of emissions has been resolved and recommends that the Party ensure the time-series consistency of this category in its next annual submission.

49. Regarding CO_2 emissions from agriculture, forestry and fisheries for liquid fuel, in the NIR, Belgium explains that, since its 2010 annual submission, CO_2 emissions from "international sea fisheries" in the Flemish region have been added to the emissions from international marine bunkers. In response to questions raised by the ERT during the review, Belgium clarified this explanation by providing evidence that the estimates of CO_2 emissions from all fishing boats are based on the Flemish energy balance and are reported under agriculture/forestry/fisheries. The ERT recommends that Belgium improve the transparency of the relevant section of the NIR in its next annual submission.

Road transportation: liquid fuels – CO_2, CH_4 and N_2O[6]

50. Belgium had reported an 11.6 per cent reduction in CO_2 emissions from diesel fuel consumption in road transportation between 2009 and 2010. During the review, the ERT asked the Party to clarify the reason for the decrease in fuel consumption and emissions. Belgium explained that the energy value of 260,920.84 TJ for 2010 reported in the CRF tables was provisional and should be corrected with the final value of 299,993.81 TJ. The ERT considered that the CO_2 emissions from diesel in road transportation for 2010 had been potentially underestimated and included this issue in the list of potential problems and further questions raised by the ERT during the review week. The ERT recommended that Belgium estimate CO_2 emissions from diesel consumption in road transportation using the final value and not the provisional value for 2010. In its response to the list of potential problems and further questions raised by the ERT during the review week, the Party submitted revised CO_2 emissions estimates for diesel consumption in road transportation for 2010. Belgium also provided revised CO_2 emission estimates for gasoline and liquefied petroleum gas (LPG). The ERT requested the Party to provide additional information to justify, in a transparent manner, the revised emission estimates for gasoline and LPG. The ERT found that, similar to the estimates for diesel, the revised estimates for gasoline and LPG were in line with the updating of the provisional energy balance with the final values and that this approach was fully consistent with the revised CH_4 and N_2O estimates provided by Belgium as part of its response to the list of potential problems and further

[6] Not all emissions related to all gases under this category are key categories, particularly CH_4 and N_2O emissions. However, since the calculation procedures for issues related to this category are discussed as a whole, the individual gases are not assessed in separate sections.

questions raised by the ERT during the review week (see para. 53 below). The ERT agreed with the explanations provided by the Party and accepted the revised AD and CO_2 emission estimates for consumption of diesel, gasoline and LPG in road transportation. The ERT considers that the potential problem regarding the underestimation of emissions has been resolved. The ERT acknowledges that it is good common practice for energy agencies to provide provisional energy balances to GHG inventory compilers, but recommends that the Party improve the QC of the provisional data to ensure as much consistency as possible with the final energy balances for future annual submissions.

51. Belgium uses default EFs from the Revised 1996 IPCC Guidelines to estimate CO_2 emissions from gasoline used in road transportation. The IPCC CO_2 EF for gasoline is significantly lower than any of the EFs used by other Annex I Parties. The ERT noted that the default carbon EF of 18.9 (CO_2 EF of 69.3 t/TJ) from table 1–1 of the Revised 1996 IPCC Guidelines refers to a more general default value for calculations made using the reference approach. In response to questions raised by the ERT during the review, Belgium explained that there is no precise, validated information from the fuel suppliers on the carbon content and NCVs in the country. The ERT noted that, according to the IPCC good practice guidance (chapter 2.1.1.2), when traded fuels are in common circulation it is good practice to obtain the carbon content of the fuels and the NCVs from the fuel suppliers and to use local values wherever possible. The ERT recommends that the Party obtain data on the NCVs and carbon content from the fuel suppliers and estimate the CO_2 emissions from gasoline in order to develop and use more accurate EFs in its next annual submission. Otherwise, the ERT recommends that Belgium use the default CO_2 EF of 73.0 t/TJ from table 1-36 of the reference manual of the Revised 1996 IPCC Guidelines, as this is the recommended default value applicable to European gasoline passenger cars.

52. Belgium uses tier 3 regional models to estimate CH_4 and N_2O emissions from road transportation. During the review, the ERT found that the total fuel used in the three regional models is considerably less that the total fuel sold which is used to estimate the total CO_2 emissions from road transportation in Belgium. The ERT noted that the Revised 1996 IPCC Guidelines (vol. 3, pp.1.63–1.64) recommends that Parties determine the amount of energy consumed by vehicle type and fuel type and compare it with the national energy balance. The ERT also notes that the UNFCCC reporting guidelines require national GHG inventories to be complete. The ERT considered that there was a potential underestimation of CH_4 and N_2O emissions from road transportation, as the emission estimates do not account for all fuel sold in Belgium and are therefore not complete, as required by the UNFCCC reporting guidelines. The ERT included this issue in the list of potential problems and further questions raised by the ERT during the review week. The ERT recommended that Belgium provide revised estimates of CH_4 and N_2O emissions from road transportation for all years between 1990 and 2010, accounting for all fuel sold in Belgium, and provide transparent documentation on the method used to calculate the emissions, in accordance with the IPCC good practice guidance and the UNFCCC reporting guidelines.

53. In its response to the list of potential problems and further questions raised by the ERT during the review week, Belgium submitted revised CH_4 and N_2O emission estimates for consumption of diesel, gasoline and LPG in road transportation for the whole time series. The Party also provided transparent documentation on the method used to calculate the emissions, which is performed by up-scaling the average vehicle-km per fuel in the regional models by a factor corresponding to the ratio of total fuel sales (according to the national energy balance) to total fuel consumption (according to the regional models). The ERT considers that the potential underestimation of emissions has been resolved and recommends that Belgium include the revised estimates in its next annual submission. The ERT also recommends that the Party improve the transparency of the input parameters for the models used to estimate CH_4 and N_2O emissions, as well as the description of the

method used to calculate the emissions, in order to ensure the consistency of the total fuel sales with the total fuel consumption according to the regional models, in the NIR of its next annual submission.

54. In the 2011 annual review report, the ERT recommended that Belgium recalculate the entire time series of estimates of CH_4 and N_2O emissions from road transportation. In response, the Party expressed some concerns regarding data availability prior to 2003 for use in the transition to the COPERT IV model. The present ERT noted the efforts made by the Party and recommends that Belgium ensure a consistent time series of estimates of CH_4 and N_2O emissions from road transportation and transparently document how time-series consistency has been achieved in the NIR of its next annual submission.

55. Belgium has reported CH_4 and N_2O emissions from biomass used in road transportation as included elsewhere ("IE"). No further information is provided in the NIR. This issue was also referenced in recommendations in the previous review report. The ERT recommends that the Party improve the transparency of its reporting by including background information on the biofuel use in the country and make efforts to report the CH_4 and N_2O emission estimates separately in its next annual submission.

4. Non-key categories

Civil aviation: liquid fuels – CO_2, CH_4 and N_2O

56. It is reported in the NIR that, in the Flemish region, the total kerosene used in aviation is allocated to international aviation bunkers and all gasoline is allocated to civil aviation. In response to questions raised by the ERT during the review, Belgium explained that the assumption used by the Flemish region to determine the split between kerosene and gasoline is checked against data from Belgocontrol, according to which only 0.4 per cent of the total airplane movements per year in Belgium are flights between Belgian airports, and that the type of fuel used is not known. The ERT noted that the reported consumption of kerosene in civil aviation for the years 2008–2010 is considerably lower than the consumption reported for the years 1990–2007. During the review week, in response to questions raised by the ERT, Belgium was not able to provide evidence to demonstrate that no kerosene was used for civil aviation in the Flemish region. The ERT considered that the emissions from the use of kerosene in civil aviation may therefore have been underestimated and included this issue in the list of potential problems and further questions raised by the ERT during the review week.

57. In response to the list of potential problems and further questions raised by the ERT during the review week, Belgium provided transparent revised estimates of CO_2 emissions from kerosene used in civil aviation based on aircraft movements between Flemish airports and the total kerosene consumed in the Flemish region. The Party also provided revised CO_2 emission estimates for the Walloon region, in order to ensure consistency between the kerosene and gasoline estimates for the whole time series. The ERT considers that the revised estimates have improved the quality of the time series of estimates of CO_2 emissions from civil aviation for Belgium as a whole. The ERT also considers that, as a result, the potential problem relating to the underestimation of emissions has been resolved. The ERT recommends that Belgium include the revised emission estimates in its next annual submission.

58. The ERT found that, in the Party's response to the questions raised by the ERT regarding the potential underestimation of emissions from kerosene used in civil aviation in the Flemish region, Belgium did not submit revised emission estimates for CH_4 and N_2O. The Party explained that those emissions are estimated for the Walloon and Flemish regions separately using tier 2 methods from the *European Monitoring and Evaluation Program/Core Inventory of Air Emissions (EMEP/CORINAIR) Emission Inventory*

Guidebook.[7] The Walloon region applies a tier 2a method with aggregate EFs to estimate landing and take-off (LTO) and cruising emissions. The Flemish region applies a tier 2b method with individual aircraft EFs for the LTO cycle, but does not estimate non-CO_2 cruising emissions owing to the unavailability of separate AD for domestic and international flights. The ERT noted that CH_4 emissions are negligible in the cruising mode and considers that N_2O cruising emissions are also likely to be at a very low level in the Flemish region. However, EFs for the average fleet are available to estimate N_2O emissions from cruising and the cruising fuel could be estimated by subtracting the LTO fuel from the total domestic fuel. The ERT noted that Belgium has already estimated the total domestic fuel in response to the list of potential problems and further questions raised by the ERT during the review week regarding CO_2 emissions from kerosene in the Flemish region. The ERT also noted that the Party could use this method to estimate N_2O emissions from cruising in the Flemish region, but recommends that Belgium first consult with Belgocontrol in relation to obtaining the AD to estimate emissions from civil aviation, either by region or for the country as a whole, for the next annual submission. In addition, the ERT encourages the Party to make use of additional sources of information, such as Eurocontrol, as a supplementary QA activity.

C. Industrial processes and solvent and other product use

1. Sector overview

59. In 2010, emissions from the industrial processes sector amounted to 13,466.78 Gg CO_2 eq, or 10.0 per cent of total GHG emissions, and emissions from the solvent and other product use sector amounted to 213.97 Gg CO_2 eq, or 0.2 per cent of total GHG emissions. Since the base year, emissions have decreased by 22.4 per cent in the industrial processes sector and increased by 0.3 per cent in the solvent and other product use sector. The key drivers for the fall in emissions in the industrial processes sector are the reduction in by-product emissions of PFCs and SF_6 in production of halocarbons and SF_6, the decrease in N_2O emissions from nitric acid production and the reduction in CO_2 emissions from iron and steel production. Within the industrial processes sector, 19.2 per cent of the emissions were from cement production, followed by 16.1 per cent from chemical industry (other non-specified), 13.8 per cent from nitric acid production and 12.2 per cent from lime production. Refrigeration and air conditioning accounted for 12.0 per cent and iron and steel production accounted for 8.2 per cent. The remaining 18.4 per cent were from ammonia production, caprolactam production, glass production and smaller emission categories, whose emissions amounted to around 1.0 per cent of the total sectoral emissions. For the solvent and other product use sector, Belgium has reported only N_2O emissions from the use of N_2O for anaesthesia. Belgium has made recalculations for the industrial processes sector between the 2011 and 2012 annual submissions in response to the 2011 annual review report and following changes in AD and EFs. The impact of these recalculations on the industrial processes sector is an increase in emissions of 5.3 per cent for 2009. The main recalculations took place in the following categories:

(a) CO_2 emissions from chemical industry – other (increase in estimated emissions of 625.66 53 Gg CO_2 eq, or 60.1 per cent, for 2009);

(b) CO_2 emissions from lime production (increase in estimated emissions of 75.53 Gg CO_2 eq, or 5.4 per cent, for 2009);

(c) HFC emissions from refrigeration and air-conditioning equipment (decrease in estimated emissions of 50.95 Gg CO_2 eq, or 3.1 per cent, for 2009).

[7] European Environment Agency. 2006.

60. The Party has not made any recalculations for the solvent and other product use sector.

61. The inventory for the industrial processes and solvent and other product use sectors is complete. The ERT noted that some improvements have been made to the completeness of the inventory compared with the previous annual submission, namely with regard to the estimation of HFC emissions from the disposal of commercial refrigeration equipment. Additionally, in the response to the list of potential problems and further questions raised by the ERT during the review week, Belgium submitted estimates of HFC emissions from fire extinguishers, SF_6 emissions from electrical equipment and PFC emissions from other (consumption of halocarbons and SF_6). The Party has reported PFC emissions from other (consumption of halocarbons and SF_6) as "NO".

62. The ERT concludes that the reporting of these categories is generally transparent. Belgium currently reports category-level information only for mineral products, chemical industry, metal production and food and drink production and includes a chapter on production and consumption of F-gases in the NIR. The ERT recommends that Belgium describe, in the subchapters on chemical industry, which subcategories are key and which method is used (i.e. tier 1, 2, 3 or country-specific) to calculate emissions, and provide information on the AD and EFs used (i.e. default, plant-specific or country-specific).

2. Key categories

Ammonia production – CO_2 and CH_4

63. In Belgium, one of the two ammonia production plants recovers CO_2 and produces calcium carbonate using the CO_2 recovered. The amount of CO_2 recovered is subtracted prior to reporting the total amount of CO_2 emissions from ammonia production; as a result, the IEF used by the Party (1.12 t/t) is one of the lowest values compared with those of other reporting Parties (ranging from 1.09 to 2.44 t/t; the United Kingdom of Great Britain and Northern Ireland uses a value of 36.94 t/t). According to the Revised 1996 IPCC Guidelines (vol. 3, p.2.16): "the CO_2 from ammonia production may be used for producing urea or dry ice. This carbon will only be stored for a short time. Therefore, no account should consequently be taken for intermediate binding of CO_2 in downstream manufacturing processes and products". The calcium carbonate produced from recovered CO_2 is sold to other companies as limestone. According to the Revised 1996 IPCC Guidelines, all CO_2 emissions, including the recovered emissions, must be reported under the category ammonia production. However, the Revised 1996 IPCC Guidelines also refer to further uses, such as urea or dry ice production. These are all categories in which the CO_2 is only bound for a very short time and the production processes for these categories are not yet described in the Revised 1996 IPCC Guidelines. Subtracting the recovered amounts from the total CO_2 emissions from ammonia production would therefore lead to an underestimation of emissions. In response to questions raised by the ERT during the review, the ERT learned that, in Belgium, the recovered CO_2 emissions are bound in calcium carbonate, which is then sold as limestone. The ERT found that the limestone use is appropriately reported under the relevant subcategories, and therefore the ERT considers that the Party has not underestimated the CO_2 emissions. The ERT recommends that Belgium provide a clear description of the amount of CO_2 recovered during ammonia production processes and of how the completeness of the reporting is ensured.

64. Belgium receives plant-specific data on the amount of ammonia produced and the amount of feedstock from each plant. The Party informed the ERT that it used the IPCC default values to determine the CO_2 EFs for ammonia production processes in the Flemish and Walloon regions, which has resulted in a uniform EF of 55.8 t CO_2/TJ. The Revised 1996 IPCC Guidelines (vol. 3, p.2.16) state: "if the emissions are calculated from the gas or oil consumption, the standard emission factors suggested in the energy chapter will be

relevant. The carbon content of natural gas may vary, and it is recommended that this is determined for each plant". The ERT reiterates the recommendation in previous review reports that the Party provide clearer information in the NIR on the methodology used, including justification for the oxidation factor applied. The ERT also reiterates the encouragement that Belgium develop plant-specific EFs.

65. Belgium has reported CH_4 emissions from ammonia production in CRF table 2(I), but has not provided an explanation of these emissions in the NIR. In response to a question raised by the ERT during the review, Belgium explained that the ammonia production plant had performed a CH_4 analysis in 1999 on the scrubber of ammonia during the production of ammonia and that these emissions are reported in the GHG inventory. The ERT recommends that the Party include the information provided to the ERT during the review in the NIR of its next annual submission, in order to increase transparency.

Nitric acid production – N_2O

66. Belgium has reported in the NIR that the AD and emissions for this category are measured and that the global EF of 6.34 kg/t is used. However, it is not clear whether the emissions are measured or calculated on the basis of the global EF. In response to a question raised by the ERT during the review, the Party informed the ERT that the AD and emissions for both plants (one of which is in the Walloon region, the other in the Flemish region) are measured by the plants themselves. The data are then submitted to the inventory agency for use in the preparation of the national inventory. The ERT recommends that Belgium provide transparent documentation on the method used to obtain the AD in the NIR of its next annual submission.

Other (chemical industry) – CO_2

67. The CO_2 emissions from other (chemical industry) account for 50.0 per cent of total emissions from chemical industry. However, the Party has not provided a detailed description of the sources of the CO_2 emissions in the Flemish region in the NIR. The emissions are estimated by the companies producing the chemical products, but no information has been provided on the methods, AD and EFs used in the NIR. In response to a question raised by the ERT during the review, the Party informed the ERT that the Flemish region receives the data directly from the chemical federation Essencia. An agreement has been established between VITO and Essencia, which guarantees the consistent delivery of data over time. As the data are confidential, the industry only sends the sum of the process CO_2 emissions and the products. During the review, Belgium showed the ERT the long list of products summarized in these CO_2 emissions and explained that this is why only the most significant products are reported in the NIR. The ERT noted that this could lead to an underestimation of emissions; however, as part of its QA/QC procedures, Belgium verifies the data with the preliminary EU ETS data. The comparison of the data showed that the information in the data sets was generally consistent. The results of the comparison of the data was shown to the ERT during the review, thereby demonstrating that the emissions had not been underestimated. Further, from 2012 onwards, these emissions will be included under the EU ETS and Belgium will be able to obtain considerably more detailed data. The ERT accepted this explanation but strongly recommends that the Party provide more detailed information in the NIR of its next annual submission.

68. Belgium has reported CO_2 emissions from flaring in the Flemish region under other (chemical industry). The Walloon region reports these emissions under waste incineration. This means that the same CO_2 emissions from flaring in chemical industry in the Flemish and Walloon regions are reported under different categories and sectors. The ERT recommends that Belgium consistently report these emissions under the same category in its next annual submission.

69. In Belgium, one plant produces carbon black; however, the Party has not provided any information thereon in the NIR or in the CRF tables. The Party has reported the CO_2 emissions as "NO" in CRF table 2(I). In response to questions raised by the ERT during the review, Belgium informed the ERT that these CO_2 emissions are reported under other (chemical industry), but that they are confidential. The ERT recommends that the Party report this information in the NIR and clearly identify, in CRF table 2(I), the emissions from carbon black using the notation key for confidential in its next annual submission.

Iron and steel production – CO_2

70. The Flemish and Walloon regions both report emissions from coke consumption under the energy sector. The IPCC good practice guidance (p.3.28) states: "since the primary purpose of coke oxidation is to produce pig iron, the emissions are considered to be industrial processes emissions, and they should be preferably reported as such. If this is not the case, it should be explicitly mentioned in the inventory". The ERT noted that Belgium does not clearly state the allocation of these emissions and therefore recommends that, in its next annual submission, the Party clearly and transparently explain, in the chapter of the NIR on iron and steel production (under the industrial processes sector), that the emissions from coke consumption are reported under the energy sector and explain why.

71. Belgium has reported the further use of BFG as fuel, one part of which is used to produce heat, while the other part is used to produce electricity. As a result of the current reporting method used, the Party is able to identify the amount used to produce electricity only. The CO_2 emissions from electricity production are allocated to the energy sector. Belgium was able to allocate only part of the CO_2 emissions to iron and steel production under the industrial processes sector. The Party has reported the CO_2 emissions from coke used in iron and steel production as the total emissions for this category and has subtracted only the CO_2 emissions from the use of BFG as electricity. The use of BFG for heat in iron and steel production processes is still included under the CO_2 emissions from coke consumption. The ERT accepts the method currently used by the Party to report CO_2 emissions from iron and steel production under the industrial processes sector. However, the ERT recommends that Belgium improve the transparency of its reporting by providing information on the allocation of CO_2 emissions for this category in the NIR of the next annual submission.

72. The Party has reported the CO_2 emissions from limestone and dolomite used as flux in blast furnaces under iron and steel production. However, according to the IPCC good practice guidance (p.3.25), the emissions from limestone and dolomite use should be reported under limestone and dolomite use. The ERT recommends that Belgium report these emissions under limestone and dolomite use in its next annual submission.

Consumption of halocarbons and SF_6 – HFCs, PFCs and SF_6

73. According to the NIR, Belgium estimates emissions from transport refrigeration separately from domestic, commercial and industrial refrigeration. However, emissions are not reported for transport refrigeration in CRF table 2(II).F. In response to a question raised by the ERT during the review, Belgium informed the ERT that emissions from transport refrigeration are included under the category commercial refrigeration, but that they have been calculated separately. The ERT found that the reporting of emissions from transport refrigeration is not transparent and not consistent with the way emissions are calculated. The ERT recommends that Belgium report emissions from transport refrigeration separately from commercial refrigeration in its next annual submission.

74. Similarly, according to the NIR, emissions from industrial refrigeration and stationary air-conditioning are estimated; however, Belgium has not reported any information on emissions from industrial refrigeration and stationary air-conditioning in the

CRF tables. In response to a question raised by the ERT during the review, the Party informed the ERT that the emissions are included under commercial refrigeration in the CRF tables. The ERT recommends that Belgium report the emissions from industrial refrigeration and stationary air-conditioning as "IE" in CRF table 2(II).F in the next annual submission. The Party informed the ERT that it will do so in its next annual submission.

75. The ERT noted that Belgium reported emissions of HFCs from fire extinguishers ("from stocks") and reported HFCs from fire extinguishers ("from manufacturing" and "from disposal") in the CRF table 2(II).F as not estimated (NE). The ERT considered that this could lead to a potential underestimation of HFC emissions from fire extinguishers "from manufacturing" and "from disposal". In response to questions raised by the ERT during the review, the Party confirmed that these emissions have not been included in the inventory. In response to the list of the potential problems and further questions raised by the ERT during the review week, Belgium submitted estimates of HFC emissions "from manufacturing" based on the quantity of HFCs contained in the new equipment and using an EF of 0.1 per cent. Belgium has identified emissions "from disposal" as "NO", owing to the assumption that the product lifetime is 20 years and that the country only began using HFCs in 1995. The ERT concluded that the issue has been resolved by the Party by providing new estimates of HFC emissions from fire extinguishers "from manufacturing".

76. Although Belgium reports HFC, PFC and SF_6 emissions from semiconductor manufacture in CRF table 2(II).F, the Party has not provided a corresponding discussion in the NIR. In response to a question raised by the ERT during the review, the Party informed the ERT that the producers measure the emissions and submit these measurements directly to the agency responsible for compiling the inventory. The ERT recommends that Belgium include, in the NIR of its next annual submission, information on the AD, EFs and method used and on the confidentiality of the plant-specific measurements, in order to increase the transparency of its reporting.

77. The ERT noted that Belgium has reported SF_6 emissions from electrical equipment "from manufacturing" as "NE" and "from disposal" as "NO" in CRF table 2(II).F. The ERT considered that this could lead to a potential underestimation of SF_6 emissions "from manufacturing". In response to questions raised by the ERT during the review, the Party confirmed that these emissions have not been included in the inventory. In response to the list of the potential problems and further questions raised by the ERT during the review week, Belgium submitted estimates of SF_6 emissions from electrical equipment for 2009 and 2010. No data are available for the previous years of the time series. The emissions have been estimated on the basis of the quantity of SF_6 contained in the new equipment and using an EF of 1 per cent. Emissions from disposal are reported only for 2010 and are assumed to occur for the first time in 2010, assuming a product lifetime of 40 years, an initial consumption equal to that in 2011 and a disposal EF of 5 per cent. The ERT strongly recommends that Belgium also report, in its next annual submission, emissions for the years 1990–2008. Further, the ERT strongly recommends that the Party report the emissions from "disposal" for 2010 onwards and explain, in the NIR, why the disposal emissions from electrical equipment only occur from 2010 onwards.

78. The ERT noted that Belgium reported potential PFC emissions (432.18 Gg CO2 eq) from other (consumption of halocarbons and SF_6), but reported actual PFC emissions as "NO" in CRF table 2(I). In response to a question raised by the ERT during the review, the Party could not explain the origin of these emissions. The ERT considered that because actual emissions were not reported the method used by Belgium to report PFC emissions from other (consumption of halocarbons and SF_6) was not in line with the IPCC good practice guidance, thereby leading to a potential underestimation of PFC emissions. In response to the list of the potential problems and further questions raised by the ERT during the review week, Belgium submitted an estimate for actual emissions of perfluoropropane

(C_3F_8) for 2008 and an estimate of actual emissions of perfluorohexane for the period 2007–2010. The Party informed the ERT that the emissions are from laboratory and other uses and that the potential emissions have been incorrectly reported due to the use of an incorrect data source (external trade data on total use by the European Union). The ERT strongly recommends that Belgium explain, in the NIR of its next annual submission, the source of the C_3F_8 emissions for 2008 and why those emissions only occurred in one year. The ERT further recommends that the Party calculate the F-gas emissions from laboratory and other uses for before 2007 and describe the data sources and the methods used to calculate the emission estimates in its next annual submission.

79. Belgium has reported SF_6 emissions from double-glazed windows under the category other (consumption of halocarbons and SF_6). The ERT considers that there could be additional sources of SF_6 emissions, such as the production of sports shoes, trace gas or military uses. The ERT therefore encourages Belgium to conduct research in order to ascertain whether there are any additional uses of SF_6 in Belgium, in order to ensure the completeness of the reporting, and to report the results of the research in future annual submissions.

3. Non-key categories

Other (mineral products) – CO_2

80. Belgium has reported a sharp decline in the value of the IEF for container glass from 2005 (156 kg CO_2/t) to 2006 (109 kg CO_2/t). In response to questions raised by the ERT during the review, the Party informed the ERT that the AD was too high for 2005; accordingly the revised IEF for 2005 will be 97 kg CO_2/t. The ERT recommends that the Party correct the AD for glass production for 2005 in the next annual submission.

Solvent and other product use – N_2O

81. Although N_2O emissions are reported for the use of N_2O for anaesthesia (213.97 Gg CO_2 eq in 2010), the AD and IEF for this category have been reported as "NE". In response to a question raised by the ERT during the review, Belgium indicated that the number of hospital beds in Belgium was used as the AD. The ERT recommends that the Party replace the notation key "NE" with the AD on the number of hospital beds in Belgium in the next annual submission.

D. Agriculture

1. Sector overview

82. In 2010, emissions from the agriculture sector amounted to 10,042.06 Gg CO_2 eq, or 7.4 per cent of total GHG emissions. Since the base year, emissions have decreased by 15.3 per cent. The key drivers for the fall in emissions are the significant decrease in the number of dairy cattle and the reduction in the amount of nitrogenous mineral fertilizer applied to soils. Within the sector, 40.3 per cent of the emissions were from agricultural soils, followed by 35.4 per cent from enteric fermentation and 24.3 per cent from manure management. CH_4 emissions accounted for 51.9 per cent of total sectoral emissions, while N_2O emissions accounted for 48.1 per cent.

83. Belgium has made recalculations for the agriculture sector between the 2011 and 2012 annual submissions in response to the 2011 annual review report. The impact of these recalculations on the agriculture sector is an increase in emissions of 3.2 per cent for 2009. The main recalculations took place in the following categories:

(a) N_2O emissions from crop residues (increase in estimated emissions of 226.11 Gg CO_2 eq, or 51.5 per cent, for 2009);

(b) N_2O emissions from synthetic fertilizers (increase in estimated emissions of 60.31 Gg CO_2 eq, or 7.7 per cent, for 2009);

(c) N_2O emissions from animal manure applied to soils (increase in estimated emissions of 22.76 Gg CO_2 eq, or 2.9 per cent, for 2009);

(d) Indirect N_2O emissions (increase in estimated emissions of 20.68 Gg CO_2 eq, or 2.4 per cent, for 2009).

84. The ERT noted that the explanations of the recalculations are provided in the NIR and in CRF table 8(b); however, the explanations are not sufficiently detailed to allow the ERT to fully understand the rationale for the recalculations and the impact on the total sectoral and national emissions. The ERT recommends that Belgium provide, in a tabular or graphical format, information on the most significant recalculations for the agriculture sector at the national and/or at the regional level and fully explain the impact of each recalculation at the category and regional levels.

85. Belgium states in its NIR that all agriculture emissions from the Brussels-Capital region have been recalculated for the 2012 annual submission following their inclusion for the first time in the 2011 annual submission. The only methodological description provided in the NIR for the Brussels-Capital region is a brief reference to the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the 2006 IPCC Guidelines). In response to a question raised by the ERT during the review, Belgium confirmed that all emissions from agriculture for the Brussels-Capital region were estimated using the methods, EFs and parameters from the 2006 IPCC Guidelines. The Party did not provide any justification for using the methods, EFs and parameters from the 2006 IPCC Guidelines; the ERT found that this is not in line with the IPCC good practice guidance or the UNFCCC reporting guidelines. In response to the list of potential problems and further questions raised by the ERT during the review week, Belgium provided revised estimates for all emissions from the agriculture sector for the Brussels-Capital region using the methods, parameters and EFs from the Revised 1996 IPCC Guidelines (see paras. 88 and 92 below). The ERT strongly recommends that the Party estimate the emissions from all three regions using appropriate methods that are relevant to the national circumstances, in accordance with the IPCC good practice, in its next annual submission. The ERT also encourages Belgium to improve the sector-specific QA checks performed by designating QA responsibility at the sectoral level to the national experts within one of the three regions.

86. Belgium has provided an uncertainty analysis in annex 2 to the NIR which includes uncertainty estimates for the agriculture sector. The ERT found that the uncertainty analysis for the agriculture sector has not been performed at the same level of detail as that for the other sectors (e.g. the uncertainty analysis for the agriculture sector has only been provided for the categories enteric fermentation (CH_4), manure management (CH_4), manure management (N_2O) and agricultural soils (N_2O)). The ERT recommends that the Party conduct an uncertainty analysis at the same level of detail as its key category analysis for the agriculture sector in its next annual submission.

87. As described in paragraph 16 above, the Party's national inventory comprises three regional inventories which are presented at different levels of detail in the NIR. The ERT found that the information provided for some categories in the agriculture sector and for some regions (methodological descriptions for the Brussels region), is not transparent and comparable to the detail provided for other regions. The ERT reiterates the recommendation in the previous review report that Belgium present the data for the agriculture sector for all three regions at a comparable level of detail to the information presented for the other sectors and for the national inventory as a whole. The ERT

specifically recommends that the Party restructure and revise NIR tables 6.5–6.13 to include information on the parameters, EFs and methods used for all three regions, in order to improve transparency. The ERT also recommends that Belgium improve the structure of the agriculture chapter in the NIR by providing the same level of detail for all categories, by gas, for each region, in accordance with the recommended annotated outline of the NIR (see para. 26 above).

2. Key categories

Enteric fermentation – CH_4

88. The ERT noted that emissions from dairy and non-dairy cattle were estimated using a tier 2 method for the Flemish and Walloon regions and that a tier 1 method was used for all other animals, in line with the IPCC good practice guidance. The ERT found that, since the previous annual submission, Belgium has revised the estimates for this category for the Brussels-Capital region using the methods, parameters and EFs from the 2006 IPCC Guidelines, tier 1 approach. The Party did not provide any justification for using the methods, parameters and EFs from the 2006 IPCC Guidelines and the ERT found that this in not in line with the IPCC good practice guidance or the UNFCCC reporting guidelines. In response to the list of potential problems and further questions raised by the ERT during the review week, Belgium provided revised estimates for enteric fermentation for the Brussels-Capital region using the methods, parameters and EFs from the Revised 1996 IPCC Guidelines, and the ERT accepted the revised estimates. The ERT recommends that the Party provide emission estimates for the Brussels-Capital region calculated using appropriate and comparable methods to those used in the Flemish and Walloon regions in its next annual submission. The ERT further recommends that Belgium provide additional methodological descriptions of these changes in the NIR and revise NIR tables 6.5–6.8 to include specific information relating to all three regions.

Manure management – CH_4 and N_2O

89. The ERT found that the tier 2 CH_4 EF for dairy cattle for the Flemish region (20.30 kg CH_4/head) is considerably higher than the value for the Walloon region (11.45 kg CH_4/head). In response to questions raised by the ERT during the review, the Party explained that the different animal waste management systems used in the two regions affect the overall CH_4 EF by animal type. The ERT recommends that Belgium present the reasons for the large differences in the EFs between the regions in its next annual submission.

90. During the review, the ERT asked the Party to elaborate on the choice of methane conversion factors (MCFs) used in the annual submission, as presented in table 6.10 of the NIR, in particular the references to the use of the MCFs from the 2006 IPCC Guidelines. The Party provided the ERT with data to explain the choice of MCFs and how they are appropriate to the national circumstance. The ERT recommends that Belgium provide an explanation outlining the appropriateness of the MCFs used in all three regions in its next annual submission.

91. The ERT noted that CH_4 emissions from cattle and swine were estimated using a tier 2 method for the Flemish and Walloon regions and that a tier 1 method was used for all other animals, in line with the IPCC good practice guidance. The ERT found that the tier 2 EF for swine in the Flemish region (9.99 kg CH_4/head/day) is considerably higher than the value for the Walloon region (4.81 kg CH_4/head/day); the default value for Western Europe (cool climate) from the Revised 1996 IPCC Guidelines is 3 kg CH_4/head/day. In response to a question raised by the ERT during the review, the Party explained that the reasons for the differences in the EFs used for the two regions can be attributed to the different values

of the gross energy intake used for the estimation of the volatile solid excretion rates; the Walloon region uses region-specific values, while the Flemish region uses revised 1996 IPCC default values (38 MJ/day). During the review week, Belgium informed the ERT that this issue was resolved during the European Union internal review in June 2012 by using a harmonized EF for swine for both regions. The ERT recommends that the Party report the results of the efforts to harmonize the EF in its next annual submission and submit revised CH_4 emission estimates accordingly.

92. The ERT found that, since the previous annual submission, Belgium has submitted revised emissions estimates of CH_4 and N_2O from manure management for the Brussels-Capital region using the methods, parameters and EFs from the 2006 IPCC Guidelines. The Party did not provide any justification for using the methods, parameters and EFs from the 2006 IPCC Guidelines and the ERT found that this in not in line with the IPCC good practice guidance or the UNFCCC reporting guidelines. In response to the list of potential problems and further questions raised by the ERT during the review week, Belgium provided revised emission estimates for manure management for the Brussels-Capital region using the methods, parameters and EFs from the Revised 1996 IPCC Guidelines, and the ERT accepted the revised estimates. The ERT recommends that the Party provide emission estimates for the Brussels-Capital region using appropriate and comparable methods to those used in the Flemish and Walloon regions in its next annual submission. The ERT further recommends that Belgium provide additional methodological descriptions of these changes in the NIR and revise NIR tables 6.9–6.13 to include specific information relating to all three regions.

Agricultural soils – N_2O

93. The ERT found that Belgium has made considerable improvements in its 2012 annual submission by: revising the equation used for animal manure applied to soils in the Flemish region; using the same amount of exported manure for the direct and indirect N_2O emission estimates; and harmonizing the fractions used for N-fixing crops between the Flemish and Walloon regions. The ERT commends Belgium for the improvements made since the previous annual submission, in particular the improvements in response to recommendations in the previous review report.

94. The ERT noted that, since the previous annual submission, Belgium has revised the estimates of N_2O emissions for all subcategories under agricultural soils for the Brussels-Capital region using the methods, parameters and EFs from the 2006 IPCC Guidelines. Belgium did not provide any justification for using the methods, parameters and EFs from the 2006 IPCC Guidelines and the ERT found that this in not in line with the IPCC good practice guidance or the UNFCCC reporting guidelines. In response to the list of potential problems and further questions raised by the ERT during the review week, Belgium provided revised estimates of N_2O emissions for all subcategories under agricultural soils for the Brussels-Capital region using the methods, parameters and EFs from the Revised 1996 IPCC Guidelines, and the ERT accepted the revised estimates. The ERT recommends that the Party provide emission estimates for the Brussels-Capital region using appropriate and comparable methods to those used in the Flemish and Walloon regions in its next annual submission and provide additional methodological descriptions of these changes in the NIR.

95. The ERT also finds that the descriptions of the methodologies used to estimate direct and indirect N_2O emissions from agricultural soils lack transparency, noting in particular the incomplete descriptions in the NIR of the methods, equations and EFs used from the Revised 1996 IPCC Guidelines for each source of N_2O emissions for the Flemish and Walloon regions, and the lack of transparency provided by Belgium for the Brussels-Capital region in its response to the list of potential problems and further questions raised

by the ERT during the review week. The ERT recommends that Belgium revise the structure of the chapter of the NIR on agricultural soils to include, in the next annual submission: a full description of the methods and equations used for both direct and indirect N_2O emissions; information on the choice of the EFs, by region, according to the CRF categories; and information on the EFs and AD for synthetic fertilizers, animal manure applied to soils, N-fixing crops, crop residues, cultivation of histosols, pasture range and paddock, atmospheric deposition and N leaching and run-off.

96. The ERT noted that recommendations in previous review reports included that Belgium provide an N manure mass balance in its NIR to improve the transparency of the reporting relating to the import/export of animal manure for the Flemish region, due to the manure surplus in the region, and according to the region's manure action plans. The ERT found that the Party has not yet provided this information in its annual submission and therefore reiterates the recommendation in the previous review reports that Belgium include an N manure mass balance in its next annual submission and revise the structure of the chapter of the NIR on agricultural soils, as recommended above (see para. 95 above).

E. Land use, land-use change and forestry

1. Sector overview

97. In 2010, net removals from the LULUCF sector amounted to 1,015.04 Gg CO_2 eq. Since 1990, net removals have decreased by 18.6 per cent. The key driver for the decrease in net removals is the increase in emissions of CO_2 emissions from cropland, which have grown by 55.3 per cent since the base year, mostly due to the increase in soil carbon emissions from grassland converted to cropland. Within the sector, all of the removals were from forest land (3,491.38 Gg), while the majority of the emissions were from cropland (1,905.26 Gg), followed by land converted to settlements (589.18 Gg).

98. The Party has made recalculations for the LULUCF sector between the 2011 and 2012 annual submissions in response to the 2011 annual review report and following changes in AD and EFs. The impact of these recalculations on the LULUCF sector is a decrease in removals of 31.9 per cent for 2009. The main recalculations took place in the following categories:

(a) Liming, reported for the first time in the 2012 annual submission (increase in estimated emissions of 53.31 Gg CO_2 eq for 2009);

(b) N_2O emissions from land converted to cropland, reported for the first time in the 2012 annual submission (increase in estimated emissions of 91.88 Gg CO_2 eq for 2009);

(c) AD (areas) across all LULUCF categories as a result of the increase in the sampling intensity.

99. The methodologies used to estimate the emissions and removals are in line with the IPCC good practice guidance for LULUCF for all land categories and sources.

100. While recognizing the efforts made by the Party to improve the consistency and accuracy of the time series (e.g. recalculating the carbon stock changes for soils on forest land), the ERT recommends that the Party include, in the NIR of its next annual submission, a clear description of the methods used and an explanation of the effects of the recalculations on the estimates of emissions and removals, in order to enhance transparency.

101. The completeness of the inventory has improved compared to the previous annual submission. The main improvements relate to the reporting of new mandatory carbon pools and non-CO_2 emissions. The ERT noted that several categories, such as wetlands remaining wetlands, settlements remaining settlements and other land remaining other land, have been

reported using the notation key "NO" and no documentation has been provided to substantiate that the emissions are really not occurring and should not be reported instead as "NE". This issue was raised in the previous review report, but has not been addressed by the Party in the 2012 annual submission. The ERT recommends that the Party use the appropriate notation keys in CRF table 5 in its next annual submission. The ERT acknowledges that, in line with a recommendation in the previous review report, Belgium has reported net CO_2 emissions and removals for 1990 for all land-use conversion categories for the first time in the 2012 annual submission, thereby improving the completeness of the CRF tables.

102. The ERT noted that the Party has provided limited information in the NIR on the forestry sector in Belgium. The ERT encourages the Party to enhance the information in the overview of the sector, in order to better describe its dynamics and drivers (e.g. enhance the description of Belgian forests in the different regions).

103. In general, the discussion of the LULUCF sector in the NIR is not fully transparent. The information on the methods used is rather brief and it is difficult for the ERT to assess the extent to which the methods from the IPCC good practice guidance for LULUCF have been followed. The ERT considers that the Party has made efforts to include good-quality information in the inventory and to continually improve it; however, this is not clearly reflected in the NIR, as much of the relevant information available was not included.

104. During the review week, the ERT had the opportunity to discuss issues relating to the annual submission with the Party and to request additional information, in particular related to methods used to monitor land-use changes. All of the questions raised by the ERT were adequately answered and the requested additional information was provided. The ERT recommends that, in its next annual submission, the Party explain in greater detail in the NIR the methods used to monitor land-use changes and to ensure the consistent representation of land.

105. Belgium uses a methodology developed by Gembloux Agro-Bio Tech University to represent land and land-use changes in a spatially explicit manner. This methodology is similar to approach 3 of the IPCC good practice guidance for LULUCF as it allows the identification of units of land at the level of resolution of the minimum area defined by Belgium in its definition of forest (0.5 ha). The Party uses data from satellite images that are geoprocessed, as well as ortophotographs from different years. Every point in a grid encompassing an area of 100 ha that covers the whole country (wall-to-wall mapping) is used. The IPCC good practice guidance for LULUCF states that, in order to relate land cover to land use, it is good practice to complement the remotely sensed data with ground reference data (often referred to as "ground truth data"). In response to questions raised by the ERT during the review, the Party stated that forest inventories and surveys were used to check the remotely sensed data. The ERT recommends that the Party include a full description of the method used in the next annual submission, in particular explaining how it distinguishes between similar land cover such as cropland, grassland and young forests. These explanations are critical to allow the ERT to understand how the Party minimizes the uncertainties in the classification of lands.

106. Following the recommendation made in the previous review report, the Party has improved the accuracy of the AD on land use and land-use change, due to the increase in the intensity of the sampling. The ERT welcomes this improvement and acknowledges the challenge represented by collecting data for the three regions in Belgium, inasmuch as they use different data and methods to prepare the inventory. In this regard, the ERT encourages the Party to make efforts to consolidate and harmonize the methodological approaches used across the three regions in its next annual submission.

107. Belgium has presented, for the first time, a quantitative key category analysis for the LULUCF sector, both level and trend assessment. The following seven land-use categories/subcategories have been identified by the Party as key categories: forest land remaining forest land (level); forest land converted to cropland (trend); cropland remaining cropland (level); land converted to cropland (level); grassland remaining grassland (trend); land converted to grassland (level and trend); and land converted to settlements (level and trend). The ERT welcomes the Party's effort to conduct a quantitative key category analysis.

2. Key categories

Forest land remaining forest land – CO_2

108. The Party has calculated the estimates for this key category using country-specific EFs and/or removal factors. The ERT noted, however, that the NIR does not include all of the relevant data used for the calculations (e.g. the annual increment in merchantable volume of wood, the volume of wood harvested), thereby affecting the transparency of the NIR. In response to questions raised by the ERT during the review, the Party was able to provide this information. The ERT recommends that Belgium report, in the NIR of its next annual submission, all relevant factors and data used to calculate the estimates, in line with the methodology contained in the IPCC good practice guidance for LULUCF.

109. Belgium has used two different methods from the IPCC good practice guidance for LULUCF to estimate the carbon stock changes in the Flemish and Walloon regions: the IPCC default method was used for the Flemish region, while the IPCC carbon stock change method was used for the Walloon region. The ERT encourages the Party to harmonize the methodologies used in future submissions by extending the use of the carbon stock change method to the Flemish region, in order to increase the accuracy of the estimates.

110. The NIR states that the carbon stock changes in soils have been recalculated downwards in the Walloon region, meaning that the removals had previously been overestimated. At the same time, the situation regarding the same pool in the Flemish region, which represents 23.0 per cent of Belgian forest land, has not been clarified in the NIR. During the review, the ERT asked the Party to clarify any potential overestimations of removals in the Flemish region. The Party explained that the soils in the Flemish region are of lower carbon content and that the removals from its soils have been quantified at a lower rate of 0.43 t C/ha/year^{-1}. The ERT recommends that the Party increase the transparency of the explanation of this issue in the NIR by including more details on the regional data in its next annual submission.

111. In the CRF tables, the Party has reported the carbon stock changes in living biomass for forest land converted to all other land-use categories, but the NIR states that only lands converted to grassland and cropland have been reported. The ERT recommends that the Party ensure the consistency between the NIR and the CRF tables through appropriate QC procedures in its next annual submission.

Cropland remaining cropland – CO_2

112. The carbon stock changes in living biomass on cropland remaining cropland are reported as "NE", although Belgium notes in the NIR that the area of orchards has increased significantly since 1990 and therefore the subcategory is assumed to be a net sink. Nevertheless, the ERT found that the lack of reporting causes an issue of completeness and recommends that the Party report this missing pool in its next annual submission.

113. Liming is common practice in cropland in Belgium. In previous annual submissions, the Party reported the emissions from liming as "NO". Belgium has reported emissions from liming for the first time in the 2012 annual submission using expert judgment and data

from neighbouring countries. The ERT acknowledges the improvement in the completeness of the reporting and recommends that the Party refine the emission estimates using country-specific information on the amount of limestone and dolomite applied in its next annual submission.

Land converted to grassland – CO_2

114. In the previous annual submission, Belgium reported removals (1.27 Gg C in 2009) from the carbon stock changes in mineral soils in forest land converted to grassland, when in fact these should have been reported as emissions. The ERT acknowledges that the Party has implemented the recommendation made in the previous review report and has corrected this error; in the 2012 annual submission, Belgium has reported emissions of 2.59 Gg C from land converted to grassland for 2009.

3. Non-key categories

Biomass burning – CO_2, CH_4 and N_2O

115. According to the information provided in the NIR, the emission estimates for wildfires have not been updated since 2007, although these emissions have been reported as "NO" in the CRF tables. This creates an inconsistency between the information provided in the NIR and in the CRF tables. The ERT recommends that Belgium use the appropriate notation key in the CRF tables to report wildfires in its next annual submission, in order to enhance the completeness of the reporting.

Emissions from disturbance associated with land-use conversion to cropland – N_2O

116. For the first time, the Party has reported N_2O emissions from soil disturbance in CRF table 5(III), which significantly improves the completeness of the inventory. The ERT noted, however, that the NIR does not provide explanations of the methods or data sources used. The ERT recommends that Belgium provide a full description of the methods and data sources used for this category in its next annual submission, in order to increase the transparency of the reporting.

Emissions from agricultural lime application – CO_2

117. In previous annual submissions, the Party reported CO_2 emissions from lime application using the notation key "NO"; however, in the 2012 annual submission, these emissions (53.31 Gg CO_2 eq in 2010) have been quantified for the first time and are reported in CRF table 5(IV). The ERT acknowledges this significant improvement in terms of completeness and accuracy. However, the ERT noted that the NIR does not provide explanations of the methods or data sources used. The ERT recommends that Belgium provide a full description of the methods and data sources used for this category in its next annual submission, in order to increase the transparency of the reporting.

Biomass burning – CO_2, CH_4 and N_2O

118. According to the information provided in the NIR, the emission estimates for wildfires have not been updated since 2007, although these emissions have been reported as "NO" in the CRF tables. This creates an inconsistency between the information provided in the NIR and in the CRF tables. The ERT recommends that Belgium use the appropriate notation key in the CRF tables to report wildfires in its next annual submission, in order to enhance the completeness of the reporting.

F. Waste

1. Sector overview

119. In 2010, emissions from the waste sector amounted to 1,165.08 Gg CO_2 eq, or 0.9 per cent of total GHG emissions. Since 1990, emissions have decreased by 66.3 per cent. The key drivers for the fall in emissions are the decrease in biodegradable waste disposed in solid waste disposal sites, as a result of the implementation of national and regional waste management policies, the development of CH_4 gas recovery in landfills and the promotion of waste incineration with energy recovery. Within the sector, 53.7 per cent of the emissions were from solid waste disposal on land, followed by 36.4 per cent from wastewater handling, 7.8 per cent from waste incineration and 2.1 per cent from compost production reported under other (waste).

120. The Party has made recalculations for the waste sector between the 2011 and 2012 annual submissions following changes in AD and EFs and in order to rectify identified errors. The impact of these recalculations on the waste sector is an increase in emissions of 22.9 per cent for 2009. The main recalculations took place in the following categories:

(a) CH_4 emissions from solid waste disposal on land: an increase of 259.26 Gg CO_2 eq, or 61.2 per cent, owing to updated AD and CH_4 gas recovery data for the Flemish region, and as a result of a revised degradable organic carbon (DOC) value for the Walloon region and some changes to the parameters used;

(b) Other (waste): a decrease of 38.86 Gg CO_2 eq, or 63.5 per cent, in the estimated CH_4 emissions from compost production, owing to a change in the EF for the Flemish region.

121. The inventory for the waste sector is complete in terms of reporting items, categories, years, gases and geographical coverage. Since the total national GHG emissions for the waste sector were aggregated from the regional GHG emissions reported by the Flemish, Walloon and Brussels-Capital regions, the NIR includes explanations of the regional GHG estimation methods used. However, the ERT noted that the information in the NIR is still insufficient, as noted by recommendations in the previous review report. In order to improve the transparency of the reporting, the ERT strongly recommends that Belgium provide, in the NIR of its next annual submission, a sufficiently detailed explanation to allow the ERT to understand the region-specific methodologies applied, assumptions, EFs, parameters, AD and data sources used (see paras. 122, 124, 131 and 132 below).

122. The ERT noted that the description of the sector-specific QA/QC procedures is still insufficient and therefore reiterates the recommendation in the previous review report that Belgium improve its reporting of the sector-specific QA/QC procedures by providing more detailed information on the on-going category-specific QA/QC activities in each region, in its next annual submission. Furthermore, the ERT detected several errors in the NIR that should have been addressed in the QA/QC process, including inaccurate explanations of the parameters used (e.g. the Party reported "Qi" on page 154 and "w" on page 156 for the fraction of total waste disposed) and an incorrect data table (e.g. the Party reported the amount of organic carbon (C_0) for domestic waste after 1991 in table 8.2 and the DOC value in figure 8.4). The ERT recommends that Belgium conduct an intensive QA/QC check of the content of the NIR prior to its official submission to the secretariat.

2. Key categories

Solid waste disposal on land – CH_4

123. CH_4 emissions from solid waste disposal on land were estimated using two different approaches: a combination of the multiphase model for active landfills

("16 solid waste disposal sites" (SWDS)) and the FOD model for closed landfills for the Flemish region; and the FOD model for the Walloon region. There are no landfills in the Brussels-Capital region. The ERT noted a lack of transparency in the descriptions of the models and in the explanations of the selection of the region-specific parameters. The ERT reiterates the recommendation in the previous review report that Belgium list, in the NIR of its next annual submission, the parameters used for each model in a single table, using the same terminology.

124. The ERT noted a lack of justification in the NIR for the use of two different models to estimate the CH_4 emissions from closed and active landfills in the Flemish region. In addition, the ERT noted that a scientific rationale for use of the region-specific multiphase model was not provided in the NIR. In order to increase the transparency of the CH_4 emission estimates for this category, the ERT recommends that Belgium explore the possibility of using a harmonized approach for the estimation of CH_4 emissions from solid waste disposal on land in the Flemish region. Further, if Belgium continues to use the region-specific multiphase model, the ERT recommends that the Party provide a rationale for using this model for recent landfills only, in its next annual submission.

125. Since Belgium estimates CH_4 emissions from solid waste disposal sites, by region, using different approaches and methodologies, the ERT reiterates the recommendation in the previous review report that the Party report the emissions separately, by region, in CRF table 6.A, in order to ensure the transparency of its reporting.

126. The ERT noted that the region-specific multiphase model used for the estimation of CH_4 emissions from new landfills in the Flemish region is compatible with the IPCC FOD method, and the "formation factor" parameter is similar to the methane correction factor from the IPCC FOD method. A region-specific parameter of 0.6 was used for the "formation factor" in the region-specific model, taking into account the conditions of landfill sites, however the Party did not provide a rationale or references in the NIR for use of this factor. The ERT noted that the IPCC default methane correction factor for emissions from managed waste disposal sites is 1.0 and considered that there could have been an underestimation of CH_4 emissions as a result of using a "formation factor" of 0.6. During the review week, the ERT recommended that Belgium either provide justification for using the region-specific "formation factor" of 0.6 for SWDS in the Flemish region or submit revised emissions estimates of CH_4 for the Flemish region using a "formation factor" of 1.0 in order to avoid the potential underestimation of emissions. In response to the list of potential problems and further questions raised by the ERT during the review week, Belgium provided revised estimates of CH_4 emissions for the Flemish region using a "formation factor" of 1.0. The ERT concluded that the revised estimates of CH_4 emissions.

127. The Flemish region estimates the amount of CH_4 recovery from 16 SWDS. In response to questions raised by the ERT during the review, the ERT learned that the amount of CH_4 recovery in each SWDS was estimated by multiplying a region-specific value of 80 per cent or a site-specific value of 10 per cent (De Kock Huldenberg) or 1 per cent (Igemo) with the amount of CH_4 generation in each SWDS based on expert judgment, without any justification for the values used. The ERT also noted that the IPCC good practice guidance (section 5.1.1.2, page 5.10) states that the default value for CH_4 recovery is zero and that this default value should only be changed when references are available. Therefore the ERT considered that Belgium could be overestimating recovery (i.e. underestimating emissions) and recommended that Belgium provide estimates of CH_4 emissions from solid waste disposal on land, based on the metering of gas recovered for energy utilization and flaring, in line with the IPCC good practice guidance. In response to the list of potential problems and further questions raised by the ERT during the review week, Belgium provided revised estimates of CH_4 recovery from 16 SWDS in the Flemish region based on metered gas recovery data, which are consistent with the Flemish regional

energy balance. The ERT concluded that the issue has been resolved by the Party by providing revised estimates of CH_4 recovery from the 16 SWDS in the Flemish Region.

3. Non-key categories

Wastewater handling – CH_4

128. CH_4 emissions from municipal wastewater treatment plants in the Flemish region and CH_4 emissions from septic tanks in the Flemish and Walloon regions are reported under this category. Municipal wastewater treatment plants in the Walloon and Brussels-Capital regions do not release CH_4 to the atmosphere because the municipal wastewater in both regions is treated either aerobically or with CH_4 recovery for energy purposes. Industrial wastewater in the Flemish and Walloon regions is treated aerobically and the CH_4 from very limited anaerobic treatment is mostly recovered by flaring activity. However, the notation key "NE" is still used to report CH_4 emissions from industrial wastewater in CRF table 6.B, indicating that AD are not available. The ERT recommends that Belgium revise this inconsistency in its next annual submission.

129. In response to questions raised by the ERT during the review, Belgium explained that the Flemish region will harmonize the assumption used for the estimation of CH_4 emissions from municipal wastewater treatment plants with the assumption used by the other regions that all municipal wastewater is treated either aerobically or with CH_4 recovery. However, the ERT recommends that Belgium carefully evaluate the practices of municipal wastewater treatment plants in the Flemish region, to ensure that the assumptions used by the other regions are applicable to the Flemish region. Furthermore, the ERT recommends that, if the CH_4 emissions from municipal wastewater treatment plants are not reported for the Flemish region in the next annual submission, the Party provide a clear rationale for this in the NIR.

130. The ERT noted that CH_4 emissions from septic tanks are estimated based on a country-specific methodology combined with the IPCC GPG default EF and country-specific parameters. The ERT recommends that Belgium provide a detailed explanation of the country-specific methodology and parameters used, especially the scientific background information used to derive the fraction of anaerobic degradation of 25 per cent, in its next annual submission.

131. To improve the transparency of the reporting, the ERT encourages Belgium to report CH_4 emissions from municipal wastewater treatment plants and septic tanks separately in CRF table 6.B and to include the cross-sectoral information on the CH_4 recovered from municipal wastewater treatment plants under the energy sector in its next annual submission.

Waste incineration – CO_2, CH_4 and N_2O

132. For the estimation of CO_2, CH_4 and N_2O emissions from waste incineration, each region applies its own methodology, all of which are similar to the methodology in the Revised 1996 IPCC Guidelines, and region-specific EFs according to the availability of data in each region. In line with the IPCC good practice guidance, CO_2, CH_4 and N_2O emissions from waste incineration with energy recovery are reported under the energy sector. The CO_2 EFs are calculated based on the data on the carbon content of waste for the Flemish region and on the CO_2 concentration in the exhaust gas in the waste incinerators for the Walloon region. The Brussels-Capital region uses a CO_2 EF from the United States of America and reports the emissions under the energy sector because the incinerator in the Brussels-Capital region recovers energy. The ERT noted that the information provided in the NIR is not sufficiently clear to enable the ERT to understand the assumptions used to calculate the CO_2, CH_4 and N_2O emission estimates for each region. In response to

questions raised by the ERT during the review, the Party provided detailed explanations regarding the methodology and calculation methods used to derive the CO_2 EFs. The ERT strongly recommends that Belgium include this information in a transparent manner in the NIR of its next annual submission.

133. The Flemish region reports CO_2 emissions from flaring in chemical industry under the industrial processes sector, whereas the Walloon region reports CO_2 emissions from the same source in the waste incineration category under the waste sector. The ERT reiterates the recommendation in the previous review report that Belgium ensure that the reporting of waste incineration activities is consistent and transparent between the regions, in particular regarding the sector in which the emissions are reported, in its next annual submission.

Other (waste) – CH_4

134. CH_4 emissions from compost production are estimated in the Flemish and Walloon regions using a country-specific methodology and EF. The ERT noted that the Party uses a CH_4 EF from the Netherlands of 0.75 kg CH_4/t after 2009 in the Flemish region and for 1990 to 2010 in the Walloon region. In the Flemish region, an EF of 2.4 kg CH_4/t was applied for the years prior to 2009. In addition, the Party is planning to evaluate the EF from Germany for use in the national inventory in the near future when the results of a study conducted in Germany become available. The ERT encourages Belgium to clearly explain the applicability of the CH_4 EFs from neighbouring countries and provide a sufficiently clear explanation for not changing the EF used for the Flemish region between 2008 and 2009, in order to enhance time-series consistency. Further, the ERT encourages Belgium to estimate CH_4 emissions from the Brussels-Capital region in its next annual submission.

G. Supplementary information required under Article 7, paragraph 1, of the Kyoto Protocol

1. Information on activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol

Overview

135. Belgium has elected not to report activities under Article 3, paragraph 4, of the Kyoto Protocol and to account for activities under Article 3, paragraph 3, at the end of the commitment period.

136. Belgium has provided information relating to the KP-LULUCF activities following the annotated outline of the NIR, including information that is in line with the requirements outlined in paragraphs 5–9 of the annex to decision 15/CMP.1, with the exception of paragraph 6(a), as explained in paragraph 145 below. The Party has reported emissions and removals from afforestation and reforestation, and deforestation activities under Article 3, paragraph 3, of the Kyoto Protocol for the years 2008, 2009 and 2010.

137. Belgium has made recalculations for the KP-LULUCF activities between the 2011 and 2012 annual submissions following changes in AD, as a result of the increase in the sampling intensity from 1/200 ha to 1/100 ha. This has reduced the uncertainties in the estimation of the AD and has increased the accuracy of the estimates. In response to questions raised by the ERT during the review, the Party clarified that it does not plan to continue increasing the number of sampling plots. The ERT acknowledges the Party's efforts to increase the intensity of the sampling plots in the 2012 annual submission. The impact on each KP-LULUCF activity for 2009 is as follows:

(a) Afforestation/reforestation: increase in estimated removals of 130.25 Gg CO_2 eq (28.3 per cent);

(b) Deforestation: increase in estimated emissions of 565.89 Gg CO_2 eq (120.5 per cent).

138. The factors that caused the recalculations were not clearly documented in the NIR; chapter 10 of the NIR does not provide transparent information on the effects of each updated method or the updated AD on the emissions from each activity. The ERT reiterates the recommendation made in the previous review report that the Party clearly explain, in the NIR, the recalculations performed for activities under Article 3, paragraph 3, of the Kyoto Protocol and their effects on the estimates of emissions and removals, in its next annual submission.

139. In response to the list of potential problems and further questions raised by the ERT during the review week, Belgium provided revised estimates for removals from afforestation and reforestation, and deforestation (see paras. 139 and 148 below). The revision of the estimates resulted in an increase in net removals from afforestation and reforestation of 33.02 Gg CO_2 eq (or by 11.7 per cent) and an increase in net emissions from deforestation of 25.12 Gg CO_2 eq (or by 5.1 per cent) for 2010.

140. Belgium uses a statistical approach based on the land-use classification of points using thematic and remotely-sensed layers to determine the land-use change activities related to afforestation and reforestation, and deforestation. This method is consistent with reporting approach 3 for the representation of land areas from the IPCC good practice guidance for LULUCF. The spatial assessment unit of this system, 0.5 ha, as reported by Belgium, is consistent with the minimum area of the Party's forest definition (0.5 ha). Nonetheless, the thematic and remotely-sensed data are not available for all regions for the base year (1990) and for all years of the commitment period. During the review, the ERT requested that Belgium provide further explanations to enable the ERT to understand how the Party dealt with the lack of data for certain years of the time series for every piece of land. In response to questions raised by the ERT during the review, the Party provided information on the land-use change estimation method used and, in particular, on the extrapolation methods used to reconstruct the whole time series. The ERT recommends that the Party include detailed information on the extrapolation method in the NIR of its next annual submission, in order to increase transparency. Further, the ERT encourages Belgium to consider the inclusion of maps (e.g. base maps, maps for each year of the time series, to the extent as possible) in the NIR of a future annual submission. The ERT also recommends, as already stated for the reporting of the LULUCF sector under the Convention (see para. 105 above), that Belgium use ground reference data ("ground truth data") to complement the remotely sensed data, and that the Party provide, in an annex to the NIR, all complementary information and reports that increase the transparency of the NIR, in its next annual submission.

141. Belgium has reported the carbon stock changes in living biomass and soil organic carbon for activities under Article 3, paragraph 3, of the Kyoto Protocol. However, the carbon stock changes in dead wood and litter under afforestation and reforestation have been reported in the original submission as "NO" (applying a tier 1 default method from the IPCC good practice guidance for LULUCF). The NIR does not contain transparent and verifiable information to demonstrate that these pools are not a net source. In response to a question raised by the ERT during the review, the Party provided two recent studies[8] and

[8] Gembloux Agro-Bio Tech University. 2011. *Inventaire sur l'Affectation des Terres et du Changement d'Affectation des Terres et la Foresterie (LULUCF) de la Belgique*.

one published paper.[9] In addition, Belgium submitted revised KP-LULUCF CRF tables and reported the carbon stock changes in these two pools as "0" for afforestation and reforestation. In light of the two studies provided by the Party, the ERT considers that Belgium has demonstrated, in a transparent and verifiable way, that dead wood and litter are not a net source and recommends that, at a minimum, the Party use the notation key "NE" (not the notation key "NO") in its next annual submission. The ERT noted however that the Party has country-specific data available to report this pool using a tier 2 method (the above-mentioned studies conducted by Gembloux Agro-Bio Tech University report positive annual carbon stock changes in the litter pool in afforested/reforested lands of around (0.04 t C ha^{-1} yr^{-1}). Therefore, the ERT encourages the Party to report estimates for these pools using the country-specific data available, in order to enhance the completeness of the reporting.

142. The ERT noted that the revised KP-LULUCF CRF tables submitted by the Party contain revised estimates for the emissions from dead wood in deforested areas using the country-specific data available (see para. 139 above). As a result, the revised emission estimates are higher than those reported in the original 2012 annual submission. The ERT acknowledges the Party's efforts to increase the accuracy of its inventory.

143. The Party has reported that GHG emissions from wildfires are rare in Belgium and has assumed that, when they do occur (as in 1996), they occur in forest land remaining forest land only. The basis for this assumption is that most of the forest area is included in this category. The application of this assumption to afforested and reforested land does not seem appropriate, as reporting Parties are required to define the land subject to activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol and monitor them, and if there is a fire or another intervention, they are required to report the associated emissions. During the review, the ERT discussed this issue with the Party and, as a result, Belgium confirmed that the assumption that fires only occur in forest land remaining forest land will be revised for future annual submissions in the context of the method adopted by Belgium to monitor its units of land subject to activities under Article 3, paragraph 3, of the Kyoto Protocol.

144. The Party has reported CO_2 emissions from liming and CO_2, CH_4 and N_2O emissions from biomass burning under Article 3, paragraph 3, of the Kyoto Protocol as "NO" and has reported N_2O emissions from organic soils from disturbance associated with land-use conversion to cropland as "NE". Noting that CO_2 emissions from lime application are reported under the Convention (see para. 116 above) and in response to questions raised by the ERT during the review, the Party provided information indicating that it is possible that these emissions do occur in Belgium on land subject to activities under Article 3, paragraph 3, of the Kyoto Protocol. The ERT strongly recommends that the Party estimate the emissions from these categories in the next annual submission, or clearly justify that emissions from these categories do not occur in Belgium.

145. Belgium uses the same methodologies and data to estimate emissions and removals from the LULUCF sector under the Convention and from the KP-LULUCF activities under the Kyoto Protocol, as referenced in the KP-LULUCF chapter of the NIR (chapter 10). However, the description of the LULUCF sector in the LULUCF chapter of the NIR (chapter 7) does not provide sufficient and transparent information on all of the methodologies applied and data used for the calculation of emissions and removals from the Convention reporting (see para. 104 above), nor their application to activities under Article 3, paragraph 3, of the Kyoto Protocol. Further, the ERT found that the information provided in chapter 10 of the NIR is less detailed compared to the information provided in

[9] Latte N. Not published. *Forest Biomass, Litter and Soil Carbon Stocks: a Regional Inventory Approach (Southern Belgium)*.

chapter 7 and strongly recommends that the Party increase the level of detail in chapter 10 in its next annual submission.

146. In addition, the ERT detected some inconsistencies between the different chapters of the NIR; for example, Belgium reports that tier 1 methods were used to calculate emissions and removals from afforestation and reforestation, and deforestation activities, while the LULUCF chapter of the NIR states that tier 1 and tier 2 approaches were used together with country-specific EFs. The ERT strongly reiterates the recommendation in the two previous review reports that the Party improve the clarity of the information provided in its NIR, provide further information to satisfy the mandatory reporting element of paragraph 6(a) of the annex to decision 15/CMP.1 and clearly specify, in the NIR, the methods used to report the emissions from each carbon pool under afforestation and reforestation, and deforestation. Additionally, the ERT recommends that Belgium improve its QA/QC procedures in relation to the information provided in the NIR of its next annual submission, in order to ensure that the text is up-to-date and transparent.

Activities under Article 3, paragraph 3, of the Kyoto Protocol

Afforestation and reforestation – CO_2

147. Belgium has reported forest data for the Flemish, Walloon and Brussels-Capital regions and has used different soil EFs and methodologies for each region. The ERT reiterates the recommendation made in the previous review report that Belgium disaggregate the reporting of afforestation and reforestation in the CRF tables according to the three regions for the next annual submission, in order to improve the transparency of the methods and assumptions applied to each region.

148. The NIR states that Belgium has used a tier 1 method to calculate the carbon stock changes in afforestation and reforestation activities for the EF and the removal factor. In response to a question raised by the ERT during the review, the Party clarified that, as both the EF and the removal factor are country-specific, the approach used is tier 2, but that this has not been transparently demonstrated in the NIR. The ERT recommends that the Party correct this issue in its next annual submission.

Deforestation – CO_2

149. The ERT noted that the emissions reported for deforestation activities under the Kyoto Protocol are consistent with the sum of the emissions reported under the Convention for forest land converted to the other five land-use categories.

150. The ERT noted that the KP-LULUCF CRF tables did not follow the requirements of decision 16/CMP.1 (annex, chapter E, paras. 18 and 19) with regard to the reporting of areas under deforestation, and are not in line with the IPCC good practice guidance for LULUCF, chapter 4.1. According to the KP-LULUCF CRF table 5(KP-I)A2 in the 2012 annual submission, the areas reported under deforestation were decreasing between 2008 (19.95 ha) and 2010 (19.63 ha) this is not consistent with the requirements of decision 16/CMP.1, paragraph 19. Once land is accounted for under Article 3, paragraphs 3 and 4, all anthropogenic GHG emissions by sources from, and removals by sinks on, this land must be accounted for throughout subsequent and contiguous commitment periods. In other words, this means that areas under Article 3, paragraph 3, of the Kyoto Protocol may only grow from 0 ha on 1 January 1990 up to a certain value in 2012, and that at any given point in time, the afforestation and reforestation, and deforestation categories should contain all areas of land that have been afforested, reforested or deforested since 1990. The ERT identified this as a potential underestimation of emissions and included it in the list of potential problems and further questions raised by the ERT during the review week. In response, Belgium submitted revised KP-LULUCF CRF tables, thereby resolving the

problem detected by the ERT during the review: the new tables report increasing areas for deforestation from 2008 (20.99 ha) to 2010 (22.79 ha).

151. The ERT noted that the Party has not included a detailed inventory improvement plan in its annual submission. The ERT recommends that Belgium prepare a detailed improvement plan for the KP-LULUCF activities, with a view to applying the improvements to the 2013 and 2014 annual submissions.

2. Information on Kyoto Protocol units

Standard electronic format and reports from the national registry

152. Belgium has reported information on its accounting of Kyoto Protocol units in the required SEF tables, as required by decisions 15/CMP.1 and 14/CMP.1. The ERT took note of the findings included in the SIAR on the SEF tables and the SEF comparison report.[10] The SIAR was forwarded to the ERT prior to the review, pursuant to decision 16/CP.10. The ERT reiterated the main findings contained in the SIAR.

153. Information on the accounting of Kyoto Protocol units has been prepared and reported in accordance with decision 15/CMP.1, annex, chapter I.E, and reported in accordance with decision 14/CMP.1 using the SEF tables. This information is consistent with that contained in the national registry and with the records of the international transaction log (ITL) and the clean development mechanism registry and meets the requirements referred to in decision 22/CMP.1, annex, paragraph 88(a–j). The transactions of Kyoto Protocol units initiated by the national registry are in accordance with the requirements of the annex to decision 5/CMP.1 and the annex to decision 13/CMP.1. No discrepancy has been identified by the ITL and no non-replacement has occurred. The national registry has adequate procedures in place to minimize discrepancies.

National registry

154. The ERT took note of the SIAR and its finding that the reported information on the national registry is complete and has been submitted in accordance with the annex to decision 15/CMP.1. The ERT further noted from the SIAR and its finding that the national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1, and continues to adhere to the technical standards for data exchange between registry systems in accordance with decisions 16/CP.10 and 12/CMP.1. The national registry also has adequate security, data safeguard and disaster recovery measures in place and its operational performance is adequate.

Calculation of the commitment period reserve

155. Belgium has reported its commitment period reserve in its 2012 annual submission. Belgium reported that its commitment period reserve has not changed since the initial report review (606,595,975 t CO_2 eq), as it is based on the assigned amount and not on the most recently reviewed inventory. The ERT agrees with this figure.

3. Changes to the national system

156. Belgium reported that there have been no changes to its national system since the previous annual submission. The ERT concluded that the Party's national system continues

[10] The SEF comparison report is prepared by the ITL administrator and provides information on the outcome of the comparison of data contained in the Party's SEF tables with corresponding records contained in the ITL.

to be in accordance with the requirements of national systems outlined in decision 19/CMP.1.

4. Changes to the national registry

157. Belgium reported that there have been no changes to its national registry since the previous annual submission. The ERT concluded that the Party's national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1, and continues to adhere to the technical standards for data exchange between registry systems in accordance with relevant decisions of the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol (CMP).

5. Minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol

158. Belgium did not provide information on changes in its reporting of the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol in its annual submission. However, in response to questions raised by the ERT during the review, the Party acknowledged that there have been no changes in its reporting under Article 3, paragraph 14. The ERT recommends that the Party, in its next annual submission, report any change(s), or the lack thereof, in its information provided under Article 3, paragraph 14, in accordance with decision 15/CMP.1, annex, chapter I.H.

159. The ERT concluded that the information reported in the 2012 annual submission is generally complete and transparent. However, the ERT reiterates the recommendation in the previous review report that Belgium improve its reporting by providing information on how it gives priority to its policies, actions and projects in accordance with paragraph 24(a–f) of the annex to decision 15/CMP.1, and include information on any changes that have occurred since the previous annual submission, in accordance with paragraph 25 of the annex to decision 15/CMP.1.

160. Belgium has reported some actions taken by Belgium in order to respect its commitments present no direct or indirect adverse effects for developing countries, for example its policies and measures address not only fossil fuel combustion but also emissions of all gases covered by the Kyoto Protocol, such as methane and nitrogen protoxide from agriculture and waste management or F-gases in refrigeration systems.

III. Conclusions and recommendations

A. Conclusions

161. Belgium made its annual submission on 15 April 2012. The annual submission contains the GHG inventory (comprising CRF tables and an NIR) and supplementary information under Article 7, paragraph 1, of the Kyoto Protocol (information on: activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, Kyoto Protocol units, changes to the national system and the national registry, and the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol). This is in line with decision 15/CMP.1.

162. The ERT concludes that the inventory submission of Belgium has been prepared and reported in accordance with the UNFCCC reporting guidelines. The inventory submission is complete and the Party has submitted a complete set of CRF tables for the years 1990–2010 and an NIR; these are complete in terms of geographical coverage, years and sectors, as well generally complete in terms of categories and gases (see para. 112 above). During

the review, the ERT found that Belgium had not reported estimates for the following emissions: HFC emissions from manufacturing and from disposal of fire extinguishers; SF_6 emissions from manufacturing of electrical equipment; and PFC emissions from other consumption of halocarbons and SF_6. Belgium submitted revised emissions estimates for these categories in response to the list of potential problems and further questions raised by the ERT during the review week.

163. The submission of information required under Article 7, paragraph 1, of the Kyoto Protocol has been prepared and reported in accordance with decision 15/CMP.1.

164. The Party's inventory is generally in line with the Revised 1996 IPCC Guidelines, the IPCC good practice guidance and the IPCC good practice guidance for LULUCF. In response to the list of potential problems and further questions raised by the ERT during the review week, Belgium submitted revised emissions estimates and additional information to improve the accuracy and completeness of the estimates for the 2012 annual submission.

165. The Party has made recalculations for the inventory between the 2011 and 2012 annual submissions in response to the 2011 annual review report, following changes in methods, AD and EFs and in response to the list of potential problems and further questions raised by the ERT during the review week. The impact of these recalculations on the national totals is an increase in emissions of 0.6 per cent for 2009. The main recalculations took place in the following sectors/categories:

(a) CO_2 emissions from all energy categories;

(b) CO_2 emissions from chemical industry;

(c) N_2O emissions from agricultural soils;

(d) N_2O emissions from land converted to cropland;

(e) CH_4 emissions from solid waste disposal on land.

166. Belgium has provided information on the KP-LULUCF activities that is generally in line with the IPCC good practice guidance for LULUCF and the requirements of the annex to decision 15/CMP.1. However, the Party did not follow the requirements contained in paragraphs 18 and 19 of decision 16/CMP.1 (annex, chapter E) with regard to the reporting of areas under deforestation. This issue was raised as a potential problem and further question raised by the ERT during the review week, and the Party submitted revised KP-LULUCF CRF tables, thereby resolving the problem.

167. Belgium has reported information on its accounting of Kyoto Protocol units in accordance with decision 15/CMP.1, annex, chapter I.E, and used the required reporting format tables as specified by decision 14/CMP.1.

168. The national system continues to perform its required functions as set out in the annex to decision 19/CMP.1.

169. The national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1, and continues to adhere to the technical standards for data exchange between registry systems in accordance with relevant CMP decisions.

170. Belgium has reported information under decision 15/CMP.1, annex, chapter I.H, "Minimization of adverse impacts in accordance with Article 3, paragraph 14" as part of its 2012 annual submission. The information was provided on 15 April 2012. The ERT concluded that the information reported in the 2012 annual submission is generally complete and transparent.

B. Recommendations

171. The ERT identifies issues for improvement as listed in table 6 below. Recommendations are for the next annual submission, unless otherwise specified.

Table 6
Recommendations identified by the expert review team

Sector	*Category*	*Recommendation*	*Paragraph reference*
General	Inventory planning	Consider devolving or allocating responsibility for the consistency of methodological choice, the reporting in the NIR, and the QA/QC activities at the sectoral level in accordance with the relevant expertise and national circumstances, in order to minimize inconsistencies in the reporting and to reduce the number of QA issues, such as those identified for the agriculture sector for the Brussels-Capital region	16
	Key categories	Report the key category analyses both excluding and including LULUCF and discuss the results	18
		Include the information on whether the key category analysis is used to prioritize future inventory improvements	18
	Uncertainties	Assess the uncertainty of the emissions from the agriculture sector at the same level as the key category analysis and at the same level as for the other sectors	20
		Include emissions from biomass burning, liming and soil disturbance in the uncertainty analysis	21
		Provide information on how the results of the uncertainty analysis are used to prioritize future inventory improvements	22
	Recalculations	Provide additional information in a table or in a figure, by sector, outlining the impact of the recalculations on the sectoral and national total emissions in each sector chapter of the NIR	23
	QA/QC	Implement a QA procedure that ensures the consistency of the approaches used across the three regions, in particular when improvements are made at the regional level using a new methodological approach	24
		Facilitate effective access to, and the sharing of, all relevant data underpinning the GHG inventory between the regions and at the national level, especially for the energy balance	25
Energy	Transparency	Include, in future annual submissions, clear descriptions of the main reasons underpinning the recalculations as well as a quantification of the effects on the AD, EFs and/or emissions in the NIR	34
		Improve the transparency of the information on the choice of the EFs used	35
		Include the full list of NCVs used (i.e. ensure that annex IV to the NIR is complete) and differentiate, where applicable, by region	35
		Include copies of the extended regional and federal energy balances for the latest reported year, outlining the final energy consumption by category	35
		Facilitate effective access to, and the sharing of, all relevant data underpinning the GHG inventory between the regions and at the federal level	39

Sector	*Category*	*Recommendation*	*Paragraph reference*
		Improve the description/transparency of the category-specific QA/QC procedures performed in the NIR, by explaining the links between the plant-specific AD from the EU ETS, the regional energy balances, and the AD reported in the CRF tables; and the link between the regional and federal energy balances affecting the emission estimates	39
	QA/QC	Improve the consistency between the regional and federal energy balances	38, 43 and 44
	Reference approach	Provide information on the energy balance for Belgium and its regions in the next NIR	13
		Clearly document any remaining differences between the reference approach and the sectoral approach and provide explanations for these differences in the NIR	38 and 42
	Fuel combustion: diesel – CO_2, CH_4 and N_2O	Report off-road emissions from: industrial activities under other (manufacturing industries and construction); ground activities in airports and harbours, and any off-road activities not otherwise reported under agriculture/forestry/fisheries or manufacturing industries and construction, under other transportation; and military transport under other (fuel combustion activities)	41
	Stationary combustion: all fuels – CO_2	Include the relevant aggregated EU ETS plant-specific data, at the national level, in the NIR	45
		Improve the transparency of the NIR with regard to the consistency of the reporting of the EU ETS data and the emission estimates provided in the GHG inventory	45 and 46
		Report the AD from the blast furnace gas sold to the electricity sector under public electricity and heat production and not under iron and steel in order to improve the comparability of the EFs across Parties included in Annex I to the Convention	47
	Agriculture/forestry/fisheries: liquid fuels – CO_2	Improve the transparency of the relevant section of the NIR on CO_2 emissions from "international sea fisheries" in the Flemish region, in order to avoid future misunderstandings and to allow the ERT to clearly understand the information provided	49
	Road transportation: liquid fuels – CO_2, CH_4 and N_2O	Improve the consistency between the provisional and final values in the energy balance in future annual submissions	50
		Obtain data on the NCVs and carbon content from the fuel suppliers and estimate the CO_2 emissions from gasoline in order to develop and use more accurate EFs. Otherwise, use the default CO_2 EF of 73 t/TJ from table 1-36 of the reference manual of the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*	51
		Include the revised estimates of CH_4 and N_2O emissions from consumption of diesel, gasoline and liquefied petroleum gas in road transportation	53
		Improve the transparency of the input parameters for the models used to estimate CH_4 and N_2O emissions, as well as the description of the method used to calculate the emissions, in order to ensure the consistency of the total fuel sales with the total fuel consumption according to the regional models in the NIR	53
		Ensure a consistent time series of CH_4 and N_2O emissions from	54

Sector	*Category*	*Recommendation*	*Paragraph reference*
		road transportation and transparently document how this consistency has been achieved in the NIR	
		Improve the transparency of the reporting by including background information on the biofuel use in the country and make efforts to report the CH_4 and N_2O emission estimates separately	55
	Civil aviation: liquid fuels – CO_2, CH_4 and N_2O	Include the revised estimates of CO_2 emissions from kerosene used in civil aviation	57
		Consult with Belgocontrol in relation to obtaining the necessary AD to estimate emissions from civil aviation, either by region or for the country as a whole	58
Industrial processes and solvent and other product use	Transparency	Improve the transparency of the reporting by providing a subchapter on all subcategories reported in the NIR (e.g. subchapters on ammonia production and nitric acid production in chemical industry)	62
		Describe, in these subchapters, which subcategories are key, which method is used (i.e. tier 1, 2, 3 or country-specific) and provide information on the AD and EFs used (i.e. default, plant-specific or country-specific)	62
	Ammonia production – CO_2	Provide a clear description of the amount of CO_2 recovered during ammonia production processes and of how the completeness of the reporting is ensured	63
		Provide clearer information in the NIR on the methodology used, including justification for the oxidation factor applied	64
		Include the information provided to the ERT during the review in the NIR in order to increase transparency	65
	Nitric acid production – N_2O	Provide transparent documentation on the method used to obtain the AD in the NIR	66
	Other chemical industry – CO_2	Consistently report CO_2 emissions from flaring under the same category across the three regions	68
		Report the information on the categories reported as confidential (“C”) in the NIR and clearly identify, in CRF table 2(I) the emissions from carbon black using the notation key “C”	69
	Iron and steel production – CO_2	Clearly and transparently explain in the NIR that the emissions from coke consumption are reported under the energy sector and explain why the emissions are reported under the energy sector	70
		Improve the transparency of the reporting by providing information on the allocation of CO_2 emissions from this category in the NIR	71
		Report the CO_2 emissions from limestone and dolomite used as flux in blast furnaces in iron and steel production under limestone and dolomite use	72
	Consumption of halocarbons and SF_6 – HFCs, PFCs and SF_6	Report emissions from transport refrigeration separately from commercial refrigeration	73
		Report emissions from industrial refrigeration and air conditioning as included elsewhere in CRF table 2(II).F	74
		Include, in the NIR information on the AD, EFs and method used and on the confidentiality of the plant-specific measurements, in order to increase the transparency of the reporting	76

Sector	*Category*	*Recommendation*	*Paragraph reference*
		Report emissions for the years 1990–2008	77
		Explain, in the NIR, why the disposal emissions from electrical equipment only occur from 2010 onwards	77
	Other (mineral products and glass production) – CO_2	Correct the AD for glass production for 2005	80
	Use of N_2O for anaesthesia – N_2O	Replace the notation key for not estimated ("NE") with the AD on the number of hospital beds in Belgium	81
Agriculture	Recalculations	Provide, in a tabular or graph format, information on the significant recalculations for the agriculture sector at the national or at the regional level and fully explain the impact of each recalculation at the category and regional levels, in the NIR	84
	Accuracy	Estimate the emissions from all three regions using appropriate methods that are relevant to the national circumstances, in accordance with the IPCC good practice	85
	Uncertainties	Conduct an uncertainty analysis at the same level as the key category analysis for the agriculture sector	86
	Transparency	Present the data for all three regions and for the national inventory as a whole in the same way	87
		Restructure and revise NIR tables 6.5–6.13 to include information on the parameters, EFs and methods used for all three regions	87
		Improve the structure of the agriculture chapter of the NIR by providing the same level of detail for all categories, by gas, for each region, in accordance with the recommended annotated outline of the NIR	87
	Enteric fermentation – CH_4	Provide emission estimates for the Brussels-Capital region using appropriate and comparable methods to those used in the Flemish and Walloon regions, and provide additional methodological descriptions of these changes in the NIR and revise NIR tables 6.5–6.8 to include specific information relating to all three regions	88
	Manure management – CH_4 and N_2O	Present the reasons for the large differences in the EFs between the regions	89
		Provide an explanation outlining the appropriateness of the methane conversion factors used in the three regions	90
		Report the results of the efforts to harmonize the EF for swine for the Flemish and Walloon regions and revise the CH_4 emission estimates accordingly	91
		Provide emission estimates for the Brussels-Capital region using appropriate and comparable methods to those used in the Flemish and Walloon regions, and provide additional methodological descriptions of these changes in the NIR and revise NIR tables 6.9–6.13 to include specific information relating to all three regions	92
	Agricultural soils – N_2O	Provide N_2O emission estimates for all subcategories for the Brussels-Capital region using appropriate and comparable methods to those used in the Flemish and Walloon regions and provide additional methodological descriptions of these changes in the NIR	94
		Revise the structure of this chapter of the NIR to include: a full description of the methods and equations used for both direct and indirect N_2O emissions; information on the choice of the EFs, by	95

Sector	*Category*	*Recommendation*	*Paragraph reference*
		region, according to the CRF source categories; and information on synthetic fertilizers, animal manure applied to soils, nitrogen-fixing crops, crop residues, cultivation of histosols, pasture range and paddock, atmospheric deposition and nitrogen leaching and run-off	
		Include a nitrogen manure mass balance and revise the structure of the chapter of the NIR on agricultural soils	96
LULUCF	Completeness	Report the emissions and removals from living biomass in cropland remaining cropland and the emissions from wildfires	12
		Use the appropriate notation keys in CRF table 5	101
	Recalculations	Include, in the NIR, a clear description of the methods used and an explanation of the effects of these recalculations on the estimates of emissions and removals	100
	Transparency	Explain in greater detail in the NIR the methods used to monitor land-use change and to ensure the consistent representation of land	104
		Include a full description of the method used to represent land and land-use changes in a spatially explicit manner, in particular explaining how similar land cover, such as cropland, grassland and young forests, is differentiated	105
	Forest land remaining forest land – CO_2	Report, in the NIR, all relevant factors and data used to calculate the estimates, in line with the methodology contained in the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry*	108
		Increase the transparency of the explanation of this issue in the NIR and disaggregate the regional data in CRF table 5.A	110
		Ensure the consistency between the NIR and the CRF tables through appropriate QC procedures	111
	Cropland remaining cropland – CO_2	Report this missing pool (the carbon stock changes in living biomass in cropland)	112
	Biomass burning – CO_2, CH_4 and N_2O	Update the emission estimates for wildfires and use the appropriate notation keys in the CRF tables	115
	Emissions from soil disturbance – N_2O	Provide a full description of the methods and data sources used for this category	116
	Emissions from lime application – CO_2	Refine the emission estimates using country-specific information on the amount of limestone and dolomite applied	113
		Provide a full description of the methods and data sources used for this category	117
Waste	Transparency	Provide a sufficiently detailed explanation to allow the ERT to understand the region-specific methodologies, assumptions, EFs, parameters, AD and data sources used in the NIR	120
	QA/QC	Conduct an intensive QA/QC check of the content of the NIR prior to its submission to the secretariat	121
	Solid waste disposal on land – CH_4	List, in the next NIR, the parameters used for each model in a single table, using the same terminology	122
		Explore the possibility of using a harmonized approach for the estimation of CH_4 emissions from solid waste disposal on land in the Flemish region; and, if Belgium continues to use the region-specific multiphase model, provide a rationale for using this model for recent landfills only	123

Sector	*Category*	*Recommendation*	*Paragraph reference*
		Report the emissions separately by region in CRF table 6.A	124
	Wastewater handling – CH_4	Revise this inconsistency between the reported notation key and actual CH_4 recovery in each region	127
		Provide a clear rationale in the NIR if the CH_4 emissions from municipal wastewater treatment plants are no longer reported for the Flemish region	128
		Provide a detailed explanation of the country-specific methodology and parameters used, especially the scientific background information used to derive the fraction of anaerobic degradation of 25 per cent	129
	Waste incineration – CO_2 and N_2O	Include transparent information on the methodology used to calculate the CO_2 and N_2O emissions and the CO_2 EF	131
		Ensure that the reporting of waste incineration activities is consistent and transparent between the regions, in particular regarding the sector in which the emissions are reported	132
KP-LULUCF	General	Clearly explain, in the NIR, the recalculations performed for activities under Article 3, paragraph 3, of the Kyoto Protocol and their effects on the estimates of emissions and removals	137
		Include detailed information on the extrapolation method in the NIR and consider the inclusion of maps (e.g. base maps, maps for each year of the time series, to the extent possible) in the NIR	139
		Use ground reference data (“ground truth data”) to complement the remotely sensed data and provide, in an annex to the NIR, all complementary information and reports that increase the transparency of the NIR	139
		Use the notation key “NE” for carbon stock changes in living biomass and soil organic carbon for activities under Article 3, paragraph 3, of the Kyoto Protocol	140
		Estimate the CO_2 emissions from liming and the CO_2, CH_4 and N_2O emissions from biomass burning under Article 3, paragraph 3, of the Kyoto Protocol or clearly justify that emissions from these categories do not occur in Belgium	143
		Improve the clarity of the information provided in the NIR, provide further information to satisfy the mandatory reporting element of paragraph 6(a) of the annex to decision 15/CMP.1 and clearly specify, in the NIR, the methods used to report the emissions from each carbon pool under afforestation and reforestation, and deforestation	145
		Improve its QA/QC procedures in relation to the information provided in the NIR in order to ensure that the text is up-to-date and transparent	145
	Afforestation and reforestation – CO_2	Disaggregate the reporting of afforestation and reforestation in the CRF tables according to the three regions	146
		Correct the description of the method used to calculate the carbon stock changes in afforestation and reforestation in the NIR	147
	Deforestation – CO_2	Prepare a detailed improvement plan for the KP-LULUCF activities, with a view to applying the improvements to the 2013 and 2014 annual submissions	150
Article 3,		Report any change(s) in the information provided under Article 3,	158

Sector	*Category*	*Recommendation*	*Paragraph reference*
paragraph 14, of the Kyoto Protocol		paragraph 14, in accordance with decision 15/CMP.1, annex, chapter I.H	

Abbreviations: AD = activity data, CRF = common reporting format, EF = emission factor, ERT = expert review team, EU ETS = European Union emissions trading scheme, GHG = greenhouse gas, IPCC = Intergovernmental Panel on Climate Change, KP-LULUCF = land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, LULUCF = land use, land-use change and forestry, NCV = net calorific value, NIR = national inventory report, QA/QC = quality assurance/quality control.

IV. Questions of implementation

172. No questions of implementation were identified by the ERT during the review.

Annex I

Documents and information used during the review

A. Reference documents

Intergovernmental Panel on Climate Change. *2006 IPCC Guidelines for National Greenhouse Gas Inventories*. Available at <http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html>.

Intergovernmental Panel on Climate Change. *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*. Available at <http://www.ipcc-nggip.iges.or.jp/public/gl/invs1.htm>.

Intergovernmental Panel on Climate Change. *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*. Available at <http://www.ipcc-nggip.iges.or.jp/public/gp/english/>.

Intergovernmental Panel on Climate Change. *Good Practice Guidance for Land Use, Land-Use Change and Forestry*. Available at <http://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf.htm>.

"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/SBSTA/2006/9. Available at <http://unfccc.int/resource/docs/2006/sbsta/eng/09.pdf>.

"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>.

"Guidelines for national systems under Article 5, paragraph 1, of the Kyoto Protocol". Decision 19/CMP.1. Available at <http://unfccc.int/resource/docs/2005/cmp1/eng/08a03.pdf#page=14>.

"Guidelines for the preparation of the information required under Article 7 of the Kyoto Protocol". Decision 15/CMP.1. Available at <http://unfccc.int/resource/docs/2005/cmp1/eng/08a02.pdf#page=54>.

"Guidelines for review under Article 8 of the Kyoto Protocol". Decision 22/CMP.1. Available at <http://unfccc.int/resource/docs/2005/cmp1/eng/08a03.pdf#page=51>.

Status report for Belgium 2012. Available at <http://unfccc.int/resource/docs/2012/asr/bel.pdf>.

Synthesis and assessment report on the greenhouse gas inventories submitted in 2012. Available at <http://unfccc.int/resource/webdocs/sai/2012.pdf>.

FCCC/ARR/2011/BEL. Report of the individual review of the annual submission of Belgium submitted in 2011. Available at <http://unfccc.int/resource/docs/2012/arr/bel.pdf>.

UNFCCC. *Standard independent assessment report*, parts I and II. Available at <http://unfccc.int/kyoto_protocol/registry_systems/independent_assessment_reports/items/4061.php>.

B. Additional information provided by the Party

Responses to questions during the review were received from Mr. Olivier Biernaux (Interregional Cell for the Environment), including additional material on the methodologies and assumptions used. The following documents[1] were also provided by Belgium:

INSTITUT DE CONSEIL ET D'ETUDES EN DÉVELOPPEMENT DURABLE, 2009, *BILAN ENERGETIQUE DE LA REGION DE BRUXELLES-CAPITALE 2007*, Namur.

INSTITUT DE CONSEIL ET D'ETUDES EN DÉVELOPPEMENT DURABLE, 2010, *BILAN ENERGETIQUE DE LA REGION DE BRUXELLES-CAPITALE 2008*, Namur.

INSTITUT DE CONSEIL ET D'ETUDES EN DÉVELOPPEMENT DURABLE, 2011, *BILAN ENERGETIQUE DE LA REGION DE BRUXELLES-CAPITALE 2009*, Namur.

INSTITUT DE CONSEIL ET D'ETUDES EN DÉVELOPPEMENT DURABLE, 2006, *RECUEIL DE STATISTIQUES ENERGETIQUES DE LA REGION DE BRUXELLES-CAPITALE 1990-2004*, Namur.

INSTITUT DE CONSEIL ET D'ETUDES EN DÉVELOPPEMENT DURABLE, 2010, *BILAN ENERGETIQUE DE LA REGION WALLONNE 2008*, Namur.

INSTITUT DE CONSEIL ET D'ETUDES EN DÉVELOPPEMENT DURABLE, 2010, *BILAN ÉNERGÉTIQUE DE LA WALLONIE 2008 CONSOMMATION DU SECTEUR DOMESTIQUE*, Service Public de Wallonie.

INSTITUT DE CONSEIL ET D'ETUDES EN DÉVELOPPEMENT DURABLE, 2010, *BILAN ENERGETIQUE DE LA REGION WALLONNE 2008 Bilan de l'industrie et bilan global*, Namur.

INSTITUT DE CONSEIL ET D'ETUDES EN DÉVELOPPEMENT DURABLE, 2011, *RECUEIL DE STATISTIQUES ÉNERGÉTIQUES DE LA WALLONIE 2000-2009*, Service Public de Wallonie.

INSTITUT DE CONSEIL ET D'ETUDES EN DÉVELOPPEMENT DURABLE, 2008, *RECUEIL DE STATISTIQUES ENERGETIQUES WALLONNES 1990-2000*, Namur.

[1] Reproduced as received from the Party.

Annex II

Acronyms and abbreviations

AD	activity data
BFG	blast furnace gas
CH_4	methane
C	carbon
C	confidential
C_3F_8	perfluoropropane
CMP	Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol
CO_2	carbon dioxide
CO_2 eq	carbon dioxide equivalent
CRF	common reporting format
DOC	degradable organic carbon
EF	emission factor
ERT	expert review team
EU ETS	European Union emissions trading scheme
F-gas	fluorinated gas
FOD	first order decay
GHG	greenhouse gas; unless indicated otherwise, GHG emissions are the sum of CO_2, CH_4, N_2O, HFCs, PFCs and SF_6 without GHG emissions and removals from LULUCF
HFCs	hydrofluorocarbons
IE	included elsewhere
IEA	International Energy Agency
IEF	implied emission factor
IPCC	Intergovernmental Panel on Climate Change
ITL	international transaction log
kg	kilogram (1 kg = 1,000 grams)
KP-LULUCF	activities under Article 3, paragraph 3, and, if any, Article 3, paragraph 4, of the Kyoto Protocol
LPG	liquefied petroleum gas
LTO	landing and take-off
LULUCF	land use, land-use change and forestry
MCF	methane conversion factors
N_2O	nitrous oxide
NA	not applicable
NCV	net calorific values
NE	not estimated
NIR	national inventory report
NO	not occurring
PFCs	perfluorocarbons
QA/QC	quality assurance/quality control
SEF	standard electronic format
SF_6	sulphur hexafluoride
SIAR	standard independent assessment report
SWDS	solid waste disposal sites
TJ	terajoule (1 TJ = 10^{12} joule)
UNFCCC	United Nations Framework Convention on Climate Change