Advance Version

COMPLIANCE COMMITTEE **CC/ERT/ARR/2012/15**
2 May 2012

Report of the individual review of the annual submission of Belgium submitted in 2011

Note by the secretariat

The report of the individual review of the annual submission of Belgium submitted in 2011 was published on 30 April 2012. For purposes of rule 10, paragraph 2, of the rules of procedure of the Compliance Committee (annex to decision 4/CMP.2, as amended by decision 4/CMP.4), the report is considered received by the secretariat on the same date. This report, FCCC/ARR/2011/BEL, contained in the annex to this note, is being forwarded to the Compliance Committee in accordance with section VI, paragraph 3, of the annex to decision 27/CMP.1.

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Report of the individual review of the annual submission of Belgium submitted in 2011*

* In the symbol for this document, 2011 refers to the year in which the inventory was submitted, and not to the year of publication.

Contents

I. Introduction and summary

A. Overview

1. This report covers the centralized review of the 2011 annual submission of Belgium, coordinated by the UNFCCC secretariat, in accordance with decision 22/CMP.1. The review took place from 19 to 24 September 2011 in Bonn, Germany, and was conducted by the following team of nominated experts from the UNFCCC roster of experts: generalists – Mr. Takeshi Enoki (Japan) and Mr. Dennis Rudov (Belarus); energy – Mr. Tomas Gustafsson (Sweden), Ms. Agnieszka Janowska (European Union) and Ms. Inga Valuntiene (Lithuania); industrial processes – Mr. Kiyoto Tanabe (Japan) and Mr. Hongwei Yang (China); agriculture – Ms. Britta Hoem (Norway) and Ms. Tajda Mekinda-Majaron (Slovenia); land use, land-use change and forestry (LULUCF) – Mr. Kevin Black (Ireland) and Mr. Robert de Ligt (Australia); and waste – Ms. Sirinthornthep Towprayoon (Thailand) and Ms. Medea Inashvili (Georgia). Mr. Tanabe and Mr. Yang were the lead reviewers. The review was coordinated by Ms. Sevdalina Todorova-Brankova and Ms. Astrid Olsson (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.

B. Emission profiles and trends

3. In 2009, the main greenhouse gas (GHG) in Belgium was carbon dioxide (CO_2), accounting for 87.0 per cent of total GHG emissions[1] expressed in CO_2 eq, followed by nitrous oxide (N_2O) (6.2 per cent) and methane (CH_4) (5.2 per cent). Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6) collectively accounted for 1.6 per cent of the overall GHG emissions in the country. The energy sector accounted for 82.1 per cent of total GHG emissions, followed by the industrial processes sector (9.2 per cent), the agriculture sector (7.8 per cent), the waste sector (0.8 per cent) and the solvent and other product use sector (0.2 per cent). Total GHG emissions amounted to 124,517.97 Gg CO_2 eq and decreased by 13.9 per cent between the base year[2] and 2009.

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.

[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 2009[a]

			Gg CO_2 eq								*Change*
		Greenhouse gas	*Base year*[a]	*1990*	*1995*	*2000*	*2005*	*2007*	*2008*	*2009*	*Base year–2009 (%)*
Annex A sources		CO_2	118 629.56	118 629.56	123 897.76	124 551.49	124 859.83	116 689.44	119 105.39	108 348.04	–8.7
		CH_4	10 030.87	10 030.87	9 540.24	8 324.17	6 841.08	6 679.11	6 531.75	6 455.69	–35.6
		N_2O	10 929.68	10 929.68	11 743.78	11 211.15	9 430.21	7 659.40	7 544.18	7 668.60	–29.8
		HFCs	442.68	442.68	442.68	916.03	1 413.54	1 669.46	1 746.25	1 825.42	312.4
		PFCs	2 335.24	1 753.32	2 335.24	360.90	152.51	177.52	198.32	123.72	–94.7
		SF_6	2 205.16	1 662.49	2 205.16	111.52	85.97	81.13	88.76	96.50	–95.6
KP-LULUCF	Article 3.3[b]	CO_2							5.75	3.62	
		CH_4							NO	NO	
		N_2O							NE, NO	NE, NO	
	Article 3.4[c]	CO_2	NA						NA	NA	NA
		CH_4	NA						NA	NA	NA
		N_2O	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 to 2009[a]

			Gg CO_2 eq								*Change*
		Sector	*Base year*[a]	*1990*	*1995*	*2000*	*2005*	*2007*	*2008*	*2009*	*Base year–2009 (%)*
Annex A		Energy	111 938.06	111 938.06	115 953.17	116 529.71	115 842.06	107 769.03	110 809.06	102 186.31	–8.7
		Industrial processes	17 335.28	16 210.69	19 193.15	15 574.17	15 599.12	14 084.43	13 526.34	11 473.09	–33.8
		Solvent and other product use	213.41	213.41	203.65	217.22	214.91	214.37	214.14	214.00	0.3
		Agriculture	11 682.61	11 682.61	11 792.01	10 825.28	9 740.23	9 736.77	9 615.38	9 666.07	–17.3
		Waste	3 403.82	3 403.82	3 022.89	2 328.88	1 386.83	1 151.47	1 049.73	978.50	–71.3
		LULUCF	NA	–1 556.62	–1 083.45	–1 127.97	–1 602.53	–1 558.32	–1 499.36	–1 542.32	NA
		Total (with LULUCF)	**NA**	**141 891.98**	**149 081.41**	**144 347.29**	**141 180.62**	**131 397.75**	**133 715.29**	**122 975.64**	**NA**
		Total (without LULUCF)	**144 573.19**	**143 448.60**	**150 164.86**	**145 475.26**	**142 783.15**	**132 956.07**	**135 214.65**	**124 517.97**	**–13.9**
		Other[b]	NO	NO	NO	NO	NO	NO	NO	NO	NO
KP-LULUCF	Article 3.3[c]	Afforestation and reforestation							–228.12	–232.28	
		Deforestation							233.87	235.90	
		Total (3.3)							**5.75**	**3.62**	
	Article 3.4[d]	Forest management							NA	NA	
		Cropland management	NA						NA	NA	NA
		Grazing land management	NA						NA	NA	NA
		Revegetation	NA						NA	NA	NA
		Total (3.4)	**NA**						**NA**	**NA**	**NA**

Abbreviations: LULUCF = land use, land-use change and forestry, KP-LULUCF = LULUCF emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, 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.

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

Table 3
Information to be included in the compilation and accounting database in tonnes of carbon dioxide equivalent

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]	*Accounting quantity*[c]
Commitment period reserve	**606 595 975**			**606 595 975**	
Annex A emissions for current inventory year					
CO_2	108 348 023	108 348 041		108 348 041	
CH_4	6 451 527	6 455 690		6 455 690	
N_2O	7 618 662	7 668 599		7 668 599	
HFCs	1 801 449	1 825 418		1 825 418	
PFCs	123 719			123 719	
SF_6	96 499			96 499	
Total Annex A sources	**124 439 880**	**124 517 966**		**124 517 966**	
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	–222 520	–232 278		–232 278	
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	168 205	235 895		235 895	
Activities under Article 3, paragraph 4, for current inventory year[d]					
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] "Accounting quantity" is included in this table only for Parties that chose annual accounting for activities under Article 3, paragraph 3, and elected activities under Article 3, paragraph 4, if any.

[d] 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 Party's 2011 annual inventory submission was submitted on 15 April 2011; it contains a complete set of common reporting format (CRF) tables for the period 1990–2009 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 under Article 3, paragraph 14, of the Kyoto Protocol. The standard electronic format (SEF) tables were submitted on 15 April 2011. The annual submission was submitted in accordance with decision 15/CMP.1.

7. Belgium officially submitted revised emission estimates and data on KP-LULUCF activities on 7 November 2011 in response to the list of potential problems and further questions raised by the ERT during the course of the review. The values used in this report are those submitted by the Party on 7 November 2011.

8. Where necessary, the ERT also used the previous year's submission 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 but are in many cases referenced in the NIR. The full list of information and documents used during the review is provided in annex I to this report.

Completeness of inventory

10. The inventory is generally complete in terms of years, sectors and geographical coverage. The ERT noted that some emissions were reported for the first time in the 2011 submission, such as: emissions from the agriculture sector in the Brussels-Capital Region; a small amount of missing CH_4 and N_2O emissions from combustion activities from "other fuels" in the Flemish Region; and actual PFC emissions from consumption of halocarbons and SF_6. The ERT commends Belgium for these improvements to the completeness of the inventory. However, the ERT noted that some categories were reported as not estimated ("NE") in the CRF tables and in the NIR due to a lack of activity data (AD) (e.g. CO_2 emissions from asphalt roofing and road paving, emissions from industrial wastewater and sludge, and potential SF_6 emissions from electrical equipment). The ERT further noted that actual PFC emissions from refrigeration and air-conditioning equipment and from double-glazed windows were reported as not occurring ("NO"), while values were reported for the potential emissions from the same categories. Potential SF_6 emissions from electrical

[3] The SIAR, parts I and II, is prepared by an independent assessor in line with decision 16/CP.10 (paras. 5(a), 6(c) and 6(k)), under the auspices of the international transaction log 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.

equipment and double-glazed windows were reported as "NE" and "NO", while estimates of the actual emissions were reported. Non-CO_2 emissions from KP-LULUCF activities were reported as "NO", with the exception of N_2O emissions from disturbance associated with land-use conversion to cropland, which were reported as "NE". CO_2 and CH_4 fugitive emissions from oil transport were also reported as "NO", and HFC emissions from the disposal of commercial refrigeration equipment were reported as "NE". In response to the list of potential problems and further questions raised by the ERT during the review, Belgium submitted estimates for the emissions from the disposal of HFC-134a used in refrigeration equipment, as well as for CO_2 and CH_4 fugitive emissions from oil transport. The ERT recommends that Belgium revise the use of the notation keys in the CRF tables for fluorinated gases and encourages the Party to further improve the completeness of its inventory in the next annual submission.

11. The ERT also notes that the Party has included CRF tables 7 (summary overview for key categories) and 8(b) (recalculation – explanatory information) in its 2011 submission in response to the recommendation in the previous review report, although CRF table 7 has been completed for the base year and for 2008 and 2009 only. The ERT commends Belgium for this improvement.

12. With regard to the completeness of the NIR, the ERT notes that, despite the recommendation in the previous review report, the executive summary and some of the recommended annexes, such as "CO_2 reference approach and comparison with sectoral approach (including information on energy balance)" and "Assessment of completeness", have not been provided. During the review, the Party clarified that the executive summary had not been provided due to a lack of time, and committed to provide it in the next annual submission. With regard to the missing annexes, Belgium responded that all relevant information is contained in the appropriate chapters of the NIR.

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

Overview

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

14. The Party reported that there have been no changes to the national system since the previous annual submission.

Inventory planning

15. The Interregional Cell for the Environment (IRCEL-CELINE) has overall responsibility for the compilation of the national inventory. The federal structure of Belgium includes three regions (the Brussels-Capital Region, the Flemish Region and the Walloon Region), each of which prepares its own inventory. The regional agencies responsible for the selection of AD, emission factors (EFs) and methodologies, quality assurance/quality control (QA/QC) activities, as well as the archiving of all related information are: the Flemish Environment Agency (Flemish Region), the Walloon Agency for Air and Climate (Walloon Region) and Brussels Environment (Brussels-Capital Region). Once the local inventories have been compiled, IRCEL-CELINE combines them into the national inventory using the CRF Aggregator software. The National Climate Commission has to approve the inventory prior to its submission to the UNFCCC secretariat. The Coordination Committee for International Environmental Policy working

group on emissions is responsible for the overall coordination of the inventory preparation process (e.g. the exchange of information, the implementation of QA/QC procedures, and the uncertainty analysis).

16. It is noteworthy that as a result of the federal structure of the country and the related arrangements for the compilation of the national inventory, the main issues identified by the ERT remain unresolved from year to year, including: the harmonization of the emission estimation methodologies applied by the three regions; the transparency of the reporting; and the inconsistent use of notation keys and provision of comments in the CRF tables. Belgium explained to the ERT that efforts are being made to address these issues following the recommendations made in the previous review report, but also emphasized that it is difficult to eliminate differences in the methodologies used by the three regions because these regions differ with regard to the historical background of the development of methodologies, available data sources, and available resources to develop and further improve the GHG emission inventories. The ERT noted this explanation, and recommends that Belgium include further information in an overview of the category-specific chapters in the NIR, explaining the reasons for the different methodologies used by the three regions. The ERT also recommends that Belgium explore the possibility of a more centralized approach when developing new methods or revising current methods, EFs and AD, and improved internal QA/QC procedures between the three regions prior to the submission of the inventory, which would improve the internal consistency and transparency of the national inventory.

Inventory preparation

Key categories

17. Belgium has reported a tier 1 key category analysis, both level and trend assessment, as part of its 2011 submission, and has applied a qualitative approach in determining its key categories. The key category analysis performed by the Party and that performed by the secretariat[4] produced similar results. Belgium has implemented the recommendation of the previous ERT by performing a key category analysis both including and excluding LULUCF, in accordance with 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) 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. In response to a recommendation from the previous review report, Belgium has performed a qualitative key category analysis for the KP-LULUCF activities. Based on the key category analysis (according to which, land converted to cropland and land converted to grassland are identified as key categories), deforestation is also identified as a key category. However, the Party reports that deforestation accounts for only 6.9 per cent of emissions from land converted to cropland and only 11.2 per cent of emissions from land converted to grassland, and, therefore, it should not be considered a key category. The ERT encourages Belgium to perform a quantitative analysis of the emissions associated with

[4] 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 LULUCF. 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.

forest land converted to cropland and forest land converted to grassland,[5] and to clearly report the results of the key category analysis in CRF table NIR 3 in the next annual submission.

19. Taking into account the significant improvements to the key category analysis made since the previous annual submission, the ERT notes that it was not clear from the NIR whether the key category analysis was used to prioritize future inventory improvements. The ERT recommends that Belgium include this information in the next annual submission.

Uncertainties

20. Belgium has undertaken a tier 1 uncertainty analysis. The uncertainties of the AD and EFs were mostly estimated using expert judgment or values contained in the IPCC good practice guidance. The uncertainties of the estimates for both the level and the trend assessment were calculated, with an overall level uncertainty of 7.94 per cent for 2009 without LULUCF and a trend uncertainty of 2.83 per cent. These values correspond closely to the uncertainties reported in the previous annual submission for 2008 (7.63 per cent and 3.09 per cent, respectively). The results of the uncertainty analysis have been included in annex 2 to the NIR.

21. The ERT noticed that the LULUCF sector has not been included in the uncertainty analysis; however, in the NIR, Belgium reports on its plans to include LULUCF in its uncertainty assessment in the next annual submission. The ERT recommends that the Party ensure that the LULUCF sector and the KP-LULUCF activities are included in the uncertainty analysis in its 2012 annual submission.

22. During the review, the ERT noticed an inconsistency in the total emission figures reported in the uncertainty table in annex 2 to the NIR and in the CRF tables. There is a reference to the 2010 submission for the base year figures, and the values for the total emissions for 1990 and 2009 do not match the values in CRF table summary 2 (e.g. 141,787.57 Gg CO_2 eq in CRF table summary 2 compared to 141,194.25 Gg CO_2 eq in the NIR for 1990, and 122,839.63 Gg CO_2 eq in CRF table summary 2 compared to 122,833.36 Gg CO_2 eq in the NIR for 2009). In response to questions raised by the ERT during the review, Belgium explained that this difference is not due to the fact that certain categories were not reported, but due to the fact that the uncertainty analysis was not performed for the latest version of the annual submission due to a lack of time. The ERT recommends that Belgium ensure that it allocates sufficient time to the preparation of the uncertainty analysis, in order to avoid such inconsistencies in the future.

23. The ERT could not ascertain from the text of the NIR whether the uncertainty analysis is used to prioritize future inventory improvements. The ERT recommends that Belgium include this information in the next annual submission.

Recalculations and time-series consistency

24. 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 1990–2008 have been undertaken due to: the revision of AD, EFs and methodologies in all sectors; the inclusion of previously unreported emissions from the Brussels-Capital region (agriculture and LULUCF sectors); as well as the correction of identified mistakes in EFs and AD. The magnitude of the impact is a decrease of 0.04 per cent in estimated total GHG emissions for the base year and an increase of 1.4 per cent for 2008, excluding LULUCF. The recalculations did not have a significant impact on the overall emissions

[5] See section 5.4.4 of the IPCC good practice guidance for LULUCF.

trend. The reasons for the recalculations have been provided in the NIR and in CRF table 8(b), which was included in the CRF tables in response to the recommendation in the previous review report. However, the ERT noted that, in some cases, the recalculations have not been sufficiently explained (see paras. 36, 68 and 80 below) and recommends that Belgium provide further detail on the rationale for and the impact of the recalculations for all the recalculations performed in its next annual submission.

Verification and quality assurance/quality control approaches

25. In its 2011 annual submission, Belgium has included information on its QA/QC procedures and on the national QA/QC plan, in accordance with the IPCC good practice guidance. The plan includes general tier 1 QC procedures; however, the Party has reported that the category-specific tier 2 QC procedures for the key categories and for those individual categories where significant methodological or data revisions have been performed are still applied on a case-by-case basis at the national and regional levels. Therefore, the ERT reiterates the encouragement from previous review reports that Belgium implement tier 2 QC procedures in line with the IPCC good practice guidance, especially at the national level, in order to harmonize the different methodologies used for the same categories.

26. The ERT found a number of inconsistencies and errors in the NIR (e.g. in relation to the Party's emission estimates, uncertainty estimates, and methodological descriptions); in the CRF tables (incorrect data entries (e.g. an incorrect N_2O implied emission factor (IEF) for biomass, and the non-reporting of some emissions from other fuels under other (manufacturing industries and construction)), incorrect AD (e.g. for gaseous fuels under the category other transportation, and the misallocation of off-road CO_2 emissions), and the incorrect use of notation keys); and between the NIR and the CRF tables. The ERT recommends that Belgium strengthen its QC procedures prior to submitting its annual submission, so as to ensure transparency and consistency between the CRF tables and the NIR and in order to improve accuracy through the reduction of incorrect data entries and the minimization of errors in the calculations performed for the reported emission estimates.

Transparency

27. The NIR includes information on the key categories, methods, data sources and uncertainty estimates, as well as a description of the QA/QC procedures and verification activities performed in the preparation of the GHG inventory. The sectoral chapters of the NIR include information on methodological issues, AD and EFs, together with category-specific uncertainty assessments, QA/QC procedures and verification activities, recalculations and planned inventory improvements. However, the ERT notes that the transparency of this information requires significant improvement, including: the information on the QA/QC checks performed and the description of the recalculations in the energy sector; the information on the AD for specific categories in chemical industry and for the category agricultural soils; the description of how the emission estimates obtained using different methodologies in different regions are consolidated into a common national inventory; and information on how the consistency of the AD and EFs is ensured. The ERT recommends that Belgium structure this information and report it in a clear and transparent way in the next annual submission. The ERT also reiterates the recommendation from the previous review report that the Party include a discussion of time-series consistency in the appropriate sections of the NIR.

Inventory management

28. As noted by the ERT in previous review reports, 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, in its 2011 inventory submission, Belgium has implemented some of the recommendations made in the previous review report, such as:

(a) The improvement of completeness by including CRF tables 7 (summary overview for key categories) and 8(b) (recalculation – explanatory information) and reporting emission estimates for some categories that had not previously been reported (see para. 11 above);

(b) The improvement of the key category analysis by providing estimates both including and excluding LULUCF, the disaggregation of categories by fuel type, as required by the IPCC good practice guidance, and the performance of the key category analysis for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol (see paras. 17 and 18 above);

(c) The improvement of transparency in the reporting on the agriculture and LULUCF sectors (see paras. 71 and 83 below).

30. The main recommendations made in the previous review report which have not been implemented by Belgium in its 2011 inventory submission are:

(a) The improvement of completeness in the NIR by including the executive summary and the recommended annexes in the NIR (see para. 12 above);

(b) An assessment of how the implementation of improvements to the key category analysis affects the selection of methodologies for the key categories (see para. 19 above);

(c) The improvement of transparency through the provision of a discussion on time-series consistency in the NIR (see para. 27 above);

(d) The further implementation of the existing tier 1 QC measures in the national inventory preparation process as well as at the regional level, in order to prevent inconsistencies, misprints and errors in the text of the NIR and in the CRF tables (see para. 26 above).

4. Areas for further improvement

Identified by the Party

31. In chapter 9.2 of the NIR, Belgium has reported on the following planned improvements:

(a) The optimization of the environmental impact module for road transportation (MIMOSA model) in the Flemish Region;

(b) The estimation of emissions due to the use of limestone in pollution control in industry;

(c) The examination of the N_2O EF for the calculation of emissions from the use of anaesthesia in the Brussels-Capital Region;

(d) The improvement of the area estimates of the land-use change matrix in the LULUCF sector, and also in the KP-LULUCF inventory;

(e) The inclusion of the LULUCF sector in the uncertainty analysis;

(f) The estimation of emissions from waste composting for the first time in the Brussels-Capital Region.

Identified by the expert review team

32. During the review, the ERT identified several cross-cutting issues for improvement. These are listed in paragraph 0 below.

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

B. Energy

1. Sector overview

34. The energy sector is the main sector in the GHG inventory of Belgium. In 2009, emissions from the energy sector amounted to 102,186.31 Gg CO_2 eq, or 82.1 per cent of total GHG emissions. Since the base year, emissions have decreased by 8.7 per cent. The key driver for the fall in emissions is the decrease in emissions from public electricity and heat production, where emissions have fallen by 11.6 per cent due to technological improvements and the switch from solid fuels to gaseous fuels. Emissions from manufacturing industries and construction decreased by 40.1 per cent, mostly due to the impact of the economic crisis on iron and steel production. However, the decrease in emissions from these categories was offset by the increase in emissions from transport, mainly road transportation, where the number of vehicles increased by 43.0 per cent between 1990 and 2009, together with the average vehicle-km, which increased by 40.0 per cent in the same period. Within the sector, 28.3 per cent of the emissions were from other sectors, followed by 26.2 per cent from transport, 26.0 per cent from energy industries, 19.0 per cent from manufacturing industries and construction and 0.5 per cent from fugitive emissions from fuels. The remaining 0.1 per cent were from the category other.

35. The Party has made recalculations for the energy sector between the 2010 and 2011 submissions following changes in AD and EFs. The impact of these recalculations on the energy sector is an increase in emissions of 1.4 per cent for 2008. The main recalculations took place in the following categories:

(a) Iron and steel, due to the improvement in the completeness of data on the fuels used (e.g. coke for the complete time series and anthracite from 2004 onwards) in the biggest plant in the Flemish Region;

(b) Public electricity and heat production, due to the use of new CH_4 and N_2O EFs based on the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the 2006 IPCC Guidelines);

(c) Road transportation and civil aviation, due to the transition to the COPERT IV model in the Walloon and Brussels-Capital Regions; and improved data on energy consumption per landing and take-off (LTO) for domestic flights (105 kg fuel/LTO instead of 57 kg fuel/LTO) in the Walloon Region;

(d) Agriculture/forestry/fisheries and commercial/institutional sector, due to the use of a new EF for farming vehicles and new AD for liquid fuels.

36. The recalculations are not extensively described in the NIR. Therefore, in order to improve transparency and to facilitate the review process, the ERT recommends that Belgium improve its reporting on the recalculations performed by providing detailed information for each recalculation on the underlying rationale for the change in method, AD or EF, and on how the change improves the accuracy of the inventory, along with quantified revised emission estimates.

37. The CRF tables include estimates for all gases and most categories in the energy sector. However, the ERT noted that, whereas Belgium has reported emissions from oil refining/storage, emissions from transport under fugitive emissions from oil have been reported as "NO". In response to the list of potential problems and further questions raised by the ERT during the review, the Party submitted estimates of CO_2 and CH_4 emissions from oil transport for the period 1990–2009 calculated using the IPCC tier 1 methodology[6] and default IPCC CO_2 and CH_4 EFs for oil transport in pipelines. The revised estimates led to an increase in sectoral emissions by 4.14 Gg CO_2 eq for 2009. The ERT accepts the revisions and recommends that Belgium continue to report emissions from this category in the next annual submission and provide detailed documentation on the methodology used in the NIR.

38. The information reported by Belgium is largely transparent. There were some issues regarding the transparency of the documentation on the deviation in the trend for some IEFs (e.g. the CO_2 IEF for solid fuels for iron and steel (see para. 45 below)) and the CO_2 EFs for road transportation (gaseous fuels), which were clarified by the Party during the review. The ERT recommends that Belgium include the information provided to the ERT during the review on these issues in the next NIR.

39. The ERT commends the Party for following some of the recommendations in the previous review report regarding the correction of the temporary values for 2008, such as the CO_2 EFs for liquid fuels for petroleum refining, gaseous fuels for the subcategory other (manufacturing industries and construction), and gas/diesel oil for navigation. However, the ERT recommends that the Party make efforts to improve the availability of the final values of the EFs used, in a timely manner, for the preparation of the NIR and the CRF tables in the next annual submission. The ERT further noted that some recommendations in the previous review report have still not been implemented by the Party, especially with regard to the transparency of the QA/QC checks performed and the provision of an explanation for the differences between the reference and sectoral approaches and the national and regional energy balances (see para. 40 below). During the review, the Party provided further details on the regional QA/QC checks performed, but these descriptions were not included in the NIR as recommended in the previous review report. The ERT reiterates the recommendation that Belgium improve the transparency of its reporting and include sector-specific information on the QA/QC checks performed in the next annual submission, such as the examples provided to the ERT during the review. Additional outstanding recommendations are discussed in the category-specific sections of this report.

[6] See page 2.87 and table 2.16 of the IPCC good practice guidance.

2. Reference and sectoral approaches

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

40. The comparison of the reference approach and sectoral approach shows a difference of 2.3 per cent for 2009. In previous submissions, the difference has fluctuated between –4.3 per cent (for 2002) and +4.0 per cent (for 2000). The main reason for the differences is that the reference approach is performed using the national energy balance whereas the sectoral approach is performed using the three regional energy balances. Several reasons for the differences have been identified and described in the NIR (e.g. different caloric values and EFs used for liquid fuels, and the allocation of some emissions under the industrial processes sector for the sectoral approach). The work to further harmonize the regional and national energy balances, and, subsequently, the reference and sectoral approaches, has been ongoing in Belgium for several years and is coordinated by a working group on energy balances (established in 2003) under the National Climate Commission. In 2010 the task of regionalizing the national statistics was taken over by ENOVER/CONCERE, a consultative body responsible for energy-related issues between the national and regional authorities. The latest developments are expected to help increase the consistency between the regional and national energy balances. The ERT commends Belgium for the efforts undertaken and reiterates the recommendation in the previous review report that the Party further improve the transparency of its reporting on the different approaches, and provide detailed information in the NIR on the progress made in harmonizing the different data sources, and the impact of the measures already undertaken and implemented to reduce the differences between the reference and sectoral approaches in the next annual submission. The ERT encourages Belgium to provide energy balance sheets for the latest inventory year (at the national and regional levels) in the next annual submission, in order to further improve the transparency of its reporting.

41. Some limited differences can be observed with regard to the comparison of data reported in the CRF tables and those reported to the International Energy Agency (IEA), mainly regarding the trade data on liquid fuels and the stock change of solid and liquid fuels. The ERT commends Belgium for the satisfactory data consistency between the CRF and the IEA data overall. However, the ERT encourages Belgium to further investigate the outstanding issues regarding the differences between the CRF and the IEA data in the next annual submission.

International bunker fuels

42. Information on international bunkers comes from both the regional and the national energy statistics. No international bunker activities take place in the Brussels-Capital Region as Brussels airport belongs to another region (Flemish Region). With regard to the airports in the Flemish Region, the reported kerosene fuel is assigned to bunker fuels and all gasoline for aviation is allocated to domestic aviation. In the Walloon Region, the bunker fuel consumption for international aviation, as well as the AD, are given directly by the two regional airports. During the previous review, Belgium explained that a change in the data collection methodology took place between 2007 and 2008, which resulted in a large discrepancy between the CRF and the IEA data. However, the Party has not provided information on this methodological change in the NIR and no explanations have been provided on how the time-series consistency of the data is ensured. In addition, the recurring issues regarding the discrepancy in the jet kerosene values between the CRF and the IEA data (e.g. 25 per cent in 2007, 40 per cent in 2009) have not been resolved in the 2011 submission and the jet kerosene consumption (international aviation) value reported to the IEA for 2009 (80,754 TJ) is 29.8 per cent higher than the fuel consumption value reported in the CRF tables (62,210 TJ). According to the response provided by Belgium

during the review, the difference is caused by the use of temporary data. The ERT noted that a similar explanation was provided by the Party during the previous review, but there was no change to the value for 2008 and no further explanations were provided in the NIR of the 2011 submission. In response to questions raised by the ERT during the review, Belgium explained that the consumption of jet kerosene (international bunkers) was reviewed by the Federal Public Service in April 2011 and the values would be further updated, leading to reduced differences between the IEA and the CRF data (i.e. from +41 per cent to –4.1 per cent for 2008). The ERT recommends that Belgium, in its next annual submission, correct the temporary figures and transparently explain the reasons for the data discrepancies and the follow-up revisions that have taken place, and document how the time-series consistency of the reported data is ensured.

43. With regard to marine bunkers, the CO_2 emissions originate from the Flemish Region only, which is the only region with a coastline in Belgium. The ERT commends the Party for following the recommendations from the previous review report regarding the change of terminology used in the NIR in order to maintain consistency with the CRF and IPCC terminology.

Feedstocks and non-energy use of fuels

44. According to the NIR, fuel consumption used as feedstock, non-energy use of fuels and related emissions are allocated to the categories manufacturing industries and construction, ammonia production and other (chemical industry). The ERT commends the Party for following the recommendation from the previous review report and correcting the notation key used for coal oils and tars (from coking coal), gas/diesel oil and residual fuel oil to "NO". The ERT recommends that Belgium increase the transparency of its reporting by providing additional information in CRF table 1.A(d) to facilitate the tracking of cross-sectoral information.

3. Key categories

Stationary combustion: solid fuels – CO_2

45. The CO_2 IEF for iron and steel provided for 2009 (49.68 t/TJ) is much lower than the value provided for 2008 (65.50 t/TJ) and the lowest among reporting Parties (ranging from 49.68 to 206.44 t/TJ). During the review, Belgium explained that the change in the value is due to the drop in the AD for the Walloon Region, which has a higher IEF (85.62 t/TJ) compared to the Flemish Region (43.09 t/TJ). While this explanation has clarified the inter-annual change in the IEF, it is not sufficient to explain the large inter-regional difference in the IEF. The ERT recommends that Belgium include further information on the EFs used for this subcategory and on the deviations in the trend in its next annual submission.

46. The CO_2 IEF reported for 2009 (40.98 t/TJ) for manufacture of solid fuels and other energy industries is 52.6 per cent lower than the value reported for 1990 (86.23 t/TJ). In addition, the values of this IEF are among the lowest reported by Parties (ranging from 33.73 to 196.60 t/TJ). In response to questions raised by the ERT during the review, Belgium explained that the low IEF for 2009 is due to the inclusion of coal consumption from energy-related activities in the Flemish coal mines until 1996 (waste coal was used for electricity production). The high CO_2 IEF in the 1990s is due to the much higher values of the EFs for coal compared to coke oven gas, and the use of blast furnace gas in some coke oven furnace plants in the Walloon Region during the period 1990–1999. The ERT recommends that the Party improve the transparency of its reporting of information on the trend of the IEF in the next annual submission.

4. Non-key categories

Stationary combustion: liquid fuels – N_2O and CH_4

47. In the category public electricity and heat production, the CH_4 IEF value for liquid fuels used for 2009 (26.99 kg/TJ) is 784.8 per cent higher than the value used for 1990 (2.05 kg/TJ). This increase is the highest among all reporting Parties and the inter-annual change for 2008–2009 amounts to +49.3 per cent. Similarly, the 2009 N_2O IEF (8.97 kg/TJ) is 3,415.0 per cent higher than the value reported for 1990 (0.26 kg/TJ) and the inter-annual change for 2008–2009 is –31.4 per cent. In response to questions raised by the ERT during the review, Belgium explained that the differences were caused by the misallocation of the CH_4 and N_2O emissions from combined heat and power installations in the Flemish refineries to liquid fuels instead of to gaseous fuels. The ERT recommends that the Party correct this error in the next annual submission and enhance the QC procedures performed prior to submitting the inventory.

Road transportation: liquid fuels – CH_4 and N_2O

48. Belgium has still not implemented the recommendation of the previous review report regarding the use of the same methodology for non-CO_2 emissions from road transportation for all regions and for the entire time series. In the 2011 submission, the Party has used different models to estimate emissions from road transportation (the COPERT IV model for the Brussels-Capital and Walloon Regions for the years 2007–2009 and the COPERT III model for the previous years of the time series and the MIMOSA model for the Flemish Region). In response to questions raised by the ERT during the review, the Party stated that the Flemish Region uses the MIMOSA model in accordance with the mobility policy in the Flemish Region, and explained that the MIMOSA model is similar to the COPERT model but different input data are used. However, for the estimation of CH_4 and N_2O emissions, the functions from the COPERT IV model are used in the MIMOSA model. As a result of the different methods used across the inventory years and regions, the inter-annual changes in the values of the CH_4 and N_2O IEFs for gasoline and diesel oil show large deviations in recent years (e.g. inter-annual changes for gasoline for 2006–2007, 2007–2008 and 2008–2009 of –40.0, –25.3 and 20.0 per cent for CH_4, and –69.8, –15.4 and –5.1 per cent for N_2O; and inter-annual changes for diesel oil for 2006–2007, 2007–2008 and 2008–2009 of –47.0 per cent, –5.9 per cent and –2.2 per cent for N_2O). The ERT recommends that, in addition to the inclusion of information on the methodological changes, Belgium include information explaining the trend in the IEFs across the years of the time series in its next annual submission.

49. With regard to the planned transition to a COPERT IV model for the entire time series in the Walloon Region, the Party has expressed concerns regarding data availability prior to 2003, and alternative ways to ensure time-series consistency at the national level from 1990 are currently under consideration. The ERT notes the efforts made by the Party and recommends that Belgium recalculate the entire time series, in order to ensure the accuracy of the emission estimates for road transportation, and document how time-series consistency is ensured in its next annual submission.

Road transportation: biomass – CH_4 and N_2O

50. The previous ERT encouraged Belgium to report CH_4 and N_2O emissions from biomass in road transportation even though they were considered negligible. In 2011, the notation key “NE” was replaced by the notation key “IE” (included elsewhere), indicating that the CH_4 and N_2O emissions were included under gasoline and diesel oil for the years 2007–2009. This information has not been further explained in the NIR. The ERT

commends the Party for its efforts to improve the completeness of the data; however, in order to improve the transparency of its reporting, the ERT recommends that Belgium provide, in the NIR, background information on the biofuel use in the country and report the emission estimates for CH_4 and N_2O separately in the next annual submission.

C. Industrial processes and solvent and other product use

1. Sector overview

51. In 2009, emissions from the industrial processes sector amounted to 11,473.09 Gg CO_2 eq, or 9.2 per cent of total GHG emissions, and emissions from the solvent and other product use sector amounted to 214.00 Gg CO_2 eq, or 0.2 per cent of total GHG emissions. Since the base year, emissions have decreased by 33.8 per cent in the industrial processes sector, and increased by 0.3 per cent in the solvent and other product use sector. The key driver for the fall in emissions in the industrial processes sector is attributable to the sharp decrease in emissions from the production of HFCs due to the installation of a gas incinerator with a fluoride recuperation unit, as well as the decrease in emissions from metal production. Measures introduced by nitric acid plants to reduce process emissions have also contributed to the decrease in sectoral emissions. Within the industrial processes sector, 40.0 per cent of the emissions were from mineral products, followed by 33.9 per cent from chemical industry, 16.8 per cent from consumption of halocarbons and SF_6 and 8.3 per cent from metal production. The remaining 1.1 per cent were from production of halocarbons and SF_6.

52. Belgium has made recalculations for the industrial processes sector between the 2010 and 2011 submissions in response to the 2010 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 3.6 per cent for 2008. The main recalculations took place in the following categories:

(a) Iron and steel production, due to the inclusion of CO_2 emissions from the direct and indirect use of lime (via grinded ores and recovery products) in the sinter factory in the Flemish Region;

(b) Ammonia production and caprolactam reported under other (chemical industry), due to improved AD for ammonia production in the Flemish Region (for 2006 onwards) and for caprolactam production for 2008 (temporary figures were used for the 2010 submission).

53. Belgium has made recalculations for the solvent and other product use sector between the 2010 and 2011 submissions following changes in AD. The impact of these recalculations on the solvent and other product use sector is a decrease in emissions of 13.2 per cent for 2008. The main recalculations took place in the category use of N_2O for anaesthesia, due to the revision of the number of hospital beds in the Flemish Region used in the calculations for the entire time series.

54. The recalculations are sufficiently justified in the NIR and explained in the CRF tables and in the NIR. They have been consistently applied across the time series.

55. The inventory for the industrial processes and solvent and other product use sectors is generally complete. The ERT noted that some improvements have been made to the completeness of the inventory compared to the previous annual submission, namely the inclusion of emissions from semiconductors and the improvement of the CO_2 emission estimates for iron and steel production. However, the ERT noted that some emissions are still reported as "NE", such as HFC emissions from the disposal of commercial refrigeration equipment and some categories for which there are no default methods and/or

EFs provided in the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Revised 1996 IPCC Guidelines) and/or the IPCC good practice guidance and the IPCC good practice guidance, such as CO_2 emissions from asphalt roofing and road paving with asphalt. In response to the list of potential problems and further questions raised by the ERT during the review, Belgium provided emission estimates for the disposal of commercial refrigeration equipment (see para. 63 below). Potential SF_6 emissions from electrical equipment and double-glazed windows are reported as "NE" and "NO", although the actual emissions are reported.

56. The ERT concluded that the reporting for the sector is transparent, and that the recalculations, uncertainties and planned inventory improvements have been appropriately addressed. The ERT commends Belgium for the improvement in the reporting of category-specific QC information in the sectoral chapters of the NIR in response to the recommendations from the previous review report.

57. Belgium has made necessary improvements to the inventory following the recommendations in the previous review report, including the consideration of the magnesium oxide (MgO) content in cement clinker, and the increased transparency in the reporting of CO_2 emissions from ammonia production and from iron and steel production, and of N_2O emissions from nitric acid production. The ERT noted that some previous recommendations regarding the provision of improved documentation on the country-specific EFs have still not been implemented, and those are reiterated in the category-specific sections of this report.

2. Key categories

Cement production – CO_2

58. As indicated in the previous review report, it is not clear whether the impact of the magnesium oxide (MgO) content in clinker on the CO_2 EFs has been considered for the whole time series. In response to questions raised by the ERT during the review, Belgium provided an additional description of the methodology used to determine the EFs and confirmed that the MgO content in clinker has been considered for the estimates since 2004. The ERT recommends that the Party apply the same approach to the EFs for the entire time series, in order to improve time-series consistency, and improve the documentation on the EF in the NIR, in order to improve the transparency of the next annual submission.

Ammonia production – CO_2

59. According to the information contained in the NIR, Belgium has used plant-specific data and 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. In response to questions raised by the ERT during the review, the Party confirmed that a methane oxidation rate of 99.5 per cent was used for the Flemish Region (similarly to the combustion efficiency) rather than a plant measurement. The ERT reiterates the recommendation from the previous review report that Belgium provide clearer information in the NIR on the methodology used, including justification for the oxidation factor applied. The ERT further recommends that Belgium develop plant-specific EFs for this key category and further update the description in the NIR on the development of the EFs for the next annual submission.

Nitric acid production – N_2O

60. N_2O emissions from nitric acid production declined by 58.7 per cent for 2009 compared to the base year level and the inter-annual change between 2005 and 2006 was as high as 32.2 per cent. Following the recommendation from the previous review report, Belgium has provided an explanation for the inter-annual changes in the NIR, which the ERT found was not sufficient to explain the trend. During the review, the Party clarified that the decline was mainly due to strengthened abatement measures adopted in the Flemish Region where four dual-pressure process plants have been installed with a selective catalytic reduction process, and one single-pressure process plant has been installed with a non-selective catalytic reduction process. The ERT recommends that Belgium include this explanation in the NIR of its next annual submission, in order to improve transparency.

Other (chemical industry) – CO_2 and N_2O

61. Belgium has reported emission estimates for some categories without providing AD that are either confidential or impossible to attribute to one specific activity under the category other (chemical industry). The ERT commends the Party for this effort, which has improved the completeness of the emission estimates, and recommends that Belgium include information on the coverage of the category in the documentation box of CRF table 2(I)A-G and try to attribute these emissions to specific activities, where applicable, by gas, for the next annual submission, in order to improve the transparency of its reporting.

Iron and steel production – CO_2

62. CO_2 emissions from electric arc furnaces were underestimated for the period 1990–2002 as Belgium applied an EF of 5 kg CO_2/t steel for electrodes, which was proven to be much lower than the plant-specific EFs (the highest figure in the five most recent years is 35 kg CO_2/t steel) that became available for recent years of the time series. The ERT recommends that Belgium provide a justification for the applicability of the plant-specific EFs for the early years and conduct recalculations, in order to ensure the time-series consistency of the emission estimates in the next annual submission.

Consumption of halocarbons and SF_6 – HFCs and SF_6[7]

63. The ERT commends Belgium for the improvement with regard to the HFC-134a emissions from the disposal of domestic refrigeration equipment in response to the recommendations from the previous review report, noting that HFC emissions from the disposal of commercial refrigeration equipment have not yet been estimated. The ERT highlighted this issue as a potential problem during the review and recommended that Belgium provide estimates of HFC emissions from commercial refrigeration equipment by applying the default data provided in the IPCC good practice guidance.[8] The Party followed the recommendation of the ERT and submitted the CRF tables, including the estimates of HFC-134a emissions from the disposal of commercial refrigeration equipment, which led to an increase in sectoral emissions of 23.97 Gg CO_2 eq or 0.2 per cent for 2009. For the other HFC emissions reported under this category, Belgium explained that the disposal of refrigeration and air-conditioning equipment has not yet occurred, assuming a 15-year lifespan of the equipment. The ERT recommends that Belgium include this information in

[7] Not all emissions related to all gases under this category are key categories, particularly SF_6 emissions. However, since the calculation procedures for and issues related to this category are discussed as a whole, the individual gases are not assessed in separate sections.

[8] See table 3.22 (page 3.106) in section 3.7.4 of the IPCC good practice guidance.

the NIR of the next annual submission and revise the notation key used in CRF table 2(II) accordingly.

64. Belgium applied different data sets for the estimates of SF_6 emissions from electrical equipment, which resulted in constant emissions over the years 1990–2003 (0.8165 t), followed by a drop of approximately 50 per cent in recent years (e.g. 0.4507 t in 2009). In response to questions raised by the ERT during the review, Belgium explained that 98 per cent of these emissions are from transmission and confirmed that the EF of 0.85 per cent for the years 2004–2009, based on information from ELIA Engineering, is of higher quality than the EF of 2 per cent used for the years 1990–2003. The ERT recommends that the Party justify, in the next annual submission, the applicability of the EFs to the whole time series and make appropriate updates in order to maintain time-series consistency, supported by appropriate documentation in the NIR.

3. Non-key categories

Other (mineral products) – CO_2

65. The ERT noted that Belgium has reported CO_2 emissions from ceramics production that occurred mainly in the Flemish and Walloon Regions. The ERT commends Belgium for this effort to improve the completeness of the inventory.

66. The ERT identified that the 2009 IEF for the Flemish Region (80 kg CO_2/t) is much higher than the value for the Walloon Region (25 kg CO_2/t). The Party has not provided an explanation for this difference in the NIR. The ERT recommends that Belgium investigate the reasons for the difference and make the necessary improvements to the EFs for the next annual submission.

D. Agriculture

1. Sector overview

67. In 2009, emissions from the agriculture sector amounted to 9,666.07 Gg CO_2 eq, or 7.8 per cent of total GHG emissions. Since the base year, emissions have decreased by 17.3 per cent. The key drivers for the fall in emissions are the decrease in the number of cattle, the shift from dairy cattle to non-dairy cattle in the country, and the smaller quantities of nitrogen (N) from mineral fertilizers applied to soils. Within the sector, 38.5 per cent of the emissions were from agricultural soils, followed by 36.7 per cent from enteric fermentation and 24.8 per cent from manure management. CH_4 is the dominant GHG, accounting for 53.5 per cent of the sectoral emissions, while N_2O accounts for the remaining 46.5 per cent.

68. The Party has made recalculations for the agriculture sector between the 2010 and 2011 submissions following changes in AD, and in order to rectify identified errors and improve time-series consistency. The impact of these recalculations on the agriculture sector is a decrease in emissions of 1.1 per cent for 2008. The main recalculations took place in the category agricultural soils. The ERT noted that the recalculations have not always been adequately explained in the NIR and in the CRF tables (see para. 75 below). The ERT recommends that Belgium include detailed descriptions of all the recalculations performed in its next annual submission.

69. The Party's 2011 inventory for the agriculture sector is complete. The ERT noted that, as a follow-up to the previous review report, the Party has included emissions for the Brussels-Capital Region in the 2011 submission, and adequate explanatory information has been presented in the NIR. The ERT noted that the submission of 7 November 2011 contained, besides the requested revisions for N_2O emissions from agricultural soils (see

para. 77 below), revised estimates for emissions from the Brussels-Capital Region for the period 1990–2009, which were not specifically requested by the ERT. The changes were explained with the amended methodology for the Brussels-Capital region and affect the emission estimates for enteric fermentation and manure management, resulting in an increase in emissions of 0.05 Gg CO_2 eq for 2009. The ERT accepted the revised estimates and recommends that Belgium provide the description of the methodological changes used in the calculation of the emission estimates for the Brussels-Capital Region in the next annual submission.

70. Given the specificity of the national inventory, the ERT considers that further information is needed to ensure the transparent and comparable presentation of the information for the three regions. The ERT recommends that Belgium present data for all three regions and for the country as a whole in the same way (e.g. using tables with the same structure and form), which will greatly improve transparency and enable comparability. The ERT further recommends that the Party improve the transparency of its reporting, particularly with regard to the chapter on agricultural soils, by including more information on the AD, such as the use of synthetic fertilizers and on crop production. The ERT reiterates the encouragement of the previous review report that Belgium make efforts, as far as possible, to translate the information presented in annex 3 to the NIR into English or to provide a summary in English in its next annual submission.

71. The ERT noted that Belgium has implemented many of the recommendations of the previous review report (e.g. improved transparency, the performance of a consistency check of the different data sets on the cattle population, the correction of information in the documentation box in CRF table 4.B(a) and the correction of the area of N-fixing crops). However, the ERT noted that some of the recommendations of the previous review reports have not been implemented (e.g. data on the import and export of organic fertilizers). Those recommendations are reiterated in the category-specific sections of this report.

72. Belgium has implemented tier 1 QC procedures for the agriculture sector, but some errors are still occurring in the NIR and in the CRF tables. When checking the calculation sheets provided by Belgium during the review, the ERT found that the total emissions from all three regions are not the same as those reported in CRF table 4.D (agricultural soils) and that the final emissions are underestimated. In response to the list of potential problems and further questions raised by the ERT during the review, the Party provided new calculation sheets and explained that the AD in the calculations sheets provided during the review were not the same as those used for the original 2011 submission, and, according to the new data, the final emissions are not underestimated. The ERT recommends that Belgium archive all relevant data, calculation sheets and other material used during the preparation of the GHG inventory after each official submission.

2. Key categories

Enteric fermentation – CH_4

73. Emissions from dairy and non-dairy cattle have been estimated using a tier 2 method, while for other animals a tier 1 method has been used, which is in line with the IPCC good practice guidance. AD for the years prior to 2000 for all regions are from the National Statistics Institute (NIS). Since 2000, AD from the Manure Bank of the Flemish Land Agency (VLM) have been used for the Flemish Region, while the two other regions continue to use data from NIS. In response to the recommendation from the previous review report, Belgium has performed a consistency check of the AD for the years after 2000. According to the estimates, which were not included in the NIR, but provided to the ERT during review, the CH_4 emission estimates calculated from both data sets differ, ranging from 1.4 to 5.0 per cent for enteric fermentation and from 0.5 to 6.0 per cent for

manure management, depending on the year. The differences between the data sets do not exceed 10 per cent, which is the uncertainty level for the animal population data from NIS. The VLM data represent the average animal population in each year and are also consistent with other parameters collected on the level of the stable. The ERT commends Belgium for the verification activity undertaken and recommends that the Party document the results of the consistency check in the next annual submission.

Manure management – CH_4

74. Emissions from cattle and swine have been estimated using a tier 2 method, while for other animals a tier 1 method has been used, which is in line with the IPCC good practice guidance. The tier 2 EF for swine for the Flemish Region (9.99 kg CH_4/head) is twice as high as the value for the Walloon Region (4.81 kg CH_4/head), while the IPCC default value for Western Europe and cool climate regions is 3 kg CH_4/head. The reasons for the differences in the values of the EFs for these regions are mentioned in the NIR and are attributed to the different values of gross energy intake used for the calculation of volatile solid excretion rates. While in the Walloon Region the country-specific values have been used, in the Flemish Region the default value of 38 MJ/day from the Revised 1996 IPCC Guidelines has been used, due to the unavailability of country-specific data. The ERT recommends that the Party further investigate the possibility of using a value of gross energy intake that is more suitable to the region in the next annual submission and correct the CH_4 EF for swine used for the Flemish Region accordingly.

Agricultural soils – N_2O

75. Following the recommendation of the previous review report, Belgium has improved the data on the area of N-fixing crops for 1990–1999 and has recalculated the emissions accordingly, but no explanation has been provided in the NIR or in the CRF tables. The ERT commends the Party for improving the time-series consistency, but recommends that Belgium provide clear justification for and documentation of the recalculation in its next annual submission.

76. The 2010 review report reiterated the recommendation that Belgium provide documentation on how the emissions from exported manure were accounted for in the national inventories of importing countries, or that the Party recalculate relevant agricultural emissions to include emissions from all manure produced in the country. The ERT noted that the description of the issue in the NIR of the 2011 submission is still not sufficient. Belgium provided additional information and tables with a mass balance of animal manure during the review. Based on the additional information received during the review, the ERT concluded that approximately 17.5 kt N was exported from Belgium in 2009 (the largest amount was exported to France) while 5.3 kt N was imported, resulting in a mass balance of 12.2 kt N exported from Belgium in 2009. However, in the calculation sheets provided by the Flemish Region, two values for exported manure were provided: 13,281,957 kg N to calculate the N from animal manure applied to agricultural soils and 4,703,281 kg N to calculate the fraction of N that is lost through leaching and run-off ($Frac_{LEACH}$). The use of these two values leads to an underestimation of emissions in the following categories: animal manure applied to soils and indirect N_2O emissions. In response to the list of potential problems and further questions raised by the ERT during the review, Belgium provided an explanation for the different values and a justification for the use of the value 13.3 kt for exported manure, but agrees with the ERT that the value used in the calculation of $Frac_{LEACH}$ is incorrect and leads to an underestimation of N_2O emissions from N leaching and run-off (see para. 77 below). The ERT recommends that Belgium include data on the mass balance of animal manure in its next annual submission.

77. In addition to the error in the calculation of $Frac_{LEACH}$, (see para. 76 above), the ERT noticed that the Party used an incorrect equation when calculating emissions from animal manure applied to soils. As a result of these errors, N_2O emissions from agricultural soils were underestimated for the categories animal manure applied to soils and indirect emissions. In response to the list of potential problems and further questions raised by the ERT during the review, Belgium submitted revised estimates for the entire time series 1990–2009 using the recommended equation (equation 4.23 from the IPCC good practice guidance) and the correct value of $Frac_{LEACH}$. As a result, its estimate of N_2O emissions from agricultural soils increased by 1.4 per cent, from 3,673.54 Gg CO_2 eq to 3,723.48 Gg CO_2 eq for 2009. The ERT accepts these revised estimates.

E. Land use, land-use change and forestry

1. Sector overview

78. In 2009, net removals from the LULUCF sector amounted to 1,542.32 Gg CO_2 eq. Since the base year, net removals have decreased by 0.9 per cent. The key driver for the decrease in removals is the increase in emissions from cropland, which is mostly due to the increasing soil carbon emissions from grassland converted to cropland. Within the sector, net removals of 3,360.34 Gg were from forest land, followed by net emissions of 1,577.19 Gg from cropland, 104.26 Gg from grassland, 114.70 Gg from settlements and 23.05 Gg from other land. Wetlands accounted for net removals of 1.18 Gg.

79. The Party has made recalculations for the LULUCF sector between the 2010 and 2011 submissions following changes in AD, due to the use of updated data from the land-use change matrix and the inclusion of the Brussels-Capital Region in all categories, and due to changes in EFs for some categories. The impact of these recalculations on the LULUCF sector is an increase in removals of 22.0 per cent for 2008. The recalculations affected all categories in the LULUCF sector and resulted in an increase in emissions from grassland and forest land, including a shift for grassland from a net sink to a net source, and a decrease in emissions from cropland, settlements and other land. The ERT noted that the recalculations were documented in CRF table 8(b), but were not accompanied by detailed information on the methods and data that led to the recalculations in the NIR. The ERT recommends that Belgium provide more detailed information relating to the recalculations, as well as the estimated value of the recalculation caused by each updated method or data component in the NIR of the next annual submission.

80. The revisions performed during the review affected forest land, settlements and other lands and reduced the net removals from the sector by 3.6 per cent in 2008 and 2009. Those revisions included the reincorporation of emissions from soil carbon resulting from forest land converted to settlements into the annual submission (see para. 111 below). The Party has also implemented a 20-year transition period for forest land, settlements and other lands to divide remaining land areas and converted land areas, as for the other land categories.

81. With regard to completeness, Belgium has failed to report all mandatory carbon pools and emissions, including all non-CO_2 sectoral emissions. The ERT notes that, in some cases, AD are reported for 2009 for certain subcategories but the related carbon stock changes are reported as "NO". While the notation key "NE" is only used to report N_2O emissions from disturbance associated with land-use conversion to cropland and the carbon stock change in living biomass for cropland remaining cropland, other missing categories are reported as "NO". All land-conversion categories, as well as wetlands, settlements and other lands, are incorrectly reported as "NO" for 1990. In response to questions raised by the ERT during the review, Belgium provided further explanatory information relating to several categories reported as "NO" or "NE", including in CRF tables 5(I), 5(II), 5(III),

5(IV) and 5(V) for all land uses and gases. During the review, the Party indicated that lime application was a management practice in Belgium; however, the Party reported lime application as "NO" in the CRF tables. Belgium described its intention to develop new or updated AD and carbon stock change estimates for a number of categories, including cropland remaining cropland and N_2O emissions from land converted to cropland. The ERT recommends that Belgium report emissions from agricultural lime application consistently for land under the Convention and units of land subject to deforestation activity under Article 3, paragraph 3, of the Kyoto Protocol, as well as N_2O emissions from land converted to cropland under the Convention (CRF table 5(III)) and under the Kyoto Protocol (table 5(KP-II).4), in the next annual submission. The ERT notes the efforts being made by Belgium to develop its inventory capacity, and reiterates the recommendations from previous review reports that the Party report a complete inventory that covers all mandatory carbon pools and GHGs and covers the entire time series, in its next annual submission. The ERT further recommends that Belgium include information in the NIR explaining the methods and assumptions used and the rationale for the notation keys used in the CRF tables.

82. The ERT notes that the transparency of the inventory has improved in the 2011 submission following a recommendation in the previous review report. The ERT recommends that the Party continue to improve the transparency of the inventory, including a more thorough description of the methods used in each region. During the review, the ERT identified that, in some instances, the notation keys in the CRF tables were not appropriately applied (e.g. carbon emissions from agricultural lime application were reported as "NO" instead of "NE"). The ERT recommends that the Party use the notation keys in the CRF tables in accordance with 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).

83. The Party has addressed many of the recommendations in the previous review report in the 2011 submission, including the use of the land-use classification system with more intensive sampling plots in order to improve the estimates, and the inclusion of emissions from the Brussels-Capital Region for cropland and grassland. The Party has also made efforts to improve the information in and transparency of the NIR. However, a number of recommendations remain unresolved and are reiterated in the sections below.

2. Key categories

Forest land remaining forest land – CO_2

84. Belgium has reported, for the first time, the carbon stock change in the Flemish Region for above-ground biomass following a recommendation from the previous review report. The Party has based the method on the forest inventory data available for the Walloon Region, since the second cycle of the forest inventory in the Flemish Region has not yet been completed. Belgium provided further information during the review indicating that the climate and conditions in the Walloon Region are similar to those in the Flemish Region. The Party informed the ERT that it is working to ensure that the inventory will be completed in order to update the methods and data for forest land under the Convention and for the activities under Article 3, paragraph 3, of the Kyoto Protocol.

Land converted to grassland – CO_2

85. Belgium has reported emissions from the carbon stock change in mineral soils due to forest land conversion to grassland as a net sink of 1.27 Gg. In table 7.6 of the NIR, the soil carbon stock changes for forest land in the Walloon and Flemish Regions (99 and 92 t

C/ha, respectively) are greater than the soil carbon stock changes for grassland (88 and 82 t C/ha, respectively). This would suggest that the conversion of forest land to grassland results in emissions of soil carbon. In response to questions raised by the ERT during the review, Belgium indicated that this was due to an error in the calculation. The ERT recommends that the Party correct this error and implement improved QA/QC procedures to ensure that such errors do not occur in future annual submissions.

Land conversion categories – CO_2

86. Belgium has reported all subdivisions of land converted to cropland, land converted to grassland and land converted to forest land as "NO" for 1990 but has provided estimates for the majority of the subdivisions for all other years of the time series. The ERT recommends that the Party report the emissions for the subdivisions of these categories that are occurring in Belgium for 1990.

3. Non-key categories

Biomass burning – CO_2, CH_4 and N_2O

87. Belgium has reported emissions from controlled burning and wildfires as "NO". The Party provided further information during the review which indicated that controlled burning is not practised in Belgium on forest land, cropland and grassland. The ERT recommends that the Party include, in the NIR, information regarding the use of controlled burning in Belgium. Further, the Party indicated that AD are available to estimate emissions from wildfires. Additionally, recent large wildfires occurred in Belgium in 2011. The ERT recommends that the Party report the emissions from wildfires under the relevant land-use categories consistently for the reporting under the Convention and for the reporting of land subject to the KP-LULUCF activities in the next annual submission.

F. Waste

1. Sector overview

88. In 2009, emissions from the waste sector amounted to 978.50 Gg CO_2 eq, or 0.8 per cent of total GHG emissions. Since 1990, emissions have decreased by 71.3 per cent. The key driver for the fall in emissions is the Party's waste sector policy directed at the prevention of landfilling, and at increasing recycling, recovery and waste incineration for energy purposes. Within the sector, 43.3 per cent of the emissions were from solid waste disposal on land, followed by 42.6 per cent from wastewater handling, 7.8 per cent from waste incineration and 6.3 per cent from composting. The sectoral emissions show a gradual decrease since the base year, mostly due to the considerable decrease in CH_4 emissions from solid waste disposal on land, which outweighs the persistent increase in emissions from waste incineration, particularly since 1998. Wastewater handling and composting show a fluctuating trend throughout the time series.

89. The Party has made recalculations for the waste sector between the 2010 and 2011 submissions in response to the 2010 annual review report and due to the availability of updated AD. The impact of these recalculations on the waste sector is an increase in emissions of 3.4 per cent for 2008. The main recalculations took place in the following categories:

(a) N_2O emissions from human sewage, which increased due to the use of revised values from the Food and Agriculture Organization of the United Nations on protein consumption per capita;

(b) CH_4 emissions from composting reported under other (waste), which increased due to the updated AD for the period 2006–2008 for the Walloon Region.

90. The inventory for the waste sector is generally complete in terms of reporting items, categories, years, gases and geographical coverage, including the estimation of emissions for the Flemish, Walloon and Brussels-Capital Regions. However, despite the recommendation from the previous review report, the ERT noted that CH_4 emissions from industrial wastewater are still reported as "NE" (see para. 98 below).

91. The ERT concluded that the transparency of the reporting for the sector is still insufficient. Given that the different waste treatment methods (landfilled, energy recovery, incineration, composting) are interrelated, the ERT recommends that Belgium show the distribution of these shares of waste in a table in its next NIR, in order to improve the transparency of the inventory.

92. Also, the ERT finds that the description of sector-specific QA/QC procedures is not sufficient, and reiterates the encouragement from the previous review report that Belgium improve its reporting of sector-specific QA/QC procedures in the next annual submission.

93. The ERT noted that some of the recommendations of the previous review report have not yet been implemented by the Party (e.g. regarding the transparency of the description of the methodology for solid waste disposal on land in the NIR, and the inconsistency in the reporting of waste incineration activities between the regions), and therefore reiterates those recommendations.

2. Key categories

Solid waste disposal on land – CH_4

94. Emissions from the category solid waste disposal on land were estimated using two different models: the multiphase model (for landfills with permits) and the first order decay (FOD) model (for old 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 description of the models with regard to the management practices on closed landfills in the Flemish Region and inconsistencies in the terminology used for the parameters of the two models across the time series. The ERT reiterates the recommendation of the previous review report that Belgium list, in the next NIR, the parameters used for the two models in a single table, using the same terminology.

95. The ERT noted some inconsistencies in the formulae used for the estimation of CH_4 emissions from the Flemish Region (see page 138 of the NIR) with regard to the omission of a few parameters, such as the normalization factor (that is currently less than 1, but if changed, this omission may lead to an underestimation of emissions); the oxidation factor; the methane conversion factor; the share of methane in the landfill gas; and the methane recovery, but which are, however, considered in the calculation; and discrepancies between the different assumptions for the two models used in the Flemish Region. The ERT finds that these inconsistencies hinder transparency and may affect the accuracy of the emission estimates. The ERT strongly recommends that the Party enhance the category-specific QC procedures both at the regional and at the national levels, in order to increase the accuracy and consistency of the reporting in the next annual submission.

96. The ERT notes a lack of justification for the use of the two different models for the estimation of emissions from closed and active landfills with different assumptions and lifetimes, and strongly recommends that Belgium explore the possibility of using a unified/homogeneous approach for the whole country in its next annual submission. Until the Party is able to use a consistent approach, the ERT recommends that Belgium report separately in CRF table 6.A information from the regions, as well as from the closed and

active landfills in the Flemish Region with their specific parameters according to the region-specific and model-specific conditions and assumptions used in order to ensure the transparency of its reporting.

3. Non-key categories

Wastewater handling – CH_4

97. Belgium has estimated CH_4 emissions from wastewater and sludge together and has reported emissions from domestic and commercial wastewater from municipal wastewater treatment plants in the Flemish Region and from septic tanks in the Flemish and Walloon Regions. There are no septic tanks in the Brussels-Capital Region and all the domestic and commercial wastewater plants in the Walloon and Brussels-Capital Regions treat the wastewater either aerobically or for energy purposes. In response to a request by the ERT, Belgium provided references to the energy sector where these emissions are reported. The ERT encourages the Party to investigate the possibility of reporting the estimates of emissions from wastewater treatment plants and septic tanks separately in the NIR, using different coefficients, and include the cross-sectoral information under the energy sector in the NIR of the next annual submission.

98. Belgium has not estimated CH_4 emissions from industrial wastewater and explains in the NIR that for the Walloon and Brussels-Capital Regions, the industries treat industrial wastewater aerobically, recover the CH_4 and report the emissions under the energy sector, while for the Flemish Region, the data to estimate these emissions are missing. Belgium considers that these emissions are negligible since, similarly to the two other regions, in the Flemish Region wastewater treatment is also mostly aerobic and/or with energy recovery. Nevertheless, the ERT strongly reiterates the recommendation of the previous ERT that Belgium enhance its efforts in order to obtain the necessary data for the estimation of emissions from industrial wastewater treatment in the Flemish Region and provide comprehensive information on industrial wastewater treatment in the next annual submission, including information in the additional information box in CRF table 6.B.

Waste incineration – CO_2 and N_2O

99. The category waste incineration only contains the shares of municipal solid waste, hospital waste and chemical waste (flaring) that are not incinerated for energy purposes. To estimate CO_2 and N_2O emissions, the Walloon and Flemish Regions apply different methodologies according to their region-specific data availability, which creates inconsistencies in the reporting at the national level. The only incineration plant in the Brussels-Capital Region recovers energy and the emissions are reported under the energy sector. In the Flemish Region, emissions from flaring activities in the chemical industry are reported under the category other (chemical industry) under the industrial processes sector, whereas the Walloon Region reports these emissions under waste incineration. Emissions from medical waste, incinerated together with municipal solid waste, are estimated for the Walloon Region only and are reported under the energy sector. The emissions reported for the Flemish Region comprise household waste only. The ERT noted that Belgium has reported the AD for municipal waste burning and has used the notation key "IE" for CO_2 and N_2O emissions. In response to questions raised by the ERT during the review, Belgium provided comprehensive information on the amounts of waste incinerated with energy recovery, together with their EFs and references. The ERT recommends that the Party clearly report, in the NIR, the shares of incinerated waste with and without energy recovery and provide clear quantitative information on the emissions from waste incineration reported under other sectors. The ERT further reiterates the recommendation of the previous review reports that Belgium ensure that the reporting of waste incineration activities is consistent and transparent between the regions in its next annual submission.

Other (waste) – CH_4

100. CH_4 emissions from composting activities are estimated for the Walloon and Flemish Regions using region-specific EFs and approaches. The category makes a minor contribution to the sectoral emissions but is showing a steady increase throughout the time series. The ERT encourages the Party to unify the regional methodologies for the Walloon and Flemish Regions in the estimation of CH_4 emissions from composting 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

101. Belgium has provided information relating to KP-LULUCF activities following the annotated outline of the NIR, including information that is generally in line with the requirements of the annex to decision 15/CMP.1. 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 and 2009. Belgium has elected not to report activities under Article 3, paragraph 4, of the Kyoto Protocol.

102. Belgium has made recalculations for the KP-LULUCF activities between the 2010 and 2011 submissions following changes in AD and EFs. The impact of these recalculations on each KP-LULUCF activity for 2008 is as follows:

(a) Net removals from afforestation and reforestation decreased by 180.76 Gg due to updated AD and EFs for the soil carbon in mineral soils and the growth of above-ground biomass in the Flemish Region;

(b) Net emissions from deforestation decreased by 300 Gg due to updated AD for the areas subject to deforestation, and updated EFs for the soil carbon emissions.

103. The factors that caused the recalculations were documented in the NIR; however, the Party did not clearly explain the effect of each updated method or AD on the recalculations. The ERT recommends that the Party clearly explain in the NIR the rationale for the recalculations and the updates which led to the recalculations.

104. In response to the list of potential problems and further questions raised by the ERT during the review, Belgium provided revised estimates for emissions from soil carbon for forest land converted to settlements and for forest land converted to other lands (see para. 111 below) and implemented a 20-year transition period for forest land, settlements and other lands to divide the remaining land areas and converted land areas. The revisions resulted in an increase in net removals from afforestation and reforestation of 4.4 per cent and an increase in the emissions from deforestation of 40.2 per cent for 2009.

105. Belgium uses a statistical approach based on the land-use classification of points from thematic and remotely sensed layers to determine land-use change activities related to afforestation, reforestation and deforestation. This method is consistent with the reporting approach 2 for representing land areas in 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 of 0.5 ha. 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 Party provided further information[9] on the land-use change estimation method and the extrapolation method used to reconstruct the time series. The ERT recommends that the Party include a summary of this information in the next annual submission.

106. For the 2011 submission, Belgium has increased the intensity of the sampling plots used to determine land-use change activities from 1 point/400 ha to 1 point/200 ha, with the aim of reducing the uncertainty in the estimation of land-use changes. This has resulted in a new estimate for land-use change activities under Article 3, paragraph 3, of the Kyoto Protocol, and subsequent recalculations of the reported emissions/removals for afforestation, reforestation and deforestation. The ERT commends the Party's intention to continue increasing the intensity of the sampling plots for the next annual submission.

107. The inventory for activities under Article 3, paragraph 3, of the Kyoto Protocol is generally complete for the carbon stock changes in each of the pools. However, there are two exceptions: the carbon stock changes in dead wood under afforestation/reforestation are reported as "NO" (where it is assumed that no change in the dead wood on land converted to forest land occurs, in accordance with the IPCC good practice guidance for LULUCF); and the Party has not estimated the removals from living biomass following deforestation. The ERT reiterates the recommendation from the previous review report that the Party estimate this carbon stock change in its next annual submission. 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, as "NO" and has reported N_2O emissions from disturbance associated with land-use conversion to cropland as "NE". Belgium provided information during the review indicating that it is possible that these emissions occur on lands subject to activities under Article 3, paragraph 3, in Belgium. The ERT strongly recommends that the Party estimate the emissions from these categories in the next annual submission, or clearly justify that these categories are not occurring in Belgium.

108. Belgium uses the same methodologies and data to estimate emissions and removals under the Convention and under the Kyoto Protocol, as referenced in the KP-LULUCF chapter in the NIR (chapter 10). However, the description of the LULUCF sector in the LULUCF chapter (chapter 7) of the NIR does not always provide clear information on all the methodologies applied and data used for the calculation of emissions and removals from activities under Article 3, paragraph 3. In addition, some inconsistencies have been detected, since Belgium reports that tier 1 methods are applied to report emissions and removals from afforestation and reforestation, and deforestation activities, while the LULUCF chapter includes information for both tier 1 and tier 2 approaches with the use of country-specific EFs. Noting that Belgium provided additional information in the NIR of the 2011 submission, the ERT reiterates the recommendation of the previous review report that the Party improve the clarity of its NIR and 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 method used to report emissions from each carbon pool under afforestation, reforestation and deforestation. Additionally, the ERT encourages Belgium to 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.

109. The ERT notes that, in response to the recommendations in the previous review report, Belgium has included further information in the NIR relating to paragraph 6(e) of the annex to decision 15/CMP.1, providing information on the carbon pools that are not accounted for, as well as on the key category analysis undertaken.

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

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

Afforestation and reforestation – CO_2

110. Belgium has reported forest data for the Flemish, Walloon and Brussels-Capital Regions and has used different soil EFs and forest inventory sources for each region. The ERT recommends 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.

Deforestation – CO_2

111. In the 2010 submission, Belgium provided an estimate of the soil carbon emissions from deforestation where forest land conversion to settlements had occurred. The method used by Belgium was a tier 2 carbon stock change method, where the initial forest carbon stock and final soil carbon stock under settlements were based on expert judgement. In the 2011 submission, Belgium no longer reports the soil carbon emissions from forest land converted to settlements. The Party explained that no methodological guidance for the estimation of the soil carbon stock change in settlements remaining settlements is provided in the IPCC good practice guidance for LULUCF. During the review, the Party explained that the soil carbon stock change in settlements reported by Belgium (30 t C ha^{-1}) is based on expert judgement and that informal consultation with experts indicated that the soil carbon in settlements was likely to be highly variable. Belgium was not able to demonstrate using transparent and verifiable information that this pool is not a net source. The ERT raised this issue in its list of potential problems and further questions during the review and recommended that Belgium either demonstrate that the soil carbon pool for forest land converted to settlements is not a net source or report emissions from soil carbon for forest land converted to settlements using the tier 2 method previously implemented by the Party or using an improved method, if available. In response to the list of potential problems and further questions raised by the ERT during the review, Belgium provided estimates for the missing carbon pool, which resulted in an increase in emissions from deforestation by 66.16 Gg. The ERT recommends that the Party continue to report these emissions and provide further information in the NIR outlining the source of the data used to estimate the carbon stock changes of soils in settlements.

112. The ERT identified that the IEFs for the carbon stock changes in the litter (–0.0004 Mg C/ha) and dead wood (–0.00005 Mg C/ha) pools is comparatively lower than other reporting Parties (which range between –9.29 and +0.09 Mg C/ha) (although the IEF for deforestation is not always a good indicator of the emissions intensity for deforestation activity in the given year of reporting). In response to questions raised by the ERT during the review, Belgium identified that an error had occurred in the calculation of emissions from the carbon stock changes in the litter and dead wood pools. The ERT encourages the Party to perform improved QA/QC procedures, in order to ensure that such errors do not occur in future annual submissions. The ERT also reiterates the recommendation of the previous ERT that Belgium include information in the NIR relating to the data source used to estimate the carbon stock changes in the litter pool for deforestation.

2. Information on Kyoto Protocol units

Standard electronic format and reports from the national registry

113. 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.

114. Information on the accounting of Kyoto Protocol units has been prepared and reported in accordance with chapter I.E of the annex to decision 15/CMP.1, 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 set out in paragraph 88(a–j) of the annex to decision 22/CMP.1.

National registry

115. The ERT took note of the SIAR and its findings 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 findings 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

116. Belgium has reported its commitment period reserve in its 2011 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 the most recently reviewed inventory. The ERT agrees with this figure.

3. Changes to the national system

117. Belgium reported that there have been no changes to its national system since the previous annual submission. The ERT concluded that Belgium's national system continues to be in accordance with the requirements of national systems outlined in decision 19/CMP.1.

4. Changes to the national registry

118. Belgium reported that there have been no significant changes to its national registry since the previous annual submission, besides the new security measures for user authentication. 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

119. Belgium has included information on the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol, as requested in chapter I.H

[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.

of the annex to decision 15/CMP.1, in its 2011 submission. The Party has not provided information on changes in its reporting of the minimization of adverse impacts in the NIR of the 2011 submission. A comparison of the submissions shows the inclusion of a list of clean development mechanism projects in which Belgium is involved. In response to a question raised by ERT during the review, Belgium replied that it was decided that, in the 2011 submission, the only projects reflected would be those where the Belgian federal or regional governments have signed an emissions reduction purchase agreement and are therefore more directly involved. The Party provided web links to the information on the projects delivering carbon credits via secondary markets and/or carbon funds. The ERT encourages Belgium to include this information in the appropriate section of the NIR in the next annual submission, in order to maintain the transparency of its reporting.

120. The ERT concluded that the information reported in the 2011 submission is generally complete and transparent. However, the ERT recommends 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.

III. Conclusions and recommendations

121. Belgium made its annual submission on 15 April 2011. 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, and 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.

122. 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 1990–2009 and an NIR; these are generally complete in terms of geographical coverage, years and sectors, as well as complete in terms of categories and gases. Some categories were reported as "NE" due to a lack of AD (e.g. industrial wastewater handling in the Flemish Region, and N_2O emissions from disturbance associated with land-use conversion to cropland). During the review, Belgium submitted revised estimates of CO_2 and CH_4 fugitive emissions from oil transport, HFC emissions from the disposal of commercial refrigeration equipment, N_2O emissions from animal manure application and indirect N_2O emissions in response to the list of potential problems and further questions raised by the ERT.

123. 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.

124. 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. Belgium has provided additional information to improve the estimates for the 2011 submission.

125. The Party has made recalculations for the inventory between the 2010 and 2011 submissions in response to the 2010 annual review report and following changes in AD and EFs. The impact of these recalculations on the estimated national totals is an increase in

emissions of 1.4 per cent for 2008. The main recalculations took place in the following sectors/categories:

(a) Energy (manufacturing industries and construction);

(b) Industrial processes (metal production);

(c) Agriculture (agricultural soils);

(d) LULUCF.

126. Belgium has provided information relating to 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 report emissions from soil carbon for forest land converted to settlements in the 2011 submission, even though the emissions were reported in the 2010 submission. During the review, Belgium provided the estimates for the missing carbon pool. Some other pools and sources (e.g. the carbon stock change in dead wood (afforestation/reforestation), CO_2 emissions from liming, N_2O emissions from soil disturbance associated with land-use conversion to cropland, and emissions from wildfires) were also not accounted for and the ERT strongly recommends that Belgium include them in the next annual submission or demonstrate that they are not a net source.

127. The ERT commends Belgium for the significant effort made to increase the intensity of the sampling plots used to estimate the area of land subject to afforestation, reforestation and deforestation. As a result, the Party has made recalculations for the KP-LULUCF activities between the 2010 and 2011 submissions following changes in AD and EFs. The impact of these recalculations on each KP-LULUCF activity for 2008 is as follows.

(a) Afforestation and reforestation: net removals decreased by 180.76 Gg;

(b) Deforestation: net emissions decreased by 300.47 Gg.

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

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

130. 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.

131. Belgium has reported information under chapter I.H of the annex to decision 15/CMP.1, "Minimization of adverse impacts in accordance with Article 3, paragraph 14" as part of its 2011 annual submission. The information was provided on 15 April 2011. The ERT concluded that the information reported in the 2011 submission is generally complete and transparent.

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

(a) The improvement of the transparency of the reporting across all sectors regarding the assumptions used for the recalculations, the inclusion of a discussion on the selection of the methodologies and EFs, the enhancement of the description of the sector-specific QA/QC checks performed, and the provision of a clear explanation for the differences between the data sets used;

(b) The intensification of the harmonization process for the methodologies, EFs and data sets used, as well as the improvement of overall cooperation and internal QA

procedures between the three regions, in order to avoid inconsistencies in the emission estimates and to increase the transparency of the reporting;

(c) The inclusion of a discussion of time-series consistency in the appropriate sections of the NIR;

(d) The implementation of category-specific QC procedures at the national level, particularly where different methodologies are used for the same categories across the regions and ensuring that the QC procedures are consistently applied across all sectors during the preparation of the NIR, in order to avoid errors, and providing updated information;

(e) The strengthening of efforts in the implementation of sector-specific recommendations in the previous review report that have not yet been addressed.

133. In the course of the review, the ERT formulated a number of sector-specific recommendations relating to the completeness and transparency of the information presented in the Party's annual submission. The key recommendations are that Belgium:

(a) Improve the transparency of reporting in the energy sector by providing more explanatory information regarding the differences between the AD in the CRF tables and those provided to the IEA and harmonizing the AD used in the calculations for the sectoral and reference approaches, and improve the accuracy and consistency of the reporting of emissions from the transport category;

(b) Improve the time-series consistency of the emission estimates for the industrial processes sector, for example for CO_2 emissions from cement production, by applying the same approach to the EFs across the entire time series; and for CO_2 emissions from iron and steel production, by justifying the applicability of the plant-specific EFs for the early years of the time series;

(c) Improve the transparency of the agriculture sector by including data on the mass balance of animal manure, the amount of synthetic fertilizers used and the crop production for each of the three regions and for the Party as a whole;

(d) Improve the transparency of the LULUCF sector by improving the category-specific information on the methods, AD and assumptions used, particularly with regard to each of the three regions;

(e) Improve the completeness of its reporting by reporting all mandatory carbon pools and gases consistently under the Convention and under the KP-LULUCF activities, in particular emissions from lime application and N_2O emissions from land converted to cropland, and by reporting estimates for land-use conversion categories for 1990;

(f) Improve the transparency of the reporting on the two different models used for the estimation of CH_4 emissions from solid waste disposal on land;

(g) Improve the transparency of the NIR by providing quantitative information on the shares of incinerated waste (with and without energy recovery) and on the emissions from waste incineration reported under the energy sector;

(h) Improve the completeness of the estimates by obtaining the necessary data on industrial wastewater treatment in the Flemish Region and improve the reporting of the category.

IV. Questions of implementation

134. 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 2011. Available at <http://unfccc.int/resource/docs/2011/asr/bel.pdf>.

Synthesis and assessment report on the greenhouse gas inventories submitted in 2011. Available at <http://unfccc.int/resource/webdocs/sai/2011.pdf>.

FCCC/ARR/2010/BEL. Report of the individual review of the annual submission of Belgium submitted in 2010. Available at <http://unfccc.int/resource/docs/2011/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. Biernaux (IRCEL-CELINE), including additional material on the methodologies and assumptions used.

The following document[1] was also provided by Belgium:

Philippe Lejeune et al. 2011. *Inventaire sur l'affectation des terres et du changement d'affectation des terres et la foresterie (LULUCF) de la Belgique* (Rapport final).

[1] Reproduced as received from the Party.

Annex II

Acronyms and abbreviations

AD	activity data
CH_4	methane
CO_2	carbon dioxide
CO_2 eq	carbon dioxide equivalent
CMP	Conference of the Parties
CRF	common reporting format
EF	emission factor
ERT	expert review team
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
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
kg	kilogram (1 kg = 1,000 grams)
LTO	landing and take-off
LULUCF	land use, land-use change and forestry
Mg	megagram (1 Mg = 1 tonne)
MgO	magnesium oxide
MSW	municipal solid waste
N	nitrogen
NA	not applicable
N_2O	nitrous oxide
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
TJ	terajoule (1 TJ = 10^{12} joule)
UNFCCC	United Nations Framework Convention on Climate Change