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

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

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I. Introduction and summary

1. This report covers the centralized review of the 2012 annual submission of Hungary, coordinated by the UNFCCC secretariat, in accordance with decision 22/CMP.1. The review took place from 10 to 15 September 2012 in Bonn, Germany, and was conducted by the following team of nominated experts from the UNFCCC roster of experts: generalists – Mr. Paul Filliger (Switzerland) and Ms. Batima Punsalmaa (Mongolia); energy – Ms. Duduzile Nhlengethwa-Masina (Swaziland) and Ms. Songli Zhu (China); industrial processes – Ms. Valentina Idrissova (Kazakhstan), Mr. Predrag Novosel (Montenegro) and Mr. Jacek Skoskiewicz (Poland); agriculture – Mr. Jorge Alvarez (Peru) and Mr. Daniel Bretscher (Switzerland); land use, land-use change and forestry (LULUCF) – Ms. Oksana Butrym (Ukraine), Mr. Agustin Inthamoussu (Uruguay) and Ms. Thelma Krug (Brazil); and waste – Ms. Maryna Bereznytska (Ukraine) and Mr. Sabin Guendehou (Benin). Ms. Bereznytska and Ms. Krug were the lead reviewers. The review was coordinated by Mr. Roman Payo (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 Hungary, which provided comments that were considered and incorporated, as appropriate, into this final version of the report.

3. In 2010, the main greenhouse gas (GHG) in Hungary was carbon dioxide (CO₂), accounting for 75.8 per cent of total GHG emissions¹ expressed in CO₂ eq, followed by methane (CH₄) (12.5 per cent) and nitrous oxide (N₂O) (9.8 per cent). Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF₆) collectively accounted for 1.8 per cent of the overall GHG emissions in the country. The energy sector accounted for 72.4 per cent of total GHG emissions, followed by the agriculture sector (12.2 per cent), the industrial processes sector (9.6 per cent), the waste sector (5.4 per cent) and the solvent and other product use sector (0.4 per cent). Total GHG emissions amounted to 67,784.81 Gg CO₂ eq and decreased by 40.9 per cent between the base year² and 2010. The decreasing emission trend between the base year and 2010 is reasonable given Hungary’s transformation from a centralized economy to a market economy in the 1990s.

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, CO₂, CH₄ and N₂O emissions included in the rows under Annex A sources do not include emissions and removals from the LULUCF sector.

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

¹ In this report, the term “total GHG emissions” refers to the aggregated national GHG emissions expressed in terms of CO₂ eq excluding LULUCF, unless otherwise specified.

² “Base year” refers to the base year under the Kyoto Protocol, which is the average of the period 1985–1987 for CO₂, CH₄ and N₂O, and 1995 for HFCs, PFCs and SF₆. 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^a to 2010

		<i>Gg CO₂eq</i>								<i>Change (%)</i>		
		<i>Greenhouse gas</i>	<i>Base year^a</i>	<i>1990</i>	<i>1995</i>	<i>2000</i>	<i>2005</i>	<i>2008</i>	<i>2009</i>	<i>2010</i>	<i>Base year–2010</i>	
Annex A sources		CO ₂	84 911.38	72 505.09	61 681.20	58 722.97	60 701.94	56 285.54	50 595.84	51 392.66	–39.5	
		CH ₄	12 504.25	11 748.82	9 501.65	9 692.69	8 989.76	8 608.49	8 452.92	8 478.76	–32.2	
		N ₂ O	16 998.95	12 697.37	7 299.21	8 225.15	8 744.72	7 179.44	6 738.18	6 658.08	–60.8	
		HFCs	0.74	NA, NO	0.74	223.05	741.71	1 054.95	974.19	1 019.76	138 536.7	
		PFCs	166.82	270.83	166.82	211.27	209.41	2.43	1.76	0.61	–99.6	
		SF ₆	169.59	87.62	169.59	195.26	237.72	275.50	220.55	234.94	38.5	
KP-LULUCF	Article 3.3 ^b	CO ₂						–1 071.95	–1 026.27	–1 215.55		
		CH ₄						0.27	0.36	0.42		
		N ₂ O						0.28	0.30	0.29		
	Article 3.4 ^c	CO ₂	NA						–2 806.76	–1 914.00	–1 704.05	NA
		CH ₄	NA						20.64	20.13	22.09	NA
		N ₂ O	NA						2.10	2.04	2.24	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, NO = not occurring.

^a “Base year” for Annex A sources refers to the base year under the Kyoto Protocol, which is the average of the period 1985–1987 for CO₂, CH₄ and N₂O, and 1995 for HFCs, PFCs and SF₆. The “base year” for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol is the average of the period 1985–1987.

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

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

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

		<i>Gg CO₂ eq</i>								<i>Change (%)</i>	
<i>Sector</i>		<i>Base year^d</i>	<i>1990</i>	<i>1995</i>	<i>2000</i>	<i>2005</i>	<i>2008</i>	<i>2009</i>	<i>2010</i>	<i>Base year–2010</i>	
Annex A	Energy	78 811.46	67 601.36	58 428.88	55 851.10	57 450.80	53 429.16	48 548.69	49 069.85	–37.7	
	Industrial processes	14 633.07	11 572.74	7 853.66	8 167.89	9 002.11	6 946.16	6 066.80	6 492.22	–55.6	
	Solvent and other product use	284.54	226.27	205.16	213.71	366.33	406.30	340.09	268.88	–5.5	
	Agriculture	17 946.38	14 524.01	8 684.46	9 118.49	8 848.07	8 811.93	8 294.85	8 266.75	–53.9	
	Waste	3 076.30	3 385.36	3 647.05	3 919.21	3 957.95	3 812.80	3 733.01	3 687.11	19.9	
	LULUCF	NA	–1 946.78	–5 801.10	–390.83	–4 413.00	–4 202.78	–3 316.41	–3 372.11	NA	
Total (with LULUCF)		NA	95 362.95	73 018.12	76 879.56	75 212.25	69 203.57	63 667.03	64 412.70	NA	
Total (without LULUCF)		114 751.74	97 309.73	78 819.22	77 270.39	79 625.25	73 406.35	66 983.45	67 784.81	–40.9	
Other ^b		NA	NA	NA	NA	NA	NA	NA	NA	NA	
KP-LULUCF	Article 3.3 ^c	Afforestation and reforestation					–1 112.89	–1 107.08	–1 259.66		
		Deforestation					41.49	81.47	44.82		
		Total (3.3)					–1 071.40	–1 025.62	–1 214.84		
	Article 3.4 ^d	Forest management						–2 784.02	–1 891.82	–1 679.71	
		Cropland management	NA					NA	NA	NA	NA
		Grazing land management	NA					NA	NA	NA	NA
		Revegetation	NA					NA	NA	NA	NA
		Total (3.4)	NA					–2 784.02	–1 891.82	–1 679.71	NA

Abbreviations: KP-LULUCF = land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, LULUCF = land use, land-use change and forestry, NA = not applicable.

^a “Base year” for Annex A sources refers to the base year under the Kyoto Protocol, which is the average of the period 1985–1987 for CO₂, CH₄ and N₂O, and 1995 for HFCs, PFCs and SF₆. The “base year” for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol is the average of the period 1985–1987.

^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 national totals.

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

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

Table 3
Information to be included in the compilation and accounting database in t CO₂ eq for the year 2010, including the commitment period reserve

	<i>As reported</i>	<i>Revised estimates</i>	<i>Adjustment^a</i>	<i>Final^b</i>
Commitment period reserve	338 395 251	338 924 042		338 924 042
Annex A emissions for current inventory year				
CO ₂	51 392 659			51 392 659
CH ₄	8 478 762			8 478 762
N ₂ O	6 658 076			6 658 076
HFCs	914 259	1 019 764		1 019 764
PFCs	356	609		609
SF ₆	234 939			234 939
Total Annex A sources	67 679 050	67 784 808		67 784 808
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	-1 175 277			-1 175 277
3.3 Afforestation and reforestation on harvested land for current year of commitment period as reported	-84 387			-84 387
3.3 Deforestation for current year of commitment period as reported	44 823			44 823
Activities under Article 3, paragraph 4, for current inventory year^c				
3.4 Forest management for current year of commitment period	-1 679 710			-1 679 710
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				

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

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

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

Table 4
**Information to be included in the compilation and accounting database in t CO₂ eq for
the year 2009**

	<i>As reported</i>	<i>Revised estimates</i>	<i>Adjustment^a</i>	<i>Final^b</i>
Annex A emissions for 2009				
CO ₂	50 595 838			50 595 838
CH ₄	8 452 921			8 452 921
N ₂ O	6 738 178			6 738 178
HFCs	854 980	974 193		974 193
PFCs	1 743	1 761		1 761
SF ₆	220 554			220 554
Total Annex A sources	66 864 214	66 983 445		66 983 445
Activities under Article 3, paragraph 3, for 2009				
3.3 Afforestation and reforestation on non-harvested land for 2009 as reported	-1 060 546			-1 060 546
3.3 Afforestation and reforestation on harvested land for 2009 as reported	-46 538			-46 538
3.3 Deforestation for 2009 as reported	81 466			81 466
Activities under Article 3, paragraph 4, for 2009^c				
3.4 Forest management for 2009	-1 891 824			-1 891 824
3.4 Cropland management for 2009				
3.4 Cropland management for base year				
3.4 Grazing land management for 2009				
3.4 Grazing land management for base year				
3.4 Revegetation for 2009				
3.4 Revegetation in base year				

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

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

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

Table 5
**Information to be included in the compilation and accounting database in t CO₂ eq for
the year 2008**

	<i>As reported</i>	<i>Revised estimates</i>	<i>Adjustment^a</i>	<i>Final^b</i>
Annex A emissions for 2008				
CO ₂	56 285 536			56 285 536
CH ₄	8 608 492			8 608 492
N ₂ O	7 179 436			7 179 436
HFCs	940 266	1 054 950		1 054 950
PFCs	2 431			2 431
SF ₆	275 505			275 505
Total Annex A sources	73 291 666	73 406 350		73 406 350
Activities under Article 3, paragraph 3, for 2008				
3.3 Afforestation and reforestation on non-harvested land for 2008 as reported	-1 087 466			-1 087 466
3.3 Afforestation and reforestation on harvested land for 2008 as reported	-25 422			-25 422
3.3 Deforestation for 2008 as reported	41 487			41 487
Activities under Article 3, paragraph 4, for 2008^c				
3.4 Forest management for 2008	-2 784 023			-2 784 023
3.4 Cropland management for 2008				
3.4 Cropland management for base year				
3.4 Grazing land management for 2008				
3.4 Grazing land management for base year				
3.4 Revegetation for 2008				
3.4 Revegetation in base year				

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

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

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

II. Technical assessment of the annual submission

A. Overview

1. Annual submission and other sources of information

6. The 2012 annual inventory submission was submitted on 14 April 2012; it contains a complete set of common reporting format (CRF) tables for the period 1985–2010 and a national inventory report (NIR) (submitted on 4 May 2012). Hungary also submitted information required under Article 7, paragraph 1, of the Kyoto Protocol, including information on: activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, accounting of Kyoto Protocol units, changes in the national system and in the national registry, and the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol. The standard electronic format (SEF) tables were submitted on 14 April 2012. The annual submission was submitted in accordance with decision 15/CMP.1.

7. Hungary officially submitted revised emission estimates on 4 May 2012 and a revised NIR on 25 May 2012. In addition, Hungary submitted revised emission estimates on 17 October 2012 in response to the list of potential problems and further questions raised by the expert review team (ERT) during the review week (see paras. 62–65 and 145 below). The values used in this report are those submitted by the Party on 17 October 2012.

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

9. During the review, Hungary 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 complete in terms of years, geographical coverage and sectors, and generally complete in terms of mandatory⁴ source and sink categories for the period 1985–2010, except for some categories in the LULUCF sector (see para. 86 below). Improvements have been made since the previous annual submission, such as the inclusion of emission estimates for several categories in the LULUCF sector that were previously

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 (ITL) administrator using procedures agreed in the Registry System Administrators Forum. Part I is a completeness check of the submitted information relating to the accounting of Kyoto Protocol units (including the SEF tables and their comparison report) and to national registries. Part II contains a substantive assessment of the submitted information and identifies any potential problem regarding information on the accounting of Kyoto Protocol units and the national registry.

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

reported as not estimated (“NE”) (see para. 85 below). Nevertheless, some categories in the LULUCF sector have still been reported as “NE” (see para. 86 below). Therefore, the ERT reiterates the recommendation made in the previous review report that Hungary improve the completeness of its reporting by reducing the number of LULUCF categories reported as “NE”, in accordance with the Intergovernmental Panel on Climate Change (IPCC) *Good Practice Guidance for Land Use, Land-Use Change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF), in its next annual submission.

11. In response to a recommendation made in the previous review report,⁵ Hungary has listed in annex 5 to the NIR all of the LULUCF categories reported as “NE” and provided explanations for not estimating them. The ERT commends Hungary for this newly introduced table, as well as for the additional information provided in the LULUCF chapter 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

12. The ERT concluded that Hungary’s national system continued to perform its required functions.

13. Hungary described minor changes to the national system since the previous annual submission and these changes are discussed in paragraph 146 below.

Inventory planning

14. The NIR described the national system for the preparation of the inventory. The Ministry of Rural Development (in agreement and cooperation with the Ministry of National Development) is the single national entity with overall responsibility for the national inventory (the Ministry of Environment and Water, the previous single national entity, was abolished in 2010). The inventory is approved by two ministers: the Minister of National Development and the Minister of Rural Development – the first approves the inventory submission before it is submitted to the European Commission; and the second approves it before it is submitted to the UNFCCC secretariat.

15. A Greenhouse Gas Inventory Division was established within the Hungarian Meteorological Service (OMSZ)⁶ for the preparation and development of the inventory. The division is responsible for all inventory-related tasks, compiles the GHG inventory and other reports and supervises the maintenance of the national inventory system. In addition, it coordinates the work with other ministries, government agencies, universities, companies and consultants on a contractual basis. The Central Agricultural Office and the Forest Research Institute compile the LULUCF and KP-LULUCF parts of the inventory, while the Karcag Research Institute of the University of Debrecen contributes to the preparation of the inventory for the agriculture sector.

16. Since late 2009, following the entry into force of a governmental decree, the Forestry Directorate of the Central Agricultural Office and the Forest Research Institute have been responsible for the part of the LULUCF sector inventory concerning forestry, including the supplementary reporting on activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, and making recommendations to OMSZ, the entity responsible for the preparation and development of the Party’s GHG inventory. The Karcag Research Institute

⁵ FCCC/ARR/2011/HUN.

⁶ Országos Meteorológiai Szolgálat, in Hungarian.

of the University of Debrecen (Department of Soil Utilisation and Rural Development) and the Research Institute for Animal Breeding and Nutrition are responsible for the part of Hungary's inventory on the agriculture sector, including data collection, selection of methods and emission factors (EFs), background research and the development of country-specific parameters.

17. In response to an encouragement made in the previous review report, Hungary has provided in the NIR an overview of the inventory preparation process, including a timeline for the preparation of the inventory and information on allocated responsibilities.

Inventory preparation

Key categories

18. Hungary has reported tier 1 and tier 2 key category analyses, both level and trend assessment, as part of its 2012 annual submission. The tier 1 key category analysis performed by the Party and that performed by the secretariat⁷ produced similar results. Hungary has included the LULUCF sector in its key category analysis, which was performed in accordance with the 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 LULUCF. No key categories were identified using qualitative criteria.

19. The results of the tier 1 and tier 2 (level and trend, both including categories in the LULUCF sector) key category analyses were combined to define 29 key categories, which the Party used to prioritize the development and improvement of its inventory. The ERT considers this to be a good and reasonable approach. The ERT noted that the information on key categories in NIR table 1.2 is not completely consistent with the information in CRF table 7: NIR table 1.2 lists 29 key categories, while CRF table 7 lists only 25 (e.g. N₂O emissions from wastewater handling is listed in NIR table 1.2 but not in CRF table 7). The ERT recommends that the Party make the information on key categories in the NIR consistent with the information in CRF table 7 in the next annual submission.

20. Hungary has identified key categories for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, for 2010.

Uncertainties

21. Hungary has reported a tier 1 uncertainty analysis in accordance with the IPCC good practice guidance and the IPCC good practice guidance for LULUCF. The Party has included the LULUCF sector in its uncertainty analysis for the first time for its 2012 annual submission (in response to a recommendation made in the previous review report). The uncertainties have been provided at both the summary and individual category levels. According to the information provided in the NIR, the uncertainty estimates for individual categories were taken mainly from the IPCC good practice guidance, but country-specific information from industry and expert judgement were also used, where available, to estimate uncertainties for the key categories. The ERT encourages Hungary to investigate

⁷ 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.

the possibility of developing country-specific uncertainty estimates for the key categories for which information from the IPCC good practice guidance is currently used.

22. The ERT noted that the total level uncertainty, including emissions and removals from the LULUCF sector, was estimated at 18.2 per cent for 2010, with the trend uncertainty estimated at 3.0 per cent. Both uncertainties are slightly higher than those reported in the Party's 2011 annual submission (17.6 per cent for the level and 2.4 per cent for the trend for 2009, both excluding the LULUCF sector), which is due to the inclusion of the LULUCF sector. The total level uncertainty is dominated by the uncertainty of the estimated N₂O emissions from agricultural soils, as is also the case for many other Parties.

23. Hungary did not perform an overall tier 2 uncertainty analysis, but has started to use a tier 2 uncertainty analysis for the LULUCF sector. The Party mentioned the use of a tier 2 uncertainty analysis as a planned improvement in relation to the agriculture sector. The ERT commends the Party for the improvement made and encourages it to continue its efforts to use a tier 2 uncertainty analysis for all sectors in the inventory.

Recalculations and time-series consistency

24. Recalculations have been performed and reported in accordance with the IPCC good practice guidance. The ERT noted that recalculations were performed for the entire time series 1985–2009 and were triggered mainly by the following:

(a) In the energy sector (see para. 41 below): new data for coke oven gas for the period 1985–2005; the separate reporting of the emissions from iron and steel and from non-ferrous metals; the reallocation of emissions from the use of coke as a reducing agent in blast furnaces to the industrial processes sector; and revised EFs for fugitive emissions from oil and natural gas;

(b) In the industrial processes sector (see para. 58 below): revised activity data (AD) for steel production; the reallocation of emissions from iron and steel from the energy sector to the industrial processes sector; and revised AD and EFs for consumption of halocarbons and SF₆ (in response to the list of potential problems and further questions raised by the ERT during the review week; see paras. 62–65 below);

(c) In the agriculture sector (see para. 68 below): the revision of the livestock population (e.g. for dairy cattle), the reallocation of emissions under manure management and the revision of nitrogen excretion rates;

(d) In the LULUCF sector (see para. 84 below): the recommendations made in the previous review report;

(e) In the waste sector (see para. 115 below): revisions to the AD and EFs.

25. Many of the recalculations were undertaken in response to recommendations made in the previous review report. The documentation on the recalculations in chapter 10 of the NIR is very well structured and gives detailed information, including the rationale for the recalculations, and the information in CRF table 8(b) is transparent. The ERT commends Hungary for its efforts.

26. The major changes due to the recalculations, and the magnitude of the impact, include an increase in the estimated total GHG emissions for the base year (by 0.6 per cent) and an increase in the corresponding estimate for 2009 (by 0.3 per cent).

Verification and quality assurance/quality control approaches

27. Hungary has provided information in the NIR regarding its quality assurance/quality control (QA/QC) procedures, which are in line with the IPCC good practice guidance. OMSZ has a quality management system, which also covers its GHG Inventory Division

and the GHG inventory preparation process, certified by the International Organization for Standardization (ISO). Internal audits are conducted every year and the quality management system, including the activities of the GHG Inventory Division, is subject to regular external audits. The ISO certification was renewed in January 2012.

28. Hungary has a QA/QC plan, which is an audited document, but it is only available in Hungarian. The content of the plan is summarized in section 1.7 of the NIR, including specific roles and responsibilities, the requirements for documentation, the QA/QC activities and a development and training plan. In response to a question raised by the ERT during the review as to whether the QA/QC plan has been translated into English as indicated to the previous ERT, the Party indicated that the translation has started, but that it is under revision with a view to: considering issues of consistency with the reporting under the Convention on Long-range Transboundary Air Pollution; introducing new records of tier 1 and tier 2 QC checks; and including a formal improvement plan. In response to another question raised by the ERT during the review, the Party forwarded to the ERT the draft English translation of the QA/QC plan, the inventory development plan and two examples of QC forms. Hungary plans to include such documents in its next annual submission, and the ERT recommends that the Party do so.

29. The handling of confidential information has been described in the NIR of the Party's 2012 annual submission (in response to a recommendation made in the previous review report). The general record management regulation of OMSZ was amended in 2011. It defines explicit rules for the management of confidential data, which are summarized in section 1.4 of the NIR.

30. Hungary used data from the European Union emissions trading scheme (EU ETS) to estimate some emissions (see para. 60 below). Being aware of the possibility of introducing inconsistencies in the time series, Hungary has explained in the NIR that no emission estimates were taken directly from the EU ETS data and included in the CRF tables. Instead, facility-level AD (on fuel use) and CO₂ EFs from the EU ETS database were used to calculate weighted averages of the EFs for different fuel types. These derived country-specific EFs were then used with the data on fuel use from the national energy statistics to estimate emissions. The ERT agrees with the Party's approach.

Transparency

31. Hungary has followed the annotated outline of the NIR contained in annex I to 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). The information provided in the NIR is generally in accordance with the UNFCCC reporting guidelines. However, the ERT recommends that transparency be improved in some areas (see paras. 35, 42, 43, 44, 48, 52, 53, 56, 59, 61, 74, 80, 86, 88, 104, 108, 112 and 119 below).

32. In response to the recommendation made in the previous review report, considerable new and additional information has been included in the NIR, mainly in the chapters on the industrial processes sector, the LULUCF sector and recalculations. A new annex 8 to the NIR has been introduced, listing all recommendations and encouragements made in the previous review report and indicating how they have been taken into account and where the improvements can be found. The ERT commends the Party for providing this very informative list and for its efforts to make substantial improvements since the previous review, thus ensuring a much more transparent NIR in its 2012 annual submission. Further improvements relating to the enhancement of transparency are described in the respective sectoral chapters of this report.

33. Hungary's use of the notation keys has improved since its previous annual submission. In response to the recommendation made in the previous review report, the Party has re-evaluated its use of the notation keys for several categories (e.g. for the subcategory refrigeration and air-conditioning equipment under consumption of halocarbons and SF₆ in the industrial processes sector and for CH₄ and CO₂ emissions from the distribution of oil products in the energy sector).

Inventory management

34. Hungary has a centralized archiving system that includes the archiving of background documents, EFs and AD, as well as documentation on the sources of EFs and AD and how they have been generated and aggregated for the preparation of the inventory. The archived information also includes internal documentation on QA/QC procedures, external and internal reviews, and documentation on annual key categories and key category identification and planned inventory improvements. Many of the background data are stored by contracted external institutions as well (e.g. EU ETS data, forestry statistics and agricultural data). The NIR states that at least a copy of all information used for the annual submission will be transferred to the centralized archiving system in the near future. The ERT encourages the Party to report on the status of this initiative in its next annual submission.

35. The centralized archiving system is maintained by OMSZ. Within the GHG Inventory Division of OMSZ, a nominated archive manager is responsible for the maintenance of the archiving system. According to the NIR, a procedural manual for the management and maintenance of the archiving system is under preparation. In addition, a harmonized, or maybe unified, computerized database containing all of the data relevant to the national system, as well as for the EU ETS, is under development. In order to improve transparency, the ERT encourages the Party to finalize these tasks and report on the status of preparation of the procedural manual for the management and maintenance of the archiving system in its next annual submission.

3. Follow-up to previous reviews

36. In response to a recommendation made in the previous review report, Hungary has included in annex 8 to its NIR a detailed list of all improvements implemented or ongoing. The Party has made efforts to implement many improvements throughout the inventory, which enhances the transparency of the documentation (see para. 32 above) and the accuracy and completeness of the inventory.

37. The ERT commends Hungary for the improvements implemented in its 2012 annual submission in response to the recommendations made in the previous review report. However, the ERT noted that there are still some recommendations and encouragements to be addressed, including: the provision of emission estimates for the LULUCF categories reported as "NE" (see para. 86 below); the use of a tier 2 uncertainty analysis (see para. 23 above); and the finalization and formalization of the archiving system (see paras. 34 and 35 above).

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

38. During the review, the ERT identified several issues for improvement. These are listed in table 7 below.

39. Recommended improvements relating to specific categories are presented in the relevant sector chapters of this report and in table 7 below.

B. Energy

1. Sector overview

40. The energy sector is the main sector in the GHG inventory of Hungary. In 2010, emissions from the energy sector amounted to 49,069.85 CO₂ eq, or 72.4 per cent of total GHG emissions. Since the base year, emissions have decreased by 37.7 per cent (29,741.61 Gg CO₂ eq). The key driver for the fall in emissions from the energy sector is the decrease in fuel consumption: between 1989 and 1990 the regime change in the country resulted in a radical decline in economic output, which resulted in a fall in emissions. Emissions decreased between the base year and 2010 by 41.0 per cent (10,422.73 Gg CO₂ eq) from public electricity and heat production, by 46.8 per cent (7,984.08 Gg CO₂ eq) from residential and by 77.3 per cent (6,045.68 Gg CO₂ eq) from other (manufacturing industries and construction), which more than offset the 67.1 per cent (4,655.43 Gg CO₂ eq) increase in emissions from road transportation. Within the sector, 34.0 per cent of the emissions were from energy industries, followed by 29.1 per cent from other sectors, 24.2 per cent from transport and 8.0 per cent from manufacturing industries and construction. Fugitive emissions from fuels accounted for 4.8 per cent of the sectoral emissions (4.8 per cent from oil and natural gas and 0.02 per cent from solid fuels).

41. Hungary has made recalculations for the energy sector between its 2011 and 2012 annual submissions in response to recommendations made in the previous review report (i.e. to report emissions from iron and steel and from non-ferrous metals differently, reallocating emissions from pig iron to the industrial processes sector, and to report emissions from the use of coke as a reducing agent under the industrial processes sector), in order to rectify identified errors (inconsistencies in AD) and owing to the availability of more accurate EFs. The impact of these recalculations on the energy sector is a decrease in the estimate of emissions for 2009 of 3.3 per cent. The main recalculations took place in the following categories:

(a) Iron and steel: the emission estimate for 2009 decreased by 84.8 per cent (1,864.67 Gg CO₂ eq) (NIR, section 10.2.2). Part of the decrease was the reallocation of 152.02 Gg CO₂ eq to non-ferrous metals (previously reported as included elsewhere ("IE"));

(b) Oil and natural gas: the CO₂ emission estimate for 2009 increased by 209.4 per cent (109.5 Gg CO₂ eq), owing to the availability of a more accurate EF (NIR, section 10.2.5).

42. The ERT noted that recalculations of estimates of emissions have been briefly described in specific sections of the NIR for each category (e.g. recalculated CH₄ emission estimates have been discussed in section 3.2.8.5 of the NIR), but that the chapter in the NIR dedicated to analysing the recalculations (chapter 10.2) includes information on the recalculation of CO₂ emission estimates only. The ERT recommends that the chapter of the NIR exclusively dealing with recalculations cover all gases, in order to improve the consistency and transparency of the NIR.

43. Discrepancies were noted between the NIR and the CRF tables in the reporting on the recalculation of the estimates of emissions from oil and natural gas and from transport. For example, in table 10.7 of the NIR it is reported that in the previous annual submission the estimated CO₂ fugitive emissions from oil and natural gas included only flaring. However, the ERT noted that the latest annual submission for 2011 (submitted on 16 September 2011) included also estimates for the category natural gas. In response to a question raised by the ERT during the review, Hungary explained that for fugitive emissions from oil and natural gas the NIR compares the 2011 annual submission submitted on 21 April 2011 with the 2012 annual submission. The ERT noted that the

submission of 21 April 2011 is not the latest 2011 annual submission, and therefore the ERT recommends that the Party ensure consistency between the NIR and the CRF tables in this regard in its next annual submission.

44. The ERT also noted that the description of the impact of recalculations for CH₄ emissions from natural gas in the transport sector (page 270 of the NIR) includes only the maximum difference observed over the time series. The ERT recommends that, in its next annual submission, in order to improve transparency, the Party report the impact of recalculations for every year in the entire time series for every recalculation.

45. The ERT commends Hungary for taking into consideration the recommendation made in the previous review report that the Party pay attention to the carbon balances reported for categories in which there are backflows or transfers of secondary energy products to other facilities, which has resulted in some recalculations.

2. Reference and sectoral approaches

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

46. For 2010, CO₂ emission estimates calculated using the reference approach were 1.6 per cent higher than those calculated using the sectoral approach. Hungary has explained the difference in the documentation table of CRF table 1.A(c) and in the NIR, which is due to the different ways of calculating emissions from non-energy use of fuels and treating fugitive emissions in the two approaches. However, the ERT noted that the difference in the estimates of CO₂ emissions from solid fuels was 6.0 per cent, and commends Hungary for explaining the reason for this difference (transformational losses in gas coke distillation and briquetting) in the documentation box of CRF table 1.A(c). The estimates calculated using the reference approach also compare well (0.5 per cent difference) with international statistics (data from the International Energy Agency (IEA)).

47. The ERT noted that the estimated production of natural gas liquids reported in CRF table 1.A(b) is 15–55 per cent lower than according to IEA statistics for the period 1985-2000. In response to a question raised by the ERT during the review, Hungary explained that the Hungarian energy statistics have been revised in this respect, which is not yet reflected in the CRF tables but will be amended in its next annual submission. The ERT recommends that the Party revise the necessary data and explain any recalculation in its next annual submission.

48. Hungary has reported in NIR table 3.5 the differences between its coal classification system and that of both the IPCC and IEA, which make it difficult to compare the reporting in the CRF tables with IEA statistics: for example, in the Party's system, a small proportion of lignite is grouped together with sub-bituminous coal and other bituminous coal as hard coal. In order to improve transparency and comparability, the ERT recommends that Hungary use the coal classification system from the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Revised 1996 IPCC Guidelines) for its next annual submission.

International bunker fuels

49. No emissions from navigation have been reported under international bunker fuels by Hungary (all AD for marine bunkers have been reported as not applicable ("NA") in CRF table 1.C). The main drivers for this are the absence of Hungarian sea harbours and the decrease in the role of waterway transportation (decrease in the share of goods transportation from 28.2 per cent to 2.9 per cent) between 1990 and 2000. However, the ERT considers that the possibility of international navigation on the River Danube cannot be excluded and therefore reiterates the encouragement made in the previous review report

that the Party explore the possibility that international navigation does occur on the River Danube and report its findings, including emission estimates if appropriate, in its next annual submission.

50. Significant discrepancies in the figures reported for energy consumption for international aviation of up to 23.3 per cent exist between the IEA statistics and the data reported in the CRF tables for between 2000 and 2006, with higher consumption reported in the IEA statistics. In response to a question raised by the ERT during the review, Hungary acknowledged that this is an issue requiring investigation. The ERT recommends that the Party investigate the discrepancies and report its findings in its next annual submission.

Feedstocks and non-energy use of fuels

51. Hungary uses facility-level emission estimates from the EU ETS for some categories where there is non-energy use of fuels (e.g. petroleum refining, petrochemicals, and iron and steel). In the previous review report it was noted that Hungary had not explained how the reporting facilities ensure that emissions from the non-energy use of fuels are accounted for within the EU ETS data, and the Party was therefore encouraged to increase the transparency of its reporting by explaining how data on emissions from non-energy fuel use from reporting facilities are accounted for within such facility-level emission inventories and how these data are consistent with those in the Revised 1996 IPCC Guidelines and the IPCC good practice guidance. The ERT commends Hungary for improving the transparency of the information provided on the non-energy use of fuels in manufacturing (NIR, section 10.2.3) and recommends that the Party also make reference to those improvements in the section on feedstocks and non-energy use of fuels (NIR, section 3.2.3) of its next annual submission.

3. Key categories

Stationary combustion: solid and liquid fuels – CO₂

52. The inter-annual changes in the CO₂ implied emission factors (IEFs) for liquid fuels for the subcategories iron and steel, and food processing, beverages and tobacco are significant for several years in the time series. For example, in the period 2006–2010, the IEF for liquid fuels used in food processing, beverages and tobacco was 74.37 t/TJ, 71.27 t/TJ, 69.55 t/TJ, 72.79 t/TJ and 69.80 t/TJ, respectively, which shows a 4.2 per cent decrease in the IEF between 2006 and 2007 and a 4.7 per cent increase between 2008 and 2009. In the previous review report it was recommended that Hungary provide more detailed information on the fuel mix for these subcategories, in order to explain the inter-annual differences in the CO₂ IEFs. In the 2012 annual submission, the changes in the fuel mix have been reported, but aggregated for manufacturing industries and construction. In response to a question raised by the ERT during the review, Hungary provided disaggregated data for the iron and steel and food processing, beverages and tobacco subcategories. The ERT recommends that the Party further improve transparency in this regard by including this information on the variation in the fuel mix, by subcategory, in the NIR of its next annual submission.

53. The inter-annual changes in the CO₂ IEFs for solid fuels for the subcategories iron and steel, and food processing, beverages and tobacco are also significant for several years in the time series. For example, for food processing, beverages and tobacco, the CO₂ IEF for solid fuels was 98.37 t/TJ, 104.59 t/TJ, 101.92 t/TJ and 106.00 t/TJ for 1985, 2006, 2007 and 2008, respectively. In the previous review report it was recommended that Hungary increase the transparency of the explanations provided for the significant variation in the fuel mix of solid fuels used for the subcategories iron and steel, and food processing,

beverages and tobacco, which has led to the fluctuations in the CO₂ IEFs. In the 2012 annual submission, the changes in the fuel mix have been reported, but aggregated for manufacturing industries and construction. In response to a question raised by the ERT during the review, Hungary provided disaggregated data, which showed that the use of coal and briquette has become insignificant for food processing, beverages and tobacco. In the case of iron and steel, although the use of solid fuels remains significant, a change in their mix can be observed, particularly that the use of coal and briquette is becoming insignificant, leaving behind some use of coke, with coke oven gas being the predominant solid fuel reported (coke oven gas made up 70.3 per cent of the fuel mix in 2010). The ERT recommends that the Party further improve transparency by including information on the variation in the fuel mix, by subcategory, in the NIR of its next annual submission.

4. Non-key categories

Stationary combustion: biomass – CO₂, CH₄ and N₂O

54. Hungary has reported emissions from the use of biomass as not occurring (“NO”) for iron and steel and as “IE” for the production of non-ferrous metals in CRF table 1.A(a) (manufacturing industries and construction). Hungary also reported that the latter emissions were reported under the corresponding fuel in the category iron and steel production, owing to a lack of disaggregated data. In response to a question raised by the ERT during the review, the Party explained that 80 per cent of biomass used in manufacturing industries and construction is used in the production of iron and steel. The ERT recommends that Hungary use this information to disaggregate the available data and report each category and fuel separately in both the NIR and the CRF tables in its next annual submission.

Civil aviation: liquid fuels – CO₂, CH₄ and N₂O

55. Hungary has continued to report emissions from domestic aviation as “IE” (reported with emissions from gasoline used in road transportation) and from the domestic use of both aviation gasoline and jet kerosene as “NO”. In response to a question raised by the ERT during the review, the Party acknowledged that, even though there are no domestic commercial flights, there is domestic traffic in the form of aircrafts used for sport or hobby, and it expressed its intention to verify whether relevant data can be obtained to enable appropriate reporting in its next annual submission. The ERT commends the intention of the Party to improve its reporting. Furthermore, the ERT reiterates the recommendations made in the previous review report that the Party report emissions from aviation gasoline separately from emissions from gasoline used in road transportation and that the Party confirm that all flights that use jet kerosene are international flights in its next annual submission.

Other transportation: gaseous fuels – CO₂

56. Emissions from the transport of gas in pipelines are reported as “NO” in the CRF tables, despite natural gas production occurring in Hungary and the country having a natural gas pipeline network. The NIR reports that, for confidentiality reasons, such emissions have been reported under manufacturing industries and construction. For consistency and transparency, the ERT recommends that the Party, in its next annual submission, report the emissions using the notation keys “IE” and “C” (confidential), together with an explanation in the documentation box of the appropriate CRF table of where the emissions have been reported, and explain why the emissions are confidential.

C. Industrial processes and solvent and other product use

1. Sector overview

57. In 2010, emissions from the industrial processes sector amounted to 6,492.22 Gg CO₂ eq, or 9.6 per cent of total GHG emissions, and emissions from the solvent and other product use sector amounted to 268.88 Gg CO₂ eq, or 0.4 per cent of total GHG emissions. Since the base year, emissions have decreased by 55.6 per cent in the industrial processes sector and by 5.5 per cent in the solvent and other product use sector. The key drivers for the decrease in emissions in the industrial processes sector are the decrease in industrial production due to the closure of factories, especially metal production, and the introduction of emission abatement technologies through joint implementation projects (e.g. in nitric acid production). Within the industrial processes sector, 34.6 per cent of the emissions were from metal production (iron and steel production), followed by 21.8 per cent from mineral products (especially cement production, lime production and limestone and dolomite use). Consumption of halocarbons and SF₆ accounted for 19.3 per cent and other (industrial processes)(the country-specific category feedstocks) for 16.3 per cent of the sectoral emissions. The remaining 8.0 per cent were from chemical industry (ammonia production and production of carbon black, ethylene and nitric acid).

58. Hungary has made recalculations for the industrial processes sector between its 2011 and 2012 annual submissions following recommendations made in previous review reports and changes in AD and in order to rectify identified errors (e.g. the reallocation of emissions from the energy sector; see para. 41 above). The impact of these recalculations on the industrial processes sector is an increase in the estimate of emissions for 2009 of 44.6 per cent. The main recalculations took place in the following categories:

(a) Iron and steel production: the estimate of emissions for 2009 increased by 953.8 per cent (1,721.04 Gg CO₂ eq), owing to the reallocation of emissions from the energy sector;

(b) Refrigeration and air-conditioning equipment: the estimate of emissions of HFCs and PFCs for 2009 increased by 1.8 per cent (14.19 Gg CO₂ eq), owing to the revision of AD to address the potential underestimation of emissions raised in the list of potential problems and further questions raised by the ERT during the review week (see paras. 62 and 63 below);

(c) Foam blowing: the estimate of emissions of HFCs for 2009 increased by 1,273.1 per cent (108.75 Gg CO₂ eq), owing to the revision of AD to address the potential underestimation of emissions raised in the list of potential problems and further questions raised by the ERT during the review week (see paras. 64 and 65 below).

59. The ERT noted that Hungary has followed most of the recommendations in the previous review report in relation to the industrial processes sector and substantially improved the transparency of the NIR by providing additional information on recalculations, methodological issues and any changes in industries leading to variations in trends and IEFs. The ERT commends the Party for its efforts. However, some recommendations have yet to be addressed: the description of the category-specific QA/QC procedures was not completely transparent in the NIR and the information provided on uncertainties was also not completely transparent in the industrial processes chapter of the NIR (e.g. separate uncertainties of AD and EFs were reported in annex 7 to the NIR only and there was limited information provided on the source of the uncertainty values). The ERT reiterates the recommendation made in the previous review report that Hungary improve the transparency of the information provided on category-specific uncertainties and QA/QC procedures in dedicated subchapters of the NIR of its next annual submission.

60. For some industries (e.g. cement and glass production), Hungary used plant-specific data on CO₂ emissions from the EU ETS for the period 2005–2010 and default methodologies from the IPCC good practice guidance to estimate emissions for the period 1985–2004, which may have resulted in time-series inconsistency. In response to a question raised by the ERT during the review, the Party informed the ERT that the data from the EU ETS are considered to be more accurate. The ERT recognizes that these data may be more reliable, but that the potential inconsistency of the time series still exists. Therefore, the ERT recommends that the Party, in its next annual submission, transparently explain how time-series consistency is ensured when data from the EU ETS are used for just some years of the entire time series. One option that the Party may want to consider is using the average IEF values for the period for which EU ETS data are used to estimate the emissions from production for the remaining years of the time series.

2. Key categories

Ammonia production – CO₂

61. NIR table 4.10 shows the significant difference in the CO₂ IEF for ammonia (NH₃) production between 1985 (1.76 t CO₂/t NH₃) and 2010 (1.29 t CO₂/t NH₃). In response to a question raised by the ERT during the review, the Party explained that the difference can be attributed to the constant decrease in the amount of natural gas used for ammonia production due to improved efficiency, including better technology. The ERT recommends that Hungary clarify, in the NIR of its next annual submission, the technological improvements in ammonia production, in order to improve the transparency of its reporting.

Consumption of halocarbons and SE₆ – HFCs and PFCs

62. For refrigeration and air-conditioning equipment, the ERT noted that in CRF table 2(II).F the Party has reported HFC emissions from disposal of domestic equipment using the notation key “NO”. The ERT also noted that the Party has reported PFC emissions from disposal of commercial refrigeration equipment as “NO”. In response to a question raised by the ERT during the review, Hungary recognized that some disposal takes place in the country and expressed its intention to include estimates of emissions from disposal in its next annual submission. The ERT considered that not reporting HFC or PFC emissions from disposal of refrigeration and air-conditioning equipment represented a potential underestimation of emissions and included this issue in the list of potential problems and further questions raised by the ERT during the review week.

63. Hungary submitted revised emission estimates on 17 October 2012 and included estimates of HFC emissions from disposal of domestic refrigeration and air-conditioning equipment and PFC emissions from disposal of commercial refrigeration equipment. The Party used the tier 2 method and parameters described in section 3.7.4 of the IPCC good practice guidance to estimate the missing emissions. As a result, the estimate of actual HFC emissions from refrigeration and air-conditioning equipment for 2010 increased from 866.33 Gg CO₂ eq to 880.60 Gg CO₂ eq (by 1.6 per cent) and the estimate of actual PFC emissions increased from 0.36 Gg CO₂ eq to 0.61 Gg CO₂ eq (by 71.0 per cent). The ERT agreed with the revised estimates and considered that the potential underestimation of emissions had been resolved.

64. For foam blowing, the ERT noted that, according to the information on page 111 of the NIR, Hungary estimated HFC emissions from annual losses from closed-cell foams for foams produced in the country only. In response to a question raised by the ERT during the review, the Party confirmed that HFC emissions from imported closed-cell foams were not accounted for. The ERT considered that this represented a potential underestimation of emissions for the subcategory and included the issue in the list of potential problems and further questions raised by the ERT during the review week. The ERT recommended that

Hungary address the issue following the IPCC good practice guidance, using either AD on the export and import of closed-cell foams or expert judgement (proxy data).

65. Hungary submitted revised emission estimates on 17 October 2012 and included estimates of HFC emissions from imported closed-cell foams and revised the estimates of emissions from foam manufacturing using AD on the import, export and production of foam products. As a result, the estimate of actual HFC emissions from foam blowing for 2010 increased by 2,437.5 per cent (from 3.74 Gg CO₂ eq to 94.98 Gg CO₂ eq). The ERT agreed with the revised estimates and considered that the potential underestimation of emissions had been resolved.

3. Non-key categories

Solvent and other product use – N₂O

66. Hungary used data on N₂O production for anaesthesia obtained from the manufacturers to estimate N₂O emissions from the use of N₂O for anaesthesia. However, no data on imported products were available. The ERT reiterates the recommendation made in the previous review report that the Party determine whether the import of products into Hungary occurs and, if appropriate, collect appropriate data and report relevant estimates of N₂O emissions in its next annual submission.

D. Agriculture

1. Sector overview

67. In 2010, emissions from the agriculture sector amounted to 8,266.75 Gg CO₂ eq, or 12.2 per cent of total GHG emissions. Since the base year, emissions have decreased by 53.9 per cent. The key driver for the fall in emissions is the economic and political transition that took place in the country during the 1990s, affecting mainly animal husbandry and to a lesser degree crop production (liquidation of cooperatives, and the lack of a thoroughly assessed agricultural policy following the loss of eastern markets⁸). Within the sector, 58.0 per cent of the emissions were from agricultural soils, followed by 22.6 per cent from manure management, 19.3 per cent from enteric fermentation and 0.1 per cent from rice cultivation.

68. Hungary has made recalculations for the agriculture sector between its 2011 and 2012 annual submissions in response to recommendations made in the previous review report and following changes in AD and EFs. The impact of these recalculations on the agriculture sector is a decrease in the estimate of emissions for 2009 of 0.2 per cent. The main recalculations were due to the revision of the livestock population time series and the implementation of a new data set on the fat content of milk, both leading to new estimates of gross energy intake and excretion rates of volatile solids and nitrogen (N). The ERT commends Hungary for the improvements introduced in its 2012 annual submission with regard to the agriculture sector, in particular the enhanced transparency related to recalculations and the rationale for them. For 2009, the main recalculations took place in the following categories:

(a) Enteric fermentation for dairy cattle: the estimate of CH₄ emissions increased by 1.0 per cent (6.83 Gg CO₂ eq), owing to the revision of the dairy cattle population;

⁸ Laczka É and Soós L. 2003. Some Characteristics of the Hungarian Agriculture in the 1990s. *Hungarian Statistical Review*. Special number 8. 2003: pp.3–19. Available at <http://www.ksh.hu/statszemle_archive/2003/2003_K8/2003_K8_003.pdf>.

(b) Manure management: N₂O emissions from swine manure produced in pits are now reported under other animal waste management systems (AWMS), separately from the liquid systems under which they were reported previously; while the estimate of N₂O emissions from liquid systems decreased by 46.5 per cent (6.39 Gg CO₂ eq) and N₂O emissions from other AWMS changed from being reported as “NO” to being estimated at 6.39 Gg CO₂ eq;

(c) Direct soil emissions: the estimate of N₂O emissions decreased by 0.8 per cent (21.76 Gg CO₂ eq), owing to the revision of the livestock population and nitrogen excretion rates.

69. Emissions have been estimated for all sectoral categories, with the exception of emissions from prescribed burning of savannas. Following a recommendation made in the previous review report, that activity has now been reported as “NO” in CRF table 4.E. Hungary has reported estimates of emissions from field burning of agricultural residues for the period 1985–1989, but has reported the activity as “NO” for the period 1990–2010.

70. The time series are consistent and the trends have been described transparently at the subcategory level. Uncertainties have been provided for all subcategories and the reported values are within the expected range according to the default uncertainties from the IPCC good practice guidance and the uncertainty ranges of other Parties.

71. Hungary has implemented a set of QA/QC measures in the agriculture sector and described them in the NIR. In response to a question raised by the ERT during the review, the Party informed the ERT that no special comprehensive quality report beyond the regular QC procedures outlined in chapter 6.1.5 of the NIR has been elaborated for the 2012 annual submission, although such a report was elaborated for the previous annual submission. The ERT reiterates the recommendation made in the previous review report that the Party report in more detail on QA/QC activities in the NIR of its next annual submission, particularly the comparison of country-specific data with default EFs from the IPCC good practice guidance and other parameters and with the respective values applied by other Parties with similar conditions. The results of the comparison should be documented in the category-specific subchapters of the NIR, together with explanations of the reasons for any discrepancies.

72. Hungary identified several planned improvements in the NIR and in response to questions raised by the ERT during the review. The most important planned improvements in relation to the inventory for the agriculture sector include:

- (a) The revision of the feed energy conversion rate for cattle;
- (b) The revision of the data on the distribution of AWMS on the basis of the General Agricultural Census 2010 and the upcoming census of 2013;
- (c) The development of a country-specific value for the volatile solid excretion of poultry;
- (d) General improvements to the transparency of the inventory.

73. The ERT welcomes the planned improvements and recommends that Hungary implement them and report on the respective outcomes in its next annual submission.

2. Key categories

Enteric fermentation – CH₄

74. Hungary used a decreasing country-specific value for the methane conversion rate for dairy cattle (5.95 per cent for the base year and 5.78 per cent for 2010), which is slightly lower than the default value from the IPCC good practice guidance (6.00±0.50 per cent).

Hungary has stated in the NIR that the estimated value is based on the percentage of concentrate in the animal feed, which has increased since the base year. In response to a question raised by the ERT during the review, Hungary further stated that its animal feed is of a high quality and that the IPCC good practice guidance suggests using a value at the lower limit (5.50 per cent) of the default range in such a case. The ERT agrees that using a methane conversion rate lower than 6.00 per cent in the case of good feed quality is justified. However, specific information explaining why the feed used in Hungary is of superior quality than the one that results in the 6.00 per cent default value could not be found. Furthermore, the calculation procedure according to which the country-specific methane conversion rates were derived is not transparently described in the NIR. The ERT recommends that the Party describe the calculation procedure for the country-specific methane conversion rate for dairy cattle and provide more information to sustain the assumption of superior feed quality in its next annual submission, in order to improve transparency.

75. As already indicated in the previous review report, the Party's estimate of average gross energy intake for dairy cattle (353.1 MJ/head/day for 2010) is the highest among all reporting Parties (range of 239.7–353.1 MJ/head/day). In response to a question raised by the ERT during the review, Hungary stated that it plans to revise the estimate of gross energy intake for cattle, specifically the feed energy conversion rate that relates the estimated net energy to digestible energy and gross energy. The ERT welcomes this planned improvement and recommends that Hungary report thereon and include additional information on feed energy conversion in the NIR of its next annual submission.

Manure management – CH₄ and N₂O

76. The ERT noted that the reported allocation of manure to AWMS for non-dairy cattle is incorrect: the values reported for liquid systems and solid storage in CRF table 4.B(a) (18,240,383,045,867,500.0 per cent and 8,317,596,169,541,320.0 per cent, respectively) are not expressed in per cent values. In response to a question raised by the ERT during the review, the Party explained that a transcription error had occurred between the Excel version used and the CRF Reporter and that it will investigate the issue. In addition, Hungary provided the correct values (1.82 per cent for liquid systems and 83.18 per cent for solid storage). The ERT agrees with these values and recommends that Hungary resolve the information-technology problem that led to the incorrect reporting, submit the correct data and improve the QA/QC procedures for its next annual submission.

77. The ERT noted that Hungary used a nitrogen excretion rate for swine (7.85–9.56 kg/head/year) that is considerably below the default value for Western and Eastern Europe from the Revised 1996 IPCC Guidelines (20 kg/animal/year). In response to a question raised by the ERT during the review, Hungary provided comprehensive background information, including two published studies^{9, 10} and a spreadsheet showing the calculation procedure, which supports the country-specific estimate. The ERT agrees with the approach chosen by Hungary and recommends that the Party include further information (e.g. nitrogen excretion rates by swine subcategory and/or kg nitrogen excretion/kg body mass by swine subcategory) in the NIR of its next annual submission.

78. Hungary has stated in NIR table 6.20 that the N₂O EF for manure management for other AWMS is 0.005 kg N₂O-N/kg N. However, in CRF table 4.B(b) a weighted EF of

⁹ Fébel H and Gundel J. 2007. A takarmányozás és a környezetvédelem kapcsolata. [Connection between nutrition and environmental protection.] *Állattenyésztés és Takarmányozás*. 56: pp.427–456. (In Hungarian, with English summary.)

¹⁰ Koelsch R and Shapiro C. 1997. *Estimating manure nutrients from livestock and poultry*. G97–1334A. University of Nebraska. Available at <http://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=2405&context=extensionhist>.

0.001 kg N₂O-N/kg N has been reported. In response to a question raised by the ERT during the review, the Party explained that the discrepancy occurred because emissions from pit storage of swine manure were reported under other AWMS for the first time in the 2012 annual submission. The ERT recommends that Hungary list the three N₂O EFs (for pit storage < one month, for pit storage > one month and for other AWMS for goat manure) together with the weighted EF under the header “other AWMS” in NIR table 6.20 in its next annual submission.

Agricultural soils – N₂O

79. The ERT compared the Party’s estimates of the amount of synthetic fertilizer applied to agricultural soils with the respective data from the International Fertilizer Industry Association (IFA). The data on fertilizer consumption from IFA¹¹ are somewhat different from the data provided in CRF table 4.D. For example, the IFA data on fertilizer consumption for the period 1995–2006 are, on average, almost 25 per cent higher than the corresponding data in the CRF table, even after subtracting 10 per cent of the nitrogen that volatilizes as ammonia before the fertilizer is applied to the fields. The data for 2007 are almost equal, but the IFA data are lower for 2008 (by 21 per cent) and 2009 (by 8 per cent). In response to a question raised by the ERT during the review, the Party explained that the methodology used by IFA results in an overestimation of fertilizer consumption for Hungary because it is based on expert judgement that takes into account the sowing area of the main crops and the fertilizer requirements, but fertilizer use in Hungary is often below the recommended amount because of its high price. The Party also explained that it had noted these discrepancies before the review and that it had been communicating with IFA for some time to correct them. The ERT commends the Party for this thorough QC and encourages the Party to report on this and similar QC activities in the NIR of its next annual submission.

80. The ERT could not find any information on N₂O emissions from cultivation of histosols in the agriculture sector of the NIR. Furthermore, the ERT noted that the respective emissions have been reported as “NO” in CRF table 4.D. Hungary has reported in the LULUCF chapter of the NIR that all organic soils in the country are wetland soils and therefore protected and not cultivated. The ERT recommends that the Party include this information in chapter 6.5 of the NIR (on agricultural soils) and in the documentation box of the respective CRF table in its next annual submission, in order to improve the transparency of the reporting.

81. Hungary used country-specific data to estimate N₂O emissions from crop residues for sunflower and oilseed rape. In response to a question raised by the ERT during the review, the Party provided additional material clarifying the data sources of the values for residue to crop product ratio, dry matter fractions and nitrogen fractions of all crop residues, including the reference for sunflower and oilseed rape.¹² The ERT welcomes this additional information and recommends that Hungary report all data sources of the above-mentioned parameters in the NIR of its next annual submission.

¹¹ Available at <<http://www.fertilizer.org/ifa/ifadata/search>>. Accessed 15 September 2012.

¹² Zsembeli J, Czibalmos R and Takács M. 2011. *Determination of country-specific values of the crop residue rate, dry matter content and nitrogen content of crop residue of oilseed rape and sunflower*. University of Debrecen, Centre for Agricultural and Applied Economic Sciences, Research Institutes and Study Farm, Karcag Research Institute. Karcag, Karcag Research Institute.

E. Land use, land-use change and forestry

1. Sector overview

82. In 2010, net removals from the LULUCF sector amounted to 3,372.11 Gg CO₂ eq. Since the base year, total net removals have increased by 55.3 per cent. This increase in removals is due mainly to the abandonment of cropland and grassland, the afforestation of abandoned cropland and sustainable forest management.

83. Within the LULUCF sector, net removals of 3,093.57 Gg CO₂ eq and 922.05 Gg CO₂ eq resulted from forest land and cropland, respectively, while net emissions of 444.54 Gg CO₂ eq and 198.97 Gg CO₂ eq were from grassland and settlements, respectively. Under forest land, the most CO₂ removals were from forest land remaining forest land (64.0 per cent, all from the living biomass pool). Emissions from wetlands and other land were reported as “NE” and “NO”.

84. Hungary has made recalculations for the LULUCF sector between its 2011 and 2012 annual submissions. Most of them resulted from recommendations made in the previous review report, including: the application of a 20-year transition period after land conversion, which led to a different land allocation between the broad land-use categories; the separation of emissions and removals from land converted to forest land, previously aggregated in the subcategory cropland converted to grassland; the use of an EF for dolomite based on its stoichiometric formula instead of the default value from the IPCC good practice guidance for LULUCF; the reallocation of carbon stock changes in living woody biomass to the appropriate cropland subcategories instead of aggregated under cropland; and the inclusion of (previously omitted) gains in carbon stock for perennial cropland converted to grassland. Other recalculations were performed as a result of improved data and the correction of some transcription errors. The Party has described the rationale for all recalculations in the NIR. Following the recommendation made in the previous review report, Hungary has provided a quantification of the effects of the recalculations at a more disaggregated level. The ERT commends the Party for the improvements introduced in its 2012 annual submission with regard to the LULUCF sector and for the detailed information provided in the NIR. The impact of the recalculations on the time series since 1985 was, in general, an increase in the estimated net removals. The estimate of net removals for 2009 increased by 9.9 per cent and that for the base year (average annual emissions for the period 1985–1987) by 0.4 per cent. The main recalculations took place in the following categories:

(a) For forest land remaining forest land, a decrease in the estimate of net CO₂ removals for 2009 by 33.7 per cent (from 3,076.86 Gg CO₂ reported in the 2011 annual submission to 2,041.13 Gg CO₂ reported in the 2012 annual submission);

(b) For land converted to forest land, the estimate of net CO₂ removals for 2009 increased by 711.8 per cent (from 138.88 Gg CO₂ to 1,127.44 Gg CO₂) and the estimated net emissions for the base year (24.99 Gg CO₂ eq) were recalculated as net removals (–5.28 Gg CO₂ eq);

(c) For cropland remaining cropland, an increase in the estimate of net CO₂ removals (excluding CO₂ emissions from agricultural lime application) for 2009 by 127.8 per cent (from 503.45 Gg CO₂ to 1,146.83 Gg CO₂);

(d) For land converted to grassland, the estimate of net CO₂ removals (–189.94 Gg CO₂) was replaced by an estimate of net CO₂ emissions (40.29 Gg CO₂) for 2009;

(e) For land converted to settlements, the estimate of net CO₂ emissions for 2009 increased by 44.2 per cent (from 156.12 Gg CO₂ to 255.06 Gg CO₂).

85. The ERT commends the Party for providing estimates for many subcategories previously reported as “NE”. Following a recommendation made in the previous review report, Hungary has reported in its 2012 annual submission estimates of area and related emissions and removals for forest land converted to other land uses for 1985 to 2010 (previously reported as “NE”) as an information item in CRF table 5. The ERT commends the Party for this improvement.

86. However, the ERT noted that the inventory is not complete. Hungary has reported the areas of wetlands remaining wetlands, grassland converted to wetlands and settlements converted to wetlands in CRF table 5.D, while other subcategories have been reported as “NO”. Regarding the carbon pools, Hungary has reported all carbon stock changes for wetlands remaining wetlands as “NE” and those for all subcategories of land converted to wetlands as “NO”, except for grassland converted to wetlands, for which carbon stock changes have been reported as “NE” for all pools except the dead organic matter pool (reported as “NO”). For settlements converted to wetlands, the notation key “NO” has been used to report all carbon pools except for soils (reported as “NE”). The ERT strongly recommends that the Party report estimates of emissions for the currently not-estimated mandatory categories for which methodologies are provided in the IPCC good practice guidance for LULUCF, to increase the completeness of its reporting, in its next annual submission. If no relevant methodologies are available, the ERT encourages the Party to evaluate the possibility of using methodologies from the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the 2006 IPCC Guidelines) for its next annual submission. Hungary has indicated in the NIR that all land under other land is unmanaged and has used the notation key “NO” to report all subcategories and carbon pools, except for the carbon stock change in soils (reported as “NE”). The ERT noted, however, that a small area (e.g. 0.01 kha for 2010) has been reported for grassland converted to other land in CRF table 5.F, but no estimates of emissions have been reported. The ERT recommends that the Party provide these mandatory estimates (for all land conversions to wetlands, settlements and other land) in its next annual submission, in order to increase completeness and transparency. Hungary has reported in the NIR that it still requires data to identify managed peatlands and flooded lands, but that peatland extraction is negligible in the country. The ERT strongly recommends that the Party refine the data used for the wetlands category and report on all mandatory subcategories, even if only low levels of emissions or removals occur, in its next annual submission.

87. The ERT commends Hungary for the extensive information and methodological description provided for the land-area representation in the country, in particular its efforts to seek consistency between the different data sources (the National Forest Inventory, the Hungarian Central Statistical Office, the coordination of information on the environment (CORINE) land-cover inventories and the CORINE land-cover change databases). The approach used by Hungary resulted in using a mix of approaches 1 and 2 from the IPCC good practice guidance for LULUCF for its land representation, which was the basis for a set of consistent land use and land-use change matrices for the entire time series. The ERT considers the approach used by the Party to be in line with the IPCC good practice guidance for LULUCF.

88. Hungary has provided in sections 7.2.1 and 7.3 of the NIR a clarification of the definitions of forest and forest land, the latter including not only stocked and temporarily unstocked areas (referred to as “forest subcompartments” in the NIR) but also unstocked areas that will not revert to forest, including, for example, roads, openings, wildlife forage grounds, glades and buildings serving forest management purposes. For years prior to 2009, Hungary reported only the stocked areas as the forest land area, but the value reported in the NIR and the CRF tables for 2010 corresponds to the total land under forest management (i.e. forest subcompartments, both stocked and temporarily unstocked, and unstocked areas), resulting in an increase of the estimated forest land area by 6.5 per cent (from

1,922.1 kha estimated as stocked or temporarily unstocked areas to the 2,046.4 kha value reported, according to NIR table 7.5). The Party clarified, however, that the changes in carbon stock were estimated only for the forest subcompartments. The ERT recommends that the Party increase the transparency of the figures in CRF table 5.A by disaggregating the area of the forest subcompartments and the ‘permanently’ unstocked areas for its next annual submission.

89. Hungary partly used the 2006 IPCC Guidelines as a basis for its LULUCF inventory, noting that they contain more and updated default values and provide more flexibility with the transition period, thus facilitating the separation between forest land remaining forest land and land converted to forest land, as recommended in the previous review report. The ERT noted, however, that the Party has not provided the reasons for using the default EFs from the 2006 IPCC Guidelines and demonstrated that they better match the national conditions. The ERT therefore recommends that the Party include such information for each EF used from the 2006 IPCC Guidelines in its next annual submission.

90. Hungary carried out a tier 1 uncertainty analysis, which included, for the first time, the LULUCF categories, following the recommendation made in the previous review report. The uncertainties associated with the AD for the LULUCF categories were based on expert judgement, whereas those associated with EFs were based on the default values provided in the IPCC good practice guidance for LULUCF. Hungary has provided the uncertainties in a disaggregated way (for AD and EFs separately) for categories and pools, estimating an overall sectoral uncertainty of ± 52 per cent (NIR, section 7.10, page 243). The highest uncertainty for CO₂ emissions (592.6 per cent) (see annex 7 to the NIR) is associated with land converted to grassland, for which the estimate of CO₂ emissions is the lowest among the categories for which estimates have been provided. The lowest uncertainty for CO₂ emissions (26.0 per cent) is associated with forest land remaining forest land, responsible for the most CO₂ removals. The ERT noted that the uncertainty of the EF for N₂O emissions from forest land remaining forest land has been reported as 1.0 per cent. The ERT recommends that the Party revise the uncertainty value for this EF and indicate the source of the value (e.g. based on expert judgement) in its next annual submission.

91. Hungary has not implemented the recommendation made in the previous review report that it report carbon stock changes in organic soils for the subcategories of forest land, cropland and grassland. Hungary has continued to report the changes as “NO”. However, the Party has indicated in the NIR that a project has been initiated in the country to identify whether some forest land soils can be classified as organic soils in accordance with the IPCC good practice guidance for LULUCF. The ERT commends the Party for this initiative and recommends that the Party provide in the NIR of its next annual submission information on the status of the initiative. In addition, the ERT reiterates the recommendation made in the previous review report that the Party report carbon stock changes in organic soils separately in its next annual submission.

2. Key categories

Forest land remaining forest land – CO₂

92. In 2010, forest land covered 22.0 per cent of the national territory and included forest subcompartments covered by trees (91.0 per cent) or potentially covered by trees (2.9 per cent), as well as unstocked areas (6.1 per cent). There are no unmanaged forests in the country, although, on a small percentage referred to as forest reserves (0.5 per cent), no forestry operations have taken place for at least two decades but management activities (inspection, monitoring and game control) still occur.

93. Following the recommendation in the previous review report, Hungary has reported as an information item in CRF table 5 the estimated area and related emissions and

removals for forest land converted to other land uses for 1985 to 2010 (previously reported as “NE”).

94. Hungary has reported in the NIR that more forest areas are identified annually than would be expected from the difference between the annual areas afforested/reforested and deforested. This additional area of ‘found forest’ (the average annual area of which in 2008, 2009 and 2010 (4.1 kha, according to page 186 of the NIR) is significant compared with the average total area afforested or reforested annually over the same time period (5.7 kha, as reported in the KP-LULUCF CRF tables)) is associated with areas of natural regeneration, unofficial afforestation/reforestation and reclassification of land, among others. Since Hungary uses the stock-change method from the IPCC good practice guidance for LULUCF to estimate the annual change in carbon stock, the Party has explained in the NIR (pages 186 and 187 and section 11.2.2) that it excluded these new areas and related carbon stock changes from the estimates provided for forest land remaining forest land (as well as for forest land converted to other land uses and for land converted to forest land) in the inventory year, to avoid overestimating the net removal. However, the new areas are included in the forest land area in the following inventory year. The ERT encourages the Party to include in the documentation box of CRF table 5.A the total area of found forest identified in the inventory year, as well as the associated carbon stock change, to increase transparency.

95. The ERT commends the Party for introducing revised values of basic wood density for the main species and species groups of trees in its 2012 annual submission, which are now more similar to those in the IPCC good practice guidance for LULUCF. However, the ERT noted that the IPCC values refer to the basic wood densities of stemwood, while the densities presented by the Party apply to all wood components of the tree (branches, twigs and bark). This may lead to an overestimation of the total biomass volume when calculated from the estimated tree volume (see para. 96 below). The ERT recommends that the Party address this concern in the NIR of its next annual submission.

96. Hungary applied an adaptation to the methodological approach from the 2006 IPCC Guidelines to estimate the annual change in carbon stock in biomass for forest land remaining forest land and did not apply a biomass expansion factor to expand the wood volume to the total biomass volume. This is due to the fact that the country’s tree volume data represent the volume of all above-ground parts of the tree above the stump (stem, branches, twigs and bark) and not only the merchantable volume. The ERT noted that applying the same wood density value to the entire tree may lead to a slight overestimation of the biomass volume. The ERT thus recommends that the Party seek to separate the wood volume into merchantable and non-merchantable volume and apply the IPCC methodological approach to estimate the annual carbon stock change in biomass for forest land remaining forest land as indicated in the IPCC good practice guidance for LULUCF and the 2006 IPCC Guidelines for its next annual submission.

97. Regarding the changes in carbon stock in the dead organic matter and soil pools for forest land remaining forest land, Hungary has indicated in the NIR that no relevant systematic data have been collected in the country and has reported the notation key “NE” in CRF table 5.A. The Party has, however, presented detailed information in the NIR to support the use of the tier 1 approach (which is a conservative assumption), assuming no changes in carbon stock in these pools, following the recommendation made in the previous review report. The ERT noted, however, that the appropriate reporting value has not been reflected in CRF table 5.A and recommends that the Party report these carbon stock changes as “NO” in CRF table 5.A.

98. In the previous review report the Party was encouraged to explore possible reasons for the high inter-annual variation in the estimated net CO₂ emissions and removals from forest land remaining forest land, ranging from a 140.7 per cent decrease (from net CO₂

removals of 775.41 Gg to net CO₂ emissions of 315.77 Gg) between 1999 and 2000 to a 485.9 per cent increase between 2002 (419.32 Gg) and 2003 (2,456.71 Gg). Hungary has indicated in the NIR that the inter-annual fluctuations in the net removals have been levelled out owing to the disaggregation of forest land into subcategories (forest land remaining forest land and land converted to forest land), but that those that may be related to, inter alia, the changing annual harvest rate, still remain. The ERT commends the Party for the disaggregation and explanations provided in the NIR.

Land converted to forest land – CO₂

99. Hungary has reported emissions and removals from living biomass for land converted to forest land, but assumed that changes in carbon stock in the other pools (dead organic matter and soils) were negligible and therefore equal to zero (reported as “NE” or “NO” in CRF table 5.A). The assumption of zero carbon stock change is based on research findings indicating that conversion from cropland does not entail emissions from soils and that the majority (81 per cent) of the land-use conversions in the country occur from abandoned cropland (NIR, section 7.3.2.1, page 195). To improve transparency, the ERT recommends that the Party report the changes in carbon stock that are zero as “NO” in the next annual submission.

100. Hungary has used the 20-year transition period for land converted to forest land for the first time in its 2012 annual submission, following a recommendation made in previous review reports. The Party recalculated the estimates of emissions and removals for this subcategory for all years of the time series considering a fixed transition period. The ERT commends the Party for this improvement.

101. Hungary has reported the net carbon stock changes in dead organic matter and soils for the conversions of cropland, grassland and settlements to forest land as “NE” in CRF table 5.A. In section 7.3.2.1 of the NIR, Hungary has provided information and references in support of the assumption that land conversion from abandoned cropland, the most frequent land conversion to forest land in the country (81 per cent of the area afforested between 1990 and 2009), does not entail net emissions from soils. The ERT noted that, for grassland converted to forest land, the Party has indicated in the NIR that it assumed that the dead organic matter and soil pools were in equilibrium (reported as “NE” or “NO” in CRF table 5.A). However, the NIR also indicates in the same section that the conversion of grassland to forest land may lead to net emissions from those pools. There is no mention in the NIR of the conversion of settlements to forest land. Since grassland conversion is the second most frequent conversion to forest land, the ERT recommends that the Party provide estimates of changes in carbon stock in the soil and dead organic matter pools from conversion of grassland to forest land in its next annual submission. The ERT also encourages the Party to clarify in the documentation box of CRF table 5.A in its next annual submission that the tier 1 method has been applied wherever justifiable.

Cropland remaining cropland – CO₂

102. Cropland is the main land-use category in Hungary, covering 56.1 per cent of the national territory. Annual crops correspond to approximately 84.3 per cent of the total cropland area. The remaining area includes perennial cropland (3.4 per cent among orchards and vineyards) and set-aside cropland (12.3 per cent). All emissions and removals from living biomass, dead organic matter and mineral soils were estimated for cropland remaining cropland, as well as emissions from lime use and biomass burning. This subcategory has been a net sink since 1992, with removals mainly associated with the improved management of mineral soils.

103. Hungary applied methodologies consistent with tier 1 methods from the IPCC good practice guidance for LULUCF to estimate emissions and removals for this category and

stratified the area of cropland according to soil type, climate, management practice and fertilizer input, using a number of different country-specific data sources. The Party reported that conservation tillage practices (including reduced till, mulch till and crop residue management) were introduced in the country in 1998 and that initial research results assessing the impact of such practices on carbon in mineral soils are available (NIR, section 7.4.2.2, page 210). Domestic legislation does not allow the cultivation of organic soils. The Party has mentioned in the NIR that it did not consider the effect of no till in estimating removals for years prior to 2000 and assumed that tillage has occurred since 2000. The ERT recommends that the Party provide a justification for this assumption and report on its impact on the estimates for 2000 onward in its next annual submission. The ERT commends the Party for the transparent information provided and its efforts to continuously improve the estimates for this subcategory, and recommends that the Party use the improvements made to move to a higher-tier estimation method, as this is a key category.

Grassland remaining grassland – CO₂

104. The Party has reported the change in carbon stock in living biomass for grassland remaining grassland as “NO”, explaining that the management practices of grassland remaining grassland could be considered static and therefore no change in carbon stock was estimated, following the tier 1 method from the IPCC good practice guidance for LULUCF. The ERT encourages the Party to report in the appropriate documentation box that a tier 1 method was used, assuming carbon stock change to be zero, in order to increase the transparency of the reporting. The ERT noted an inconsistency in the NIR: the Party reported that the grassland-management practices could be considered to be static when discussing carbon stock change in living biomass, but mentioned that those practices are changing when discussing carbon stock change in mineral soils. The ERT recommends that the Party clarify the assumption of static management practices assumed for the entire time series in its next annual submission.

105. The ERT commends the Party for the detailed and transparent information provided regarding the estimation of emissions from mineral soils, similar to for cropland (see para. 103 above), and recommends that the Party apply a higher-tier method to estimate emissions and removals for this key category for its next annual submission.

Land converted to grassland – CO₂

106. Although the area of settlements converted to grassland has been provided in CRF table 5.C (e.g. 2.84 kha for 2010), the Party has reported changes in carbon stock in living biomass and mineral soils for settlements converted to grassland as “NE”. The ERT recommends that the Party provide relevant estimates in its next annual submission, in order to improve the completeness of its reporting.

107. To estimate the carbon stock of the biomass present on the land before its conversion from cropland to grassland, the ERT noted that, according to page 210 of the NIR, the Party used the default value from table 3.4.8 of the IPCC good practice guidance for LULUCF for the carbon stock of annual crops (5 t carbon (C)/ha) but did not mention the carbon stock of perennial crops (63 t C/ha, from table 3.3.2 of the IPCC good practice guidance for LULUCF) for the above-ground biomass carbon stock at harvest. In response to a question raised by the ERT during the review, the Party clarified that the carbon stock of perennial crops had been included in the calculations, although it was not mentioned in the NIR. The ERT thus recommends that Hungary include this information in its next annual submission. In addition, the ERT noted that this is a key category and therefore recommends that the Party calculate estimates using a higher-tier method (country-specific coefficients) for its next annual submission.

3. Non-key categories

Wetlands remaining wetlands – CO₂

108. Hungary has reported the area of wetlands remaining wetlands (e.g. 252.83 kha for 2010), the largest subcategory under wetlands, but has reported the changes in carbon stock for all pools as “NE” in CRF table 5.D. The Party has reported that, at present, it is not possible to separate flooded lands from peatlands, owing to a lack of data. The ERT recommends that the Party explain in its next annual submission the efforts being made to separate and report emissions from peatlands, in order to improve transparency.

Land converted to wetlands – CO₂

109. Hungary has not reported emissions from land converted to wetlands, but has provided the areas of conversion from grassland and settlements (10.24 kha and 0.47 kha for 2010, respectively). The Party noted that emissions from grassland converted to wetlands were not estimated because the conversion was assumed to be the result of natural processes (change in the total annual precipitation) (NIR, section 7.4.2.2, page 210). With regard to settlements converted to wetlands, Hungary indicated that the conversion is infrequent and that potential emissions are assumed to be negligible, probably zero. The ERT recommends that the Party indicate in the NIR of its next annual submission whether the assumption of conversion due to natural processes remains true for grassland converted to wetlands and report estimates of CO₂ emissions from settlements converted to wetlands, even if the emissions are considered to be negligible.

Land converted to other land – CO₂

110. Hungary has reported a small area of grassland converted to other land (e.g. 0.006 kha in 2010), but it has reported the changes in carbon stock for all carbon pools as “NO”, except for the soil pool, reported as “NE”. The Party has explained in the NIR that the conversion of grassland to other land was not considered to be human-induced and therefore was not reported.

Direct N₂O emissions from N-fertilization of forest land and other – N₂O

111. Direct N₂O emissions from N-fertilization of forest land have been reported as “IE” in CRF table 5(I), following the recommendation made in the previous review report. The ERT noted that the emissions have been reported under agricultural soils.

CO₂ emissions from agricultural lime application – CO₂

112. The ERT commends the Party for using a revised EF for dolomite (0.13 t CO₂-C/t) to estimate CO₂ emissions from agricultural lime application to cropland (CRF table 5(IV)), following the recommendation made in the previous review report. However, the ERT noted that Hungary has reported CO₂ emissions from lime application to grassland as “NO”, indicating in section 7.5.2.2 of the NIR that they are negligible. In order to improve transparency, the ERT recommends that the Party, in its next annual submission, either report estimates for CO₂ emissions from lime application to grassland, or report the emissions as “NE” if occurring but not estimated, “NO” if not occurring or “IE” if included in another category.

Biomass burning – CO₂, CH₄ and N₂O

113. Hungary has reported that on-site burning of living biomass is prohibited by legislation, except for the burning of slash on forest land. The Party has reported on biomass burning following the methodology and using the default values from the IPCC

good practice guidance for LULUCF. Following the recommendation of the previous ERT, the Party has included more detailed information on wildfires on cropland and grassland in the NIR. The ERT commends the Party for the additional information provided, which improved the transparency of the NIR.

F. Waste

1. Sector overview

114. In 2010, emissions from the waste sector amounted to 3,687.11 Gg CO₂ eq, or 5.4 per cent of total GHG emissions. Since the base year, emissions have increased by 19.9 per cent. The key driver for the rise in emissions is the increase in CH₄ emissions from solid waste disposal on land, which is due to the increase in the amount of waste sent to landfill. Within the sector, 79.9 per cent of the emissions were from solid waste disposal on land, followed by 17.7 per cent from wastewater handling and 2.4 per cent from waste incineration.

115. Hungary has made recalculations for the waste sector between its 2011 and 2012 annual submissions following changes in AD and EFs. The impact of these recalculations on the waste sector is a decrease in the estimate of emissions for 2009 of 0.1 per cent (1.95 Gg CO₂ eq). The main recalculations took place in the following categories:

(a) Domestic and commercial wastewater: the estimate of emissions for 2009 decreased by 0.4 per cent (2.16 Gg CO₂ eq);

(b) Waste incineration: the estimate of emissions for 2009 increased by 0.3 per cent (0.21 Gg CO₂ eq).

116. The inventory for the waste sector is complete in terms of gases and years and covered all required categories. The information provided in the NIR and in the CRF tables and the additional information provided during the review in response to questions raised by the ERT was, in general, sufficiently transparent to enable the ERT to understand how the emissions were estimated. However, the ERT recommends that Hungary include in the NIR of its next annual submission more information on how some data were generated and used (see para. 119 below). Lack of data continues to be a major issue in relation to the reporting on the waste sector, and the ERT recommends that the Party direct its efforts towards improving the accuracy of the inventory for the waste sector in order to reduce uncertainties.

2. Key categories

Solid waste disposal on land – CH₄

117. Hungary applied the first order decay model, waste composition option, to estimate CH₄ emissions from solid waste disposal on land. In response to a question raised by the ERT during the review, the Party provided the spreadsheets containing the calculations used to apply the model. The evaluation of the spreadsheets, AD and EFs used enabled the ERT to conclude that the method was, in general, applied in line with the IPCC good practice guidance. Default parameters from the 2006 IPCC Guidelines for methane correction factor (MCF), degradable organic carbon (DOC), fraction of DOC dissimilated, methane generation rate constant, delay time and fraction of methane in biogas were used. However, the Party has continued to apply an oxidation factor (Ox) of zero instead of the factor of 0.1 recommended for managed landfills by the IPCC good practice guidance. Also, data on the amount of CH₄ recovered is incomplete. All of these factors could lead to an overestimation of CH₄ emissions from solid waste disposal on land. In response to a question raised by the ERT during the review, Hungary indicated that data on CH₄

recovered are being collected and that the Ox value will be re-estimated. The ERT recommends that Hungary use improved data on CH₄ recovered and a revised Ox value to revise the estimates of CH₄ emissions from solid waste disposal on land for its next annual submission.

118. Hungary has annual data on the volume of waste sent to landfill for the period 1985-1989 and only data for 1975 and 1980 for the period before 1985. Data for 1990 onward were in mass units and data for previous years were converted into mass using country-specific densities. To fill data gaps, Hungary applied linear interpolation and extrapolation (data for the period 1950–1974 were assumed to be the same as for 1975). Even if it would result in conservative estimates, the ERT encourages Hungary to apply interpolation and extrapolation based on drivers (e.g. population and gross domestic product), as it will result in more accurate estimates, and to report and explain any recalculations in its next annual submission.

119. Hungary has country-specific data on waste composition for all years after 1980. The Party used the waste composition default data from the 2006 IPCC Guidelines for 1950 and extrapolated the data for up to 1980. However, the extrapolation has not been clearly explained in the NIR. The ERT recommends that Hungary explain how interpolation was applied to derive the waste composition data for between 1950 and 1980 in its next annual submission, in order to improve transparency.

Wastewater handling – CH₄ and N₂O¹³

120. Hungary used the default method from the 2006 IPCC Guidelines to estimate CH₄ emissions from industrial wastewater and domestic and commercial wastewater treatment, without providing a clear justification for the choice of the method from the 2006 IPCC Guidelines. The ERT recommends that the Party justify its use of the 2006 IPCC Guidelines in its next annual submission.

121. The ERT noted that wastewater handling was identified as a key category. However, the Party used default data, parameters and EFs (e.g. biochemical oxygen demand (BOD), chemical oxygen demand (COD), maximum CH₄ producing potential and MCF) from the 2006 IPCC Guidelines to estimate emissions. Hungary has indicated in the NIR (pages 258 and 259) that “the compiler institute expects to have direct access to the wastewater information system in the near future; therefore more detailed data will be available to refine the calculations”. The ERT informed Hungary that this statement suggests that data exist. In response, Hungary indicated that it has started to analyse the data and that a major problem is that wastewater treatment plants usually report BOD and COD data for wastewater exiting the treatment plant instead of for the wastewater entering the plant. The ERT recommends that Hungary determine country-specific BOD and COD data and revise the CH₄ emission estimates for wastewater handling for its next annual submission.

122. Taking into account the information provided in the NIR and in response to questions raised by the ERT during the review, the ERT noted that Hungary applied MCF values which were not always in line with the IPCC good practice guidance (e.g. an MCF of 0.05 for aerobic treatment of industrial wastewater and an MCF of between 0.1 and 0.15 for aerobic domestic wastewater treatment plants instead of 0), leading to a possible overestimation of emissions. The ERT recommends that Hungary either clearly explain the use of these MCF values (perhaps certain anaerobic conditions prevail in the treatment plant) or revise the MCF values and provide revised CH₄ emission estimates for wastewater handling in its next annual submission.

¹³ Not all emissions related to all gases under this category are key categories, particularly N₂O emissions. However, since the calculation procedures for issues related to this category as discussed as a whole, the individual gases are not assessed in separate sections.

123. The ERT commends Hungary for its efforts to provide AD for major industries in the country (e.g. food and beverage, paper and pulp and chemical industry), in line with the IPCC good practice guidance. The distribution of domestic wastewater and domestic sludge between handling systems (aerobic and anaerobic) has been reported as “NE” in CRF table 6.B and that of industrial wastewater and industrial sludge as “NA”. The ERT encourages Hungary to complete CRF table 6.B and recommends that the Party improve the consistency between the information reported in the NIR and in that CRF table in its next annual submission.

124. Hungary used the default method and EFs from the 2006 IPCC Guidelines (similar to the method and EFs from the Revised 1996 IPCC Guidelines) together with national statistics on protein consumption to estimate N₂O emissions from human sewage. However, in response to a question raised by the ERT during the review, Hungary was not able to explain why its data on protein consumption (32.30–38.58 kg/person/year reported in CRF table 6.B) were higher than the statistics from the Food and Agriculture Organization of the United Nations (FAO) (32.49 kg/person/year). The ERT recommends that Hungary explain how the data on protein consumption were derived and justify the discrepancy with the FAO data in its next annual submission. The ERT commends Hungary for having taken into account the additional N₂O emissions resulting from the discharge of industrial wastewater into sewers.

3. Non-key categories

Waste incineration – CO₂, CH₄ and N₂O

125. The default method from the IPCC good practice guidance was used to estimate CO₂, CH₄ and N₂O emissions from waste incineration. A large proportion of the waste incinerated was hazardous waste and Hungary used the default parameters from the 2006 IPCC Guidelines to calculate the emissions. A major improvement achieved in relation to this category was the reallocation to the energy sector of emissions resulting from waste incineration for energy purposes. The ERT commends Hungary for that improvement.

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

126. Hungary has reported emissions and removals from activities under Article 3, paragraph 3, of the Kyoto Protocol (afforestation and reforestation, and deforestation) and from forest management, the only activity under Article 3, paragraph 4, of the Kyoto Protocol that the Party has elected, for 2008, 2009 and 2010. The reporting has been prepared in line with the IPCC good practice guidance for LULUCF and reported in accordance with decisions 15/CMP.1 and 16/CMP.1. Hungary has chosen annual accounting for the activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol.

127. Hungary has made recalculations for the KP-LULUCF activities between its 2011 and 2012 annual submissions in response to the recommendations made in the previous review report and in order to correct identified errors. The impact of these recalculations on each KP-LULUCF activity for 2009 is as follows:

- (a) For afforestation and reforestation, the estimate of net removals from units of land not harvested decreased by 4.3 per cent (47.18 Gg CO₂ eq);

(b) For deforestation, the estimate of net emissions decreased by 0.01 per cent (0.01 Gg CO₂ eq);

(c) For forest management, no recalculations were identified.

128. Hungary has not provided estimates of carbon stock changes for the litter, dead wood and mineral soil carbon pools for afforestation and reforestation or for forest management activities, reporting these changes as “NE” in the corresponding CRF tables (carbon stock change in organic soils has been reported as “NO”). However, following a recommendation made in the previous review report, detailed information has been provided in the NIR to demonstrate that those pools are not net sources of emissions, based on in-country experiments and expert judgement. Since the Party’s 2011 annual submission, a major research project aimed at demonstrating that some pools are not emission sources has been completed, and the Party has provided separate justifications in relation to afforestation and reforestation and forest management activities. The ERT considers the information provided to be sufficient and commends the Party for the improvements introduced in its 2012 annual submission, which have increased the transparency, accuracy and completeness of the NIR. Based on this information, the ERT recommends that the Party change the notation key reported in CRF KP-LULUCF table NIR-1 from not reported (“NR”) to reported (“R”) in its next annual submission.

129. Hungary has transparently described in the NIR the land area-related information and the process used to detect land uses and land-use changes for all mandatory and elected KP-LULUCF activities. The differences between the forest land areas reported under the Convention (e.g. 2,046.39 kha for 2010, as reported in CRF table 5.A) and under the Kyoto Protocol (1,922.1 kha for 2010, as reported in section 11.2.2 of the NIR) have been highlighted and explained in section 11.2.2 of and annex 8 to the NIR, following the recommendation made in the previous review report.

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

Afforestation and reforestation – CO₂

130. The supplementary information provided in chapter 11 of the NIR presents a detailed description of how methodologies were applied for the estimation of net removals from afforestation and reforestation activities. The ERT considers that the methods and parameters used were appropriate and in accordance with the IPCC good practice guidance for LULUCF.

131. The ERT noted that for afforestation and reforestation (units of land not harvested since the beginning of the commitment period) Hungary conducted recalculations for 2008 and 2009 (the estimates of net CO₂ removals decreased by 4.1 per cent and 4.3 per cent, respectively; see para. 127 above). However, the Party has not provided any information on those recalculations. Since the reporting on the LULUCF sector under the Kyoto Protocol is not completely comparable to the reporting under the Convention, the ERT reiterates the recommendation made in the previous review report that the Party provide all of the necessary information on recalculations related to the KP-LULUCF activities in chapter 11 of the NIR in its next annual submission.

Deforestation – CO₂

132. Hungary has clearly described the land area-related information for deforestation activities and the process used to detect the land use and land-use changes. For the identification of land subject to deforestation, the Party relied on certificates of deforestation (for 1990 onward) from the National Forestry Database and on sample-based studies (for changes over the period 1990–2003).

133. Hungary has reported in section 11.1.3.2 of the NIR that the identification of deforested areas is based on information from the official database for deforestation certificates. According to the Party, areas deforested since 2008 are precisely known. However, for areas deforested between 1990 and 2007 the information is less precise, especially for the period 1990–2002, and the Party believed that the areas deforested were probably underestimated. As a result, the Party conducted a sample-based study and used the data from the National Forestry Database and concluded that the area of deforestation had been underestimated by a factor of 1.18 for the period 1990–2002. Therefore, the Party corrected the estimated deforestation area for the period 1990–2002 by multiplying the area derived from the deforestation certificates by a correction factor of 1.18. The ERT considers this approach to be in line with the IPCC good practice guidance for LULUCF.

Activities under Article 3, paragraph 4, of the Kyoto Protocol

Forest management – CO₂

134. Hungary applied a broad definition to identify land subject to forest management activities. The area under forest management was estimated on the basis of the known area of forest land on 31 December 1989. For the following years, the area under forest management was estimated by subtracting the accumulated area of deforestation from the initial area under forest management. No new land areas were added to the area under forest management, which implies that the areas of ‘found forest’ (see para. 94 above) were not included in the accounting under the Kyoto Protocol, nor were they included in the estimation of net removals from afforestation and reforestation activities. The ERT noted that this is a conservative approach to estimating the area of forest management.

135. The annual net removals from forest management decreased by 32.0 per cent between 2008 and 2009 and by 11.2 per cent between 2009 and 2010. However, the annual area under forest management decreased by just 0.03 per cent and 0.01 per cent, respectively. The ERT recommends that the Party explain the greater changes in carbon stock for the area under forest management compared with the changes in the area itself in its next annual submission.

136. The methods and parameters used to estimate net carbon stock change in living biomass (above-ground and below-ground) for forest management are appropriate. Hungary has reported the litter, dead wood and mineral soil pools as “NE” (see para. 128 above). Based on this information, the ERT recommends that the Party change the notation key reported in KP-LULUCF table NIR-1 from “NR” to “R” in its next annual submission.

2. Information on Kyoto Protocol units

Standard electronic format and reports from the national registry

137. Hungary 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.¹⁴ The SIAR was forwarded to the ERT prior to the review, pursuant to decision 16/CP.10. The ERT reiterated the main findings contained in the SIAR. No recommendations were reported in the SIAR.

138. Information on the accounting of Kyoto Protocol units has been prepared and reported in accordance with decision 15/CMP.1, annex, chapter I.E, and reported in

¹⁴ 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.

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

Accounting of activities under Article 3, paragraph 3, of the Kyoto Protocol and any elected activities under Article 3, paragraph 4, of the Kyoto Protocol

139. Hungary has reported information on its accounting of KP-LULUCF in the accounting table, as included in the annex to decision 6/CMP.3. Information on the accounting of KP-LULUCF has been prepared and reported in accordance with decisions 16/CMP.1 and 6/CMP.3.

140. Table 6 shows the accounting quantities for KP-LULUCF as reported by the Party and the final values after the review.

141. Based on the information provided in table 6 for the activity afforestation and reforestation, Hungary shall issue 1,165,669 removal units (RMUs) in its national registry.

142. Based on the information provided in table 6 for the activity deforestation, Hungary shall cancel 44,812 assigned amount units, emission reduction units, certified emission reductions and/or RMUs in its national registry.

143. Based on the information provided in table 6 for the activity forest management, Hungary shall issue 640,820 RMUs in its national registry.

National registry

144. The ERT took note of the SIAR and its finding that the reported information on the national registry is complete and has been submitted in accordance with the annex to decision 15/CMP.1. The ERT further noted from the SIAR and its 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

145. Hungary has reported its commitment period reserve in its 2012 annual submission. The value reported in its original 2012 annual submission was 338,395,251 t CO₂ eq and was based on the national emissions in the Party's most recently reviewed inventory (67,679.05 Gg CO₂ eq). In response to the list of potential problems and further questions raised by the ERT during the review week, Hungary submitted revised emission estimates on 17 October 2012 (see para. 7 above) and recalculated its commitment period reserve. The new value reported was 338,924,042 t CO₂ eq, which is based on the national emissions in the Party's most recently reviewed inventory (67,784.81 Gg CO₂ eq). The ERT agrees with this figure.

Table 6
Accounting quantities for activities under Article 3, paragraph 3, and, if any, activities under Article 3, paragraph 4, of the Kyoto Protocol, in t CO₂ eq

	2012 submission ^a			2010 and 2011 submissions ^b	"Net" accounting quantity ^c
	As reported	Revised estimates	Final	Final	
Afforestation and reforestation	-3 479 636		-3 479 636	-2 313 967	-1 165 669
Deforestation	167 775		167 775	122 963	44 812
Forest management	-5 316 667		-5 316 667	-4 675 847	-640 820
Article 3.3 offset ^d	0		0		
Forest management cap ^e	-5 316 667		-5 316 667	-4 675 847	-640 820
Cropland management	0		0	0	0
Grazing land management	0		0	0	0
Revegetation	0		0	0	0

Abbreviations: CRF = common reporting format, 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.

^a The values included under 2012 submission are the cumulative accounting values for 2008, 2009 and 2010 as reported in the accounting table of the KP-LULUCF CRF tables for the inventory year 2010.

^b The values included under 2010 and 2011 submissions are the final accounting values as a result of the 2010 and 2011 reviews and are included in table 4 of the 2011 annual review report (FCCC/ARR/2011/HUN, page 33) in the column "Final" under "2011 submission".

^c The "net accounting quantity" is the quantity of Kyoto Protocol units that the Party shall issue or cancel under each activity under Article 3, paragraph 3, and, if relevant, paragraph 4, of the Kyoto Protocol based on the final accounting quantity in the 2012 submission and where the quantities issued or cancelled based on the 2011 review report have been subtracted ("net accounting quantity" = final 2012 – final 2010 and 2011).

^d "Article 3.3 offset": For the first commitment period of the Kyoto Protocol, a Party included in Annex I to the Convention that incurs a net source of emissions under the provisions of Article 3, paragraph 3, of the Kyoto Protocol may account for anthropogenic greenhouse gas emissions by sources and removals by sinks in areas under forest management under Article 3, paragraph 4, of the Kyoto Protocol up to a level that is equal to the net source of emissions under the provisions of Article 3, paragraph 3, but not greater than 9.0 Mt carbon times five, if the total anthropogenic greenhouse gas emissions by sources and removals by sinks in the managed forest since 1990 is equal to, or larger than, the net source of emissions incurred under Article 3, paragraph 3.

^e In accordance with decision 16/CMP.1, annex, paragraph 11, for the first commitment period only, additions to and subtractions from the assigned amount of a Party resulting from forest management under Article 3, paragraph 4, of the Kyoto Protocol after the application of decision 16/CMP.1, annex, paragraph 10, and resulting from forest management project activities undertaken under Article 6, shall not exceed the value inscribed in the appendix of the annex to decision 16/CMP.1, times five.

3. Changes to the national system

146. Hungary reported that there have been changes in its national system since the previous annual submission. Hungary has mentioned in the NIR that, as of January 2012, the Hungarian Energy Office took over the role of energy statistics provider from the Energy Centre. The ERT concluded that the Party'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

147. Hungary reported that there have been changes in its national registry since the previous annual submission. The Party described a change in the contact details of the registry administrator and an improvement in security through the implementation of a

transaction-signing system in the registry that includes verification by telephonic short message system. The ERT concluded that, taking into account the confirmed changes in the national registry, Hungary'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

148. Hungary has not provided information on changes in its reporting of the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol in its 2012 annual submission. However, in response to a question raised by the ERT during the review, the Party acknowledged that the reporting has been extended by including a description of Hungary's financial commitment (EUR 6 million for the period 2010–2012) within the framework of the Copenhagen Accord. The ERT concluded that, taking into account the confirmed change in the reporting, the information provided is complete and transparent. The ERT recommends that the Party, in its next annual submission, report any changes in the information provided under Article 3, paragraph 14, of the Kyoto Protocol in accordance with decision 15/CMP.1, annex, chapter I.H.

149. Hungary has reported that it fully supports and implements the regulations established by the European Union (EU) targeting the avoidance of adverse impacts and the fostering of sustainable development. In parallel, a policy framework has been put in place in Hungary and is laid down in Hungary's National Climate Change Strategy for the period 2008–2025. The policy framework ensures that climate policy is integrated into development policy, thereby ensuring that climate change related projects will play an integral role in future development projects. At present, the Party does not participate in large-scale climate change projects.

III. Conclusions and recommendations

A. Conclusions

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

151. The ERT concludes that the inventory submission of Hungary 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 1985–2010 and an NIR; these are complete in terms of geographical coverage, years, gases and sectors, and generally complete in terms of categories. Some of the categories, particularly in the LULUCF sector, have been reported as “NE”.

152. 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.

153. The Party's inventory is in line with the Revised 1996 IPCC Guidelines, the IPCC good practice guidance and the IPCC good practice guidance for LULUCF.

154. The Party has made recalculations for the inventory between its 2011 and 2012 annual submissions in response to the 2011 annual review report, following changes in AD and EFs and in order to rectify identified errors. The impact of these recalculations on the national totals is an increase in the estimate of emissions for 2009 of 0.1 per cent. The main recalculations took place in the following sectors/categories:

(a) Energy: owing to new data being available for coke oven gas for the period 1985–2005; the separate reporting of emissions from iron and steel and from non-ferrous metals; the reallocation of emissions from the use of coke as a reducing agent in blast furnaces to the industrial processes sector; and the use of revised EFs for fugitive emissions from oil and natural gas operations;

(b) Industrial processes: owing to revised AD for other mineral products (bricks and ceramics); revised AD for steel production; the reallocation of emissions from iron and steel from the energy sector to the industrial processes sector; and revised AD and EFs for consumption of halocarbons and SF₆;

(c) Agriculture: owing to the revision of the livestock population (e.g. for dairy cattle);

(d) LULUCF: owing to the reallocation of removals within the LULUCF sector;

(e) Waste: owing to the correction of a time-series inconsistency.

155. Hungary has reported emissions and removals from afforestation and reforestation, and deforestation activities under Article 3, paragraph 3, of the Kyoto Protocol as well as emissions and removals from forest management under Article 3, paragraph 4, of the Kyoto Protocol. The reporting has been prepared in line with the IPCC good practice guidance for LULUCF and reported in accordance with decisions 15/CMP.1 and 16/CMP.1. The ERT noted that Hungary has provided information in the NIR demonstrating that the dead wood, litter and mineral soil carbon pools for afforestation and reforestation, and forest management activities are not net sources of emissions.

156. Hungary has made recalculations for the KP-LULUCF activities between its 2011 and 2012 annual submissions in response to the recommendations made in the previous review report and in order to correct identified errors. The impact of these recalculations on each KP-LULUCF activity for 2009 is as follows:

(a) For afforestation and reforestation, the estimate of net removals from units of land not harvested decreased by 4.3 per cent;

(b) For deforestation, the estimate of net emissions decreased by 0.01 per cent;

(c) For forest management, no recalculations were identified.

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

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

159. 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 decisions of the CMP.

160. Hungary has not provided information on changes in its reporting under decision 15/CMP.1, annex, chapter I.H, “Minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol”, as part of its 2012 annual submission. However, in response to a question raised by the ERT during the review, the Party clarified the change in its reporting since the previous annual submission. The ERT concluded that, taking into account the confirmed change, the information provided is complete and transparent.

B. Recommendations

161. The ERT identifies issues for improvement as listed in table 7 below.

Table 7
Recommendations identified by the expert review team

<i>Sector</i>	<i>Category</i>	<i>Recommendation</i>	<i>Paragraph reference</i>
Overview	Completeness	Improve the completeness of the reporting by reducing the number of land use, land-use change and forestry (LULUCF) categories reported as not estimated (“NE”)	10
	Inventory preparation	Make the information on key categories in the national inventory report (NIR) consistent with the information in common reporting format (CRF) table 7	19
		Include the English translation of the quality assurance/quality control (QA/QC) plan, the inventory development plan and examples of QC forms	28
Energy	Overview	Include information on the recalculations for all gases in the chapter of the NIR that deals with recalculations	42
		Ensure the consistency of the information on recalculations between the NIR and the CRF tables	43
		Report the impact of recalculations of the estimated emissions for the entire time series	44
	Comparison of the reference approach with the sectoral approach	Revise the estimates of the production of natural gas liquids and explain any recalculations	47
		Use the coal classification from the Intergovernmental Panel on Climate Change (IPCC) <i>Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories</i>	48
	International bunker fuels	Investigate the discrepancies in the reported energy consumption for international aviation between the CRF tables and the International Energy Agency data	50
	Feedstocks and non-energy use of fuels	Make reference to the new information on feedstocks in the chapter of the NIR on feedstocks	51
Stationary combustion: solid and liquid fuels – CO ₂	For solid and liquid fuels, include information on the variation in the fuel mix by subcategory in the NIR	52 and 53	

<i>Sector</i>	<i>Category</i>	<i>Recommendation</i>	<i>Paragraph reference</i>
	Stationary combustion: biomass – CO ₂ , CH ₄ and N ₂ O	Report emissions from biomass combustion for iron and steel and for production of non-ferrous metals separately	54
	Civil aviation: liquid fuels – CO ₂ , CH ₄ and N ₂ O	Report emissions from aviation gasoline separately from emissions from gasoline used in road transportation and confirm that all flights that use jet kerosene are international flights	55
	Other transportation: gaseous fuels – CO ₂	Use the notation keys for included elsewhere (“IE”) and confidential to report the emissions from pipeline transport, together with an explanation in the documentation box of the appropriate CRF table of where the emissions have been reported, and explain why the emissions are confidential	56
Industrial processes and solvent and other product use	Overview	Improve the transparency of the information on category-specific uncertainties and QA/QC procedures in dedicated subchapters of the NIR	59
		Explain how time-series consistency is ensured when data from the European Union emissions trading scheme are used for just some years of the entire time series	60
	Ammonia production – CO ₂	Clarify in the NIR the technological improvements in ammonia production	61
	Consumption of halocarbons and SF ₆ – HFCs and PFCs	Report HFC and PFC emissions from disposal of refrigeration and air-conditioning equipment	63
		Report HFC emissions from imported closed-cell foams	65
	Solvent and other product use – N ₂ O	Determine whether the import of N ₂ O-based anaesthesia products occurs and, if appropriate, collect appropriate data and report estimates of the associated N ₂ O emissions	66
Agriculture	Overview	Report in more detail on QA/QC activities in the NIR, particularly the comparison of country-specific data with default emission factors (EFs) from the IPCC <i>Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories</i> and other parameters and with the respective values applied by other Parties with similar conditions	71
		Implement and report on the planned improvements	73
	Enteric fermentation – CH ₄	Justify the appropriateness of the methane conversion rate for dairy cattle	74
		Review the gross energy intake for cattle and include additional information thereon in the NIR	75
	Manure management – CH ₄ and N ₂ O	Resolve the problems that led to the incorrect reporting of the values for the allocation of manure to animal waste management systems (AWMS) and improve the QA/QC procedures	76
		Include additional information on the nitrogen excretion rate for swine	77

<i>Sector</i>	<i>Category</i>	<i>Recommendation</i>	<i>Paragraph reference</i>
		List the three N ₂ O EFs (for pit storage < one month, for pit storage > one month and for other AWMS for goat manure) together with the weighted EF under the header “other AWMS” in the NIR	78
	Direct and indirect emissions from agricultural soils – N ₂ O	Include information on N ₂ O emissions from histosols	80
		Report the sources of the country-specific data used to estimate N ₂ O emissions from crop residues	81
LULUCF	Overview	Improve the completeness of the reporting by reporting emission estimates for all mandatory categories	86
		Calculate emission estimates using methodologies from the <i>2006 IPCC Guidelines for National Greenhouse Gas Inventories</i> (hereinafter referred to as the 2006 IPCC Guidelines) when no relevant methodologies exist in the <i>IPCC Good Practice Guidance for Land Use, Land-Use Change and Forestry</i>	86
		Improve the transparency of the information on the subcategories of forest land	87
		Justify the use of EFs from the 2006 IPCC Guidelines	89
		Revise the uncertainty of the EF for N ₂ O emissions from forest land remaining forest land and indicate the source of the value	90
		Report carbon stock change in organic soils for the different pools separately	91
		Forest land remaining forest land – CO ₂	Address the potential overestimation of the total biomass volume
	Report the carbon stock changes in the dead organic matter and soil pools in CRF table 5.A as not occurring (“NO”) and include information in the documentation box to indicate that these carbon stock changes are zero		97
	Land converted to forest land – CO ₂	To improve transparency, report the changes in carbon stock that are zero as “NO”	99
		Provide estimates for changes in carbon stock in the soil and dead organic matter pools from conversion of grassland to forest land, or demonstrate that those pools are not net source of emissions	101
	Cropland remaining cropland – CO ₂	Clarify the assumption that tillage has occurred since 2000, report on the impacts of that assumption on the estimates for 2000 onward and move to a higher-tier estimation method	103
	Grassland remaining grassland – CO ₂	Clarify the assumption of static management practices	104
		Apply a higher-tier method to estimate emissions and removals for this key category	105
	Land converted to grassland – CO ₂	Report changes in carbon stock in living biomass and mineral soils	106
Report, in the NIR, that the carbon stock of perennial crops has been included in the calculations and calculate estimates using a higher-tier method		107	

<i>Sector</i>	<i>Category</i>	<i>Recommendation</i>	<i>Paragraph reference</i>
	Wetlands remaining wetlands – CO ₂	Report on the effort to distinguish between flooded lands and peatlands and report emissions from peatlands	108
	Land converted to wetlands – CO ₂	Report whether the assumption of conversion due to natural processes remains true for grassland converted to wetlands, and report estimates of CO ₂ emissions from settlements converted to wetlands, even if the emissions are considered to be negligible	109
	Direct N ₂ O emissions from N-fertilization of forest land and other – N ₂ O	Include additional information in the documentation box of the relevant CRF table	111
	CO ₂ emissions from agricultural lime application – CO ₂	Report estimates of CO ₂ emissions from lime application to grassland, or report the emissions as “NE” if occurring but not estimated, “NO” if not occurring or “IE” if included in another category	112
Waste	Overview	Improve the accuracy of the inventory	116
	Solid waste disposal on land – CH ₄	Use improved data on CH ₄ recovered and a revised oxidation factor to revise the estimates of CH ₄ emissions from landfills	117
		Explain how interpolation was applied to derive the waste composition data for between 1950 and 1980	119
	Wastewater handling – CH ₄	Justify the use of the 2006 IPCC Guidelines	120
		Determine country-specific biochemical oxygen demand and chemical oxygen demand data and revise the CH ₄ emission estimates	121
		Explain the use of the methane conversion factors	122
		Improve the consistency of the information reported in the NIR and in the relevant CRF table	123
Wastewater handling – N ₂ O	Explain how the data on protein consumption were derived and justify the discrepancy in the values between those reported in the CRF tables and the data from the Food and Agriculture Organization of the United Nations	124	
Information on activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol (KP-LULUCF)	Overview	Change the notation key reported in CRF KP-LULUCF table NIR-1 from “NR” (not reported) to “R” (reported)	128
	Forest management – CO ₂	Explain the greater change in carbon stock for the forest management area compared with the change in the area itself	135
		Change the notation key reported in CRF KP-LULUCF table NIR-1 from “NR” to “R”	136

<i>Sector</i>	<i>Category</i>	<i>Recommendation</i>	<i>Paragraph reference</i>
Minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol		Report whether there are any changes in the information provided under Article 3, paragraph 14, of the Kyoto Protocol in accordance with decision 15/CMP.1, annex, chapter I.H	148

IV. Questions of implementation

162. 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 Hungary 2012. Available at <http://unfccc.int/resource/docs/2012/asr/hun.pdf>.

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

FCCC/ARR/2011/HUN. Report of the individual review of the annual submission of Hungary submitted in 2011. Available at <http://unfccc.int/resource/docs/2012/arr/hun.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. Gábor Kis-Kovács (Greenhouse Gas Inventory Division, Hungarian Meteorological Service), including additional material on the methodologies and assumptions used. The following documents¹ were also provided by Hungary:

Fébel, H.Ms. – Gundel, J. 2007. *A takarmányozás és a környezetvédelem kapcsolata*. (Connection between nutrition and environmental protection). Állattenyésztés és Takarmányozás. 2007. 56:427-456. (In Hungarian, with English summary).

Koelsch, R. – Shapiro, C. 1997. *Estimating manure nutrients from livestock and poultry*. G97-1334A. University of Nebraska. Available at <<http://www.ianr.unl.edu/pubs/wastemgt/g1334.htm>>

Laczka, É. and Soós, L. 2003. *Some Characteristics of the Hungarian Agriculture in the 1990s*. Hungarian Statistical Review, Special number 8. 2003. pp. 3-19. Available at <http://www.ksh.hu/statszemle_archive/2003/2003_K8/2003_K8_003.pdf>

Zsembeli, J., Czimbalmos, R., Takács, M. 2011. *Determination of country-specific values of the crop residue rate, dry matter content and nitrogen content of crop residue of oilseed rape and sunflower*. University of Debrecen, Centre for Agricultural and Applied Economic Sciences, Research Institutes and Study Farm, Karcag Research Institute.

¹ Reproduced as received from the Party.

Annex II

Acronyms and abbreviations

AD	activity data
BOD	biochemical oxygen demand
CH ₄	methane
C	carbon
CMP	Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol
CO ₂	carbon dioxide
CO ₂ eq	carbon dioxide equivalent
COD	chemical oxygen demand
CORINE	coordination of information on the environment
CRF	common reporting format
DOC	degradable organic carbon
EF	emission factor
ERT	expert review team
EU	European Union
EU ETS	European Union emissions trading scheme
GHG	greenhouse gas; unless indicated otherwise, GHG emissions are the sum of CO ₂ , CH ₄ , N ₂ O, HFCs, PFCs and SF ₆ without GHG emissions and removals from LULUCF
HFCs	hydrofluorocarbons
IE	included elsewhere
IEA	International Energy Agency
IEF	implied emission factor
IPCC	Intergovernmental Panel on Climate Change
ITL	international transaction log
kg	kilogram (1 kg = 1,000 grams)
KP-LULUCF	land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol
LULUCF	land use, land-use change and forestry
MCF	methane correction factor
Mg	megagram (1 Mg = 1 tonne)
N	nitrogen
N ₂ O	nitrous oxide
NA	not applicable
NE	not estimated
NH ₃	ammonia
NIR	national inventory report
NO	not occurring
NR	not reported
OMSZ	Hungarian Meteorological Service
Ox	oxidation factor
PFCs	perfluorocarbons
QA/QC	quality assurance/quality control
R	reported
RMU	removal unit
SEF	standard electronic format
SF ₆	sulphur hexafluoride
SIAR	standard independent assessment report

t	tonne
TJ	terajoule (1 TJ = 10 ¹² joules)
UNFCCC	United Nations Framework Convention on Climate Change
