COMPLIANCE COMMITTEE **CC/ERT/ARR/2013/19**
7 June 2013

Report of the individual review of the annual submission of Slovakia submitted in 2012

Note by the secretariat

The report of the individual review of the annual submission of Slovakia submitted in 2012 was published on 6 June 2013. For purposes of rule 10, paragraph 2, of the rules of procedure of the Compliance Committee (annex to decision 4/CMP.2, as amended by decision 4/CMP.4), the report is considered received by the secretariat on the same date. This report, FCCC/ARR/2012/SVK, contained in the annex to this note, is being forwarded to the Compliance Committee in accordance with section VI, paragraph 3, of the annex to decision 27/CMP.1.

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

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

Contents

I. Introduction and summary

1. This report covers the in-country review of the 2012 annual submission of Slovakia, coordinated by the UNFCCC secretariat, in accordance with decision 22/CMP.1. The review took place from 1 to 6 October 2012 in Bratislava, Slovakia, and was conducted by the following team of nominated experts from the UNFCCC roster of experts: generalist – Ms. Karin Kindbom (Sweden); energy – Mr. Darío Gómez (Argentina); industrial processes – Mr. Koen Smekens (Belgium); agriculture – Mr. Mahmoud Medany (Egypt); land use, land-use change and forestry (LULUCF) – Mr. Valentin Bellassen (France); and waste – Ms. Irina Yesserkepova (Kazakhstan). Mr. Gómez and Ms. Kindbom were the lead reviewers. The review was coordinated by Mr. Tomoyuki Aizawa (UNFCCC secretariat).

2. In accordance with the "Guidelines for review under Article 8 of the Kyoto Protocol" (decision 22/CMP.1) (hereinafter referred to as the Article 8 review guidelines), a draft version of this report was communicated to the Government of Slovakia, 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 Slovakia was carbon dioxide (CO_2), accounting for 82.5 per cent of total GHG emissions[1] CO_2 eq, followed by methane (CH_4) (9.1 per cent) and nitrous oxide (N_2O) (7.4 per cent). Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6) collectively accounted for 1.0 per cent of the overall GHG emissions in the country. The energy sector accounted for 69.4 per cent of total GHG emissions, followed by the industrial processes sector (18.7 per cent), the agriculture sector (6.7 per cent), the waste sector (4.8 per cent) and the solvent and other product use sector (0.4 per cent). Total GHG emissions amounted to 46,114.09 Gg CO_2 eq and decreased by 35.8 per cent between the base year[2] and 2010. This decrease is reasonable given the economic and political transition to a market economy and the changes that occurred in Slovakia in the early 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, CO_2, CH_4 and N_2O emissions included in the rows under Annex A sources do not include emissions and removals from the LULUCF sector.

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

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

[2] "Base year" refers to the base year under the Kyoto Protocol, which is 1990 for all gases. 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

			Gg CO_2 eq							*Change*
		Greenhouse gas	*Base year[a]*	*1990*	*1995*	*2000*	*2005*	*2008*	*2009*	*2010*	*Base year–2010 (%)*
Annex A sources		CO_2	60 745.23	60 745.23	44 879.11	41 367.41	42 659.75	41 225.58	36 030.96	38 024.57	–37.4
		CH_4	4 443.87	4 443.87	4 097.66	4 324.09	4 521.13	4 648.04	4 305.78	4 210.28	–5.3
		N_2O	6 351.04	6 351.04	4 159.70	3 582.05	3 772.33	3 853.32	3 542.06	3 417.69	–46.2
		HFCs	NA, NO	NA, NO	11.65	77.01	206.19	335.54	380.61	420.49	NA
		PFCs	271.37	271.37	114.32	11.65	20.25	36.16	17.76	21.15	–92.2
		SF_6	0.03	0.03	9.91	13.11	16.27	18.51	19.39	19.90	64 956.5
KP-LULUCF	Article 3.3[b]	CO_2						–278.64	–187.08	–331.36	
		CH_4						NA	NA	NA	
		N_2O						NA	NA	NA	
	Article 3.4[c]	CO_2	NA					NA	NA	NA	NA
		CH_4	NA					NA	NA	NA	NA
		N_2O	NA					NA	NA	NA	NA

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

[a] "Base year" for Annex A sources refers to the base year under the Kyoto Protocol, which is 1990 for all gases. The "base year" for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol is 1990.

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

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

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

			Gg CO_2 eq							*Change*
		Sector	*Base year[a]*	*1990*	*1995*	*2000*	*2005*	*2008*	*2009*	*2010*	*Base year–2010 (%)*
Annex A		Energy	53 905.54	53 905.54	39 008.15	35 723.27	36 100.02	34 549.07	30 540.55	32 007.79	–40.6
		Industrial processes	9 543.26	9 543.26	8 552.32	8 293.99	9 407.23	9 902.04	8 375.21	8 621.51	–9.7
		Solvent and other product use	147.15	147.15	121.53	85.04	171.54	166.59	164.38	164.35	11.7
		Agriculture	7 124.26	7 124.26	4 357.64	3 495.99	3 171.01	3 129.46	3 052.35	3 098.29	–56.5
		Waste	1 091.33	1 091.33	1 232.71	1 777.04	2 346.13	2 369.99	2 164.06	2 222.15	103.6
		LULUCF	NA	–10 295.39	–10 974.29	–10 282.84	–5 281.66	–7 098.83	–7 228.54	–6 088.42	NA
		Total (with LULUCF)	**NA**	**61 516.16**	**42 298.06**	**39 092.49**	**45 914.26**	**43 018.32**	**37 068.02**	**40 025.67**	**NA**
		Total (without LULUCF)	**71 811.55**	**71 811.55**	**53 272.36**	**49 375.33**	**51 195.93**	**50 117.16**	**44 296.56**	**46 114.09**	**–35.8**
		Other[b]	NA	NA	NA	NA	NA	NA	NA	NA	NA
KP-LULUCF	Article 3.3[c]	Afforestation and reforestation						–453.12	–469.30	–511.99	
		Deforestation						174.47	282.22	180.63	
		Total (3.3)						**–278.64**	**–187.08**	**–331.36**	
	Article 3.4[d]	Forest management						NA	NA	NA	
		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**					**NA**	**NA**	**NA**	**NA**

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

[a] "Base year" for Annex A sources refers to the base year under the Kyoto Protocol, which is 1990 for all gases. The "base year" for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol is 1990.

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

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

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

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

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Commitment period reserve	**229 909 329**	**230 570 430**		**230 570 430**
Annex A emissions for current inventory year				
CO_2	38 024 568			38 024 568
CH_4	4 210 279			4 210 279
N_2O	3 384 737	3 417 690		3 417 690
HFCs	321 227	420 494		420 494
PFCs	21 154			21 154
SF_6	19 902			19 902
Total Annex A sources	**45 981 866**	**46 114 086**		**46 114 086**
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	–511 990			–511 990
3.3 Afforestation and reforestation on harvested land for current year of commitment period as reported	NA			NA
3.3 Deforestation for current year of commitment period as reported	180 630			180 630
Activities under Article 3, paragraph 4, for current inventory year[c]				
3.4 Forest management for current year of commitment period				
3.4 Cropland management for current year of commitment period				
3.4 Cropland management for base year				
3.4 Grazing land management for current year of commitment period				
3.4 Grazing land management for base year				
3.4 Revegetation for current year of commitment period				
3.4 Revegetation in base year				

Abbreviation: NA = not applicable.
[a] "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).

[b] "Final" includes revised estimates, if any, and/or adjustments, if any.
[c] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

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

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Annex A emissions for 2009				
CO_2	36 030 961			36 030 961
CH_4	4 305 783			4 305 783
N_2O	3 508 303	3 542 061		3 542 061
HFCs	308 873	380 609		380 609
PFCs	17 761			17 761
SF_6	19 388			19 388
Total Annex A sources	**44 191 069**	**44 296 563**		**44 296 563**
Activities under Article 3, paragraph 3, for 2009				
3.3 Afforestation and reforestation on non-harvested land for 2009 as reported	–469 297			–469 297
3.3 Afforestation and reforestation on harvested land for 2009 as reported	NA			NA
3.3 Deforestation for 2009 as reported	282 216			282 216
Activities under Article 3, paragraph 4, for 2009[c]				
3.4 Forest management for 2009				
3.4 Cropland management for 2009				
3.4 Cropland management for base year				
3.4 Grazing land management for 2009				
3.4 Grazing land management for base year				
3.4 Revegetation for 2009				
3.4 Revegetation in base year				

Abbreviation: NA = not applicable.
[a] "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).
[b] "Final" includes revised estimates, if any, and/or adjustments, if any.
[c] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

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

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Annex A emissions for 2008				
CO_2	41 225 580	41 225 575		41 225 575
CH_4	4 648 041			4 648 041
N_2O	3 876 427	3 853 324		3 853 324
HFCs	273 189	335 542		335 542
PFCs	36 162			36 162
SF_6	18 511			18 511
Total Annex A sources	**50 077 909**	**50 117 155**		**50 117 155**
Activities under Article 3, paragraph 3, for 2008				
3.3 Afforestation and reforestation on non-harvested land for 2008 as reported	–453 118			–453 118
3.3 Afforestation and reforestation on harvested land for 2008 as reported	NA			NA
3.3 Deforestation for 2008 as reported	174 473			174 473
Activities under Article 3, paragraph 4, for 2008[c]				
3.4 Forest management for 2008				
3.4 Cropland management for 2008				
3.4 Cropland management for base year				
3.4 Grazing land management for 2008				
3.4 Grazing land management for base year				
3.4 Revegetation for 2008				
3.4 Revegetation in base year				

Abbreviation: NA = not applicable.
[a] "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).
[b] "Final" includes revised estimates, if any, and/or adjustments, if any.
[c] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

II. Technical assessment of the annual submission

A. Overview

1. Annual submission and other sources of information

6. The 2012 annual inventory submission was submitted on 15 April 2012; it contains a complete set of common reporting format (CRF) tables for the period 1990–2010 and a national inventory report (NIR). The CRF tables were submitted on 14 April 2012 and the NIR on 15 April 2012. A revised NIR was submitted on 31 August 2012. Slovakia 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. Slovakia officially submitted revised emission estimates on 16 November 2012 and on 14 December 2012 in response to questions raised by the expert review team (ERT) during the course of the in-country visit. In the submission of 16 November 2012, revised estimates were provided for CO_2 emissions from other sectors under the energy sector, HFC and SF_6 emissions from consumption of halocarbons and SF_6 under the industrial processes sector and N_2O emissions from agricultural soils under the agriculture sector. The ERT noted that the revised estimates for CO_2 emissions from other sectors were provided only for 2008, and that the emission factor (EF) used was changed by mistake, as such a revision had not been included in the questions raised by the ERT during the course of the in-country visit. Therefore, the ERT recommended that Slovakia provide revised estimates including only the revisions pointed out in the questions raised by the ERT during the course of the in-country visit. In response, Slovakia submitted revised estimates on 14 December 2012 for HFC and SF_6 emissions from consumption of halocarbons and SF_6 (see paras. 91–93 below) under the industrial processes sector and N_2O emissions from agricultural soils (see paras. 102–106 below) under the agriculture sector. These revisions resulted in an increase of 0.3 per cent in the estimated total national GHG emissions for 2009. The values used in this report are based on the values contained in the submission of 14 December 2012, unless otherwise specified.

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, Slovakia provided the ERT with additional information. The documents concerned are not part of the annual submission but are in some cases referenced in the NIR. The full list of materials used during the review is provided in annex I to this report.

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

Completeness of inventory

10. The inventory covers all mandatory[4] source and sink categories for the period 1990–2010, except for N_2O emissions from disturbance associated with land converted to cropland (see para. 129 below), reported as not occurring ("NO"). The ERT recommends that Slovakia provide estimates for this category in its next annual submission.

11. Regarding activities under Article 3, paragraph 3, of the Kyoto Protocol, the Party has submitted emission/removal estimates for most of the mandatory categories, except for: emissions from wildfires under afforestation and reforestation (A/R) activities (see para. 153 below); CO_2 emissions from lime application under deforestation activities (see para. 156 below); and N_2O emissions from disturbance associated with deforestation (see para. 156 below), which have been reported as "NO". The ERT recommends that Slovakia provide estimates for these categories in its next annual submission.

12. The Party's 2012 annual submission was generally complete; however, CRF table 8(b) on recalculations has not been filled in. The ERT therefore recommends that Slovakia complete CRF table 8(b) in its next annual submission.

2. Questions of implementation raised in the 2011 annual review report

13. The ERT noted that questions of implementation were raised in the 2011 annual review report on:

(a) Compliance with the "Guidelines for national systems for the estimation of anthropogenic greenhouse gas emissions by sources and removals by sinks under Article 5, paragraph 1, of the Kyoto Protocol" (annex to decision 19/CMP.1). In particular, the ERT concluded that the national system of Slovakia failed to perform some of the specific functions required by the annex to decision 19/CMP.1. The issues raised in the previous review report include the following:

(i) Strong formal relations and agreements between institutions concerning their roles and cooperation to ensure reliable data flow for the preparation of the inventory were not ensured;

(ii) Clear communication channels with regard to the principles, purposes and procedures of "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) and the review process with external experts were insufficient;

(iii) Limited resources were available for inventory planning, preparation and management and were not directed towards the highest priorities;

(b) Estimates for 2008 and 2009 of CO_2, CH_4 and N_2O emissions from road transportation, and of HFC, PFC and SF_6 emissions from consumption of halocarbons and SF_6 were incomplete and/or not prepared in accordance with the methodological and reporting requirements of the Intergovernmental Panel on Climate Change (IPCC) *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Revised 1996 IPCC Guidelines) and the IPCC *Good Practice Guidance and*

[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 EFs to estimate GHG emissions.

Uncertainty Management in National Greenhouse Gas Inventories (hereinafter referred to as the IPCC good practice guidance).

14. The ERT calculated and recommended adjustments for the categories mentioned in paragraph 13(b) above and documented the adjustments in the 2011 annual review report. Slovakia did not agree, in its communication of 17 April 2012, with the adjustments calculated by the ERT.

15. During the following discussion in the enforcement branch of the Compliance Committee,[5] Slovakia provided additional information on CO_2, CH_4 and N_2O emissions from road transportation and the enforcement branch concluded that the recommended adjustment for this category was no longer considered necessary. Furthermore, Slovakia accepted the recommended adjustment with respect to HFC, PFC and SF_6 emissions from consumption of halocarbons and SF_6. The enforcement branch concluded that the question of implementation relating to the disagreement over whether to apply adjustments had been resolved.

16. In the 2012 annual submission revised estimates of HFC, PFC and SF_6 emissions from consumption of halocarbons and SF_6 were reported, following recommendations in the 2011 annual review report (see para. 91 below).

17. In response to the question of implementation regarding the national system in the previous review report, Slovakia provided the "Plan and Progress Report of the Slovak Republic", submitted to the Compliance Committee on 21 September 2012. The ERT considered the report, which refers to all actions and measures explicitly as responses to the issues raised in the 2011 annual review report regarding the question of implementation concerning the national system. The Plan and Progress Report clarified the status of implementation of each measure as implemented or in preparation, or a date of implementation was provided. Slovakia also clarified the plans and progress documented in the report during the in-country visit (see paras. 163–169 below). The ERT is of the view that the "Plan and Progress Report" addresses the issues raised by the previous ERT. Most measures included in the Plan and Progress Report have been implemented, and some were ongoing during the review (formal contracts and agreements with a few institutions). The ERT is therefore of the view that the national system is performing its required functions generally in accordance with the requirements set out in the annex to decision 19/CMP.1, although the final effect will be fully visible in the 2013 annual submission.

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

Overview

18. The ERT concluded that the national system performs its required functions. Slovakia has put in place the mandatory requirements for a national system under Article 5, paragraph 1, of the Kyoto Protocol and the national system has generally been prepared in accordance with the "Guidelines for national systems under Article 5, paragraph 1, of the Kyoto Protocol" (decision 19/CMP.1). The ERT recognized, however, that parts of the national system relating to formal agreements with other agencies and organizations are in preparation but not yet fully in place. The ERT therefore recommends that Slovakia, in its next annual submission, fully describe the changes in its national system.

[5] Document CC-2012-1-7/Slovakia/EB, paragraph 21.

19. The Party described the changes to the national system since the previous annual submission and these changes are discussed in chapter II.G.3 (see paras. 163–169 below) of this report.

20. The ERT noted that the previous review report had concluded that the national system was not performing some of the specific functions of inventory preparation in accordance with paragraphs 12(c), (d) and (e), 14(c) and (g), and 16 (b) and (c) of the annex to decision 19/CMP.1. Slovakia provided additional information to the Compliance Commitee during 2012 (see para. 17 above) on the question of implementation regarding the functions of the national system. The "Plan and Progress Report of the Slovak Republic" (see para. 17 above) was provided to the ERT during the review. It includes descriptions of measures that were planned in direct response to recommendations in the 2011 annual review report regarding the national system. During the review week these plans and measures were further clarified to the ERT, which concluded that substantive progress has been made (see paras. 163–169 below). The ERT is of the view that the national system is performing its required functions generally in accordance with the requirements set out in the annex to decision 19/CMP.1.

Inventory planning

21. During the review, Slovakia explained the institutional arrangements for the preparation of the inventory. The Department of Emissions and Air Quality Monitoring (DEAQM) of the Slovak Hydrometeorological Institute (SHMU) is the single national entity and has overall responsibility for the national inventory, as delegated by the Ministry of Environment (MoE). Priority activities in the inventory preparation are specified annually by MoE, together with an allocated budget via an Annual Plan of Main Tasks. Other agencies and organizations are also involved in the preparation of the inventory (see paras. 23 and 24 below).

22. DEAQM is responsible for the coordination of the national system, including planning, improvements, coordination of experts, formal and overall quality assurance/quality control (QA/QC) activities, reporting and reviewing, data management and archiving, and, partly, estimating the sectoral approach in the energy sector. DEAQM is also responsible for the preparation of an "Annual Plan and Proposals" for tasks to be prioritized and performed for the next year's annual submission, which is sent to MoE for approval. Additional staff at SHMU are responsible for the National Emission Information System (NEIS) database, which contains information on stationary combustion sources.

23. Inventory preparation at the sectoral level is highly decentralized and delegated to sectoral experts at external institutions and organizations. The external institutions and organizations cooperate under annual contracts, based on framework contracts for the period 2010–2014. The contracts include the nomination of experts, the delegation of responsibilities, the basic QA/QC requirements and detailed knowledge of the Revised 1996 IPCC Guidelines and the IPCC good practice guidance. Annual contracts are issued within the framework covering the main tasks based on the priorities identified during the previous review cycle and other needs. Payment is related to the outcome of the review process. The responsibilities for the choice of methods, activity data (AD), recalculations, sectoral archiving and QA/QC at the sectoral level are delegated by SHMU to the external organizations that provide the sectoral inventories. This dependency on external experts was raised as a problem in the previous review report. Slovakia has, in response to this problem, introduced training in the UNFCCC reporting guidelines and processes, as well as in the Article 8 review guidelines, including QA/QC for external experts, introduced a system of peer review of sectoral inventories and also introduced a linkage between allocated funds and the output quality of the inventory in contracts with external experts. Furthermore, the staff at DEAQM has been enlarged, permitting more resources to be

directed towards QA/QC and the coordination of the inventory preparation (see paras. 163–169 below).

24. The sectoral experts nominated into the Slovak national system are listed in table 1.2 of the NIR. For example, the external institutions responsible for the energy sector include: the consultant company Profing (which is responsible for the preparation of the reference approach, national net calorific values (NCVs) and EFs, fugitive emissions from solid fuels and from oil and gas industry, and carbon stored included in the non-energy use of products); Ecosys (which is responsible for consultation on the sectoral approach methodology for fuel combustion and the carbon balance within the inventory); and several organizations contribute to the inventory for transport within the energy sector, including: the consultant company Motran (responsible for the COPERT model for road transportation); the Transport Research Center in Zilina (responsible for AD on off-road transportation and transport statistics); the Ministry of Transport and Regional Development of the Slovak Republic (responsible for statistical information, and independent inspection of output databases and emissions); and the Statistical Office of the Slovak Republic (which provides data at the level of enterprises, including confidential information). The Department of Inorganic Technology of the Faculty of Chemical Technology of the Slovak Technical University is responsible for collecting and compiling information for the industrial processes sector and the solvent and other product use sector, except for fluorinated gases (F-gases), for which the Association for Cooling and Air Conditioning Techniques is responsible. The Slovak Agricultural University Nitra is responsible for the agriculture sector, in consultation with the Ministry of Agriculture and Rural Development. The National Forest Center Zvolen is responsible for the LULUCF sector and KP-LULUCF activities. The consultant Integrated Skills Ltd is responsible for the waste sector inventory, in cooperation with SHMU Department for Water Quality (database for industrial wastewater) and the Slovak Environmental Agency.

25. The ERT noted that the process of inventory planning and the prioritization of inventory improvements is not clearly described in the NIR. During the review week, Slovakia provided additional explanations and information regarding inventory planning (see para. 28 below), institutional arrangements (see para. 21 above) and the national system for the preparation of the inventory. The ERT is of the view that the process of inventory planning and prioritization of improvements is appropriate, but that this is not clearly and transparently described in the NIR. The ERT therefore recommends that Slovakia improve the transparency of the NIR by providing, in its next annual submission, a clear description of the process of planning and prioritization of inventory improvements, including the information used to prioritize resources and actions.

Inventory preparation

Key categories

26. Slovakia has reported a key category tier 1 analysis, both level and trend assessment, as part of its 2012 annual submission. The key category analysis performed by the Party and that performed by the secretariat[6] produced similar results. Slovakia has included the LULUCF sector in its key category analysis, which was performed in accordance with the

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

IPCC good practice guidance, but not entirely in accordance with the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF), because the analysis was not performed at the land-use subcategory level (see para. 119 below).

27. During the review, Slovakia also presented results from a tier 2 key category assessment performed on selected parts of the inventory as a trial practice. The tier 1 uncertainty analysis was used to perform the tier 2 key category analysis.

28. In response to questions raised by the ERT, Slovakia stated that the results of the key category analysis are one of the driving factors for the preparation of the inventory, particularly in the prioritization of resources and methodological complexity. This information is not included in its NIR. The ERT recommends that Slovakia clearly describe in the NIR the role of the key category analysis in inventory planning and prioritization.

29. Slovakia has identified key categories for activities under Article 3, paragraph 3, of the Kyoto Protocol, for 2010. Slovakia has identified afforestation and reforestation, and deforestation as key categories.

Uncertainties

30. Slovakia has reported a tier 1 uncertainty analysis in line with the IPCC good practice guidance, and has included the LULUCF sector in the analysis. The total level uncertainty for 2010 was 7.8 per cent and the trend uncertainty was 4.8 per cent for the whole inventory. The uncertainties reported for 2010 are lower than those reported for 2009 in the Party's 2011 annual submission, for which the level uncertainty was estimated at 13.8 per cent and the trend uncertainty at 8.2 per cent. During the review, in response to questions raised by the ERT, the Party clarified, however, that errors in the Excel calculation tables for 2010 led to an underestimation of uncertainties. The ERT recommends that Slovakia correct the errors and report on changes to the uncertainty analysis in the next annual submission.

31. The Party performed tier 2 uncertainty assessments using the Monte Carlo method for stationary combustion categories in the energy sector, for all categories in the industrial processes sector and the solvent and other product use sector, and for emissions from solid waste disposal on land in the waste sector (see paras. 54, 82 and 137 below). During the review week the uncertainty analysis was presented to the ERT and the ERT found that the tier 2 analysis is developed based on thorough discussions for deeper understanding on assumptions and data quality between the sectoral experts and the expert performing the Monte Carlo calculations. The ERT commends Slovakia for its efforts in this regard. The ERT encourages Slovakia to discuss and assess, where appropriate, the influence of the recalculations on the uncertainties, since recalculations should be undertaken, among other things, to improve the accuracy of the estimates. Slovakia stated during the review week that it is using the results of the uncertainty analyses to prioritize improvements in the inventory.

Recalculations and time-series consistency

32. Recalculations have been performed and generally reported in accordance with the IPCC good practice guidance. The ERT noted that recalculations reported by the Party of the time series 1990 to 2009 have been undertaken in response to the 2011 review report to take into account changes in AD and EFs in the energy sector, to lift applied adjustments and as a result of internal QA in the industrial processes sector, changes in methodology in the agricultural sector and in the LULUCF sector, and changes in AD and specific parameters in the waste sector. The magnitude of the impact of the recalculations is a

decrease in estimated total GHG emissions in the base year (1990) of 3.2 per cent and an increase in 2009 (2.1 per cent). The major changes for 2009 include:

(a) Manufacturing industries and construction (an emission increase of 50.5 per cent);

(b) Metal production (an emission decrease of 24.4 per cent);

(c) Energy industries (an emission decrease of 12.1 per cent);

(d) Mineral products (an emission increase of 7.4 per cent);

(e) Forest land (a removal increase of 134.5 per cent).

33. Slovakia's estimates are time-series consistent and the ERT noted that great efforts have been made by Slovakia to be able to provide time-series consistent estimates. The recalculations have resulted in improvements to the inventory, but the ERT also noted that the overall implications for emission levels and trends are not described in the NIR.

34. The rationale for these recalculations is provided in the NIR but not in CRF table 8(b). Descriptions of the specific factors underlying the recalculations are in some cases not included in the NIR (see para. 123 below). The ERT noted the substantial impact of the recalculations on the emission/removal estimates in the Party's inventory. The ERT therefore reiterates the recommendation made in previous review reports that Slovakia include information on recalculations in CRF table 8(b). The ERT recommends that Slovakia improve the description of the recalculations in its next NIR by including information on the specific factors and rationale underlying the recalculations. The ERT also recommends that Slovakia complete the sections in the NIR (chapter 10) on the implications of the recalculations for emission levels and trends.

Verification and quality assurance/quality control approaches

35. Slovakia has elaborated a QA/QC plan generally in accordance with the IPCC good practice guidance. The plan includes all mandatory elements as set out in the IPCC good practice guidance and decision 19/CMP.1. The QA/QC plan and verification and QA/QC control approaches are generally described in the NIR; however, the ERT found during the review week that the plan mainly covers QA/QC of the inventory preparation and compilation after the information from the external sectoral experts has reached the single national entity. In response to questions raised by the ERT, Slovakia clarified during the review that the procedures and approaches by the sectoral experts, prior to submission to the single national entity, are in some cases more elaborated than can be understood from the general descriptions in the NIR. For example, some of the sectoral experts explained that they perform QC activities which are in line with tier 1 general inventory level QC procedures (table 8.1 in chapter 8 of the IPCC good practice guidance) prior to the submission of the results to SHMU, but these are not documented. However, it is not clear to the ERT whether all sectoral experts perform the relevant QC activities in a systematic manner, because the sectoral experts do not have any (sector-specific) systematic means of recording and documenting tier 1 QC checks. The ERT therefore recommends that Slovakia develop tier 1 QC checklists/worksheets or similar tools for the sectoral experts to use in the inventory preparation steps prior to the submission of their results to the national system coordinator, and that these QC checklists are archived in the central archiving system at SHMU. During the review, the ERT found several errors in the officially submitted CRF tables, and there were inconsistencies between the NIR and the CRF tables, which suggests that the QC of the process of compilation of the data tables and of the NIR is weak. The ERT strongly recommends that Slovakia develop, and ensure maintenance of, robust QC procedures, in order to prevent inconsistencies between the NIR and the CRF tables and future errors in the CRF tables.

36. In response to recommendations in the 2011 review report, a system of nominated deputy sectoral experts has been implemented in Slovakia. The role of the deputy sectoral expert is primarily to perform a peer review (QA/QC) of the sectoral reports (data and text) before submission to the single national entity. These peer reviews and their outcomes are, however, not documented. The ERT recommends that Slovakia develop an appropriate way of documenting the peer review of results before they are submitted to the single national entity.

37. QA activities include a planned system of review procedures conducted by personnel not directly involved in the inventory compilation/development process, as described in chapter 8 of the IPCC good practice guidance. The ERT noted that the deputy sectoral experts in Slovakia for some sectors seem to be more independent from the inventory preparation than those for other sectors. Also, the QA performed by MoE is not as independent as it could be (e.g. for the energy sector), because experts from MoE are partly involved in the inventory preparation for the energy sector (see para. 57 below). The ERT is of the view that the QA procedures could be strengthened and therefore encourages Slovakia to regularly carry out external independent reviews of the sectoral reports.

38. The QA/QC plan in the NIR (tables 1.6 and 1.7) presents the QA/QC steps. Furthermore, the ERT noted that the processes of external and internal inventory compilation are also described in these tables. This is a complex presentation where the QA/QC steps and their scope and results are not easily understandable. In order to increase the transparency of the reporting, the ERT recommends that, in addition to summary tables 1.6 and 1.7, Slovakia present its QA/QC plan for external and internal inventory compilation separately, clearly identifying what QA/QC activities are performed, by whom and at what steps during inventory preparation those actions are performed.

Transparency

39. The description of the national system, institutional arrangements, inventory management, QA/QC, verification and approval procedures as well as uncertainties are all included in the QA /QC plan reported in the NIR (tables 1.6 and 1.7) (see para. 38 above). The ERT noted that this is a complex presentation which aims to incorporate institutional arrangements, roles and responsibilities, inventory improvement as well as QA/QC steps and procedures all in two tables, one for internal processes (SHMU) and one for external processes including other institutions. The descriptions in the NIR supporting and explaining these tables are not always transparent or well structured. During the review week, in response to questions raised by the ERT, Slovakia clarified and explained the processes and roles and responsibilities. The ERT recommends that Slovakia include such explanations and clarifications in the NIR of its next annual submission.

40. The NIR is structured according to the UNFCCC reporting guidelines and contains information for each category on data sources, methodology, uncertainties and recalculations. The inventory is generally transparent and the NIR provides much of the information necessary to assess the inventory. EFs and AD are generally described in sufficient detail in the NIR. The transparency of the NIR could, however, be improved for all sectors, as noted in the sectoral chapters of this report. The transparency of the information on the industrial processes sector is quite satisfactory, but could be improved regarding methodological descriptions, which were presented more transparently during the review week (see para. 83 below). With regard to the agriculture sector, there are some shortcomings regarding the availability and transparency of the necessary information in the NIR to enable readers to fully understand the estimates (see para. 101 below). In many instances the NIR was not transparent enough for the ERT to understand the methods used to estimate emissions and removals from the LULUCF sector (e.g. recalculation of the category forest land remaining forest land, absence of justification for emission sources

being reported as "not important in Slovakia" and lack of uncertainty estimates). During the review, Slovakia clarified these methods and was able to provide the original sources of information (e.g. yield tables and quoted articles). The ERT therefore strongly recommends that Slovakia include all relevant clarifications provided during the review week in the NIR of its next annual submission.

41. The ERT considers that the improved transparency of the NIR will facilitate future reviews, particularly centralized and desk reviews; therefore, the ERT recommends that Slovakia review and carefully assess how descriptions in the NIR could be provided in a more systematic and transparent manner, without necessarily making the descriptions longer. The ERT also recommends that, as appropriate, Slovakia review and revise in particular the sections of the NIR which describe the national system, institutional arrangements, inventory preparation and planning, and information on QA/QC and verification, in order to increase transparency.

Inventory management

42. Slovakia has a centralized archiving system, which includes the archiving of disaggregated EFs and AD, and documentation on how these factors and data have been generated and aggregated for the preparation of the inventory. The archived information also includes internal documentation on QA/QC procedures and external and internal reviews, and documentation on annual key categories and key category identification and planned inventory improvements. In addition, the archive stores several types of completed protocols monitoring inventory preparation stages (e.g. protocol of input data, form of working progress, delivery protocol, verification protocol and recalculation protocol). The archive is kept at SHMU. Some components of the archive which are not available electronically, such as scientific papers and industry correspondence, are kept in hard copy at the SHMU or at the institution of the respective sector expert. Information which is not archived centrally is listed in files explaining where it is archived.

43. Slovakia was able to provide archived documents requested by the ERT during the review, including confidential information according to national procedures.

4. Follow-up to previous reviews

44. Slovakia has significantly improved its national system since the 2011 annual submission and the review thereof, when the ERT noted that Slovakia's inventory system was vulnerable and did not appear to fully exercise the leadership and functions that are required of national systems in order to fully comply with the requirements of the annex to decision 19/CMP.1. The ERT commends Slovakia for its efforts in implementing recommendations made in the previous review report in its 2012 annual submission regarding the national system, institutional arrangements and QA/QC management, as well as for the further information provided during the review, such as the "Plan and Progress Report of the Slovak Republic", submitted to the Compliance Committee on 21 September 2012, which was provided to the ERT. The "Plan and Progress Report" includes descriptions of measures that Slovakia has already implemented or intends to implement, and a timetable for these measures. It was developed in response to the recommendations from the previous review report.

45. During the review week, Slovakia clarified that it received the 2011 annual review report later than the deadline for submission of its 2012 annual submission. During the review week, Slovakia nevertheless provided an elaborate Excel file listing all recommendations from the 2011 annual review report and their status of implementation (implemented/planned), including timing and responsibilities for their implementation. The ERT commends Slovakia for its focused efforts and systematic approach in following up on the previous recommendations.

46. Major improvements in response to previous reviews include:

(a) Strengthening the national system (see para. 18 above);

(b) Estimating and reporting non-CO_2 emissions from natural gas under road transportation, previously reported as "NO" (see para. 53 below);

(c) Developing a carbon mass balance approach for iron and steel to disaggregate the emissions allocated into the energy and industrial processes sectors (see para. 68 below);

(d) Improving the reporting of emissions from limestone use in iron and steel production, desulphurization plants, and ceramics and carbide production (see para. 84 below);

(e) Implementing specific QC checks to assess the variability of the AD for ferroalloys production (see para. 94 below);

(f) Ensuring the time-series consistency of the AD for sheep in the category enteric fermentation (see para. 98 below);

(g) Undertaking significant recalculations for forest land remaining forest land on the basis of changes to three elements of the estimation method (see para. 123 below);

(h) Improving the estimates of N_2O emissions from wastewater handling on the basis of new estimated data on protein consumption (see para. 135(a) below).

47. Recommendations from previous review reports which have not yet been implemented, but are planned for the near future include:

(a) To explain all recalculations in CRF table 8(b) by including information on the rationale for changes to the inventory estimates;

(b) To improve transparency with regard to the use of AD from the different data sources employed in the energy sector and to ensure that the AD used are consistent between the different available databases;

(c) To estimate and report emissions from consumption of halocarbons and SF_6 in line with the IPCC good practice guidance and the UNFCCC reporting guidelines, respectively (see para. 93 below).

48. The ERT noted that, in accordance with decision 15/CMP.1, annex, paragraph 4, each Party included in Annex I to the Convention shall describe in its annual inventory any steps taken to improve estimates in areas that were previously adjusted. The 2011 annual review report included adjustments for road transportation and for HFC emissions from foam blowing and aerosols/metered dose inhalers in the category consumption of halocarbons and SF_6. For HFC emissions from foam blowing and aerosols/metered dose inhalers, Slovakia accepted the adjustment, while the adjustments for road transportation were no longer considered necessary, according to the final decision made by the enforcement branch of the Compliance Committee on 17 August 2012. In the Party's 2012 annual submission revised estimates of HFC, PFC and SF_6 emissions from consumption of halocarbons and SF_6 were reported, following recommendations made in the previous review report (see para. 91 below).

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

49. During the review, the ERT identified a number of areas for improvement. These are listed in table 6 below.

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

B. Energy

1. Sector overview

51. The energy sector is the main sector in the GHG inventory of Slovakia. In 2010, emissions from the energy sector amounted to 32,007.79 CO_2 eq, or 69.4 per cent of total GHG emissions. Since 1990, emissions have decreased by 40.6 per cent. The key drivers for the fall in emissions are: a strong, though temporary, decrease in economic activity; economic restructuring towards less-energy-intensive production (mostly after the Party became a member State of the European Union (EU)); switching fuel use from coal and oil to natural gas; market-driven changes in production intensity; and the adoption of national legislation on air quality aimed at the reduction of the emissions of common air pollutants. Within the sector, 29.7 per cent of the emissions were from energy industries, followed by 29.1 per cent from manufacturing industries and construction, 20.8 per cent from transport and 14.2 per cent from other sectors. The category other (energy) accounted for 2.9 per cent and fugitive emissions from oil and natural gas accounted for 2.3 per cent. The remaining 1.0 per cent was fugitive emissions from solid fuels.

52. The Party has made recalculations for the energy sector between the 2011 and 2012 submissions in response to the 2011 annual review report and following changes in AD and EFs. The impact of these recalculations on the energy sector is an increase in emissions of 6.6 per cent for 2009. The main drivers for these recalculations are: the reversion to the use of country-specific NCVs instead of plant-specific NCVs for solid and liquid fuels (see para. 66 below); and the introduction of the carbon mass balance approach to estimate and report the emissions associated with oil refining (see para. 67 below) and iron and steel (see para. 68 below). The main recalculations took place in the following categories:

(a) Manufacturing industries and construction (an emission increase of 50.5 per cent);

(b) Energy industries (an emission decrease of 12.1 per cent);

(c) Other sectors (an emission decrease of 3.0 per cent).

53. Slovakia has reported GHG emissions for all categories of the energy sector for which the Revised 1996 IPCC Guidelines and the IPCC good practice guidance provide methodologies for estimation. The previous review report concluded that there were gaps in the inventory associated with the following categories, although reported as "NO" in the 2011 annual submission: N_2O from gaseous fuel combustion in road transportation; and CO_2 emissions from coal mining and handling, which were estimated and reported in the 2012 annual submission. The ERT commends Slovakia for estimating N_2O emissions from gaseous fuels in road transportation for the period 2000–2010, which is when the use of natural gas in road transportation occurred, and reporting them in its 2012 annual submission. In response to the previous review report, Slovakia provided supporting information to confirm that CO_2 emissions from coal mining and handling are negligible (the volume of CO_2 that is potentially released into the atmosphere is close to zero and the concentration levels are below the limit of determination of the analytical instrument); however this information has not been included in the 2012 NIR. During the review week Slovakia provided this information again and indicated that it would be included in its next annual submission. The ERT recommends that Slovakia implement this improvement in the reporting.

54. Slovakia performed a tier 1 uncertainty analysis for all categories of the energy sector and a tier 2 uncertainty analysis using a Monte Carlo method for all stationary combustion categories. The NIR contains a detailed description of the method used and the results, which indicate an overall uncertainty of the stationary combustion categories within the range of –2.8 per cent to +3.9 per cent. The ERT commends Slovakia for undertaking

this tier 2 uncertainty analysis and encourages the Party to extend this analysis to the mobile combustion and fugitive emissions categories for the next annual submission.

55. The NIR summarizes the QA/QC procedures that the inventory team performs to the AD for the energy sector, which consist of cross-checking the data from the NEIS database with those of the national energy balance (NES) and comparing the CO_2 emissions obtained using the AD from the NEIS database with those obtained with the data compiled under the European Union emissions trading scheme (EU ETS). QC checks of the data input to the NEIS database are performed at its three levels (facility, regional offices and central database of SHMU) while the QA/QC procedures for the national energy balance consist of standard statistical procedures for data collection and evaluation of statistical surveys. During the review, in response to questions raised by the ERT, the Party stated that the NEIS database is equipped to check for completeness, data quality and consistency of the data structure and covers the entire time series of fuel consumption data.

56. Apart from the QC checks of the AD, the NIR does not report specific QC checks for other components of the inventory of the energy sector (for example, estimation methods, EFs and reporting). The ERT encourages that Slovakia implement specific QC checks for components of the energy sector other than AD.

57. During the review, in response to questions raised by the ERT, Slovakia informed the ERT that staff at MoE review the inventory for the energy sector; however, the ERT is of the view that this activity is not consolidated and the reviewers are not completely independent from the development of the inventory. The ERT therefore encourages Slovakia to regularly carry out external independent reviews of the sectoral report as a key QA measure as described in the IPCC good practice guidance.

58. The NEIS database constitutes the basis for the AD used to estimate emissions from stationary combustion. Although the NIR includes a discussion of how the data from NES are used to complement those from NEIS, Slovakia does not explain how the completeness of the disaggregated data from NEIS is ensured against the NES data for all subcategories and fuels. The ERT reiterates the recommendation made in previous review reports that Slovakia ensure consistency between the AD used in the sectoral approach, which are largely based on the NEIS database, and those reported in the national energy balance. During the review, Slovakia informed the ERT that MoE has recently signed an agreement with the Statistical Office of the Slovak Republic aimed at providing information to the inventory team. At the time of the review week there were ongoing negotiations regarding the provision of data disaggregated to the company level. Slovakia envisages that the availability of this information will improve the comparability of the data obtained from the national statistics with that obtained from the NEIS database and the EU ETS reports. The ERT welcomes these efforts, which will improve accuracy and transparency of the inventory, and encourages their prompt implementation.

59. In 2012, Slovakia incorporated a new member to the inventory team who is primarily dedicated to the energy sector. The ERT welcomes this addition to the inventory team.

60. Slovakia has planned a number of improvements for the energy sector, including:

(a) Checking input data (from 2001 onwards) and assessing the harmonization of data gathering in connection with the availability of disaggregated data from national statistics;

(b) Implementing a tier 2 method to estimate the emissions from civil aviation;

(c) Collecting and updating information on inland shipping (tourism) in several lakes and small rivers in the Slovak Republic.

2. Reference and sectoral approaches

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

61. CO_2 emissions from fuel combustion were calculated using the reference approach and the sectoral approach. For 2010, CO_2 emissions estimated by the sectoral approach (30,469.21 Gg) are 9.6 per cent lower than emissions estimated by the reference approach (33,576.55 Gg). However, the corresponding total energy consumption estimated by the sectoral approach (448.19 TJ) is only 0.9 per cent lower than the total apparent energy consumption, excluding non-energy use of fuels and feedstocks, estimated by the reference approach (452.37 TJ). The NIR reports the time series 1990–2010 of the CO_2 emission estimates by both approaches and provides explanations for the fluctuations in the differences between the emission estimates for both approaches over the years. From the carbon mass balance model that Slovakia has implemented for iron and steel in the 2012 annual submission (see para. 68 below), the Party has estimated the amount of coking coal used as a reductant in the industrial processes sector and the associated CO_2 emissions that amount to 3,790.16 Gg. The Party added this amount to the emissions estimated by the sectoral approach, and the difference between both approaches was –2.6 per cent in 2010 (the reference approach minus the sectoral approach). The ERT is of the view that this estimated amount should be subtracted from the CO_2 emissions estimated by the reference approach in order to be consistent with the methodology that subtracts from the estimates of the reference approach the corresponding CO_2 emissions from the use of fuels as feedstock and the non-energy use of fuels. Following this approach, the differences in CO_2 estimates between both approaches amount to –2.8 per cent in 2010. Nevertheless, the ERT welcomes this improvement in verifying the CO_2 emissions estimates by the sectoral approach.

62. The ERT notes that Slovakia reports null amounts of carbon stored for solid and gaseous fuels in the period 2002–2004. During the review, in response to questions raised by the ERT, Slovakia indicated that the amount of carbon stored for these fuels was not reported in the national energy statistics published by the Statistical Office of the Slovak Republic for 2002–2004. In addition, the Party informed the ERT that it was considering estimating the missing data. The ERT welcomes this development, encourages its prompt implementation and recommends that Slovakia use an approach in line with the IPCC good practice guidance to estimate the missing data.

International bunker fuels

63. The consumption of jet kerosene in the period 1990–2008 for the international aviation bunker represents 90.0 per cent on average of the total consumption at Slovak airports (domestic and international flights), while for the period 2009–2010 this share has increased to 95.0 per cent on average. For aviation gasoline, Slovakia assumes that 10.0 per cent of the fuel sold at airports is used for international flights for the whole period. The Party indicates in the NIR that these shares are based on expert judgement, but the ERT noted that the Party does not provide enough supporting information, as recommended in previous review reports. During the review, in response to questions raised by the ERT, Slovakia informed the ERT that the inventory team has been able to conduct a preliminary corroboration of the expert's estimation on the basis of information on the number of flights and types of aircrafts, obtained through questionnaires from the four local international airports and the analysis of the confidential information compiled in the Eurocontrol database. The ERT recommends that Slovakia provide this clarification in the NIR of its next annual submission. The ERT also recommends that Slovakia investigate the representativeness of the assumed constant shares of fuel consumption between aviation and the international bunker throughout the entire time series.

64. Emissions from marine bunkers are the result of diesel oil used for waterborne freight transportation on the Danube river. The estimates are calculated on the basis of the fuel sold at the two major ports in the country, Bratislava and Komarno. The NIR indicates that the large variability of AD is associated with fuel prices in Slovakia and in the neighbouring countries. To improve transparency, the ERT encourages Slovakia to include the time series of local diesel oil prices and, if available, the prices of this fuel in the neighbouring countries.

Feedstocks and non-energy use of fuels

65. Liquid fuels (ethane, gas oil, liquefied petroleum gas (LPG), naphtha and other fuels), solid fuels (coking coal) and natural gas are used as feedstocks in Slovakia. In addition, other non-energy use is associated with bitumen and lubricants. Default values from the Revised 1996 IPCC Guidelines are used to estimate the fraction of carbon stored under the reference approach. During the review, in response to questions raised by the ERT, Slovakia informed the ERT that these default values are consistent with the country-specific data estimated on the basis of plant-specific information and expert judgement. The ERT recommends that Slovakia include this information and the associated supporting data in the NIR of its next annual submission. The previous review report indicated that the quantity of natural gas used as feedstock in ammonia synthesis was reported as "NO" in CRF table 1.A(d) for the period 2002–2004. During the review, Slovakia indicated that it is aware of this issue and confirmed that these data are not reported in the NES for this particular period. Slovakia also indicated that it would consider filling this gap on the basis of the data provided by the ammonia producer. The ERT welcomes this approach.

3. Key categories

Stationary combustion: solid, liquid and gaseous fuels – CO_2, CH_4[7] and N_2O

66. In the NIR, Slovakia explains that fuel consumption values in mass or volumetric units for solid and liquid fuels from the NEIS database are converted into energy units using country-specific NCVs from the national energy statistics. During the review, in response to questions raised by the ERT, the Party informed the ERT that these NCVs are derived from measurements performed in major facilities. Slovakia also indicated that, for the 2011 annual submission, NCVs for the main fuels were taken directly from the EU ETS reports; however, Slovakia explained that this approach led to time-series inconsistencies and discrepancies in the reporting between the reference approach and the sectoral approach because of statistically significant differences between the NCV values reported by NEIS and those reported under the EU ETS. Under these circumstances, for the 2012 annual submission, Slovakia decided to revert to the use of country-specific NCVs instead of those plant-specific values used in the previous annual submission. Although the ERT appreciates the effort of Slovakia to avoid discrepancies, it is of the view that inconsistencies are not resolved by reducing the accuracy for more recent years. Given the wealth of plant-specific information that the Party already has available and that it is expected to increase with the data from the Statistical Office, the ERT encourages Slovakia to consider exploiting this information by:

(a) Identifying and selecting the NCVs reported under the EU ETS that are in line with the IPCC good practice guidance;

[7] Non-CO_2 emissions under this category are not key categories. However, since the calculation procedures for issues related to this category are discussed as a whole, the individual gases are not assessed in separate sections.

(b) Using a statistical analysis to generate NCVs and using them as country-specific values in the sectoral approach for those cases in which the Party does not have plant-specific ones, or for cross-checking purposes with the data from the national energy statistics.

67. For petroleum refining, Slovakia developed a carbon mass balance model that allows the estimation of the carbon flows associated with the production, recycling and consumption of petroleum-derived fuels under this subcategory. The model also considers the consumption of natural gas, which may be used as a fuel for heating and as a feedstock to produce hydrogen for use in the oil refinery cracking processes. Although the NIR lacks transparency regarding the description of the carbon balance, during the review Slovakia provided explanations that allowed the ERT to understand the estimation and allocation of the associated CO_2 emissions. Within the framework of the oil refinery, the model takes into account the following carbon flows: (i) inputs of crude oil, natural gas, refinery gas and petroleum coke; (ii) outputs of petroleum products that are used for energy purposes under all energy combustion subcategories; (iii) outputs of petroleum products in which carbon is stored (e.g. lubricants, bitumen); and (iv) recycling of products (e.g. naphtha and refinery feedstocks) back to the refinery process. The result of the described carbon balance is assigned to the fuel combusted under petroleum refining and the corresponding CO_2 emissions are estimated and reported under this subcategory. The ERT commends Slovakia for the effort made to estimate CO_2 emissions under petroleum refining to ensure completeness and avoid double counting. CH_4 and N_2O emissions are estimated on the basis of the amounts of natural gas, refinery gas and petroleum coke combusted. The ERT is of the view that the reporting of CO_2 and non-CO_2 emissions under this subcategory is inconsistent because of the use of different AD. The ERT recommends that Slovakia reconsider its reporting so that CO_2, CH_4 and N_2O emissions under petroleum refining are reported in a consistent manner and strongly recommends that the Party improve transparency regarding the description of the carbon balance and the estimation and allocation of the associated CO_2 emissions in the NIR of its next annual submission.

68. Slovakia has developed a carbon mass balance model to estimate and allocate the carbon flows associated with the consumption of solid fuels in blast furnaces in integrated steel mills. This approach has allowed the Party to: (a) disaggregate the carbon being combusted in the energy sector under the subcategory iron and steel within the category manufacturing industries and construction with that used as a reductant in the industrial processes sector under the subcategory iron and steel production; and (b) identify the main driver for the difference in CO_2 emissions between the sectoral and the reference approaches. The ERT commends Slovakia for this development and recommends that the Party improve the transparency in the NIR regarding the description of this carbon mass balance approach and the allocation of the resulting emissions in its next annual submission.

69. Slovakia informed the ERT during the review that the use of all fuels in the subcategory residential, which is below 0.3 MW, is not individually identified in the NEIS database. Solid fuel consumption is estimated using information on the amount of solid fuel sold annually to households by retailers, which is obtained from specific questionnaires that are completed within the framework of Slovak legislation. Data on natural gas consumption in households is directly retrieved from monthly reports issued by the Slovak gas industry. However, the ERT noted that, during the period 1990–2000 the questionnaires on fuel consumption in households were not carried out on an annual basis, and the missing data are estimated to obtain a consistent time series of fuel consumption values. Slovakia did not provide a transparent explanation in the NIR or during the review to explain how the alternative data on fuel consumption in households reported in the national energy statistics were used. The ERT commends Slovakia for its specific data collection for this subcategory; however, the ERT recommends that the Party indicate, in the NIR, whether the information

in the national energy statistics is used to estimate or cross-check the fuel consumption data under the subcategory residential.

70. Except that for 2008, the CO_2 implied emission factor (IEF) for gaseous fuels under the subcategory residential for the period 2000–2010 is about 3.5 per cent lower than that of 1990 (the values of the IEF, expressed in t CO_2/TJ, are: 57.0 (1990), 57.0 (2008) and 55.1 (2010)). During the review, in response to questions raised by the ERT, Slovakia indicated that this inconsistency in EFs for natural gas in 2008 was identified by the Party through the corresponding QC check and clarified that it resulted from an erroneous reporting of natural gas consumption in the corresponding CRF sectoral background table. Slovakia informed the ERT of how this error will be corrected in its next annual submission, when the resulting IEF will become 54.8 t CO_2/TJ. The ERT welcomes this improvement in reporting and recommends that Slovakia make these corrections for its next annual submission. During the review, Slovakia provided the ERT with the average composition of the natural gas combusted in the country. The ERT noted that this composition is consistent with a CO_2 EF of about 55.0 t CO_2/TJ. However, the ERT is of the view that Slovakia has not indicated whether the differences in CO_2 IEFs in the early years (1990–1999) arise from the physical properties of natural gas or from time-series inconsistencies in fuel consumption data. The ERT therefore recommends that the Party investigate this issue and provide a brief explanation in the NIR of its next annual submission.

Road transportation: liquid, gaseous and biomass fuels – CO_2, CH_4 and N_2O[8]

71. The previous ERT calculated adjustments for several subcategories, namely gasoline (CO_2 and N_2O); diesel oil (CO_2 and N_2O); LPG (CH_4 and N_2O); gaseous fuels (CH_4) and biomass (CH_4), on the basis that the Party did not provide satisfactory background data and/or sufficiently transparent information to enable the ERT to assess the emission estimates. Regarding AD, Slovakia indicates in the NIR of its 2012 annual submission that the inventory team directly retrieves vehicle fleet composition data for the specific database (Information System for Vehicle Evidence) that is operated by the Slovak Police. The NIR does not describe in a transparent manner the sources of other distance-based values and parameter values that are necessary to run the COPERT IV model, particularly kilometres travelled. During the review, in response to questions raised by the ERT, Slovakia indicated that accurate data on kilometres travelled are not available in Slovakia and therefore these AD are estimated according to the recommendations provided within the framework of the COPERT IV model and specified on the basis of fuel balance. Slovakia also informed the ERT that the main source for the estimation of shares of urban, rural and highway driving is the traffic census that is done every five years, the last ones being undertaken in 2000, 2005 and 2010. The ERT recommends that Slovakia improve the discussion of the selection of values and parameters in the NIR of its next annual submission and report the information provided to the ERT during the review. Regarding CO_2 emissions, Slovakia uses a fuel-based approach embedded in the COPERT IV model to estimate CO_2 emissions from road transportation. For the period 1990–2010, the ERT notes that the CO_2 IEFs for gasoline and diesel oil are in good agreement with the corresponding country-specific CO_2 EFs reported by the Party; the CO_2 IEFs for LPG are in general somewhat higher than the corresponding country-specific CO_2 EFs, while the CO_2 IEF for natural gas is noticeably higher than the corresponding country-specific CO_2 EFs. In 2010, the CO_2 IEF for LPG is 66.09 t CO_2/TJ while the country-specific CO_2 EF is 63.74 t CO_2/TJ. For natural gas the 2000–2010 values are: 80.20 t CO_2/TJ (IEF) and 55.11 t CO_2/TJ (EF). During the review, in response to questions raised by the ERT, Slovakia indicated that the reason for these discrepancies is

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

the NCVs, reported by the Slovak Transport Research Institute, which were used in runs of the COPERT IV model. The NCVs are 0.034 TJ/t for compressed natural gas (IPCC default 0.048 TJ/T) and 0.466 TJ/t for LPG (IPCC default 0.0473 TJ/T). The ERT strongly recommends that Slovakia resolve these discrepancies for its next annual submission and, if appropriate, undertake the corresponding recalculations. Regarding non-CO_2 emissions, during the review Slovakia provided the ERT with information on the values used for setting and calculating the EFs and the corresponding emissions in the COPERT IV model and the justification for their application. In addition, Slovakia informed the ERT of the results of a comparative assessment of CH_4 and N_2O emissions, which showed that the emission estimates of Slovakia were compatible with those of other European countries. The ERT recommends that Slovakia include this information in its next annual submission.

4. Non-key categories

Civil aviation: liquid fuels – CO_2, CH_4 and N_2O

72. Slovakia applies a tier 1 approach to estimate emissions, and expert judgement to estimate the split between civil aviation and the international aviation bunker (see para. 63 above). Slovakia explained this in its NIR. Slovakia envisages that more accurate estimates may be obtained on the basis of a recently prepared tier 2 method, which uses the amount of fuel sold at airports and the number of movements with the differentiation for national and international flights. This development is associated with the inclusion of aviation in the EU ETS after 2012. However, during the review, Slovakia informed the ERT that only two aviation companies have been included in the scheme. Slovakia indicates in the NIR that the preliminary results of this methodology have confirmed the expert's estimation on the split between civil aviation and international bunker fuels. The ERT welcomes this development, recommends its prompt implementation and also recommends that Slovakia improve the discussion of the corroboration of the expert's estimates in its next annual submission.

Navigation: liquid fuels – CO_2, CH_4 and N_2O

73. The NIR indicates that navigation in Slovakia occurs to a limited extent and is practically restricted to recreational boats. Slovakia undertook a detailed estimation of navigation for 2008 and the emissions in 2009 and 2010 were estimated by extrapolation using gross domestic product as the driving variable. The NIR also indicates that emissions from inland shipping on the Danube river are included under international marine bunkers. However, the ERT is of the view that some domestic navigation may occur on the Danube and recommends that Slovakia investigate this issue further and estimate these emissions, in case they do occur, for the next annual submission.

Coal mining and handling: solid fuels – CO_2

74. CO_2 emissions are reported as "NO", although the ERT noted that AD exist and the associated CH_4 emissions are estimated and reported. The ERT noted that the appropriate notation key for reporting the CO_2 emissions would be either not applicable ("NA") or not estimated ("NE") and therefore recommends that the Party use the most suitable option for the reporting in its next annual submission.

C. Industrial processes and solvent and other product use

1. Sector overview

75. In 2012, emissions from the industrial processes sector amounted to 8,621.51 Gg CO_2 eq, or 18.7 per cent of total GHG emissions, and emissions from the solvent and other

product use sector amounted to 165.34 Gg CO_2 eq, or 0.4 per cent of total GHG emissions. Since the base year, emissions have decreased by 9.7 per cent in the industrial processes sector, and increased by 11.7 per cent in the solvent and other product use sector. The key drivers for the fall in emissions in the industrial processes sector are economic and political circumstances affecting AD, operational performance and emission abatement technology investments, which resulted in emission decreases of CO_2 from cement production, from ammonia production and from iron and steel production, decreases of N_2O emissions from nitric acid production and a decrease of PFC emissions from aluminium production. These reductions are partially offset by increases of emissions of CO_2 from carbide production and from aluminium production and emissions of HFCs, PFCs and SF_6 from consumption of halocarbons and SF_6. Compared with in 2009, emissions from industrial processes increased by 2.9 per cent in 2010, indicating a modest recovery after the economic downturn between 2007 and 2009. Within the industrial processes sector, 49.5 per cent of the emissions were from metal production, followed by 26.7 per cent from mineral products, 18.7 per cent from chemical industry and the remaining 5.1 per cent were from consumption of halocarbons and SF_6.

76. The increase in emissions from the solvent and other product use sector between the base year and 2010 can be attributed mainly to N_2O emissions from aerosol cans, although this increase was partly offset by a decrease in emissions from paint application, resulting in an overall increase in emissions by 17.2 Gg CO_2 eq or 11.6 per cent. Between 2009 and 2010, emissions decreased by 0.04 Gg CO_2 eq or 0.02 per cent.

77. Within the solvent and other product use sector, 49.2 per cent of the emissions came from other uses, followed by 35.8 per cent from paint application and 11.3 per cent from chemical products, manufacture and processing. The remaining share (3.7 per cent) came from degreasing and dry cleaning. CO_2 emissions in this sector account for 50.8 per cent; the remaining 49.2 per cent are N_2O.

78. The Party has made recalculations for the industrial processes sector between the 2011 and 2012 submissions in response to the 2011 annual review report, in order to lift applied adjustments and as result of its internal QA. The impact of these recalculations on the industrial processes sector is a decrease in emissions of 11.8 per cent for 2009. The recalculations also result in a decrease of 11.0 per cent in 1990. The rationale and effects of the recalculations are properly addressed and reported in the NIR. However, no information was presented in CRF table 8(b). The main recalculations took place in the following categories:

(a) Limestone use: a reallocation of CO_2 emissions from this category to carbide production and a reallocation from metal production to this category (resulting in an emission increase of 170.1 Gg CO_2 eq or 143.0 per cent);

(b) Ammonia production: CH_4 and N_2O emissions were revised due to an error in the applied AD (resulting in an emission decrease of 21.6 Gg CO_2 eq or 94.5 per cent for CH_4 and a decrease of 5.9 Gg CO_2 eq or 94.4 per cent for N_2O);

(c) Nitric acid production: N_2O EFs were revised to reflect the new available measured N_2O concentrations from the actual operating situation of the plant (resulting in an emission decrease of 147.4 Gg CO_2 eq or 11.9 per cent);

(d) Carbide production: CO_2 emissions from limestone use were included (resulting in an emission increase of 69.1 Gg CO_2 eq or 47.7 per cent);

(e) Iron and steel production: CO_2 emissions were revised (partly reallocated to the energy sector) based on the carbon balance of the integrated iron and steel plant and CO_2 emissions from limestone use were reported under that category (resulting in an emission decrease of 353.7 Gg CO_2 eq or 8.0 per cent);

(f) Ferroalloys production: CO_2 emissions were revised to ensure time-series consistency for the years 1990–2001;

(g) Aluminium production: CO_2 emissions were revised based on the actual carbon content of the anodes (resulting in an emission increase of 19.4 Gg CO_2 eq or 10.6 per cent);

(h) Consumption of halocarbons: HFC emissions were revised as result of the previous review (resulting in an emission increase of 81.0 Gg CO_2 eq or 27.0 per cent).

79. The Party has not made recalculations for the solvent and other product use sector between the 2011 and 2012 submissions.

80. The ERT noted that the Party's 2012 annual submission is an improvement on the previous annual submission because many of the recommendations made during previous reviews have been properly addressed:

(a) To report all emissions from limestone use in that category;

(b) To ensure a robust national expert team for the industrial processes sector;

(c) To apply QA/QC procedures to identify inter-annual changes in EFs and AD;

(d) To provide a carbon mass balance for the iron and steel category.

81. Also during the review week, the Slovak experts were able to respond adequately and satisfactory to questions raised by the ERT, except for issues related to the category consumption of halocarbons and SF_6.

82. The NIR is structured according to the UNFCCC reporting guidelines and contains per category information on data sources, methodology, uncertainties (tier 2) and recalculations. The ERT noted that the use of notation keys in the CRF tables is not consistent, especially for indirect emissions. The ERT recommends that the Party apply them more carefully and explain the use of the notation keys. The necessary QA/QC procedures for reporting have not been correctly applied, because the ERT noticed that inconsistencies had arisen in a number of uncertainty analysis figures and tables during the process of converting the original sectoral report in MS Word format to the PDF format of the NIR. The ERT recommends that the Party conduct a final QA/QC check before submitting the NIR to ensure consistency between the NIR and underlying sectoral reports.

83. The NIR is transparent. However, it could be improved regarding the descriptions of the methodologies used, which were presented more transparently during the review week. Although sectoral QA/QC procedures are in place and are implemented, the ERT considers that the reporting thereon in the NIR could be improved by including information on: the use of the NEIS database and of EU ETS data; verification and corrective procedures in relation to information obtained from bottom-up questionnaires; and the documentation and archiving of sectoral reports and background calculations, methodology and data as presented during the review. The ERT therefore recommends that Slovakia include this information, for example by including data and control flow charts, in its next annual submission.

2. Key categories

Limestone and dolomite use – CO_2

84. Following recommendations in previous review reports, within this category, Slovakia now reports separately on limestone use in iron and steel, desulphurization plants and ceramics, distinguishing between limestone and dolomite where applicable. The ERT commends the Party for doing so. The ERT noted, however, that limestone use for

desulphurization in power plants showed a considerable decrease between 2009 and 2010 (by 25.3 Gg $CaCO_3$ or 29.5 per cent). This decrease in use is not consistent with the trend in electricity production from coal and lignite power plants (based on International Energy Agency statistics for 2012), which did not show a similar decrease (only a decrease of 284 GWh or 7.7 per cent). During the review week, in response to questions raised by the ERT, the Party explained that the largest of the power plants concerned consumed not only limestone (emissions reported under this category), but also lime from an independent producer, the emissions of which are reported under the category lime production. The Party provided the ERT with evidence of a corresponding increase in lime production from the concerned producer. The ERT recommends that Slovakia include this explanation for the decreased use of limestone in power plants in its next annual submission.

Carbide production – CO_2

85. The ERT noted that Slovakia implemented the recommendations in previous review reports and allocated emissions related to limestone consumption for carbide production under this category, and did this for the whole time series. In response to questions raised by the ERT, the Slovak expert explained during the review that there are indications that not all reported emissions from carbide consumption (acetylene) are actually emitted in Slovakia because a certain amount of carbide is exported. The ERT encourages Slovakia to investigate this further and report on its findings in the next annual submission.

Iron and steel production – CO_2

86. Following a recommendation from the previous review report, Slovakia revised its allocation of emissions from iron and steel production by applying a carbon balance methodology, disaggregating emissions allocated to subcategories in the energy and industrial processes sector. The ERT commends the Party for undertaking this effort. However, the ERT noticed some lack of transparency (specifically for coke oven and blast furnace gas) regarding the illustration of the carbon balance included in the NIR. During the review, in response to questions raised by the ERT, the Slovak experts specified that the carbon flow chart reported in the NIR only covered emission allocations within the site boundaries of the single Slovakian integrated steel mill and not the whole iron and steel category. The ERT concluded that emissions from carbon flows going outside the boundaries of the iron and steel process are correctly accounted for under the corresponding subcategories of the energy sector. In addition, Slovakia performed a comparative analysis of its results against emissions data obtained from the EU ETS; the difference was about 0.5 per cent. The ERT commends Slovakia for the improvements resulting from the preparation of the carbon balance but recommends that the Party further increase the transparency of reporting by reporting the information shown to the ERT during the review in the NIR of its next annual submission.

87. The ERT noted that, in the NIR, the reported CO_2 EFs for electric arc furnaces showed a wide range, from 0.049 to 0.165 t/t steel, depending on the plant. During the review, in response to questions raised by the ERT, the Party explained that this was due to the types of metal scrap used by the three plants, namely scrap which has different carbon contents and thus leads to different EFs. The ERT recommends that the Party add this information in the NIR of its next annual submission.

Aluminium production – CO_2 and PFCs

88. The ERT noted a varying EF for CO_2 in this category, after being constant for many years (1.8 t CO_2/t aluminium in 1990–1995, 1.5 t/t in 1996–2004 and 1.35 to 1.47 t/t in 2005–2010). In response to questions raised by the ERT during the review, the Party provided the confidential information that explains the decrease of EF below 1.4 ton

CO_2/ton in the time period 2006–2009. During the review, the ERT agreed with this justification. During the review, the Party indicated that it intends to investigate historic EFs to ensure their consistency. The ERT commends Slovakia for undertaking such QC efforts and recommends that the Party report transparently on the outcomes of its investigations in its next annual submission.

89. PFC emissions from aluminium production show a considerable decrease after the modernization of the plant in 1996 (87.0 to 96.0 per cent compared to 1990 in 1996–2010). Slovakia estimated emissions using a tier 3 approach and checked the results using the NEIS database. However, no information on the applied standards or protocols for the measurement system on the site could be provided during the review. In order to increase transparency, the ERT recommends that Slovakia acquire this information and report on it in its next annual submission.

Consumption of halocarbons and SF_6 – HFCs

90. Emissions from consumption of halocarbons and SF_6 are based on a comprehensive and extensive data collection system in Slovakia. Operators handling F-gases are required to report annually on the amount of substances handled by them. This annual reporting by companies is mandatory in order to be certified, which also has an annual validity. Since 2009, this system has existed in a web-based form. From this database, potential and actual emission estimates are derived by substance and application.

91. Slovakia has submitted revised estimates of HFC emissions from foam blowing and aerosols/metered dose inhalers for the whole time series, in order to replace the adjusted estimate calculated by the previous ERT. These revised HFC emissions were included in the 2012 annual submission, resulting in minor increases in the estimated emissions for 1999–2009, by 0.3 to 8.6 Gg CO_2 eq.

92. During the current review, the ERT noted that the methodology for estimating HFC emissions from refrigeration was not transparent, as it was not clear how the rolling annual stock of substance was calculated and if emissions from disposal were included in the stock leakage emissions. In addition, lack of QC led to incomplete reporting of emissions for this subcategory, thus causing a potential underestimation for the whole time series: only emissions from stocks were reported, not those from new fillings. During the review it became clear to the ERT that the national sectoral expert had access to more complete underlying AD and emissions data but was unable to report these emissions during the review week owing to the applied national methodology, as CRF Reporter did not convert the national estimates properly into the relevant CRF tables. For some other subcategories, for example fire extinguishers and foam blowing, it was not clear to the ERT whether emissions from disposal were included in the reported estimates, because details were not provided in CRF table 2(II).F. In response to the list of potential problems and further questions raised by the ERT during the review week, and following the recommendations of the ERT, Slovakia revised its national methodology by separating emissions from new fillings, stocks and disposal and revised the estimates of emissions from consumption of halocarbons to be in line with the IPCC good practice guidance and with the reporting format of CRF table 2(II).F, in order to ensure that all emissions for all relevant subcategories were reported according to the UNFCCC reporting guidelines. In the submission of revised estimates on 14 December 2012, HFC emissions from refrigeration and air-conditioning, foam blowing, fire extinguishers, aerosols/ metered dose inhalers and electrical equipment have been estimated taking into consideration all contributing components. The ERT accepted the revised estimates and recommends that Slovakia continue to estimate and report these emissions in this manner. The ERT also recommends that the Party include a detailed and complete description of the applied methodology in its next annual submission, as well as report on any further improvements made to it.

93. However, in spite of the improvements in estimating and reporting HFC emissions, the ERT noticed a number of remaining shortcomings in the submission of revised estimates:

(a) For refrigeration, the detailed split of species of F-gases across applications for the years 1995 to 2009 has been based on the 2010 split, for which detailed data were available. This approach leads to small deviations for the years 1995–2009 compared with a methodology in which stock and emissions are based on the previous year's stock, additions and losses. As this does not lead to systematic underestimates, the ERT accepts this approach for this review but recommends that Slovakia further improve its methodology for its next annual submission in order to avoid these small deviations;

(b) Slovakia includes in its inventory emissions from HFC-245fa and HFC-365mfc, substances that are not covered by the UNFCCC reporting guidelines. Although the ERT commends the Party for estimating such emissions, it noted that these emissions should not be included in the national total and therefore recommends that Slovakia report them informatively only in CRF table 9(b) and not in CRF table 2(II). By including these emissions, Slovakia overestimates its 2010 emission estimates by 0.37 Gg CO_2 eq. The ERT recommends that Slovakia correct this overestimate in its next annual submission;

(c) Emissions of HFC-32 are double counted in CRF table 2(II), while CRF table 2(II).F provides the correct estimate. This leads to an overestimate of 7.28 Gg CO_2 eq in 2010. The ERT recommends that Slovakia correct this overestimate in its next annual submission.

3. Non-key categories

Ferroalloys production – CO_2

94. In response to a comment formulated in the previous review report regarding the reported decrease in AD in 2009, which was actually a result of the economic crisis in that year, Slovakia performed an in-depth comparative analysis of source data for AD, including the United States Geological Services (USGS) data, and provided the outcomes thereof during the review. The ERT concluded that there was neither inconsistency nor lack of transparency regarding the AD, and that the economic revival led to higher AD in 2010. In addition, the Party presented during the review a comparative analysis of the time series showing that the effects of the change in methodology (transition from tier 2 to tier 3 in 2002) did not affect time-series consistency. The ERT commends Slovakia for performing such QA exercises on its inventory data for this category. However, in order to enhance the quality of the NIR, the ERT recommends that Slovakia include such specific information on the QA/QC activities that have been performed in its next annual submission, in the sectoral chapters or in an annex.

D. Agriculture

1. Sector overview

95. In 2010, emissions from the agriculture sector amounted to 3,098.29 Gg CO_2 eq, or 6.7 per cent of total GHG emissions. Since 1990, emissions have decreased by 56.5 per cent. The key driver for the fall in emissions is the reduction in the livestock population and the decrease in the consumption of mineral fertilizers due to the economic and political transition to a market economy which occurred in the country in the early 1990s. Within the sector, 56.4 per cent of the emissions were from agriculture soils, followed by 27.7 per cent from enteric fermentation, and 15.9 per cent from manure management.

96. The Party has made recalculations for the agriculture sector between the 2011 and 2012 submissions in response to the 2011 annual review report and following changes in methodology. The impacts of these recalculations on the agriculture sector are an increase in the estimated emissions of 1.1 per cent for 2009 and 0.9 per cent for 1990. The recalculations include the impacts of the revised estimates in response to the list of potential problems and further questions raised by the ERT during the review week. The main recalculations took place in the following categories:

(a) N_2O emissions from agriculture soils, in response to the list of potential problems and further questions raised by the ERT during the review (see para. 105 below);

(b) CH_4 emissions from enteric fermentation of sheep for the period 1990–2004, because of an improvement of the method in order to ensure time-series consistency (see para. 98 below).

97. The data provided in the CRF tables and the NIR are generally consistent. Some typographical errors were found in both CRF table 4.B(a) for 2009 and 2010 (swine and poultry) and in the NIR (table 6.13). The ERT recommends that Slovakia improve the consistency of the NIR of next annual submission.

2. Key categories

Enteric fermentation – CH_4

98. Slovakia applies the tier 2 approach for dairy cattle, non-dairy cattle and sheep, and uses a tier 1 approach for goats, horses and swine, which is in line with the IPCC good practice guidance. However, the tier 2 approach was only applied to the AD for sheep for 2004 onwards. In previous review reports, it was recommended that Slovakia ensure the time-series consistency by applying a tier 2 approach for the period 1990–2003 for sheep. During the review, the ERT noted that this issue has been resolved in this annual submission. The ERT commends Slovakia for its efforts in ensuring time-series consistency.

99. During the review, the ERT noted that the CH_4 IEF for non-dairy cattle increased by 13.2 per cent between 2000 and 2001, although the average gross energy intake increased by only 1.7 per cent in same period. The NIR (chapter 6.2.3, table 6.5) explains that Slovakia uses a tier 2 method to estimate emissions for this category and that the EFs are based on country-specific parameters, such as average gross energy intake and category of cattle, as well as explaining that the numbers of cattle in the categories of non-dairy cattle (bulls, fathering or young cattle), which have decreased since 2008, have been influenced by the economic crisis. However, the ERT noted that the explanation in the NIR is not sufficient to explain such an increase in the IEF of 13.2 per cent. The ERT therefore recommends that Slovakia investigate the change in the IEF and include the reason for such a change in the NIR of its next annual submission.

100. The NIR states that the method used to estimate emissions for cattle takes into account the different ages of cattle but does not provide any details regarding the different cattle age categories. The ERT considers that the explanation is not sufficiently transparent and therefore recommends that, in the NIR of its next annual submission, Slovakia improve the transparency of its explanation of the method used to estimate emissions for young cattle.

Manure management – N_2O

101. During the review, the ERT noted that nitrogen (N) excretion (Nex) for swine and poultry fluctuated during the period 1990–2010 (for swine, from 15.66 to 17.03 kg N/head/year; and for poultry, from 0.73 to 0.77 kg N/head/year). The ERT noted that for swine the Nex rate seems to be low compared with the IPCC default (16–20

kg N/head/year). During the review, in response to questions raised by the ERT, Slovakia provided the calculation worksheet and the ERT assessed it. The ERT noted that the Party's estimates use disaggregated information on the type of swine (e.g. sows and piglets). The Nex for sows and piglets is 36 kg N/head/year and 15 kg N/head/year, respectively, and those values, which are from the *EMEP/EEA air pollutant emission inventory guidebook 2009*,[9] are used for the calculations. The Nex for swine is calculated as a weighted average of that for sows and piglets. Poultry disaggregate into hens, broilers and other (ducks and turkeys). Taking into account the calculation process of Nex for swine and poultry, the ERT concluded that the Nex values naturally fluctuate because of the nature of the livestock population. However, in order to improve the transparency of the Party's reporting, the ERT recommends that Slovakia provide an explanation of the fluctuation in the Nex in the NIR of its next annual submission.

Agricultural soils – N_2O

102. The NIR stated that the IPCC tier 1 method is used for the estimation of emissions for the category agricultural soils, and provided the assumption that 20 per cent of N is evaporated to the atmosphere for the subcategory animal manure applied to soils. This percentage is consistent with the IPCC default $Frac_{GASM}$ (0.2 kg NH_3–N+NO_X–N/kg of N excreted by livestock). This implies a value of 80 per cent for N included in faeces from animal waste management systems (AWMS). However, the ERT noted that Slovakia reports a value of 70 per cent for N included in faeces from AWMS in the subcategory animal manure applied to soils (table 6.16 of the NIR and CRF table 4.D). This would mean that 30 per cent of the N was evaporated, and the ERT noted that this is inconsistent with the description in the NIR.

103. The N evaporated in the subcategory animal manure applied to soils is used for estimating N_2O emissions for the subcategory atmospheric deposition (indirect emissions). In this subcategory, the assumption applied is that 20 per cent of N included in faeces in AWMS is evaporated. Based on this observation, the ERT concluded that 10 per cent of N included in faeces in AWMS is missing in the N_2O emission estimates from this subcategory. This implies a potential underestimation. Additionally, the ERT noted that N-flows in the subcategories animal manure applied to soils and atmospheric deposition are interlinked.

104. In response to a question raised by the ERT during the review week, Slovakia provided an explanation that, based on academic research, 10 per cent of N applied to soils is discharged to the water regime during the winter because of frozen soils. The ERT considered that the explanation seems to be reasonable; however, Slovakia could not provide the academic reference to the ERT during the review week. Additionally, the Slovak sectoral expert was of the view that this amount of N discharged to water is not to be included in the estimates of the agriculture sector but estimated and reported elsewhere. The ERT considered that this amount of N discharged to the water regime should be included in the agriculture sector in the subcategory nitrogen leaching and run-off (indirect emissions), according to chapter 4.8 of the IPCC good practice guidance. The ERT recommended that Slovakia provide evidence that the N_2O emissions associated with the amount of N discharged to water are included elsewhere in the Slovakian inventory, or apply a consistent treatment to estimate the emissions for the subcategories animal manure applied to soil, atmospheric deposition and leaching and run-off, ensuring the complete coverage of the estimates; and submit revised estimates for the relevant categories with transparent documentation on the estimation method.

[9] Available at <http://www.eea.europa.eu/publications/emep-eea-emission-inventory-guidebook-2009>.

105. In response to the list of potential problems and further questions raised by the ERT during the review week, Slovakia submitted revised estimates of N_2O emissions from animal manure applied to soil applying a value of 80 per cent for N included in faeces from AWMS for the estimation, instead of 70 per cent. The ERT agrees with the revised estimates. The ERT therefore recommends that Slovakia ensure the completeness of the estimates of emissions from N applied to soils and provide explanations of the completeness of the coverage of N applied to soils in its NIR, even if Slovakia were to apply another method (e.g. country-specific method) for the estimation of this category in the next annual submission.

106. During the review week, the ERT noted that the AD for N_2O emissions from synthetic fertilizers (direct soil emissions) for the period 1997–2005 were different from the information from the Statistical Office of the Slovak Republic. In conjunction with its response to the list of potential problems and further questions raised by the ERT during the review week, Slovakia submitted revised estimates of N_2O emissions from synthetic fertilizers for the period 1997–2005 using the same data as the information from the Statistical Office of the Slovak Republic, and the ERT agreed with the revised estimates. The ERT recommends that Slovakia ensure that it is using the correct AD for estimating the emissions and report a summary of the results in the NIR.

E. Land use, land-use change and forestry

1. Sector overview

107. In 2010, net removals from the LULUCF sector amounted to 6,088.42 Gg CO_2 eq. Since 1990, net removals have decreased by 40.9 per cent. The key drivers for the fall in removals are the increasing age of Slovakian forests (older forests have a lower increment and are more likely to have reached maturity and to be harvested) and the decreasing rate of afforestation in Slovakia. Within the sector, 5,305.04 Gg of net removals were from forest land, followed by 714.79 Gg of net removals from cropland and 325.94 Gg of removals from grassland. Other land accounted for emissions of 137.92 Gg and settlements accounted for emissions of 119.44 Gg. Emissions from wetlands were reported as "NO".

108. The Party has made recalculations for the LULUCF sector between the 2011 and 2012 submissions in response to the 2011 annual review report. The impact of these recalculations on the LULUCF sector is an increase in removals of 108.7 per cent for 2009. The main recalculations took place in the following categories:

(a) Forest land, where removals increased by 3,773.29 Gg for 2009 (133.1 per cent);

(b) Other land, where emissions decreased by 10.81 Gg for 2009 (4.1 per cent).

109. The LULUCF sector shows net removals with high inter-annual variability for the entire time series. Salvage harvesting following natural disturbances (mainly storms and bark beetle) is a key driver for the inter-annual variability in removals.

110. The Party's reporting for the LULUCF sector is complete. Some subcategories for which reporting is mandatory are reported as "NO", following a tier 1 approach (e.g. dead organic matter and soil carbon in forest land remaining forest land, and living biomass and soil carbon in cropland remaining cropland). During the review, in response to questions raised by the ERT, Slovakia explained that even though forest land remaining forest land and cropland remaining cropland are key categories, there were no data available to apply a tier 2 approach. Slovakia presented the agenda of a research project called C-FORLAND, approved by the Slovak Research and Development Agency and to be undertaken by the National Forest Centre and Soil Science and Conservation Research Institute (VUPOP),

which is scheduled to provide data for dead organic matter and soil carbon estimation for the 2014 annual submission. The ERT encourages Slovakia to provide these explanations in the NIR, together with updates on the C-FORLAND project and its contribution to the inventory.

111. Slovakia reports as "NO" the following categories: direct N_2O emissions from nitrogen fertilization of forest land and other; non-CO_2 emissions from drainage of soils and wetlands; and N_2O emissions from disturbance associated with land-use conversion to cropland. However, the NIR indicates that these emissions have not been estimated because they are not important in Slovakia, without providing further justification. During the review, in response to questions raised by the ERT, Slovakia provided the following justifications:

(a) CO_2 emissions from peatlands are not reported because the current area of peatlands is rather small (2,773 ha) (Stanová et al., 2000) and includes strictly protected areas without active management;

(b) Wet forest soils are classified as peatlands in Slovakia and therefore included under strictly protected areas without active management;

(c) Fertilizer use in forests is not reported because such practice does not occur in Slovakia.

112. The ERT recommends that Slovakia provide these explanations and evidence in its next NIR. The ERT encourages Slovakia to provide evidence that fertilizer use in forests is not practised in Slovakia.

113. Most CO_2 estimates for land converted to cropland, land converted to grassland, and land converted to other land follow a tier 2 approach, with country-specific EFs. For the pools for which a tier 1 approach is followed (e.g. living biomass), Slovakia adequately justified during the review that no data are available to move to higher tiers. The ERT commends Slovakia for these estimates, which are generally in line with the IPCC good practice guidance for LULUCF and comparable with methods used by other Parties.

114. In many instances, the NIR was not transparent enough for the ERT to understand the methods used to estimate emissions and removals (e.g. recalculation of the forest land remaining forest land category, absence of justification for emission sources reported as "not important in Slovakia" and lack of uncertainty calculations). During the review, in response to questions raised by the ERT, Slovakia clarified these methods and was able to provide the original sources of information (e.g. yield tables, quoted articles). The ERT strongly recommends that Slovakia include all these clarifications in the NIR of its next annual submission.

115. The uncertainty applied for the AD and the EFs is fixed at 100 per cent for all land-use categories according to table A6.1 in annex 6 to the NIR. The ERT commends Slovakia for dedicating a section to uncertainties and time-series consistency in the NIR for each category. However, the ERT noted that the values provided in these sections are not always complete (e.g. no uncertainty on harvest data for forest land). In addition, the ERT considered that the values provided for forest land would likely result in a lower uncertainty than 100 per cent. This inconsistency and lack of transparency were noted in the previous review report, which recommended that Slovakia increase transparency by providing documentation on the derivation of the uncertainty values. During the review, in response to questions raised by the ERT, Slovakia indicated that this recommendation would be addressed in the 2013 annual submission. The ERT reiterates the recommendation that Slovakia increase the transparency of its reporting by providing documentation on the derivation of the uncertainty values.

116. There is no information on the QA/QC procedures conducted for the LULUCF sector, for example for the statistics from official data sources that are used in the calculation of the emission estimates. The QA/QC sections provided for each category are limited to a description of completeness. In addition, no mention of verification is provided in the NIR. Regarding QA, the recommendation of the previous review report that Slovakia implement QA activities performed by experts not involved in the preparation of the inventory is not mentioned in the NIR. During the review, in response to questions raised by the ERT, Slovakia clarified that QA/QC activities were conducted by another LULUCF expert from the National Forest Centre and gave several examples of QC checks (e.g. consistency between data in the CRF tables and national statistics), although there was no written traceability for these checks. The ERT welcomes this improvement and strongly recommends that Slovakia transparently report QA/QC procedures in the NIR, and archive the findings of these procedures for the next annual submission. The ERT further recommends that the description of QA/QC procedures in the NIR be separated from other elements such as the description of the national system, plans for improvement of the national system, or the methods used for estimating emissions and removals.

117. Slovakia has not been able to correct small inconsistencies in the total land area reported in the land-use matrices in the NIR, which were identified by the previous review report. The ERT reiterates the encouragement that Slovakia correct these inconsistencies. In addition, Slovakia has not been able to perform a tier 1 key category analysis and tier 1 uncertainty analysis based on the emissions and removals at the land-use subcategory level. The ERT reiterates the recommendation that Slovakia conduct these analyses at the land-use subcategory level.

118. During the review, in response to questions raised by the ERT, Slovakia provided harvest statistics, which are key to understanding AD in the LULUCF sector. The ERT noted that there were some discrepancies with statistics provided by the Food and Agriculture Organization of the United Nations (FAO): for example, in the national statistics, the value for harvest in 1997 is higher than that for 1998, while in the FAOSTAT data, the value for harvest was higher for 1998 than for 1997. The ERT is of the view that national statistics are more accurate because FAO uses national statistics as its primary source of information. Nevertheless, the ERT encourages Slovakia to provide an explanation for the discrepancies between national harvest statistics and FAO data, so that the comparison is fully relevant as a verification of these AD. The ERT also reiterates the recommendation made in the previous review report that Slovakia include the national harvest statistics in the NIR of its next annual submission.

2. Key categories

Forest land remaining forest land – CO_2

119. Sources of AD and EFs for this category (e.g. standing volume in individual forest stands estimated by ocular method and yield tables, unspecified source for the statement that only 90–95 per cent of harvest data are reported) are not always transparently reported in the NIR. During the review, in response to questions raised by the ERT, Slovakia clarified the following points:

(a) The average forest age, tree species and site quality are obtained from the forest management plan. The corresponding volume is then obtained from the national yield tables (Halaj and Petráš, 1998). The ocular method is only used for qualitative characteristics such as tree health and site quality;

(b) The sectoral expert does not have access to the original forest management plan database. For the current annual increment, another department in the National Forest

Centre provides the expert with aggregated values per tree species, already averaged and weighted for the area of each site, quality and age class of the tree species;

(c) Based on expert judgement, 90–95 per cent of forest owners report on harvest data. The owners that do not report represent a negligible forest area;

(d) Forest management plans are regularly audited by local forestry offices and the National Forest Centre. However, there is a tolerance for small areas and the small forest owners that do not report are not prosecuted because the forest area they represent is considered negligible (less than 10 per cent of the total forest area).

120. The ERT welcomes these clarifications and recommends that Slovakia include them in its next NIR. The ERT further recommends that Slovakia provide details on the institutional arrangements with data suppliers (cadastre and forest management plan repository), on the QA/QC procedures of these data suppliers and on the findings of these procedures. In particular, the ERT recommends that Slovakia provide information on the audit of forest management plans: their frequency, the sampling strategy and the overall findings of these audits in the NIR of its next annual submission.

121. Root-to-shoot ratios, biomass expansion factors (BEFs) and wood densities are combined in the NIR into a "biomass expansion conversion factor". During the review, in response to questions raised by the ERT, Slovakia provided the disaggregated country-specific values of these parameters. Slovakia uses the same values (1.5–1.96, depending on tree species) for BEF2 (BEF used for the conversion of merchantable volume to total above-ground volume), the underlying calculation of total biomass loss from harvest in table 7.7 of the NIR, as for BEF1 (BEF used for the conversion of merchantable increment to total above-ground increment), the underlying calculation of total carbon uptake from forest growth in table 7.6 of the NIR. The ERT noted that, although the Slovakian values for BEF1 are within the range of values reported in the IPCC good practice guidance for LULUCF for BEF2 (1.15–4.2), the Slovakian values for BEF1 are above the referenced range for BEF1 (1–1.3) and, furthermore, BEF1 indeed tends to be lower than BEF2, owing to branch mortality. The ERT is therefore of the view that the values for BEF2 are suitable, but those adopted for BEF1 are not. The ERT recommends that Slovakia continue to use those BEF values for estimates relating to total above-ground volume (BEF2), such as deforestation, fellings or other losses, but for estimates related to total above-ground increment (BEF1), such as biomass growth, the ERT recommends that Slovakia use country-specific BEF1 values or revert to tier 1 default values for BEF1. The ERT also recommends that Slovakia improve the comparability of its reporting by including in the NIR of its next annual submission the disaggregated values of root-to-shoot ratio, BEFs and wood densities instead of the condensed "biomass expansion conversion factors".

122. The ERT noted that the current annual increments (CAI) provided in the NIR for the different tree species do not follow the ranking generally observed in the temperate zone. The reported values suggest that in Slovakia conifers grow more slowly than broadleaves; and the CAI of reputedly fast-growing species such as poplars and willows are among the lowest of the reporting Parties. During the review, in response to questions raised by the ERT, Slovakia clarified that site quality and/or stand age can in principle explain this pattern. The ERT encourages Slovakia to increase the transparency of its next NIR by explicitly showing how, in practice, these factors (site quality and stand age) affect poplars, willows and conifers more than beeches and oaks in the specific context of Slovakia.

123. Significant recalculations were performed for the category forest land remaining forest land, resulting in a two- to six-fold increase in the estimate of removals, depending on the inventory year (e.g. a 133.1 per cent increase in the estimated removals for 2009). During the review, in response to questions raised by the ERT, Slovakia clarified that these recalculations were based on changes to three elements of the estimation method:

(a) The transition period for land-use change was rectified from 21 to 20 years, following the IPCC good practice guidance for LULUCF;

(b) CAI is now calculated by consistently using new yield tables (Halaj and Petráš, 1998) instead of a mix of old and new yield tables;

(c) CAI is now calculated using year-by-year data on species composition and forest age structure from forest management plans instead of interpolated data on species composition and forest age structure.

124. The ERT commends Slovakia for implementing these improvements, following a recommendation made in the previous review report. The ERT encourages Slovakia to increase the transparency of its reporting on the method used to calculate CAI and on recalculations in general by providing a transparent explanation of each component of a recalculation and its effect on the overall estimate.

Land converted to forest land – CO_2

125. Most estimates for this category follow a tier 2 approach, with country-specific EFs. The ERT commends Slovakia for these estimates, which are in line with the IPCC good practice guidance for LULUCF and comparable with methods used by other Parties. The ERT particularly commends Slovakia for providing a country-specific EF for dead wood within the dead organic matter pool in this category.

3. Non-key categories

Grassland remaining grassland – CO_2

126. For 2010, net carbon stock changes in living biomass and in soils, which are mandatory reporting categories, are reported as "NO". During the review, in response to questions raised by the ERT, Slovakia explained that grassland management had not changed since 1990, thus resulting in the use of the notation key "NO" for this category. The ERT encourages Slovakia to provide some evidence to support this justification.

Land converted to settlements – CO_2

127. The emissions from mineral soils in this category are clearly calculated by interpolating the difference in carbon stocks between settlements and other land categories over the default 20-year transition period. The ERT commends Slovakia for this improvement in transparency.

128. However, there is an abrupt increase of 52.1 per cent in the area of settlements between 1995 and 1996, 84.5 per cent of which is from the category other land. The previous review report already noted this pattern and recommended that Slovakia provide an explanation for this abrupt change, in order to ensure time-series consistency. During the review, in response to questions raised by the ERT, Slovakia explained that the change was likely due to new property owners rushing to get their land recognized as 'settlement' during the country's transition to a market economy. The ERT recognized that this probably has no impact on the emission estimates, but nevertheless encourages Slovakia to improve the time-series consistency of this land-use category. The ERT also encourages Slovakia to use a qualitative approach to consider this category as a key category, on the basis that it was key in 2009 and that most often deforested land is converted to settlements.

N_2O emissions from disturbance associated with conversion to cropland – N_2O

129. In the NIR, N_2O emissions from disturbance associated with conversion to cropland are reported as "NE". This is inconsistent with the reporting in CRF table 5(III), where

these N_2O emissions are reported as "NO". The ERT reiterates the recommendation made in the previous review report that Slovakia estimate and report N_2O emissions from disturbance associated with conversion to cropland in its next annual submission.

Agricultural lime application – CO_2

130. The method used to calculate the AD when limestone is mixed with other materials (for the years 1992 and 1994–1997) or when no statistics are available (for 1990,1991 and 1993) is not transparently described in the NIR. During the review, in response to questions raised by the ERT, Slovakia clarified that for the years when AD for total lime (CaO) are only available as a component of the AD for the application of various materials (such as dolomite and burnt lime) (i.e. for 1992 and 1994–1997), the average proportion of each material between 1998 and 2010 is applied to estimate AD for each material. Slovakia also clarified that the AD for total CaO application for the years when no statistics are available (1990, 1991 and 1993) were obtained by linear interpolation based on data for 1992 and 1994. Slovakia justified its use of these methods by explaining that linear interpolation was the most appropriate method to obtain surrogate data, as CaO application probably decreased between 1990 and 1994, in line with the decrease in farming activity which accompanied the transition to a market economy. The ERT welcomes the provided clarifications and justification and recommends that Slovakia include them in the NIR of its next annual submission.

Biomass burning – CO_2, CH_4 and N_2O

131. CO_2 emissions from forest fires are reported as included elsewhere. The ERT noted that it is indeed good practice to report these emissions in the forest land remaining forest land category. However, no mention is made of forest fires in the NIR for the forest land remaining forest land category. During the review, in response to questions raised by the ERT, Slovakia clarified that controlled burning concerns harvest residues and therefore does not constitute "other losses" under equation 3.2.6 of the IPCC good practice guidance for LULUCF. Slovakia further clarified that salvage logging is practised in all areas affected by storms and bark beetles, as reflected in the harvest statistics. The ERT welcomes these explanations and recommends that Slovakia include them in its next NIR. The ERT further recommends that Slovakia explicitly account wildfires as "other losses" under equation 3.2.6 of the IPCC good practice guidance for LULUCF, affecting the net carbon stock change in living biomass in this category.

132. The NIR explains that CH_4 and N_2O emissions from controlled burning do not occur in the category land converted to forest land, because controlled burning is a practice that concerns harvest residues in Slovakia, and that harvest does not occur in stands younger than 40 years. The ERT commends Slovakia for this improvement in transparency.

133. The NIR does not explain how AD are estimated for controlled burning; neither does it indicate the source of AD for wildfires. During the review, in response to questions raised by the ERT, Slovakia clarified that the information for wildfires comes from fire-fighters' reports, aggregated by the Ministry for the Interior. For controlled burning, Slovakia further clarified that the figure is estimated based on the expert judgement that 25 per cent of harvest residues from broadleaves and 10 per cent of harvest residues from conifers are burnt on site. The national harvest volume, corrected by BEF to obtain total tree estimate, is used to compute harvest residues, and thus CH_4 and N_2O emissions from controlled burning. The ERT welcomes these clarifications and recommends that Slovakia include them in its next NIR.

F. Waste

1. Sector overview

134. In 2010, emissions from the waste sector amounted to 2,222.15 Gg CO_2 eq, or 4.8 per cent of total GHG emissions. Since 1990, emissions have increased by 103.6 per cent. The key drivers for the rise in emissions are the growth of the population (by 2.5 per cent), an increase in per capita waste generation since 1990 (by 18.5 per cent) and the quantity of municipal waste deposited on land since 1990 (an increase of 21.5 per cent). In addition, various economic incentives and changes in legislation have contributed to the shift in solid waste disposal practices towards an increasing use of managed disposal sites. Within the sector, 72.7 per cent of the emissions were from solid waste disposal on land (44.3 per cent from managed waste disposal on land and 28.4 per cent from industrial and agricultural solid waste disposal on land), followed by 20.1 per cent from wastewater handling. Emissions from composting (reported under other (waste)) accounted for 5.3 per cent. The remaining 1.9 per cent originated from waste incineration.

135. The Party has made recalculations for the waste sector between the 2011 and 2012 submissions in response to the 2011 annual review report and following changes in AD and specific parameters. The impact of these recalculations on the waste sector is an increase in emissions of 0.2 per cent for 2009. The NIR discusses the underlying reasons for these recalculations; however, they have not been reported in CRF table 8(b). The ERT recommends that Slovakia report the recalculations in CRF table 8(b) as well as in the NIR. The main recalculations took place in the following categories:

(a) Wastewater handling: N_2O emissions from human sewage were recalculated for the period 1999–2009 in accordance with new estimated data on protein consumption;

(b) Waste incineration: CO_2 and N_2O emissions were recalculated for industrial solid waste because of corrections in AD.

136. All GHGs emitted from the waste sector in the Slovakian territory are covered in the Party's 2012 annual submission. The CRF tables are provided for all years from 1990 to 2010.

137. The Party has used a significant amount of country-specific information from official national sources and provided comprehensive explanations of the methodological choices that were made. AD and EFs for the waste sector, along with the emissions estimates for the waste sector, are transmitted by the sectoral expert and kept in the centralized archive at SHMU. Time-series consistency issues resulting from circumstances such as changes in data collection procedures, which are external to the inventory team, as well as observed fluctuations of emissions for all the categories are explained in the NIR. Uncertainty analysis is done using tier 1 methods of the IPCC good practice guidance and, additionally, a tier 2 approach is applied for CH_4 emissions from solid waste disposal sites (SWDS). Planned improvements are proposed for SWDS and waste incineration. The ERT reiterates the recommendation made in the previous review report that Slovakia develop a new plan for improvements to the wastewater handling subcategories.

138. Slovakia has identified the following areas for further improvement:

(a) Updating the country-specific degradable organic carbon (DOC) values for municipal SWDS in order to reflect the decrease in biogenic fractions of waste;

(b) Reviewing the AD in detail, particularly the interpolations and extrapolations, in order to replace and remove outlying data for the waste sector;

(c) Reviewing the data on the national population used for the 2012 annual submission, using the results from the publication of the 2011 national population census;

(d) Preparing consistent data series from 1997 and extrapolation to the base year, based on collected additional data.

2. Key categories

Solid waste disposal on land – CH_4

139. CH_4 emissions have been estimated using a tier 2 first order decay (FOD) method with parameters specific to municipal solid waste (MSW) management practices in Slovakia. The NIR reports sufficient information regarding the country-specific data available; however, the ERT noted that the collected data do not include the necessary characterization of each individual SWDS that would allow a site-by-site approach. Under these circumstances, IPCC default data are used to fill in for this missing site-specific data. During the review, in response to questions raised by the ERT, Slovakia provided further clarifications about this approach. The ERT recommends that Slovakia improve the discussion in the NIR.

140. The ERT noted that, in CRF table 6.A, Slovakia reports a value of 12 per cent for DOC, which has been actually degraded, and a value of 0.6 for the fraction of DOC in MSW under additional information. The ERT considers that these values have been transposed. The ERT recommends that the Party swap these values because, although this transposition does not influence the results of the calculations, all information should be inserted in the correct cells.

141. The value for the methane correction factor (MCF) for aerobic decomposition in the year of deposition was reported as lower than 1.0 before 2001, with increasing values for the years afterwards. The NIR explains that this increase is associated with changing waste management practices in the Slovak Republic in 2001 towards an increase in the use of managed landfills. In CRF table 6.A (additional information) Slovakia has reported a waste generation rate value of 259.99 kg/capita/day. The ERT is of the view that the reported value does not seem to be appropriate for municipal waste generation because it includes agricultural waste as well. In that case, it is not quite clear from the table with additional information that the fraction of MSW is 0.78. The ERT recommends that Slovakia provide the underlying reasons for selecting this value in the next annual submission.

Wastewater handling – CH_4

142. Emission estimates for all relevant wastewater treatment systems are reported, including industrial, domestic and commercial wastewater treatment and discharge. Country-specific information on biochemical oxygen demand (BOD) and chemical oxygen demand (COD) is available and used as AD. To estimate total organically degradable carbon in wastewater, Slovakia uses a correction factor for additional industrial BOD discharged into sewers equal to 1.25 as suggested by the 2006 IPCC Guidelines for National Greenhouse Gas Inventories. Slovakia provides the rationale for the choice of methods and national EFs used for each wastewater handling pathway. CH_4 emissions from domestic, commercial and industrial wastewater exhibit decreasing trends for the period 1990–2010. The NIR indicates that this emission reduction is associated with sludge recovery for energy use. The ERT commends the Party for its transparent reporting.

143. A number of parameters have been reported as "NA" in CRF table 6.B of the 2012 annual submission, while corresponding values were reported in the previous annual submission. These parameters include: percentage of industrial wastewater treated both aerobically and anaerobically; percentage of domestic wastewater treated; degradable organic component for domestic and commercial wastewater; total amount of treated domestic wastewater (m^3); and percentage of treated domestic wastewater. During the

review, Slovakia indicated to the ERT that these figures will be reported in the next annual submission. The ERT welcomes this decision.

3. Non-key categories

Other (waste) – CH_4 and N_2O

144. AD to estimate CH_4 and N_2O emissions from the composting of industrial solid waste have been published by the Statistical Office of the Slovak Republic only from 2002 onwards. Although the Party has consequently not estimated these emissions for the period 1900–2001, they are reported as "NO" in the CRF tables. The ERT reiterates recommendations from previous review reports that Slovakia make efforts to estimate and report the missing emissions. The ERT further recommends that, although the emissions could not be estimated, Slovakia report them using the correct notation key ("NE").

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

145. Slovakia has submitted information on activities under Article 3, paragraph 3, of the Kyoto Protocol, following the requirements outlined in paragraphs 5–9 of the annex to decision 15/CMP.1. The information was reported in chapter 11 of the NIR and in the corresponding CRF tables. Slovakia has not elected any activities under Article 3, paragraph 4, of the Kyoto Protocol. Slovakia chose commitment period accounting for all activities under Article 3, paragraph 3, of the Kyoto Protocol. Slovakia has reported activities under Article 3, paragraph 3, for 2008, 2009 and 2010. The definition of forest and the land-identification system used to determine the area subject to activities under Article 3, paragraph 3, of the Kyoto Protocol are in accordance with the IPCC good practice guidance for LULUCF.

146. The geographical location of the boundary areas that encompass the units of land subject to afforestation and reforestation, and deforestation activities is specified as the boundary of Slovak regional districts, in accordance with the Geodesy, Cartography and Cadastre Authority (GCCA) database. These areas are identified using reporting method 1 from the IPCC good practice guidance for LULUCF. However, the sample locations within each stratum that are identified and used for any future monitoring required in the IPCC good practice guidance for LULUCF are not specified in the NIR. Moreover, the NIR does not document the internal audit and verification methods put in place by GCCA to ensure that activities are neither over- nor underestimated. During the review, in response to questions raised by the ERT, Slovakia explained that sample locations were the basic land units (parcels) of the GCCA database, with one parcel corresponding to a single owner and a single land use. Slovakia further explained that the cadastral declarations regarding these land units were audited by the Ministry of the Interior, and that the National Forest Centre was planning to perform QC checks on the largest or most changing parcels. As all parcels are geographically identified and provide complete geographical coverage of Slovakia when put together, it is the understanding of the ERT that reporting method 2 is used for lands subject to activities under Article 3, paragraph 3, of the Kyoto Protocol. The ERT recommends that Slovakia assess which is the method used and improve the transparency of its reporting regarding this issue in its next NIR. The ERT also recommends that Slovakia further increase transparency by documenting the internal audit and verification methods put in place by GCCA to ensure that activities are neither over- nor

underestimated and also by documenting its own plans to perform QC checks on the largest or most-changing parcels.

147. The previous review report recommended that Slovakia provide a description of the different carbon pools in the NIR. This recommendation was duly implemented. The ERT commends Slovakia for this improvement in transparency.

148. Net carbon stock changes in dead wood for afforestation and reforestation activities, a mandatory reporting category, are reported as "NO" for 2008, 2009 and 2010. During the review, in response to questions raised by the ERT, Slovakia justified that this pool was not a net source because land uses preceding afforestation and reforestation do not contain dead wood. Slovakia further explained that this pool was likely to be a negligible sink because young forest stands do not produce significant amounts of deadwood. The ERT recommends that Slovakia provide these explanations in the relevant section of the NIR in the next annual submission.

149. Many categories under afforestation and reforestation were reported as "NA" (e.g. units of land harvested since the beginning of the commitment period, direct N_2O emissions from N fertilization, N_2O emissions from disturbance associated with land-use conversion to cropland, carbon emissions from lime application, and biomass burning). During the review, Slovakia explained that it would change the reporting to "NO" in the next annual submission. The ERT recommends that Slovakia change the notation key from "NA" to "NO" or provide an estimate for these categories in the next annual submission.

150. The Party has made recalculations for the KP-LULUCF activities between the 2011 and 2012 submissions following changes in EFs, namely the species composition of afforestation and reforestation, and deforestation (ARD) lands. The impact of these recalculations on each KP-LULUCF activity for 2009 is as follows:

(a) CO_2 removals from A/R decreased by 0.07 Gg CO_2 eq (0.01 per cent);

(b) CO_2 emissions from deforestation increased by 2.11 Gg CO_2 eq (0.75 per cent).

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

Afforestation and reforestation – CO_2, CH_4 and N_2O

151. In its 2012 annual submission, Slovakia provided estimates for the carbon stock changes in above-ground biomass, below-ground biomass, litter and mineral soils for afforestation and reforestation activities. The carbon stock changes in dead wood and organic soils have been reported as "NO". Slovakia justified that these pools are not a net source by explaining in the NIR that it is assumed that dead wood does not exist in afforestation and reforestation areas and there are no organic soils in the country. The EFs and parameters used are country-specific and based on research projects. There is no practice of applying fertilizer and liming in afforestation and reforestation areas in Slovakia, hence the notation key "NO" is used in table NIR-1. The ERT commends Slovakia for these estimates, which are in line with the IPCC good practice guidance for LULUCF.

152. The ERT noted that losses from wildfires are not accounted for on A/R lands, potentially leading to an overestimate of removals. Moreover, losses from harvest are not accounted for either because thinning does not occur before the stand reaches 40 years of age in Slovakia, which is an uncommonly old age compared with other European countries. During the review, in response to questions raised by the ERT, Slovakia clarified that losses from wildfires would be estimated in the next annual submission. Slovakia further clarified that harvest does not occur before the stand reaches the age of 40, but 'cleaning' does. However, data are only available on the area subject to cleaning every year, not on the

volume of wood felled during these cleanings. The ERT considers that failing to estimate the volume of wood lost from these cleanings is also a potential cause of overestimation of removals. Therefore, the ERT recommends that Slovakia provide an estimate of losses from wildfires and cleaning on A/R lands in the next annual submission.

153. In CRF table NIR-1, Slovakia uses the notation key "NO" for emissions from biomass burning for ARD activities. Although the ERT understands that biomass burning does not occur on deforested land (the justification in the NIR states that burning is forbidden on non-forested land), the ERT considers that it is unclear why A/R land may not be subject to controlled fire or wildfires. The previous review report also recommended that Slovakia justify this. During the review, in response to questions raised by the ERT, Slovakia clarified that controlled burning is only for harvest residues, not for fire control purposes, and that therefore young stands are not subject to controlled burning. Slovakia also explained that it would be possible to provide an estimate of emissions from wildfire on A/R land. The ERT recommends that Slovakia provide an estimate of emissions from wildfires on A/R land in the next annual submission.

Deforestation – CO_2 and N_2O

154. Slovakia has reported estimates for the carbon stock changes in above-ground biomass, below-ground biomass, dead wood, litter and mineral soils for deforestation. The carbon stock changes in organic soils are not a net source of emissions, as there are no organic soils in the country according to statements in the NIR, and are therefore reported as "NO". Most of the EFs and parameters used are country-specific. The ERT commends Slovakia for these estimates, which are in line with the IPCC good practice guidance for LULUCF.

155. The NIR indicates that the average growing stock on deforested land was estimated based on the forest management plans and yield tables. In the LULUCF section for the reporting under the Convention, however, the ERT pointed out that the forest management plan data on growing stock are biased, with lower values than the more reliable National Forest Inventory and Monitoring (NFIM) approach. The ERT considers that the use of uncorrected forest management plans data could thus result in an underestimation of emissions from deforested land. During the review, in response to questions raised by the ERT, Slovakia explained that it was impossible to use NFIM sample points to estimate emissions from deforested land because these points were not numerous enough to be representative at the scale of the district. The ERT understands that it is not possible to directly use the NFIM data. The ERT nevertheless recommends that Slovakia improve the accuracy of its reporting by taking into account this observed bias of forest management plans data.

156. Slovakia uses the notation key "NO" for emissions from agricultural lime application and N_2O emissions following disturbance in CRF table NIR-1. The NIR indicates that there is no application of CaO or N to deforested areas, hence the use of the notation key "NO" in CRF table NIR-1. The ERT considers that there is no obvious reason why crops on land deforested in the early 1990s would not be limed or fertilized, when other crops are (Slovakia has reported emissions from agricultural lime application in CRF table 5(IV)). The previous review report recommended that Slovakia provide estimates of emissions from the application of lime and N-fertilizers. The present ERT noted the justification provided in the NIR that these emissions are probably at a low level, given the limited amount of deforested areas that are now cropland. During the review, in response to questions raised by the ERT, Slovakia explained that an estimate would be provided in the next annual submission. The ERT recommends that Slovakia provide this estimation in the next annual submission.

157. Default values for root-to-shoot ratio are used to estimate below-ground biomass changes for deforestation lands. The ERT noted that, given that deforestation is a key category in Slovakia, it is good practice to apply a tier 2 or 3 method. During the review, in response to questions raised by the ERT, Slovakia explained that no representative country-specific root-to-shoot ratios were available. The ERT noted this justification and encourages Slovakia to check whether country-specific values are available for comparable countries.

2. Information on Kyoto Protocol units

Standard electronic format and reports from the national registry

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

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

National registry

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

161. The national registry has fulfilled the requirements regarding the public availability of information in accordance with section II.E of the annex to decision 13/CMP.1. However, the ERT reiterates the recommendation from the SIAR assessor that Slovakia include the automatically generated reports which the Party referenced as unavailable due to the move to the consolidated European Union Registry.

Calculation of the commitment period reserve

162. Slovakia has reported its commitment period reserve in its 2012 annual submission. Slovakia provided revised estimates in response to the list of potential problems and further questions raised by the ERT during the review week. The reported commitment period reserve is based on these revised estimates. Slovakia reported its commitment period reserve to be 230,570,430 t CO_2 eq based on the national emissions in its most recently reviewed inventory (46,114.086 Gg CO_2 eq). The ERT agrees with this figure.

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

3. Changes to the national system

163. Slovakia reported that there are changes in its national system since the previous annual submission. The national system and its processes and procedures have undergone a substantive change and improvement since the previous annual submission. The NIR of the 2012 annual submission was however not updated to fully reflect the changes in the national system. During the review, and supported by additional information such as the "Plan and Progress Report of the Slovak Republic", submitted to the Compliance Committee in September 2012, Slovakia clarified the changes in the national system.

164. The additional measures and changes described during the review week and in the "Plan and Progress Report" were in direct response to the question of implementation raised in the previous review report. The issues raised in the previous review report included that strong formal relations and agreements between institutions concerning their roles and cooperation to ensure reliable data flow for the preparation of the inventory were not ensured, that clear communication channels with regard to the principles, purposes and procedures of the UNFCCC reporting guidelines and the review process with external experts were insufficient, and that the limited resources available for inventory planning, preparation and management were not directed towards the highest priorities.The ERT commends Slovakia for its actions, but, owing to the fact that some measures were still ongoing during the review (formal contracts and agreements with a few institutions) (see para. 168 below), the ERT concluded that the Party's national system is generally in accordance with the requirements of national systems outlined in decision 19/CMP.1.

165. Measures already implemented in response to the recommendations for the national system in the 2011 annual review report include: an enlargement of the inventory team at SHMU (which now consists of 3.5 members of staff); the creation of a special working group within the inter-ministerial high-level committee, which will, among other tasks, review and revise the results of the GHG emission inventory; additional IT equipment for the archiving of GHG emission inventory data; the training of national inventory system experts on the UNFCCC review procedures and methodological issues relating to the implementation of the IPCC good practice guidance; a framework agreement between MoE and the Statistical Office of the Slovak Republic to ensure a smooth exchange of data; and agreements between MoE and the Ministry of Agriculture and Rural Development of the Slovak Republic to facilitate the implementation of reporting obligations for the LULUCF sector and KP-LULUCF activities in the 2013annual submission.

166. Measures implemented in response to recommendations regarding inventory planning, prioritization and QA/QC activities include an inventory planning process based on the outcomes of international reviews and recommendations. This includes the preparation of an analysis entitled "Status of implementation of measures as recommended in the report of the individual review of the annual submission of Slovakia submitted in 2011", where the analysis is coordinated and prepared by the single national entity in cooperation with sectoral experts. The ERT was provided with this analysis during the review, which consisted of a systematic Excel spreadsheet indicating the status of the issue, responsibilities, deadlines, and so on. Also implemented are the following measures: the regular training of the national inventory system experts on the principles of the QA/QC activities and requirements; the improvement of the QA/QC plan through further QA activities (external controls); the intensification of external inspections of the implementation of the QA/QC plan by MoE; and an agreement that the Statistical Office of the Slovak Republic will supplement the QA/QC plan for 2012 through further external controls and contribute to the inventory planning process for the next year on the basis of the outcomes of international reviews and recommendations contained in the annual review report. Slovakia has also introduced linkages between the allocated funds and the output quality of the inventory for application in contracts with the external experts/institutions.

167. Other agreements between institutions implemented in response to recommendations from the 2011 review report include: an agreement between MoE and the Ministry of Finance of the Slovak Republic on the provision of information regarding the consumption of biofuels and bioliquids in Slovakia. Furthermore, Slovakia has made a framework agreement between MoE and the Statistical Office of the Slovak Republic containing provisions obliging the latter to notify MoE of any changes in national statistics.

168. Planned measures to be implemented before the 2013 annual submission include: a contract between the Ministry of Agriculture and Rural Development and the National Forest Centre to fulfill reporting obligations for the LULUCF sector and KP-LULUCF activities in the 2013 annual submission; an agreement on cooperation between MoE and the Ministry of Transport, Construction and Regional Development of the Slovak Republic, the Transport Research Institute and SHMU regarding mutual provision of data and independent inspection of the output of databases and the creation of emission estimates for the categories relating to transport (expected in June 2013); and an agreement between SHMU and the Department of Chemical and Environmental Engineering of the Faculty of Chemical Technology of the Slovak Technical University with the purpose of providing an independent audit of (parts of) the energy sector inventory.

169. Since most of the actions and measures described in paragraphs 165–167 above have been implemented and/or planned after the 2012 annual submission was prepared, not all of the changes and improvements are fully reflected in the 2012 NIR. Recent changes and measures to be implemented before the 2013 annual submission are described in the "Plan and Progress Report", submitted to the Compliance Committee on 21 September 2012. The ERT strongly recommends that Slovakia transparently report in the NIR of the next annual submission on the complete set of changes in its national system, including the recently implemented measures and changes in institutional arrangements, and also report on the progress regarding the measures reported during the review week to be in preparation.

4. Changes to the national registry

170. Slovakia reported that there are minor changes in its national registry since the previous annual submission. The Party described the changes concerning updates of the software and changes in contact information of the National Administrator in its NIR. The ERT concluded that, taking into account the confirmed changes in the national registry, Slovakia's national registry 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

171. Slovakia has reported on the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol in its NIR. However, the ERT noted that Slovakia did not include information on whether there had been any change in its reporting since the previous annual submission. During the review week, Slovakia informed the ERT that no changes have occurred to Slovakia's reporting on the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol. The ERT concluded that the information provided continues to be complete and transparent. The ERT recommends that Slovakia include information in its next NIR on any changes to its reporting in accordance with Article 3, paragraph 14, of the Kyoto Protocol.

172. The policy of Slovakia regarding the minimization of adverse impacts is greatly influenced by Slovakia being a member of the EU. Policies supporting the utilization of biofuels are closely linked to the EU trade and common agricultural policies. Programmes which focus on the enhancement of biofuel utilization within the EU have provided

significant stimulus for the production of biofuels, which may have negative impacts on the economies of developing countries. Despite increasing imports of biofuels the impact of the Slovak Republic on the world prices of biofuels is, however, regarded as negligible. The formerly state-owned coal mines in Slovakia have been fully privatized and are granted investment aid. However, Slovakia does not export any of its coal to other countries, and in the NIR Slovakia concludes that the economy of Slovakia, in terms of coal and pricing, has minimal effect on the existing structure of international coal trade and pricing. More than 21 per cent of bilateral and specific projects relating to the foreign development policy of Slovakia during the period 2004–2008 were focused on supporting the utilization of renewable energy resources and energy efficiency, and on adaptation measures, including the construction of early warning systems, adjustments and efficiency improvements of water management, as well as capacity-building and the improvement of infrastructure for compliance with the Convention and the Kyoto Protocol (e.g. in Serbia and Kazakhstan). In addition to the development aid delivered by the Party, Slovakia has expanded the provisions of preferential market access for developing and least developed countries.

III. Conclusions and recommendations

A. Conclusions

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

174. Slovakia submitted a revised NIR on 31 August 2012, which did not fully reflect some of the implemented and ongoing changes in its national system. Slovakia resubmitted the CRF tables with revised estimates on 14 December 2012 in response to the list of potential problems and further questions raised by the ERT in the course of the review week.

175. The ERT concludes that the inventory submission of Slovakia 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, except for CRF table 8(b) for the years 1990–2010 and an NIR; these are complete in terms of geographical coverage, years and sectors, as well as complete in terms of categories and gases.

176. 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.

177. 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.

178. The Party has made recalculations for the inventory between the 2011 and 2012 submissions in response to the 2011 annual review report and in order to lift applied adjustments. The impact of these recalculations on the national totals is an increase in emissions of 2.1 per cent for 2009. The main recalculations took place in the following sectors/categories:

(a) Manufacturing industries and construction (an emission increase of 50.5 per cent);

(b) Metal production (an emission decrease of 24.4 per cent);

(c) Energy industries (an emission decrease of 12.1 per cent);

(d) Mineral products (an emission increase of 7.4 per cent);

(e) Forest land (a removal increase of 134.5 per cent).

179. In the NIR Slovakia states that land areas subject to A/R under Article 3, paragraph 3, of the Kyoto Protocol are identified using reporting method 1. During the review, further clarifications were given and it is the understanding of the ERT that reporting method 2 is used to identify land subject to activities under Article 3, paragraph 3, of the Kyoto Protocol.

180. The Party has made recalculations for the KP-LULUCF activities between the 2011 and 2012 submissions following changes in EFs The impact of these recalculations on each KP-LULUCF activity for 2009 is as follows:

(a) CO_2 removals from A/R decreased by 0.07 Gg CO_2 eq (0.01 per cent);

(b) CO_2 emissions from deforestation increased by 2.11 Gg CO_2 eq (0.75 per cent).

181. Slovakia 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.

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

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

184. Slovakia has reported information under decision 15/CMP.1, annex, chapter I.H, "Minimization of adverse impacts in accordance with Article 3, paragraph 14", as part of its 2012 annual submission. The information is considered complete and transparent.

B. Recommendations

185. The ERT identifies issues for improvement as listed in table 6 below.

Table 6
Recommendations identified by the expert review team

Sector	*Category*	*Recommendation*	*Paragraph reference*
Overview	Completeness	Provide estimates for N_2O emissions from disturbance associated with land conversion to cropland in the next annual submission	10
		Provide estimates for: emissions from wildfires under afforestation and reforestation (A/R) activities; CO_2 emissions from lime application under deforestation activities; and N_2O emissions from disturbance associated with deforestation , in the next annual submission	11
	Inventory planning	Improve the transparency of the national inventory report (NIR) by providing a clear description of the process of planning and	25

Sector	*Category*	*Recommendation*	*Paragraph reference*
		prioritization of inventory improvements, including the information used to prioritize resources and actions	
	Inventory preparation	Clearly describe in the NIR the role of the key category analysis in inventory planning and prioritization of improvements	28
	Uncertainties	Correct the errors in the Excel calculation tables for 2010, which led to an underestimation of uncertainties	30
	Recalculations and time-series consistency	Explain all recalculations in common reporting format (CRF) table 8(b) by including information on the rationale for changes to the inventory estimates	34
		Improve the description of recalculations in the next NIR by including information on the specific factors underlying the recalculations, where appropriate	34
		Complete the sections in the NIR (chapter 10) on the implications of the recalculations for emission levels and trends	34
	Verification and quality assurance/quality control (QA/QC)	Develop tier 1 QC checklists/worksheets or similar tools for the sectoral experts to use in the inventory preparation steps prior to the submission of their results to the national inventory system coordinator, and ensure that these QC checklists are archived in the central archiving system at the Slovak Hydrometeorological Institute (SHMU)	35
		Develop and ensure maintenance of robust QC procedures, in order to prevent inconsistencies between the NIR and the CRF tables and future errors in the CRF tables	35
		Develop an appropriate way of documenting the peer review of results before they are submitted to the single national entity	36
		Present the QA/QC system separately, clearly identifying what QA/QC activities are performed, by whom and at what stages during inventory preparation those actions are performed, in addition to providing summary tables 1.6 and 1.7 in the NIR, in order to increase the transparency of the reporting	38
	Transparency	Include all relevant clarifications provided during the review week in the NIR of the next annual submission	40
		Review and carefully assess how descriptions in the NIR could be provided in a more systematic and transparent manner, without necessarily making the descriptions longer	41
		Review and revise in particular the sections of the NIR which describe the national system, institutional arrangements, inventory preparation and planning, and information on QA/QC and verification, in order to increase transparency	41
Energy	Transparency	Include the reason why CO_2 emissions from coal mining and handling are negligible in the NIR	51
	Consistency	Ensure consistency between the activity data (AD) used in the sectoral approach, which are largely based on the National	58

Sector	Category	Recommendation	Paragraph reference
		Emission Information System (NEIS)database, and those reported in the national energy balance	
	Reference approach	Use an approach in line with the IPCC good practice guidance and uncertainty management in national greenhouse gas inventories to estimate the missing data	62
	International bunker fuels	Provide the clarification of the assumption of the allocation of aviation gasoline between international and national activities in the NIR of the next annual submission	63
		Investigate the representativeness of the assumed constant shares of fuel consumption between aviation and the international bunker throughout the entire time series	63
	Feedstocks and non-energy use of fuels	Include the information on applied default values of carbon stored and the associated supporting data in the NIR of the next annual submission	65
	Stationary combustion: solid, liquid and gaseous fuels – CO_2, CH_4 and N_2O	Reconsider the reporting so that CO_2, CH_4 and N_2O emissions under petroleum refining are reported in a consistent manner	67
		Improve transparency regarding the description of the carbon balance and the estimation and allocation of the associated CO_2 emissions in the NIR of the next annual submission	67
		Improve transparency in the NIR regarding the description of the carbon mass balance approach and the allocation of the resulting emissions in the next annual submission	68
		Indicate, in the NIR, whether the information in the national energy statistics is used to estimate or cross-check the fuel consumption data under the subcategory residential	69
		Correct the inconsistency in the emission factors (EFs) for natural gas for 2008 in the next annual submission	70
		Investigate the issue of the differences in CO_2 implied emission factors (IEFs) in the early years of the time series (1990–1999) and provide a brief explanation in the NIR of the next annual submission	70
	Civil aviation: liquid fuels – CO_2, CH_4 and N_2O	Implement a tier 2 estimation method	72
		Improve the discussion of the corroboration of the expert's estimates in the next annual submission	72
	Road transportation: liquid and gaseous fuels – CH_4 and N_2O	Improve the discussion of the selection of AD in the NIR and report the information provided to the expert review team (ERT) during the review	71
		Resolve the discrepancies in the CO_2 IEF for liquefied petroleum gas in the next annual submission and, if appropriate, undertake the corresponding recalculations	71
		Include the justification for the application of the values used for setting and calculating the EFs in the COPERT IV model for non-	71

Sector	*Category*	*Recommendation*	*Paragraph reference*
		CO_2 emissions in the next annual submission	
	Navigation: liquid fuels – CO_2, CH_4 and N_2O	Further investigate the issue regarding domestic navigation and estimate the corresponding emissions, in case they do occur	73
	Coal mining and handling: solid fuels – CO_2	Provide supporting information to confirm that CO_2 emissions from coal mining and handling are negligible (the volume of CO_2 that is potentially released into the atmosphere is close to zero and the concentration levels are below the limit of determination of the analytical instrument) in the next NIR	53
		Use the most suitable notation keys for the reporting in the next annual submission	74
Industrial processes	Transparency	Apply the notation keys more carefully and explain the used notation keys	82
	QA/QC	Include a final QA/QC check before submitting the NIR, in order to ensure consistency between the NIR and underlying sectoral reports	82
		Include information on QA/QC procedures, for example by including data and control flow charts, in the next annual submission	83
	Limestone and dolomite use – CO_2	Include the explanation for the decreased use of limestone in power plants in the next annual submission	84
	Iron and steel production – CO_2	Increase the transparency of reporting the applied methodology for estimating emissions relevant to iron and steel production by reporting the information shown to the ERT during the review in the NIR	86
		Add the information on CO_2 EFs for electric arc furnaces in the NIR of the next annual submission	87
	Aluminium production – CO_2	Report transparently on the outcomes of the investigations on historic EFs to ensure their consistency in the next annual submission	88
	Aluminium production – PFCs	Acquire the information on the applied standards or protocols for the measurement system on the site and report thereon in the next annual submission	89
	Consumption of halocarbons and SF_6 – HFCs	Continue to estimate and report HFC emissions from refrigeration and air-conditioning, foam blowing, fire extinguishers, aerosols and metered dose inhalers and electrical equipment, taking into consideration all contributing components	92
		Include a detailed and complete description of the applied estimation methodology in the next annual submissions, as well as report on any further improvements made to it	92
		Further improve the methodology for estimating HFC emissions from refrigeration for the next annual submission, in order to avoid small deviations	93(a)

Sector	*Category*	*Recommendation*	*Paragraph reference*
		Report emissions of HFC-245fa and HFC-365mfc informatively only in CRF table 9	93(b)
		Correct the two overestimates of HFC-32 emissions in the next annual submission	93(b)
		Correct the overestimate of emissions of HFC-32, which are double counted in CRF tables 2(II) and CRF table 2(II), in the next annual submission	93(b)
	Ferroalloys production – CO_2	Include specific information on the QA/QC activities that have been performed, in the next annual submission, in the sectoral chapters or in an annex	94
Agriculture	Consistency	Improve the consistency of the NIR of the next annual submission	97
	Enteric fermentation – CH_4	Ensure time-series consistency by applying a tier 2 approach for the period 1990–2003 for sheep	98
		Investigate the change in the IEF and include the reason for such a change in the NIR of the next annual submission	99
		Improve the transparency of the explanation of the method used to estimate emissions for young cattle	100
	Manure management – N_2O	Provide an explanation of the fluctuation in nitrogen (N) excretion in the NIR of the next annual submission	101
	Agricultural soils – N_2O	Provide evidence that the N_2O emissions associated with the amount of N discharged to water are included elsewhere in the inventory, or apply a consistent treatment to estimate the emissions from the subcategories animal manure applied to soils, atmospheric deposition and leaching and run-off, ensuring the complete coverage of the estimates; and submit revised estimates for the relevant categories, with transparent documentation on the estimation method	104
		Ensure the completeness of the estimates of emissions from N applied to soils and explain the completeness of the coverage of N applied to soils in the NIR, even if another method (e.g. country-specific method) were to be applied to the estimation of this category in future annual submissions	105
		Ensure the use of the correct AD for estimating the emissions and report a summary of the results in the NIR	106
Land use, land-use change and forestry (LULUCF)	General	Provide, in the next NIR, justifications for reporting the following categories as not occurring ("NO"): direct N_2O emissions from N-fertilization of forest land and other; non-CO_2 emissions from drainage of soils and wetlands; and N_2O emissions from disturbance associated with land-use conversion to cropland	111
		Include all clarifications provided to the ERT during the review on the methods applied and the background information used	114
		Increase transparency by providing documentation on the derivation of the uncertainty values	115

Sector	*Category*	*Recommendation*	*Paragraph reference*
		Transparently report QA/QC procedures in the NIR, and archive the findings of these procedures	116
		Separate the description of QA/QC procedures in the NIR from other elements, such as the description of the national system, plans for improvement of the national system, or the methods used for estimating emissions and removals	116
		Conduct tier 1 key category analysis and tier 1 uncertainty analysis on the basis of the emissions and removals at the land-use subcategory level	117
		Include the national harvest statistics in the NIR	118
	Forest land remaining forest land – CO_2	Include the clarifications provided to the ERT during the review about sources of AD and EFs for this category	120
		Provide details on the institutional arrangements with data suppliers, on the QA/QC procedures of these data suppliers, and on the findings of these procedures. In particular, provide information on the audit of the forest management plans	120
		Continue to use the current biomass expansion factor (BEF) values for estimates relating to total above-ground volume (BEF2), such as deforestation, fellings or other losses, but not for estimates related to total above-ground increment (BEF1), such as biomass growth	121
		Use country-specific BEF1 values or revert to tier 1 default values for BEF1	121
		Improve comparability by including in the NIR the disaggregated values of root-to-shoot ratio, BEFs and wood densities, instead of just the condensed “biomass expansion conversion factors”	121
	Land converted to settlements – CO_2	Provide an explanation for the increase of 52.1 per cent in the area of settlements between 1995 and 1996, in order to ensure time-series consistency	128
	N_2O emissions from disturbance associated with conversion to cropland – N_2O	Estimate and report N_2O emissions from disturbance associated with conversion to cropland in the next annual submission	129
	Agricultural lime application – CO_2	Clarify and justify the AD used for lime application in the NIR of the next annual submission	130
	Biomass burning – CO_2, CH_4 and N_2O	Include, in the next NIR, the explanation provided to the ERT during the review week that controlled burning concerns harvest residues	131
		Explicitly account for wildfires as “other losses” in equation 3.2.6 of the IPCC good practice guidance forLand Use, Land-Use Change and Forestry, affecting the net carbon stock change in living biomass in this category	131
		Include the information on wildfires provided to the ERT during	133

Sector	*Category*	*Recommendation*	*Paragraph reference*
		the review week in the next NIR	
Waste	General	Report the recalculations in CRF table 8(b) as well as in the NIR	134
		Develop a new plan for the improvements to the wastewater handling subcategories	137
	Solid waste disposal on land – CH_4	Improve the discussion in the NIR, particularly regarding the aspects involved in applying the decision tree provided in the 2006 IPCC guidelines for national greenhouse gas inventories	139
		Correct the values associated with degradable organic carbon reported in CRF table 6.A	140
		Provide the underlying reasons for selecting a methane correction factor for aerobic decomposition in the year of deposition of lower than 1.0 for before 2001, with increasing values for the years thereafter	141
	Other – CH_4 and N_2O	Make efforts to estimate and report CH_4 and N_2O emissions from composting of industrial solid waste for the period 1900–2001	144
Article 3, paragraphs 3 and 4, of the Kyoto Protocol	General	Assess what method is used for identifying land subject to activities under Article 3, paragraph 3, of the Kyoto Protocol and improve transparency regarding this issue	146
		Further increase transparency by documenting both the internal audit and verification methods put in place by the Geodesy, Cartography and Cadastre Authority to ensure that activities are neither over- nor underestimated, as well as the national system's plans to perform QC checks on the largest or most-changing parcels	146
		Include in the NIR the explanations provided to the ERT during the review regarding dead wood for A/R activities	148
		Change the notation key from not applicable "NA" to "NO", or provide estimates for the categories under A/R reported as "NA"	149
	Afforestation and reforestation – CO_2, CH_4 and N_2O	Provide an estimate of the losses from wildfires and cleanings on A/R land	152
		Provide an estimate of the emissions from wildfires on A/R land	153
	Deforestation – CO_2	Improve the accuracy of the reporting by taking into account the observed bias of forest management plan data	155
		Provide estimates of CO_2 emissions from agricultural lime application and N_2O emissions following disturbance	156
Kyoto Protocol units	National registry	Include the automatically generated reports which the Party referenced as unavailable due to the move to the consolidated European Union Registry	161
Changes to the national system		Transparently report on the changes in the national system, including the recently implemented measures and changes in institutional arrangements, and also report on the progress regarding the measures presented at the in-country visit as	169

Sector	*Category*	*Recommendation*	*Paragraph reference*
		underway but not yet implemented	
Article 3, paragraph 14, of the Kyoto Protocol		Include information in the next NIR on any changes to the reporting in accordance with Article 3, paragraph 14, of the Kyoto Protocol	171

IV. Questions of implementation

186. 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>.

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B. Additional information provided by the Party

Responses to questions during the review were received from Ms. Janka Szemesova (Slovak Hydrometeorological Institute), including additional material on the methodology and assumptions used. The following documents[1] were also provided by Slovakia:

Stanová V, Viceníková A, Baláz D, Seffer J, Lasák R, Gojdicová E & Soltés R 2000. *The Central European Peatland Project – National Report for Slovak Republic – Final Report, May 2000*. Report to Wetlands International, prepared by DAPHNE Centre for Applied Ecology in co-operation with Slovak Environmental Agency.

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[1] Reproduced as received from the Party.

Annex II

Acronyms and abbreviations

AD	activity data
AWMS	animal waste management systems
BEF	biomass expansion factor
CaO	calcium oxide (lime)
CH_4	methane
CMP	Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol
CO_2	carbon dioxide
CO_2 eq	carbon dioxide equivalent
CRF	common reporting format
EF	emission factor
ERT	expert review team
EU	European Union
EU ETS	European Union emissions trading scheme
F-gas	fluorinated gas
FAO	Food and Agriculture Organization of the United Nations
GHG	greenhouse gas; unless indicated otherwise, GHG emissions are the sum of CO_2, CH_4, N_2O, HFCs, PFCs and SF_6 without GHG emissions and removals from LULUCF
HFCs	hydrofluorocarbons
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
LPG	liquefied petroleum gas
LULUCF	land use, land-use change and forestry
m^3	cubic metre
N	nitrogen
N_2O	nitrous oxide
NCV	net calorific value
NA	not applicable
NE	not estimated
NIR	national inventory report
NO	not occurring
PFCs	perfluorocarbons
QA/QC	quality assurance/quality control
SEF	standard electronic format
SF_6	sulphur hexafluoride
SIAR	standard independent assessment report
SWDS	solid waste disposal sites
TJ	terajoule (1 TJ = 10^{12} joule)
UNFCCC	United Nations Framework Convention on Climate Change