



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

Note by the secretariat

The report of the individual review of the annual submission of Ukraine submitted in 2012 was published on 3 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/UKR, 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.



United
Nations

FCCC/ARR/2012/UKR



Framework Convention on
Climate Change

Distr.: General
3 June 2013

English only

**Report of the individual review of the annual submission of
Ukraine 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>Paragraphs</i>	<i>Page</i>
I. Introduction and summary	1–5	3
II. Technical assessment of the annual submission	6–140	9
A. Overview	6–26	9
B. Energy	27–57	13
C. Industrial processes and solvent and other product use	58–77	21
D. Agriculture	78–92	25
E. Land use, land-use change and forestry	93–108	29
F. Waste	109–120	32
G. Supplementary information required under Article 7, paragraph 1, of the Kyoto Protocol	121–140	35
III. Conclusions and recommendations	141–153	39
A. Conclusions	141–151	39
B. Recommendations	152	41
IV. Questions of implementation	153	44
 Annexes		
I. Documents and information used during the review		45
II. Acronyms and abbreviations		47

I. Introduction and summary

1. This report covers the centralized review of the 2012 annual submission of Ukraine, coordinated by the UNFCCC secretariat, in accordance with decision 22/CMP.1. The review took place from 17 to 22 September 2012 in Bonn, Germany, and was conducted by the following team of nominated experts from the UNFCCC roster of experts: generalists – Mr. Mikhail Gytarsky (Russian Federation) and Ms. Batimaa Punsalmaa (Mongolia); energy – Ms. Veronika Ginzburg (Russian Federation) and Mr. Glen Whitehead (Australia); industrial processes – Mr. Vladimir Danielik (Slovakia) and Ms. Detelina Petrova (Bulgaria); agriculture – Ms. Yauheniya Bertosh (Belarus) and Ms. Sumaya Zakieldeen (Sudan); land use, land-use change and forestry (LULUCF) – Mr. Vladimir Korotkov (Russian Federation) and Mr. Yusuf Serengil (Turkey); and waste – Mr. Gábor Kis-Kovács (Hungary) and Mr. Davor Vešligaj (Croatia). Mr. Gytarsky and Ms. Punsalmaa were the lead reviewers. The review was coordinated by Ms. Inkar Kadyrzhanova (UNFCCC secretariat).

2. In accordance with the “Guidelines for review under Article 8 of the Kyoto Protocol” (decision 22/CMP.1), a draft version of this report was communicated to the Government of Ukraine, which made no comment on it.

3. In 2010, the main greenhouse gas (GHG) in Ukraine was carbon dioxide (CO₂), accounting for 75.6 per cent of total GHG emissions¹ expressed in carbon dioxide equivalent (CO₂ eq), followed by methane (CH₄) (16.7 per cent) and nitrous oxide (N₂O) (7.5 per cent). Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF₆) collectively accounted for 0.2 per cent of the overall GHG emissions in the country. The energy sector accounted for 75.9 per cent of total GHG emissions, followed by the industrial processes sector (12.1 per cent), the agriculture sector (9.0 per cent), the waste sector (2.9 per cent) and the solvent and other product use sector (0.1 per cent). The LULUCF sector was a net removal of 9.9 per cent of the Annex A sources. In 2010, total GHG emissions amounted to 383,181.58 Gg CO₂ eq and decreased by 58.8 per cent between the base year² and 2010. The overall trends for the different gases and sectors reflect the changes in the national economy between the base year and 2010, and are mainly driven by the decreases in: CO₂ emissions from the energy sector (by 61.6 per cent) and the industrial processes sector (by 43.0 per cent); CH₄ emissions from the energy sector (by 52.1 per cent) and the agriculture sector (by 79.9 per cent); and N₂O emissions from the agriculture sector (by 53.1 per cent). However, during the same period, CH₄ emissions from the waste sector increased by 15.8 per cent. The expert review team (ERT) finds that the trends are reasonable.

4. Tables 1 and 2 show GHG emissions from Annex A sources, emissions and removals from the LULUCF sector under the Convention and emissions and removals from activities under Article 3, paragraph 3, and, if any, Article 3, paragraph 4, of the Kyoto Protocol (KP-LULUCF), by gas and by sector and activity, respectively. In table 1, CO₂, CH₄ and N₂O emissions included in the rows under Annex A sources do not include emissions and removals from the LULUCF sector.

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

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

² “Base year” refers to the base year under the Kyoto Protocol, which is 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 to 2010^a

		<i>Gg CO₂eq</i>								<i>Change</i>	
		<i>Greenhouse gas</i>	<i>Base year^a</i>	<i>1990</i>	<i>1995</i>	<i>2000</i>	<i>2005</i>	<i>2008</i>	<i>2009</i>	<i>2010</i>	<i>Base year–2010 (%)</i>
Annex A sources		CO ₂	718 951.47	718 951.47	360 356.18	293 541.68	320 602.57	324 540.64	274 633.14	289 707.97	–59.7
		CH ₄	151 379.05	151 379.05	98 883.41	75 633.18	70 331.85	66 440.09	62 999.04	63 865.23	–57.8
		N ₂ O	59 043.01	59 043.01	39 067.88	26 462.27	26 063.05	29 608.79	27 001.32	28 917.18	–51.0
		HFCs	0.00	0.00	0.00	14.12	253.76	571.58	586.03	658.05	NA
		PFCs	203.23	203.23	153.45	99.74	122.66	150.16	46.49	22.98	–88.7
		SF ₆	0.01	0.01	0.07	0.44	4.68	9.79	9.81	10.18	125 164.7
KP-LULUCF	Article 3.3 ^b	CO ₂						–92.05	–453.88	–506.09	
		CH ₄						0.68	0.37	0.63	
		N ₂ O						0.17	0.10	0.16	
	Article 3.4 ^c	CO ₂	NA					–56 402.19	–58 225.79	–55 854.65	NA
		CH ₄	NA					32.92	14.76	22.63	NA
		N ₂ O	NA					17.45	13.18	15.21	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.

^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

	Sector	Gg CO ₂ eq								Change
		Base year ^a	1990	1995	2000	2005	2008	2009	2010	Base year–2010 (%)
Annex A	Energy	735 556.41	735 556.41	386 146.51	305 878.26	320 170.93	318 755.30	278 484.40	290 857.51	–60.5
	Industrial processes	79 841.03	79 841.03	35 680.17	42 278.99	52 395.40	56 147.47	42 095.19	46 480.58	–41.8
	Solvent and other product use	376.80	376.80	372.11	354.89	340.38	334.73	333.42	332.01	–11.9
	Agriculture	103 602.53	103 602.53	66 469.10	37 372.46	33 809.10	35 176.48	33 484.87	34 507.43	–66.7
	Waste	10 200.00	10 200.00	9 793.09	9 866.83	10 662.76	10 907.07	10 877.96	11 004.05	7.9
	LULUCF	–69 737.11	–69 737.11	–48 757.12	–50 840.12	–38 440.09	–10 417.35	–18 267.80	–37 955.08	–45.6
	Total (with LULUCF)	NA	859 839.66	449 703.86	344 911.30	378 938.48	410 903.70	347 008.04	345 226.50	NA
	Total (without LULUCF)	929 576.77	929 576.77	498 460.98	395 751.43	417 378.57	421 321.05	365 275.83	383 181.58	–58.8
	Other ^b	NA	NA	NA	NA	NA	NA	NA	NA	NA
KP-LULUCF	Article 3.3 ^c									
	Afforestation and reforestation						–420.34	–455.22	–505.41	
	Deforestation						329.14	1.80	0.10	
	Total (3.3)						–91.20	–453.42	–505.30	
	Article 3.4 ^d									
	Forest management						–56 351.81	–58 197.86	–55 816.82	
	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					–56 351.81	–58 197.86	–55 816.82	NA

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

^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 the national totals.

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

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

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

	<i>As reported</i>	<i>Revised estimates</i>	<i>Adjustment^a</i>	<i>Final^b</i>
Commitment period reserve	1 915 907 909			1 915 907 909
Annex A emissions for current inventory year				
CO ₂	289 707 966			289 707 966
CH ₄	63 865 228			63 865 228
N ₂ O	28 917 181			28 917 181
HFCs	658 046			658 046
PFCs	22 982			22 982
SF ₆	10 179			10 179
Total Annex A sources	383 181 582			383 181 582
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	-57 798			-57 798
3.3 Afforestation and reforestation on harvested land for current year of commitment period as reported	-447 611			-447 611
3.3 Deforestation for current year of commitment period as reported	105			105
Activities under Article 3, paragraph 4, for current inventory year^c				
3.4 Forest management for current year of commitment period	-55 816 816			-55 816 816
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 CO₂ eq
for the year 2009**

	<i>As reported</i>	<i>Revised estimates</i>	<i>Adjustment^a</i>	<i>Final^b</i>
Annex A emissions for 2009				
CO ₂	274 633 145			274 633 145
CH ₄	62 999 036			62 999 036
N ₂ O	27 001 317			27 001 317
HFCs	586 032			586 032
PFCs	46 493			46 493
SF ₆	9 810			9 810
Total Annex A sources	365 275 833			365 275 833
Activities under Article 3, paragraph 3, for 2009				
3.3 Afforestation and reforestation on non-harvested land for 2009 as reported	-27 351			-27 351
3.3 Afforestation and reforestation on harvested land for 2009 as reported	-427 867			-427 867
3.3 Deforestation for 2009 as reported	1 802			1 802
Activities under Article 3, paragraph 4, for 2009^c				
3.4 Forest management for 2009	-58 197 855			-58 197 855
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 CO₂ eq
for the year 2008**

	<i>As reported</i>	<i>Revised estimates</i>	<i>Adjustment^a</i>	<i>Final^b</i>
Annex A emissions for 2008				
CO ₂	324 540 642			324 540 642
CH ₄	66 440 094			66 440 094
N ₂ O	29 608 788			29 608 788
HFCs	571 577			571 577
PFCs	150 158			150 158
SF ₆	9 788			9 788
Total Annex A sources	421 321 046			421 321 046
Activities under Article 3, paragraph 3, for 2008				
3.3 Afforestation and reforestation on non-harvested land for 2008 as reported		-27 578		-27 578
3.3 Afforestation and reforestation on harvested land for 2008 as reported		-392 761		-392 761
3.3 Deforestation for 2008 as reported		329 140		329 140
Activities under Article 3, paragraph 4, for 2008^c				
3.4 Forest management for 2008		-56 351 813		-56 351 813
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 was submitted on 13 April 2012; it contains a complete set of common reporting format (CRF) tables for the period 1990–2010 and a national inventory report (NIR). Ukraine 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 13 April 2012. The annual submission was submitted in accordance with decision 15/CMP.1.

7. 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

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

Completeness of inventory

9. The inventory covers all mandatory⁴ source and sink categories for the period 1990–2010 and is complete in terms of years, geographical coverage, sectors, categories and gases. Ukraine has provided inventory data in the CRF tables for the years 1990–2010. The set of CRF tables provided in the 2012 annual submission is complete. However, the ERT noted that several categories in the energy and industrial processes sectors were reported as not estimated (“NE”) due to the lack of available methodologies and/or emission factors (EFs) in the Intergovernmental Panel on Climate Change (IPCC) guidelines, such as: fugitive CO₂ emissions from post-mining activities and from mining activities in surface mines; fugitive CO₂ and N₂O emissions from oil refining and storage; fugitive CO₂ and CH₄ emissions from the distribution of oil products; CH₄ and N₂O emissions from ammonia production; CH₄ emissions from calcium carbide production; CO₂ emissions from adipic acid production; CO₂ emissions from paint application, from degreasing and dry cleaning, and from chemical products, manufacture and processing (see para. 63 below). The ERT

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

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

encourages the Party, subject to the availability of resources, to explore possible ways of developing appropriate methodologies and to report emission estimates for these categories in its next annual submission.

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

Overview

10. The ERT concluded that the national system continues to perform its required functions. Ukraine described the changes to the national system since the previous annual submission (see para. 137 below). The ERT considered the changes and concluded that they relate to administrative arrangements, and, as such, have not directly affected the functions of the national system.

Inventory planning

11. The NIR and additional information provided by Ukraine in response to questions raised by the ERT during the review describe the national system for the preparation of the inventory. The Ministry of the Environment and Natural Resources of Ukraine (MENR) has overall responsibility for national climate change issues, including the preparation of the national inventory. The Cabinet of Ministers of Ukraine, through MENR, designated the State Environmental Investment Agency (SEIA) as a single national entity responsible for the national system operation; inventory development; the implementation of the quality assurance/quality control (QA/QC) procedures; the submission of the national inventory to the UNFCCC; and providing support to the review process. The SEIA has within its structure the National Centre for Accounting of GHG Emissions, established in 2011 under the Act of the Cabinet of Ministers No. 1194-r, which is responsible for the improvement of the preparation, systematization, analysis, storage and archiving of the information on the national inventory. Furthermore, the SEIA has special agreements on regular data provision with major government entities, such as the State Statistics Service, the Ministry of Fuel and Energy, the Ministry of Industrial Policy, the State Forest Resource Agency and the State Committee for Water Management. Other institutions involved in the preparation of the inventory include the Ministry of Emergency Events, the Customs Service, the State Committee for Land Resources, the National Academy of Sciences of Ukraine (NASU), the Fund for Targeted Environment (Green) Investments, Ukrtransgaz, the Ukrainian Hydrometeorological Research Institute, the Gas Research Institute of NASU, the Makeevo State Research Institute for Security of Mining Operations, the State Research Institute for Automobile Transport Projections, the Energy Research Institute, the Vinnytsia National Agrarian University, the National University of Biological Resources and Environmental Management, the Ukrainian Scientific and Research Institute for Forestry and Land Melioration, other state and private entities and independent experts. The Inter-Agency Commission on the Implementation of the Commitments under the Convention reviews the national inventory prior to its submission to the UNFCCC secretariat (see para. 19 below).

12. Although the national system in Ukraine performs its functions in line with the provisions of decision 19/CMP.1, the ERT noted that specific roles of different entities involved in the development of the inventory have been insufficiently described in the NIR. For example, the ERT noted that the NIR mentions the Inter-Agency Commission on the Implementation of the Commitments under the Convention; however, its functions remain unclear. The ERT further noted that a large number of institutions and individual experts are involved in the preparation of the inventory, but the specific responsibilities of each institution (e.g. the National University of Biological Resources and Environmental Management and the State Research Institute for Automobile Transport Projections) and

their cooperation with the national inventory agency are not sufficiently documented in the NIR. A similar issue was raised in the previous review report, wherein the ERT encouraged Ukraine to review its internal procedures in order to ensure more effective inter-agency coordination. In response to a question raised by the ERT during the review, Ukraine provided additional information to explain how inter-agency coordination, interactions between experts and data flows are organized. The ERT recommends that Ukraine include this information in its next annual submission along with the description of the functions performed by the particular agencies responsible for official consideration of the national inventory and supplementary information under the Kyoto Protocol prior to its submission to the UNFCCC secretariat.

Inventory preparation

Key categories

13. Ukraine has reported a key category tier 1 analysis, both level and trend assessments, as part of its 2012 annual submission. The Party has included the LULUCF sector in its key category analysis, which was performed in accordance with the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC good practice guidance) and the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF).

14. The tier 1 key category analysis performed by Ukraine and that performed by the secretariat⁵ produced different results in terms of the categories identified and their contribution to the national emission totals, due to the different level of category disaggregation. In response to a question raised by the ERT during the review, Ukraine indicated that the differences identified would be considered under the QA/QC procedures applied to the inventory.

15. The ERT noted minor inconsistencies between the lists of key categories in the NIR and in CRF table 7. For example, nitric acid production, aluminium production and ferroalloys production were identified as key categories in the NIR, but were not reported in CRF table 7. The ERT recommends that Ukraine enhance the consistency between the key category analysis reported in the NIR and in CRF table 7 in its next annual submission.

16. The Party has identified forest management and afforestation and reforestation as key categories in the NIR-3 table of the KP-LULUCF CRF tables. However, according to the comments provided by Ukraine, afforestation and reforestation is not considered as a key category because it is less than the smallest category considered key by emission level in the inventory under the Convention. The ERT recommends that Ukraine exclude non-key categories from the NIR-3 table in the next annual submission.

Uncertainties

17. Ukraine has performed a quantitative tier 1 uncertainty analysis in accordance with the IPCC good practice guidance and the IPCC good practice guidance for LULUCF. The overall uncertainty of the level of the emissions (including LULUCF) for the 2012 annual

⁵ The secretariat identified, for each Party, the categories that are key categories in terms of their absolute level of emissions, applying the tier 1 level assessment as described in the IPCC good practice guidance for LULUCF. Key categories according to the tier 1 trend assessment were also identified for Parties that provided a full set of CRF tables for the base year or period. Where the Party performed a key category analysis, the key categories presented in this report follow the Party's analysis. However, they are presented at the level of aggregation corresponding to a tier 1 key category assessment conducted by the secretariat.

submission was 4.4 per cent, which is lower than for the 2011 annual submission (5.1 per cent). The uncertainty of the emission trend has also improved: 1.1 per cent in the 2012 annual submission compared with 1.2 per cent in the 2011 annual submission. The decrease in the uncertainty was underpinned by improvements in the estimation of emissions from coal mining and handling, limestone and dolomite use, iron and steel production, and managed waste disposal on land. The results of the uncertainty analysis and the supporting documentation have been provided in the NIR. However, it is unclear from the NIR how the results of uncertainty assessment have been used to prioritize inventory improvements, even though this issue was raised in the previous review report. In response to the questions raised by the ERT during the review, Ukraine confirmed that the results of the uncertainty assessment are used to prioritize the improvements, for example research on N₂O emissions from agricultural soils, CH₄ emissions from other leakage (natural gas) and CH₄ emissions from managed waste disposal on land. The ERT recommends that Ukraine include this information in its next annual submission.

Recalculations and time-series consistency

18. Recalculations have been performed and reported in accordance with the IPCC good practice guidance. The ERT noted that the reported recalculations of the time series 1990–2009 have been undertaken to take into account: improvements in activity data (AD), EFs and methods (in the energy, industrial processes, agriculture, LULUCF and waste sectors); the shift to higher-tier methods (in the energy, agriculture and waste sectors); and the provision of estimates for missing emissions identified in the previous review report (in the energy, industrial processes, agriculture, LULUCF and waste sectors). The recalculations, and the magnitude of their impact, include the following: a decrease in total GHG emissions for 1990 by 0.4 per cent and for 2009 by 2.4 per cent. The major recalculations were made in the following categories: CO₂ emissions in metal production and fuel combustion. The rationale for these recalculations is provided in the NIR and in CRF table 8(b). The ERT is satisfied with the provided explanations.

Verification and quality assurance/quality control approaches

19. According to the NIR, the Inter-Agency Commission on the Implementation of the Commitments under the Convention performs the verification procedures for the national inventory submission. However, specific verification procedures have not been documented in the NIR. The ERT recommends that Ukraine document the verification procedures and their outcomes in line with the IPCC good practice guidance in the next annual submission.

20. Ukraine has performed general (tier 1) and sector-specific (tier 2) QA/QC procedures, in line with the IPCC good practice guidance and the annex to decision 19/CMP.1. These procedures have been described in the annual QA/QC plan. The sector-specific activities were implemented by experts from the institutions responsible for inventory estimates with the involvement of the external experts from NASU and from the relevant ministries and research institutions. The individual QA/QC procedures applied during the inventory preparation process have been described in the sectoral chapters of the NIR. In response to a recommendation in the previous review report, Ukraine has reported more explicit information on the QA/QC procedures for the sectors where confidential information is used (see para. 64 below). The ERT commends Ukraine for the enhancement of the QA/QC procedures for the national inventory.

Transparency

21. The NIR and the CRF tables are transparent. The information contained in the NIR is sufficiently detailed to enable the understanding of how the emission estimates have been performed. The methods and the EFs used are described in such a way that enables the

reviewers to assess the underlying assumptions and rationale for the choices of data, methods and other inventory parameters.

22. The 2012 annual submission of Ukraine is organized in a way that sector-specific chapters do not describe the rationale for the choices of methods, AD and parameters used and the underlying emission and removal estimates, but this information is provided in the annexes to the NIR. The ERT is of the view that such an approach hinders the user-friendliness of the report, making it difficult to cross-check the inventory estimates (see para. 33 below). The ERT therefore encourages Ukraine to consider improving the structure of its NIR and to provide information on the data, methods and parameters and the rationale for their selection in the sector-specific chapters of the NIR in its next annual submission.

Inventory management

23. Ukraine 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 preparation of the inventory. The archived information also includes internal documentation on the QA/QC procedures, external and internal reviews, and the documentation on annual key categories and key category identification and planned inventory improvements. The system is kept at SEIA, which is responsible for its overall management.

3. Follow-up to previous reviews

24. Ukraine has implemented improvements in response to the recommendations in the previous review reports. These are described in a separate section of the NIR containing an overview table, which allows tracking the changes introduced to the inventory based on a specific recommendation from the previous review report. The ERT noted that almost all the recommendations from the previous review report have been addressed (see paras. 38 and 65 below). The ERT commends Ukraine for its efforts to improve the transparency of its inventory and encourages the Party to maintain the same level of quality in its next annual submission.

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

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

26. 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

27. The energy is the main sector in the GHG inventory of Ukraine. In 2010, the emissions from the energy sector amounted to 290,857.51 Gg CO₂ eq, or 75.9 per cent of total GHG emissions. Since 1990, emissions have decreased by 60.5 per cent. The key drivers for the fall in emissions are the economic crisis during the transformation of the country to a market economy, and the switch from liquid to gaseous fuels. In more recent years, however, there has been a shift from the use of natural gas to coal due to the rise in gas prices since 2006. A significant decrease in emissions, from 73,400.03 Gg CO₂ eq in 2008 to 54,658.71 Gg CO₂ eq in 2009 (a 25.5 per cent decrease), from manufacturing industries and construction occurred in 2009 due to the economic crisis in 2008–2009. However, the ERT noted an increase in emissions from manufacturing industries and

construction, from 54,658.71 Gg CO₂ eq in 2009 to 59,029.44 Gg CO₂ eq in 2010 (an 8.0 per cent increase), but the emissions are still much lower than in 2008.

28. Within the sector, in 2010, 35.3 per cent of the emissions were from energy industries, followed by 20.3 per cent from manufacturing industries and construction, 15.7 per cent from other sectors, 14.9 per cent from fugitive emissions, including solid fuels (6.9 per cent) and oil and natural gas (7.7 per cent), and 13.8 per cent from transport. The remaining 0.3 per cent was from the category other (energy).

29. Ukraine made recalculations for the energy sector between the 2011 and 2012 annual submissions in response to the recommendations in the 2011 annual review report, following updates of AD, EFs, parameters and methods and in order to correct the identified errors. The impact of these recalculations on the energy sector is an increase in emissions of 5.7 per cent for 1990 and of 6.2 per cent for 2009. The main recalculations took place in the following categories:

(a) CO₂ emissions from stationary combustion of gaseous fuels due to the update of the country-specific EFs and taking into account the composition of natural gas extraction inside the country. This recalculation resulted in a decrease of 0.2 per cent for 2009;

(b) CH₄ and N₂O emissions from road transportation due to the introduction of the COPERT model, country-specific EFs and updates of AD on LPG (liquefied petroleum gas) and natural gas, resulting in an increase of CH₄ emissions of 2.6 times for 2009 and an increase of N₂O emissions of 3.5 times in 2009;

(c) CO₂ and CH₄ emissions from coal mining in underground mines due to the development of country-specific CO₂ EFs based on the inventory of actual fugitive CO₂ emissions from underground coal mines, resulting in a decrease of CH₄ emissions of 28 per cent in 2009 and an increase of CO₂ emissions of 1.8 times for 2009.

30. The ERT noted that the reporting for the energy sector is complete in terms of gases, years and categories. The most categories in the energy sector have been estimated. However, some emissions are reported using the notation key "NE", such as: fugitive CO₂ emissions from post-mining activities; fugitive CO₂ emissions from mining activities in surface mines; fugitive CO₂ and N₂O emissions from oil refining and storage; and fugitive CO₂ and CH₄ emissions from the distribution of oil products. In response to a question raised by the ERT during the review, Ukraine explained that these categories were not estimated due to their low scale and the lack of the AD. The ERT encourages Ukraine to make efforts to provide these emission estimates for the following missing categories and gases, for which no methodologies or EFs are available in the Revised 1996 IPCC Guidelines and/or the IPCC good practice guidance.

31. In response to a recommendation in the previous review report, Ukraine has improved cooperation with the State Statistics Service, which has led to improvements in the accuracy of the inventory due to the correction of liquid and gaseous fuels allocation between stationary and mobile sources; the identification of correspondence between the national fuel codes and the IPCC fuel types; and the reallocation of fuels among the categories. The ERT commends Ukraine for the improvements made.

32. The energy balance for 2010 was neither included in the NIR nor provided during the review in response to a question raised by the ERT. As explained by the Party during the review, the energy balance was not used for the inventory. Two reasons for this were stated by Ukraine: the energy balance for 2010 was published by the State Statistics Service in February 2012, after the emission calculations had been completed, and, in addition, experts from the State Statistics Service had identified inaccuracies in the energy balance for 2010 and suggested the use of statistical forms as a more reliable and accurate data

source. For the next annual submission, the ERT strongly recommends that Ukraine include the energy balance for the corresponding year of its latest inventory (e.g. the energy balance for 2011 in the 2013 annual submission).

33. The ERT noted from the NIR, that Ukraine has used AD from different providers, such as Ukrtransgaz and customs service, as well as the state statistical forms. This could lead to a double-counting of emissions or inconsistency in the data. In response to a question raised by the ERT during the review, whether all fuel combusted by small enterprises was accurately accounted for in the inventory, Ukraine explained that it is obligatory for all enterprises, including small ones, to provide statistical reports. The ERT recommends that Ukraine cross-check the AD to ensure that there is no double-counting/inconsistencies; develop a mass balance for all fuels in order to ensure the completeness of the AD and explain the steps taken for these actions in the NIR of its next annual submission.

34. The ERT noted that, following a recommendation in the previous review report, Ukraine has improved transparency of the information in the NIR in relation to the AD and emission trends explanation, including the short-term trends and fuel mix changes for each category. The ERT further noted that the recommendation in the previous review report regarding the provision of detailed information in a tabular format on all the EFs used has also been implemented in the 2012 annual submission. The ERT commends Ukraine for its efforts and encourages the Party to continue to provide this information in its next annual submission.

35. The ERT further noted that the NIR for the energy sector is very detailed and has many subchapters and annexes. The ERT commends Ukraine for inclusion of additional information on the AD, methodologies and EFs used. However, the complicated structure of the NIR makes it difficult to follow the estimates performed. The ERT encourages the Party to exclude the previous years' information, which has already been presented in the previous NIRs and has not been subsequently changed, but provide a reference to the previous NIRs instead.

36. The ERT noted that the emissions of precursor gases (CO, non-methane volatile organic compounds (NMVOC), NO_x and SO₂) from fuel combustion for the period 1991–1997 were estimated, while previously they were reported as “NE”. The ERT further noted that the AD on petroleum refining and the manufacture of solid fuels and other energy industries continue to be included under public electricity and heat production for the period 1990–1997 and reported in a disaggregated way under the corresponding categories for 1998 and onwards. The ERT noted that this leads to inconsistency in the time series. In response to a question raised by the ERT during the review, Ukraine explained that there were no AD available from the State Statistics Service for these subcategories for the years 1990–1997. The ERT recommends that Ukraine explore alternative ways for estimation and appropriate allocation of the emissions from petroleum refining and from the manufacture of solid fuels and other energy industries for the period 1990–1997 using the recommendations in chapter 7 of the IPCC good practice guidance, while ensuring time-series consistency in its next annual submission.

37. In addition, the ERT noted that the emissions from agricultural off-road vehicles are reported under other transportation. Responding to the recommendation in the previous review report, Ukraine stated in the NIR that the allocation of these emissions under agriculture/forestry/fisheries is not technically possible because emissions from stationary and mobile combustion are not disaggregated in this category in CRF table 1.A(a). The ERT notes that estimation of emissions should not depend on the reporting structure and recommends that Ukraine calculate the emissions from stationary and mobile combustion under agriculture/forestry/fisheries separately in its worksheets and then calculate the total emissions, in order to provide accurate and complete information in CRF table 1.A(a). For

the next annual submission, the ERT reiterates the recommendation in the previous review report that Ukraine report emissions from agricultural off-road vehicles under agriculture/forestry/fisheries and emissions from other off-road vehicles under manufacturing industries and construction, with the exception of emissions from ground activities in airports and harbours, which have to be reported under other (energy) and other transportation.

38. Ukraine has implemented QA/QC procedures in the energy sector, including a cross-check of AD obtained from different statistical forms, verification of EFs and emission trends made by sectoral experts, comparison of calculation results made using computer programmes and worksheet calculations, and analysis of statistical forms structures made in cooperation with the State Statistics Service. The above QC procedures indicate that the quality of the inventory estimates is good, as the difference is not more than 1 per cent between the AD used in the inventory and that provided in different statistical forms. An uncertainty assessment made for the energy sector using the IPCC tier 1 method with the IPCC default uncertainties for AD and EFs shows a total uncertainty for GHG emissions of 4.3 per cent. Ukraine has addressed most of the recommendations made in the previous review report. The ERT notes that the recommendations from the previous review report to develop country-specific CO₂ EFs for motor fuels and residential fuel oil and country-specific fugitive CH₄ EFs for end-users are included in the improvement plan for 2012–2014.

2. Reference and sectoral approaches

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

39. Ukraine has provided apparent consumption data and CO₂ emission estimates calculated using the reference approach for the entire time series, including for the period 1991–1997, for the first time in the CRF tables of the 2012 annual submission. Thus, the time series for the reference approach is complete and consistent. CO₂ emissions from fuel combustion were calculated using the reference approach and the sectoral approach. The ERT commends Ukraine for its efforts.

40. The ERT noted that carbon stored was recalculated using the methodology and EFs from the Revised 1996 IPCC Guidelines for the entire time series in response to the recommendation in the previous review report. This has led to an increase in the difference of CO₂ emissions between the reference and sectoral approaches (ranging from 7.6 per cent to 21.7 per cent), which is higher than the differences reported in the previous annual submission (ranging from –1.5 per cent to 7.0 per cent). The difference for 2010 is 11.6 per cent.

41. Ukraine explained in the NIR that the large difference is due to the fact that the Party consumes a significant amount of fuels as feedstock (especially natural gas and coke) but not all of these fuels are considered as carbon stored in the reference approach. The ERT noted that the most of the problem is caused by the difference in solid fuel consumption, which is 18.8 per cent higher in the reference approach than in the sectoral approach. The ERT recommends that Ukraine cross-check solid fuel (especially coke) feedstock consumption between the energy and the industrial processes sectors and consider all non-energy and feedstock uses of solid fuels and natural gas as carbon stored in the reference approach. The other explanation provided by Ukraine is that the transportation and end-use losses and fugitive emissions are not reflected in the reference approach. The ERT noted that the difference in CO₂ emission estimates between the reference and the sectoral approaches for 2010 is one of the largest among the reporting Parties (ranging from –9.2 0 per cent to 41.0 per cent) and recommends that Ukraine improve the accuracy of the data used in the reference approach (see para. 42 below).

42. The apparent consumption of coking coal and anthracite is reported in the reference approach using the notation key “IE” (included elsewhere) for the entire time series. Ukraine explains in the NIR that these fuels are aggregated with bituminous coal in the CRF tables. The ERT noted that this is not in line with the Revised 1996 IPCC Guidelines. The ERT recommends that Ukraine disaggregate the data according to the different coal types in the CRF tables of its next annual submission.

43. The ERT noted that the apparent consumption data reported to the UNFCCC differ from those reported to the International Energy Agency (IEA). Apparent consumption in Ukraine’s reference approach reported to the UNFCCC differs within 11 per cent of the IEA data for all years. The growth rate from 1990 to 2010 for the total apparent consumption is –62 per cent (CRF tables) versus –55 per cent (IEA). For 1990, the total apparent consumption in the CRF tables is higher than that of the IEA by 9 per cent, for 2010, the total apparent consumption in the CRF tables is lower than that of the IEA by 10 per cent. In particular, the natural gas production and import data are systematically lower in the CRF tables by about 4 per cent from 1995 to 2008, after that the CRF data are about 7 per cent higher. For the years 1999–2005 and 2008–2009, natural gas imports are systematically lower, by 10–40 per cent in the CRF tables. Natural gas exports, together with exports of bitumen, lubricants, petroleum coke and other oil, are reported in the CRF tables and not reported to the IEA. Responding to the earlier stages of the review process, Ukraine explained that the data reported in the CRF tables are provided by the sole operator of the gas transportation system of Ukraine, Ukrtransgaz, while the data reported to the IEA are provided by the customs service. During the previous stages of the review process, it was also identified that the data on coal production differ from the IEA data. The ERT encourages Ukraine to ensure that the national institutions generating the data for reporting to international organizations work closely with the national inventory team. The ERT also recommends that Ukraine ensure that the reporting is based on the most accurate data and explain the reasons for the differences in its next annual submission.

International bunker fuels

44. The ERT noted that the inventory of aviation bunker emissions is complete, consistent and has been made in line with the Revised IPCC 1996 Guidelines. The approach applied to the allocation of emissions between domestic and international aviation is in line with the Revised 1996 IPCC Guidelines and the IPCC good practice guidance. Ukraine estimates fuel consumption for international and domestic aviation for the period 1996–2009 using the database on aircraft take-offs, including information on aircraft type and destination airport. The European Monitoring and Evaluation Programme Core Inventory of Air Emissions (EMEP/CORINAIR) methodology, equivalent to IPCC tier 2b, was used to estimate fuel consumption, the IPCC default EFs were used to estimate CO₂ and N₂O emissions from international bunker fuels and the EMEP/CORINAIR approach was used to estimate CH₄ emissions from international bunker fuels.

45. The detailed specification of flight types, destinations and characteristics, which is used to separate domestic and international aviation, is not available for the period 1991–1995, but is available for the years 1996–2010. Ukraine has therefore calculated aviation bunker emissions in 1990 using an average rate (22 per cent) of domestic flights. However, the justification for this rate is not provided in the NIR. Emissions for the period 1991–1995 were calculated by using an interpolation method based on 1990 and 1996 data on aviation bunker fuels use. The ERT recommends that Ukraine provide justification for the rate of international aviation for 1990.

46. The NIR reports that the national statistics do not contain any data on marine bunkers. Ukraine uses an indirect method to calculate CO₂, N₂O and CH₄ emissions from marine bunkers based on data on total fuel consumption for maritime transport collected by

the State Statistics Service, data on freight turnover for maritime transport in coastal waters and data on international shipping. This method is in line with the IPCC good practice guidance. Ukraine recalculated the emissions from international marine bunkers for 1998–2004 between the 2011 and 2012 annual submissions due to the detection of a calculation error.

Feedstocks and non-energy use of fuels

47. In response to a recommendation in the previous review report, Ukraine has revised the estimates of feedstocks and non-energy use of fuels in line with the Revised 1996 IPCC Guidelines for all years of the time series. Previously, the Party used all carbon storage fractions equal to 1, except for lubricants, and reported not only non-energy use in CRF table 1.A(d) but also inputs for coke production, natural gas losses and coke oven gas flares during coke production. In the 2012 annual submission, Ukraine considers the following fuels as feedstock: gas/diesel oil, LPG, bitumen, lubricants, coke and natural gas. For the calculation of fuel used as feedstock, Ukraine uses the default fractions of carbon stored from the Revised 1996 IPCC Guidelines.

48. According to the information reported in the NIR, as well as the explanations provided in response to a question raised by the ERT during the review, Ukraine does not consider all natural gas and coke used as feedstock from the energy sector when calculating the amount of carbon stored and carbon for non-energy use. The amount of natural gas used as feedstock in the industrial processes sector and included in this calculation is similar, but differs by 0.7 per cent, while the coke used as feedstock in the industrial processes sector is not accounted for in the carbon stored calculation at all. The ERT recommends that Ukraine improve the reporting of information on cross-cutting issues between the energy and industrial processes sectors in order to ensure accuracy and consistency of the amounts of fuel used in the industrial processes sector as feedstock and those amounts in the energy sector used for the calculation of carbon stored and carbon for non-energy use. To improve transparency, the ERT further recommends that Ukraine report in CRF table 1.A(d) the accurate fraction of each fuel used for feedstocks and non-energy use in its next annual submission.

49. Refinery feedstock (1996–2008) and naphtha (2006–2008) data are reported in the IEA data but not in the CRF tables. Ukraine explained in its response to the previous review stages that these data were not included in CRF tables because of their non-energy use. In Ukraine, the refinery feedstocks are used at the oil refineries for technological processes and the naphtha is used in the petrochemical industry as an integral part of the technological process. The ERT noted that this is not in the line with the Revised 1996 IPCC Guidelines, which require that fuels used for non-energy purposes and as feedstock are used for the calculation of carbon stored and reported in CRF table 1.A(d) and excluded from the energy sector. The ERT recommends that Ukraine report accurately non-energy use and feedstock data for refinery feedstock and naphtha for the entire time series, and explore and explain, as much as possible, any differences between the information in the CRF tables and the IEA data in its next annual submission.

3. Key categories

Stationary combustion: gaseous fuels – CO₂, CH₄ and N₂O⁶

50. In response to the recommendations in the previous review reports, Ukraine has revised the country-specific CO₂ EF for natural gas, taking into account data on natural gas that is produced domestically. The previous country-specific CO₂ EF was based only on data compiled from measurements of imported natural gas in the pipeline on the borders of the country. The recalculation has resulted in an increase in the value of the EF from 55.12 t CO₂/GJ to 55.46 t CO₂/GJ for 2009, which leads to a 0.5 per cent increase of CO₂ emissions from gas combustion. The recalculations of the CO₂ EF were made for all years, except for 1990, for which the IPCC default EF is used. However, initial AD on domestic gas production are available only for 2008–2010. The ERT commends Ukraine for the improvement made and encourages it to further explore this issue, taking into account the change in the mix of imported and domestic natural gas over the years.

51. In the 2011 annual submission following a recommendation in the previous review report, Ukraine reallocated to the energy sector a part of natural gas used for combustion purposes by the ammonia production industry. The data obtained from three of the six ammonia-producing companies were used to differentiate between natural gas feedstock and fuel use. In the 2012 annual submission, the Party provided information in the NIR chapter on the industrial processes sector that all ammonia-producing companies provided technically specific data on energy and feedstock natural gas use. However, no explanation about these data was provided in the NIR chapter on the energy sector. The ERT recommends that Ukraine provide, in the NIR of the next annual submission, summary information on the procedures or method used to split fuel and feedstock natural gas data in the chapter on the energy sector and make clear references to the detailed information in the chapter on the industrial processes sector of the NIR.

52. Ukraine has provided an aggregated balance for the natural gas consumption in the inventory in the annex to the NIR. However, the fuel consumption is presented for aggregated categories only, such as stationary combustion and mobile combustion. The ERT reiterates the encouragement from the previous review report that Ukraine improve the transparency of its reporting of the data on natural gas consumption by providing a detailed balance, including a disaggregation by subcategory, and the non-energy and feedstock use allocated to the calculation of non-energy use and excluded from the energy sector.

Road transportation: liquid and gaseous fuels – CO₂

53. Ukraine uses the IPCC default CO₂ EF for gasoline, equal to 18.9 t CO₂/TJ. Taking into account the carbon oxidation factor, the CO₂ IEF is 68.6 t CO₂/TJ, which is among the lowest for the reporting Parties (ranging from 64.6 t CO₂/TJ to 73.9 t CO₂/TJ). As CO₂ emissions from road transportation is a key category, it is good practice to develop a country-specific CO₂ EF based on the carbon content of fuel. The CO₂ EF for gasoline for European cars, equal to 73 t CO₂/TJ (19.9 t CO₂/TJ), is provided in table 1-36 of volume 3 of the Revised 1996 IPCC Guidelines; that is more appropriate, if no country-specific information is available. The ERT strongly recommends that Ukraine develop a country-specific CO₂ EF for gasoline and use it in its next annual submission. Alternatively, if that is not possible, the ERT recommends that Ukraine conduct research to develop such an EF and in the meantime use the IPCC CO₂ EF for European cars from the Revised 1996 IPCC

⁶ Not all emissions related to all gases under this category are key categories, particularly CH₄ and N₂O emissions. However, since the calculation procedures for the issues related to this category are discussed as a whole, the individual gases are not assessed in separate sections.

Guidelines, or provide information to justify that the IPCC default CO₂ EF used is appropriate to the national circumstances.

54. According to the IPCC good practice guidance, CO₂ emissions from road transportation should be calculated using both top-down and bottom-up approaches in parallel as an important quality check. The ERT therefore encourages Ukraine to apply a bottom-up approach to estimate CO₂ emissions (similar to the approach used to estimate CH₄ and N₂O emissions) in parallel with the top-down approach used, in order to ensure the accuracy of the estimates in its next annual submission.

55. Recalculations have been made by Ukraine since the previous annual submission due to the updates of the AD for LPG and compressed natural gas (CNG) for all years. Ukraine has applied a mass balance method to correct the AD for LPG, taking into account expert judgement and updated information from gas operators with CNG. The ERT considers that this has resulted in an improvement in the accuracy of the inventory and commends Ukraine for its efforts. However, the ERT noted that the Party has not provided transparent information on these recalculations in the NIR. The ERT recommends that Ukraine include a detailed explanation of the methodology used to estimate LPG and CNG consumption and the mass balances for these fuels in the NIR of its next annual submission.

Coal mining and handling – CO₂ and CH₄

56. In response to a recommendation in the previous review report, Ukraine has made improvements in the accuracy of the emission estimates for coal mining and handling. These improvements include the recalculation of: CH₄ and CO₂ emissions from underground coal mining due to direct measurements of actual fugitive emissions; CH₄ emissions from flooded/abandoned mines due to direct measurements; and CH₄ emissions from post-mining activities due to the development of a country-specific EF. The impact of the recalculations on the coal mining and handling category for 2009 is an increase in CO₂ emissions of 6.4 per cent and a decrease in CH₄ emissions of 26.4 per cent. The difference for 1990 is an increase of CO₂ emissions of 10.5 per cent and a decrease of CH₄ emissions of 6.0 per cent. Detailed explanations of these recalculations are provided in the NIR. The ERT commends Ukraine for these improvements and confirms that they have been undertaken in line with the 1996 Revised IPCC Guidelines.

4. Non-key categories

Road transportation: liquid fuels – CH₄ and N₂O

57. The ERT noted that Ukraine has applied a tier 3 method to calculate CH₄ and N₂O emissions from road transportation, thereby addressing a recommendation in the previous review report. The applied improvements are made in line with the IPCC good practice guidance. The ERT noted from the NIR that the vehicle split by category was applied based on AD from the electronic database of registered road vehicles of the Ministry of Internal Affairs according to the road transport classification of the European Environment Agency (COPERT IV model). Almost all the EFs were taken from the standard COPERT model. In order to determine the EFs for national vehicle types not included in the standard COPERT model, such as gasoline-fuelled heavy-duty vehicles such as buses, CNG-fuelled heavy-duty vehicles such as trucks and CNG-fuelled light-duty vehicles, expert judgement based on the available AD, assumptions and calculations was applied. The ERT commends the Party for the improvements made but recommends that Ukraine include a detailed explanation of the methodology, assumptions and AD used to split the vehicles by category in the NIR of its next annual submission.

C. Industrial processes and solvent and other product use

1. Sector overview

58. In 2010, emissions from the industrial processes sector amounted to 46,480.58 Gg CO₂ eq, or 12.1 per cent of total GHG emissions, and emissions from the solvent and other product use sector amounted to 332.01 Gg CO₂ eq, or 0.1 per cent of total GHG emissions. Since the base year, emissions have decreased by 41.8 per cent in the industrial processes sector and by 11.9 per cent in the solvent and other product use sector. The key driver for the fall in emissions in the industrial processes sector is a general decrease in industrial activities as a result of the transition to a market economy in the early 1990s.

59. Within the industrial processes sector, in 2010, 60.9 per cent of the emissions were from metal production, followed by 20.1 per cent from mineral products and 17.6 per cent from the chemical industry. Consumption of halocarbons and SF₆ accounted for 1.4 per cent. Within the solvent and other product use sector, in 2010, only emissions from the use of N₂O for anaesthesia were reported.

60. Ukraine has made recalculations for the industrial processes sector between the 2011 and 2012 annual submissions in response to the recommendations in the previous review report, following changes in AD and EFs and in order to rectify identified errors. The recalculations were in line with the IPCC good practice guidance and related information has been included in the NIR. The impact of the recalculations on the industrial processes sector is a decrease in emissions by 38.2 per cent for 1990 and by 40.7 per cent for 2009. The main recalculations took place in the following categories:

(a) CO₂ emissions from iron and steel production due to splitting emissions between the energy and industrial processes sectors, resulting in a decrease of 50.5 per cent for 2009;

(b) CO₂ emissions from limestone and dolomite use due to improved AD on iron and steel production, resulting in a decrease of 35.1 per cent for 2009;

(c) CO₂ emissions from lime production due to the use of country-specific EFs, resulting in a decrease of 11.4 per cent for 2009;

(d) HFC emissions from consumption of halocarbons and SF₆ due to reporting of new data about imports of refrigerators, resulting in an increase of 72.5 per cent for 2009;

(e) CO₂ emissions from ammonia production due to improved data on consumption of natural gas and the content of carbon in natural gas, resulting in an increase of 6.0 per cent for 2009;

(f) CO₂ emissions from carbide production due to improving the import/export data for calcium carbide, resulting in a decrease of 11.4 per cent for 2009;

(g) CO₂ emissions from cement production due to improvement of country-specific EFs, resulting in a decrease of 1.1 per cent for 2009;

(h) CO₂ emissions from soda ash production and use due to improvement of import/export data, resulting in an increase of 74.0 per cent for 2009;

(i) CO₂ emissions in glass production due to improvement of country-specific EFs, resulting in a decrease of 2.8 per cent for 2009.

61. The Party did not make any recalculations for the solvent and other product use sector between the 2011 and 2012 annual submissions.

62. Ukraine has reported indirect GHG emissions in the NIR and CRF tables, including NMVOC emissions in the industrial processes sector. In the solvent and other product use sector, only NMVOC were reported as indirect GHG emissions.

63. The CRF tables include the estimates of emissions for all categories from the industrial processes and solvent and other product use sectors for which there are methodologies available in the Revised 1996 IPCC Guidelines and the IPCC good practice guidance. The categories reported using the notation key “NE” are only those for which there is no IPCC methodology available (e.g. CH₄ and N₂O emissions from ammonia production, CH₄ emissions from calcium carbide production, CO₂ emissions from adipic acid production and CO₂ emissions from paint application, from degreasing and dry cleaning, and from chemical products, manufacture and processing). The sector inventory is complete in terms of gases, years and geographical coverage. The ERT noted that for some categories there are inconsistencies between the information reported in the NIR and in the CRF tables. The ERT also noted typographical errors (e.g. in the description of cement production, Ukraine reported MgCO₃ instead of MgO, and in iron and steel production the labelling of subcategories was incorrect). Furthermore, the ERT noted that the methods used are not always clearly, accurately and transparently described in the NIR (especially for lime production, carbide production, ferroalloys production and aluminium production). The ERT reiterates the recommendation in the previous review report that Ukraine check and correct any typographical errors and inconsistencies between the NIR and the CRF tables and elaborate the descriptions on the methods and background parameters used in its next annual submission.

64. According to the “Law of Ukraine on State Statistics, with amendments and additions introduced by the Law of Ukraine of 13 July 2000 No. 1922-III” (2006), which relates to the confidentiality of state statistics, information on production values from industrial activities with fewer than three plants remains confidential. Due to this law, a certain amount of confidential data is aggregated in Ukraine’s inventory, thus decreasing the comparability of the estimates and the transparency of the inventory. Although the number of categories reported as “C” (confidential) has decreased significantly since the previous annual submissions and the allocation of confidential data has been improved, the ERT reiterates the encouragement in the previous review report that Ukraine continue to decrease the number of categories reported as “C”, where possible, and improve the allocation of confidential data. For example, NO_x, SO₂, NMVOC and CO emissions from aluminium production and from adipic acid production instead of under iron and steel production and nitric acid production, respectively, could be reported under the propylene, polypropylene, polystyrene, polyethylene, phthalic anhydride, aluminium and adipic acid category. The proposed allocation better reflects the fundamental nature of the products. CO₂ emissions from ferroalloys production and from aluminium production were reported using the notation key “IE”, and, due to the confidentiality of the data, a new subcategory, other aluminium and ferroalloys production, was created in order to report aggregated data.

65. The ERT noted that Ukraine has addressed most of the recommendations in the previous review report, except for the provision of more detailed information on the background parameters for ferroalloys production (used mass of ore, reducing agent, slag-forming materials and waste, as well as their carbon content). The ERT commends Ukraine for significant improvements in the completeness and accuracy of the inventory.

66. In the NIR, Ukraine has reported very detailed new information on CO₂ emissions from limestone and dolomite use, iron and steel production, and consumption of halocarbons and SF₆. The ERT commends Ukraine for significant progress achieved in the transparency of the reporting on these categories.

67. The Party’s general QA/QC approach with regard to the industrial processes sector is to collect the data from different sources, where possible (e.g. directly from enterprises,

from the State Statistics Service and from the Ministry of Industrial Policy) and compare the AD between them, to compare emission estimates with those in the previous annual submission and to compare the country-specific EFs with the IPCC default values and with the country-specific EFs of other reporting Parties. Expert judgement (e.g. from the external experts and/or research organizations) is also used for some categories. However, the sector-specific QA/QC activities could be improved by, for example, conducting peer reviews of all inventory estimates, at least of the key categories, performed by external experts not involved in the preparation of the inventory. The ERT commends Ukraine for the implementation of peer reviews for some categories (e.g. nitric acid production, adipic acid production, iron and steel production, and ferroalloys production) and encourages Ukraine to continue such efforts.

68. For uncertainty estimates, the Party used only a tier 1 method. The ERT encourages Ukraine to use tier 2 for evaluation of uncertainties for key categories. The planned improvements, as reported in the NIR, include obtaining a country-specific EF for N₂O emissions from adipic acid production, obtaining data on destruction of N₂O and collection of AD on paint application in solvent and other products use. The ERT recommends that Ukraine implement the planned improvements in the next annual submission.

2. Key categories

Limestone and dolomite use – CO₂

69. The ERT commends Ukraine for obtaining highly detailed data on consumption of limestone and dolomite in the metallurgical industry. However, the ERT noted that the amount of limestone added during pig iron production is unusually high for 1990 (151 kg/t of pig iron). For the rest of the time series, the content reported by the Party is around three to five times lower (below 81 kg/t, mainly between 30 and 50 kg/t). In response to a question raised by the ERT during the review, Ukraine explained that the value for 1990 was based on data from the former Soviet Union, while the values reported for the other years of the time series reflect the actual national data. For the next annual submission, the ERT recommends that Ukraine check the accuracy and applicability of the 1990 data, compare them with the value derived from the extrapolation of the national data back to 1990 and check whether the inconsistency in the time series owing to the use of the present data could influence emission estimates for iron and steel production and, if necessary, revise the estimates accordingly.

70. Carbonates as limestone and dolomite are often the components of raw materials for ceramics production, resulting in CO₂ emissions from their thermal decomposition. Ukraine did not report CO₂ emissions from ceramics production because there is no IPCC methodology for ceramics production. The ERT encourages Ukraine to provide a basic overview of the use of limestone and dolomite as components of raw materials in ceramics production (their contents in raw materials) in its next annual submission.

Iron and steel production – CO₂

71. The ERT noted in the NIR and CRF tables that CO₂ emissions from iron and steel production were split between the energy and industrial processes sectors in order to reflect the allocation of combustion emissions and process emissions in respective sectors, as recommended by the previous review report. The ERT commends Ukraine for this improvement. The ERT further noted that a detailed carbon mass balance with corresponding emissions was prepared and transparently reported in the NIR. Ukraine has reported background information and details of carbon mass balance in annex 3.2.6 to the NIR. The carbon mass balance for pig iron production was prepared based on information on the amount of reducing agents and fuels, such as natural gas or blast furnace gas, carbon

stored in pig iron, and carbon content in iron ore and fuels. With regard to CO₂ emissions from steel production, the method used in the steel production process was taken into account and a complete and transparent carbon mass balance was prepared in line with the IPCC good practice guidance and reported in the NIR.

72. The ERT noted a minor inconsistency in reporting between the CRF tables and the NIR for this category. In annex 3.2.6 to the NIR, the pig iron production subcategory was referred as 2.C.1.1 and the steel production subcategory as 2.C.1.2. The labelling of the subcategories should be swapped to reflect the order of subcategories in the CRF tables. The ERT recommends that Ukraine use the correct subcategory codes in the next annual submission.

3. Non-key categories

Lime production – CO₂

73. Ukraine used country-specific EFs for this category for the first time in the 2012 annual submission. The ERT commends Ukraine for implementation of the recommendation in the previous review report. The Party has divided the produced lime into four types: high-calcium lime, dolomitic lime and their respective slaked variants. The calcium carbonate (CaO) content of lime and the content of magnesium oxide were taken into account. The ERT noted that the division between high-calcium lime and dolomitic lime is based on the default ratio 85/15 from the IPCC good practice guidance. No country-specific ratio was used. The ERT further noted that the value used for the CaO content of lime is very low (e.g. for high-calcium lime, Ukraine reported a CaO content of 75 per cent, while the IPCC good practice guidance recommends a value in the range of 93–98 per cent). In response to a question raised by the ERT during the review, the Party provided the reference to the national standard of Ukraine (DSTU B.V.2 7-90-99 C.4) and explained why it has used the value reported in the NIR. The ERT agrees with this justification. However, the ERT encourages Ukraine to collect the data in order to obtain a national ratio for the division between high-calcium lime and dolomitic lime and provide a justification for the ratio in the NIR of its next annual submission in order to fully implement the country-specific AD.

Soda ash production and use – CO₂

74. In Ukraine, soda ash is produced using the Solvay process. The ERT noted that the Party has reported CO₂ emissions from soda ash production using the notation key “NA” (not applicable) because, according to the stoichiometry consideration, CO₂ emissions from soda ash production are equal to zero. However, according to the Revised 1996 IPCC Guidelines, an excess of CO₂ emissions is formed as a result of the coke used for thermal decomposition of limestone. The ERT encourages Ukraine to report CO₂ emissions from soda ash production on the basis of the coke oxidation rate, in line with the Revised 1996 IPCC Guidelines, or provide information about the allocation of CO₂ emissions from coke oxidation in its next annual submission.

Other (metal production) – CO₂

75. The ERT noted that because of the national law on the confidentiality of the data, CO₂ emissions from ferroalloys production and aluminium production are aggregated (see para. 64 above) and reported under other (metal production). The ERT further noted that in the NIR Ukraine uses a country-specific method for ferroalloys production based on a carbon balance that is consistent with the Revised 1996 IPCC Guidelines. However, in the NIR, there is no information on the background parameters used, such as the reducing agents, slag-forming materials and the waste, as well as their carbon content. The ERT

reiterates the recommendation in the previous review report that Ukraine provide more detailed information on the background parameters used to estimate CO₂ emissions from ferroalloys production. The ERT further encourages Ukraine to continue updating the national data on carbon content of the materials used in ferroalloys production in its next annual submission.

Solvent and other product use – NMVOCs and N₂O

76. To estimate NMVOC emissions from chemical products, manufacture and processing, Ukraine has used the EFs for each industry type from the 2011 annual submission of Belarus (assuming that the technologies of its chemical industry are similar to those of Ukraine). According to the NIR, Ukraine is planning to develop country-specific NMVOC EFs for this category for each industry type. The ERT reiterates the encouragement in the previous review report that Ukraine develop country-specific EFs for this category and report thereon in its next annual submission.

77. To estimate N₂O emissions from the use of anaesthesia, Ukraine has used data on its national population and the average value of the use of N₂O for anaesthesia per capita in Belarus as the EF. This EF has been applied for all years. Although there are currently no statistics on the consumption of N₂O by medical care facilities, according to the NIR Ukraine is planning to develop a country-specific EF on the use of N₂O for anaesthesia. However, no details on the planned improvements are reported in the NIR. The ERT encourages Ukraine to develop a country-specific EF on the use of N₂O for anaesthesia and report thereon in its next annual submission.

D. Agriculture

1. Sector overview

78. In 2010, emissions from the agriculture sector amounted to 34,507.43 Gg CO₂ eq, or 9.0 per cent of total GHG emissions. Since 1990, emissions have decreased by 66.7 per cent. The key drivers for the fall are the decline in the livestock population, the decrease in the amount of fertilizer applied to soils and the area of crop cultivation, and the changes in manure management practices due to economic recession after the break-up of the Soviet Union in the early 1990s. The downward emission trend is observed throughout the entire time series, but particularly during the 1990s. The emission trend was increasing from 2000 to 2002 and then peaked in 2008 and 2010, due to increased livestock population, the growth of crop production and the application of synthetic fertilizers. Within the sector, in 2010, 58.2 per cent of the emissions were from agricultural soils, followed by 26.0 per cent from enteric fermentation, 13.6 per cent from manure management and 1.8 per cent from indirect N₂O emissions from manure management reported in the category other (agriculture). The remaining 0.4 per cent was from rice cultivation.

79. Ukraine made recalculations for the agriculture sector between the 2011 and 2012 annual submissions due to the inclusion of buffalo and camel populations in the emission estimates in the agriculture sector and to improvements in the accuracy of feed intake estimates for cattle, based on the use of updated data on the amount of feed, the chemical composition and the nutrient density of the diets of dairy and non-dairy cattle for each natural zone, the use of a tier 2 method for the estimation of CH₄ and N₂O emissions from manure management for sheep and updated AD for the calculation of N₂O emissions from agricultural soils. The recalculations were implemented for the entire time series from 1990 to 2009. The impact of these recalculations on the agriculture sector is an increase in emissions by 0.3 per cent both for 1990 and for 2009. The main recalculations took place in the following categories:

(a) CH₄ emissions from enteric fermentation due to the updated data on the amount of feed, the chemical composition and the nutrient density of the diets of dairy and non-dairy cattle for each natural zone based on the latest research, the updated age structure and milk productivity of sheep and inclusion of the camel and buffalo populations in the emission estimates. As a result, reported CH₄ emissions increased by 1.8 per cent in 2009;

(b) CH₄ and N₂O emissions from manure management due to the use of a tier 2 method for the estimation of emissions from sheep manure, inclusion of camel and buffalo populations in the calculations and corrections of data rounding for the distribution of cattle manure management systems for 2009. The impact on these recalculations resulted in a decrease in reported emissions from manure management by 0.1 per cent in 2009;

(c) Direct and indirect N₂O emissions from agricultural soils due to the inclusion of the data on the areas of crop cultivation and the production of perennial grasses in the calculation of emissions from crop residues, the use of updated data on nitrogen (N) losses during swine manure storage, the age structure of the sheep population and country-specific data on N excretion from sheep manure by age group, as well as updates of the data on the distribution of cattle manure management systems for 2009. The impact of these recalculations was a reported decrease in N₂O emissions from agricultural soils by 0.4 per cent in 2009;

(d) Indirect N₂O emissions from manure management due to the use of country-specific data on N excretion from sheep manure by age group, the updated age structure of the sheep population and the distribution of cattle manure management systems for 2009, as well as the inclusion of the camel and buffalo populations in the emission estimates. As a consequence of these recalculations, the reported emissions decreased by 0.2 per cent in 2009.

80. The reporting on the agriculture sector is complete in terms of gases, categories, years and geographical coverage. As prescribed burning of savannas does not occur in Ukraine and field burning of agricultural residues is forbidden by law, emissions from these categories were reported using the notation key “NO” (not occurring). Ukraine has estimated indirect N₂O emissions from manure management and has reported them under the category other (agriculture) in the CRF tables. This category is supplementary to those listed in the Revised 1996 IPCC Guidelines. The N₂O indirect emissions from manure management were estimated in accordance with the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter, 2006 IPCC Guidelines) using the country-specific data on N excretion rate for different animal manure and fraction of manure per different manure management systems and default EF from the 2006 IPCC Guidelines. In the 2012 annual submission, Ukraine has included for the first time CH₄ emissions from buffalo and camels as well as N₂O emissions from the application of crop residues to soils under perennial grasses. The ERT commends Ukraine for its efforts to improve the completeness of its reporting since the previous annual submission.

81. Ukraine has used country-specific methodologies and higher-tier IPCC approaches with a combination of country-specific EFs and parameters and the IPCC default EFs to estimate emissions from the key categories in accordance with the IPCC good practice guidance. The key categories include CH₄ emissions from enteric fermentation, CH₄ and N₂O emissions from manure management, and N₂O emissions from agricultural soils. The Party used an IPCC tier 1 method to estimate emissions from non-key categories, such as rice cultivation.

82. The overall description of the methods, AD and EFs used for estimation of the emissions is sufficiently transparent in the NIR. In response to the recommendations in the previous review report, Ukraine has made major improvements to enhance the transparency of its reporting by: providing references for parameters used in the CRF tables in the

corresponding chapters of the NIR; inclusion in the NIR time-series consistency analysis of the data used; and a description of data collection process for livestock population along with a summary table on the primary data sources for the agriculture sector. The ERT noted that in the NIR, Ukraine has provided a summary table on the improvement plan for the agriculture sector as well as a summary table with the status of implementation of the recommendations in the previous review reports. The ERT welcomes the efforts of Ukraine to improve the transparency of its reporting.

83. A tier 1 method from the IPCC good practice guidance was used to estimate the overall uncertainty for each category based on the error propagation equation and a combination of uncertainties. The uncertainties of the statistical data were estimated at 5.0 per cent, while the overall uncertainty of the emissions in the agriculture sector is estimated at 30.0 per cent. In response to the recommendations in the previous review report, Ukraine has improved the documentation on uncertainty assessment of country-specific EFs and parameters by including summary tables with the input data and their corresponding sources in the NIR.

84. The NIR provides information on the QA/QC and verification activities implemented for each category in the agriculture sector. Category-specific QC procedures were carried out for the key categories by conducting a comparative analysis of the country-specific EFs with the relevant IPCC default EFs and the EFs used by other reporting Parties, as well as by cross-checking the AD used for the emission estimates with comparable data from the international databases (such as the Food and Agriculture Organization of the United Nations (FAO) database). The QA activities include expert peer reviews of the country-specific methods used for the estimation of emissions from the key categories, which have been conducted by the relevant research institutions, ministries and agencies, non-governmental organizations and independent international experts. In response to the recommendations in the previous review report, in the NIR Ukraine has provided a QA/QC plan with a description of the QA/QC procedures, a time schedule for their implementation and the responsibilities of relevant institutions involved in the preparation and review of the inventory for the agriculture sector.

2. Key categories

Enteric fermentation – CH₄

85. To estimate CH₄ emissions from enteric fermentation, Ukraine used an enhanced livestock characterization, and country-specific method for cattle and tier 2 method for sheep. The country-specific method is based on the estimates of gross energy intake for cattle and takes into account the amount of feed, the chemical composition and the nutrient density of the diet for each natural zone in Ukraine, which is in line with the IPCC good practice guidance. For other minor livestock categories, such as buffalo, goats, camels, horses, mules and asses, and swine, the IPCC tier 1 method and default EFs were used. Ukraine also provided CH₄ emission estimates for animals, such as fur animals and rabbits, where the default EFs are not available in the Revised 1996 IPCC Guidelines, by assuming the similarities in their digestive systems and further deriving the relevant EFs based on the method described in the 2006 IPCC Guidelines. The ERT welcomes the efforts of Ukraine to develop country-specific EFs and methodologies and encourages the Party to conduct a peer review of the country-specific methods by their publication in international scientific journals.

86. In addition, the ERT noted that Ukraine has estimated emissions from buffalo and camels for the first time in the 2012 annual submission. Buffalo and camels are not included in the annual statistical survey. The data on buffalo population were linearly interpolated using data available for 1990 and 2010. The available FAO data on camel

population for the period 2002–2009 were also used. For the period 1990–2001 and for 2010, the Party assumed that the number of camels remained constant and was consistent with the population in 2002 and 2009, respectively. The ERT welcomes the efforts made by Ukraine to ensure the completeness of its reporting.

Manure management – CH₄ and N₂O

87. Ukraine has used country-specific EFs and the IPCC tier 2 method to estimate CH₄ emissions from cattle, swine and poultry, and IPCC default EFs and tier 1 method to estimate emissions from livestock categories such as buffalo, goats, horses, mules and asses, camels, rabbits and fur animals. This is in line with the IPCC good practice guidance. In response to the recommendations in the previous review report, Ukraine has developed a country-specific CH₄ EF for sheep (0.41 kg/head/year), which is higher than the IPCC default (0.19 kg/head/year). In the 2012 annual submission, Ukraine has applied an enhanced livestock characterization for sheep, consistent with the enteric fermentation category, and the IPCC tier 2 method on the basis of country-specific data on the volatile solids (VS) excreted. Ukraine explains in its NIR that such discrepancy between the country-specific and the default EFs might be caused by the fact that the default EFs were derived for developed countries or for Eastern Europe and do not take into account specific conditions of Ukraine, such as herd structure, feeding situation and diet. The ERT commends Ukraine for efforts made in developing country-specific EFs in order to reduce uncertainties of the estimates and improve the accuracy of reporting in the agriculture sector.

88. The ERT noted from the NIR that, based on the data used to calculate the feed intake, the diet of dairy and non-dairy cattle in agricultural enterprises differed from that for the dairy cattle and non-dairy in domestic households. Concentrates and succulent fodder are mainly used in the diet of dairy cattle and non-dairy in agricultural enterprises, whereas roughage and green fodder are mainly used in the diet of dairy and non-dairy cattle in domestic households. The ERT further noted that the same values of VS excreted were used for agricultural enterprises and for domestic households based on the standards of the Ministry of Agriculture of Ukraine for dry matter volumes of excreted manure and for the fraction of ash in manure for different age groups of dairy and non-dairy cattle. The ERT concluded that this leads to an overestimation of emissions from manure of the dairy and non-dairy cattle bred by domestic households. In response to a question raised by the ERT during the review, Ukraine informed the ERT that, since the detailed data on the specific composition of diet and feed rations for different groups of dairy and non-dairy cattle in agricultural enterprises and domestic households were used for the estimation of CH₄ emissions from enteric fermentation, it appears logical to use them consistently for the estimation of CH₄ and N₂O emissions from manure management. The ERT recommends that Ukraine revise the values of VS excreted from the manure of dairy and non-dairy cattle for different types of farms using available research studies on the diet of dairy and non-dairy cattle in order to reduce the uncertainties of the estimates and improve the accuracy of the reporting in the agriculture sector.

Direct emissions from agricultural soils – N₂O

89. The IPCC tier 1a method and default EFs were used to estimate N₂O emissions from synthetic fertilizers and animal manure applied to soils as well as N₂O emissions from the cultivation of histosols. For the estimates of N₂O emissions from the application of crop residues, Ukraine used a country-specific method, which accounted for roots and stubble and their N content and default EF. In order to avoid the double accounting of N₂O emissions in the agriculture sector, the AD and N₂O emissions from N-fixing crops are accounted for under the crop residue category with a view that all N fixed by the N-fixing bacteria is accumulated in the roots of legumes. In the previous review report, it was

recommended that Ukraine disaggregate the data on harvested cropland areas in order to improve the accuracy of the estimates and reduce the uncertainties related to the N input through the application of organic fertilizers and the incorporation of crop residues in soils; however, this recommendation has not been implemented in the 2012 annual submission. According to the improvement plan contained in annex 8.1 to the NIR and the response provided by the Party to a question raised by the ERT during the review, Ukraine is planning to conduct empirical research in order to develop country-specific EFs for direct N₂O emissions from soils, which would account for specific national climatic and soil conditions in various natural zones. Ukraine is planning to incorporate the results of these studies in its next annual submission. The ERT encourages Ukraine to develop country-specific EFs for the estimation of N₂O emissions from agricultural soils in order to improve the accuracy of its reporting and to reduce the uncertainty of emission estimates in the agriculture sector in the next annual submission.

90. In addition, the ERT noted that Ukraine has included perennial grasses in the calculation of emissions from crop residues. The ERT acknowledges the efforts made by the Party to improve the completeness of its reporting in the agriculture sector.

Indirect emissions from agricultural soils – N₂O

91. The IPCC default N₂O EF (0.01 kg N₂O-N/kg N) and country-specific fractions of N inputs that volatilize as NH₃ and NO_x were used to estimate indirect N₂O soil emissions from atmospheric deposition for the entire time series. The ERT concludes that N fractions that volatilize as NH₃ and NO_x are consistent across the same fractions that were used for the estimates of N₂O emissions from direct emissions from agricultural soils.

3. Non-key categories

Other (agriculture) – N₂O

92. Ukraine estimated indirect N₂O emissions from manure management resulting from volatile N losses in the form of NH₃ and NO_x during the storage of manure on the basis of a tier 2 approach described in the 2006 IPCC Guidelines using default EF and country-specific data on N livestock excretion rates and allocation of manure between different types of management systems. The emissions were reported under other (agriculture) in the CRF tables. The ERT acknowledges the efforts of Ukraine to ensure completeness of the inventory.

E. Land use, land-use change and forestry

1. Sector overview

93. In 2010, net removals from the LULUCF sector amounted to 37,955.08 Gg CO₂ eq. Since 1990, they have decreased by 45.6 per cent. The key driver for the fall in removals is the growth in emissions from cropland, which was responsible for removals of 16,242.95 Gg CO₂ eq in 1990, but accounted for emissions of 14,411.37 Gg CO₂ in 2010, excluding liming. Within the sector, in 2010, net removals from forest land amounted to 55,363.29 Gg CO₂, followed by net emissions of 14,411.37 Gg CO₂ eq from cropland, 2,990.56 Gg CO₂ eq from grassland, 6.20 Gg CO₂ eq from wetlands and 0.06 Gg CO₂ eq from settlements. The remaining 0.01 Gg CO₂ eq were emissions from other land. The trend in the LULUCF sector is unstable and depends on a significant variation in net CO₂ emissions from cropland as clearly explained in the NIR. In 2010, net removals from the LULUCF sector offset 9.9 per cent of total GHG emissions.

94. Ukraine made recalculations for the LULUCF sector between the 2011 and 2012 annual submissions in response to the 2011 annual review report. The main reason for the recalculation is the revision of the land-use change matrix. The impact of these recalculations on the LULUCF sector is a negligible increase in removals of 0.3 per cent for 1990 and a decrease in emissions of 5.1 per cent for 2009. The main recalculations took place in the following categories:

- (a) CO₂ emissions from cropland, resulting in an increase of 21.5 per cent for 2009;
- (b) CO₂ and N₂O emissions from wetlands, resulting in a decrease in CO₂ emissions of 98.5 per cent and an increase in N₂O emissions of 100.0 per cent for 2009;
- (c) CO₂ emissions from settlements, resulting in a decrease of 100.0 per cent for 2009;
- (d) CO₂ emissions from other lands, resulting in a decrease of 100.0 per cent for 2009.

95. The ERT noted an improvement in the quality of the reporting on the LULUCF sector under the Convention in comparison with the previous annual submission. The ERT further noted a significant improvement of transparency of the NIR and the improvements in data collection (the use of disaggregated data for revision of the land-use change matrix) and QA/QC procedures undertaken by Ukraine (verification of AD and independent peer review of the NIR), resulting in enhanced consistency between the CRF tables and the NIR. Ukraine has provided all relevant descriptions, references and sources of information for the methods, assumptions, EFs and AD used. The documentation boxes in the CRF tables have been used, where necessary, and the reasons for the trends in the key categories (i.e. grassland and forest land) have been clearly explained. Information on the rationale for recalculations has been reported in the NIR and in the CRF tables. The inventory for the LULUCF sector is complete in terms of gases, categories and years. The ERT noted that the inventory for the LULUCF sector was prepared in accordance with the IPCC good practice guidance for LULUCF.

96. Ukraine has collected data on the areas of land use and land-use change for the compilation of the annual land-use change matrices and has included these matrices in the NIR for 1990–2010. In addition, Ukraine has continued to compile a geographic information system (GIS) database related to forestry activities. Ukraine has used data from the GIS database in the assessment of land uses and land-use changes in its 2012 annual submission.

97. In response to a recommendation in the previous review report, Ukraine has provided detailed information on different data sources used for classification of land areas in accordance with the IPCC land-use categories in the 2012 annual submission. The ERT noted from the NIR that Ukraine has included additional data on land areas with detailed explanations, together with a clear description of the land use and land-use change assessment.

98. The ERT further noted that Ukraine has increased the transparency of the NIR by including additional information (in a tabular format) on how the IPCC land-use categories match the areas identified in the state statistical form and a table specifying the data sources used. The ERT commends Ukraine for including in the NIR, in a tabular format, the status of the surveys and monitoring projects on forestry activities carried out in the country.

99. The ERT also noted that Ukraine has conducted additional scientific research to develop EFs for the different climatic zones. The Party is also planning to continue its work on the GIS database. The ERT commends Ukraine for these efforts.

100. A tier 1 method from the IPCC good practice guidance was used to estimate the uncertainty for each category. In response to the recommendations in the previous review report, Ukraine has improved the documentation by including additional information on the method and assumptions on the uncertainty estimates for the country-specific EFs. The ERT commends Ukraine for these efforts.

2. Key categories

Forest land remaining forest land – CO₂

101. The ERT noted an improvement in the reporting in the NIR on forest land remaining forest land and on a consistent land area representation. Ukraine has used the information contained in the GIS database, forest inventory data and accounts from Ukraine's State Agency for Forest Resources as the main data sources for the forest land area assessment, together with data from the national statistical form. The Party has provided a detailed and clear explanation of the methodology used to ensure consistency between the areas reported under the forest land category and the areas reported for activities under Article 3, paragraph 4, of the Kyoto Protocol.

102. The ERT noted that, in response to the recommendations in the previous review report, Ukraine has enhanced the transparency of its NIR by reporting detailed information on the methodology and parameters used to estimate the carbon stock changes. The country-specific data on biomass increment and root-to-shoot ratio are reported for the major forest types and natural zones.

103. Ukraine has reported on carbon stock changes in living biomass and net carbon stock changes in dead organic matter and organic soils. The net carbon stock changes in mineral soils are reported using the notation key "NO" together with detailed information explaining why mineral soils are not a source of emissions with the references to published results of scientific investigations. The ERT commends Ukraine for this clarification.

Cropland remaining cropland – CO₂

104. The ERT noted the change from removals to emissions for cropland remaining cropland over the period 1990–2010, excluding liming. In 1990, net removals of 13,193.44 Gg CO₂ eq were reported for cropland remaining cropland, while in 2010 emissions of 14,411.37 Gg CO₂ eq were reported (essentially related to the increase in emissions in the soil pool: soil removals were equal to 25,466.07 Gg CO₂ eq in 1990, while in 2010 soil emissions amounted to 15,155.53 Gg CO₂ eq). The ERT also noted that, during the period 1990–2010, the Party reported a decrease in the cropland area of 3.1 per cent. Ukraine used a country-specific approach, based on the balance of N fluxes, to estimate emissions and removals from soils. In the NIR, Ukraine explained that this significant change in emissions from cropland remaining cropland was a consequence of the variation of several factors, such as the amounts of harvested crops, organic residues and fertilizers applied to soils, and the dynamics of garden planting. The ERT further noted that this change mainly occurs in mineral soils.

105. In the NIR, Ukraine provided a detailed explanation of country-specific factors and parameters used to estimate carbon content in soils, using the N inputs and outputs (e.g. the inputs from dead organic matter and organic fertilizer humification and crop N mineralization). In response to questions raised by the ERT during the review, Ukraine provided additional information from the Ukrainian Centre for Soil Fertility Protection confirming the correctness of the methodology used for the calculation of emissions from mineral soils. The methodology was discussed at a scientific conference and published in national peer-reviewed journals. The ERT welcomes these efforts.

Grassland remaining grassland – CO₂

106. The ERT noted an increasing trend in total emissions from grassland remaining grassland. In 1990, emissions from this category amounted to 606.79 Gg CO₂ eq, but in 2010 they increased to 2,990.55 Gg CO₂ eq, owing to the increase in emissions from organic soils and the decrease in removals from mineral soils. The ERT also noted that, during the period 1990–2010, Ukraine reported a negligible decrease in the grassland remaining grasslands area of 1.4 per cent. The Party used a country-specific approach, based on the balance of N fluxes, to estimate emissions and removals from mineral soils, in line with the IPCC good practice guidance for LULUCF. In the NIR, Ukraine explained that this fluctuation in emissions was a consequence of the variation of several factors, such as changes in management practices.

107. Although the detailed explanation of the country-specific factors and parameters used to estimate the carbon content in mineral soils has been included in the NIR, the information on methods, EFs and AD used for the calculation of net carbon stock changes in organic soils was not provided. To enhance transparency of the reporting, the ERT recommends that Ukraine provide detailed information on the methods, EFs and AD used for the calculation of the net carbon stock changes in organic soils in the next annual submission.

3. Non-key categories

Biomass burning – CH₄ and N₂O

108. Ukraine has significant areas of grassland remaining grassland, amounting to 6,940 kha in 2010. The Party has reported biomass burning on grassland using the notation key “NO”. In response to a question raised by the ERT during the review, Ukraine informed the ERT that the national statistical reports do not contain data on fires on grassland and that the burning of vegetation is officially banned by the Code of Ukraine on the Administrative Offences. The ERT identified an independent source⁷ that provides information on the areas of grassland burned in Ukraine during the period 2000–2006. The ERT is of the view that the remote data on wildfires on grassland could be made available from different sources for the entire time series and could be used in the compilation of the inventory in the next annual submission. The ERT recommends that Ukraine collect the necessary AD and report the emissions from wildfires on grassland in its next annual submission.

F. Waste

1. Sector overview

109. In 2010, emissions from the waste sector amounted to 11,004.05 Gg CO₂ eq, or 2.9 per cent of total GHG emissions. Since 1990, emissions have increased by 7.9 per cent. However, the emission trends vary among the different categories; for example, emissions from solid waste disposal on land have increased by 31.0 per cent since 1990, mainly due to the increased amount of disposed waste on landfills (by 17.3 per cent during 1990–2010) and the growing share of managed waste disposal (by 23.2 during 1990–2010). In contrast, wastewater handling activities have led to a decrease in emissions (by 21.2 per cent over the same period). The key drivers for this fall in emissions are the significant decrease during 1990–2010 in organic waste in industrial wastewater (by 35.5 per cent), the decline in the population (by 11.9 per cent) and the decrease in protein consumption (by 24.7 per cent). Within the sector in 2010, 67.6 per cent of the emissions were from solid waste

⁷ <<http://www.iki.rssi.ru/eng/>>.

disposal on land, followed by 32.4 per cent from wastewater handling. The category other (waste) represented 0.002 per cent of the sectoral emissions. Emissions from waste incineration (with the exception of CH₄ reported as “NE”) are reported under the energy sector, in line with the IPCC good practice guidance as all waste incinerated in the country entails energy recovery.

110. Ukraine made several recalculations for the waste sector between the 2011 and 2012 annual submissions in response to the 2011 annual review report. The impact of these recalculations on the waste sector is an increase in emissions of 21.0 per cent for 1990 and of 11.7 per cent for 2009. The main recalculations took place in the following categories:

(a) CH₄ emissions from solid waste disposal on land, due to the introduction of a national multi-component model for landfills, which resulted in a general increase of emissions of 2.3 per cent in 2009;

(b) CH₄ emissions from wastewater handling, due to the application of the results of comprehensive national research on emissions from wastewater handling, with a resulting significant emission increase of 62.2 per cent in 2009.

111. Ukraine has significantly improved its reporting on the waste sector compared to the previous annual submission. All of the recommendations in the 2011 annual review report have been addressed. Most importantly, the Party has started to use its national multi-component first-order decay (FOD) model with country-specific parameters for the estimation of emissions from solid waste disposal on land, and has recalculated the estimates of CH₄ emissions from wastewater handling by identifying comprehensive wastewater flows through the various treatment types. The documentation in the NIR has generally improved; the Party has provided more detailed information on the key AD, EFs and other parameters used, as well as enhanced methodological descriptions. Ukraine has provided estimates of N₂O emissions from industrial wastewater handling for the first time in the 2012 annual submission. Furthermore, the Party has increased the completeness of its reporting by including estimates of CH₄ and N₂O emissions from waste composting. The ERT commends Ukraine for the above-mentioned improvements. However, the ERT found some inconsistencies between the CRF tables, the NIR and the annexes to the NIR (see para. 114 below) and recommends that Ukraine improve its QC activities for the next annual submission, in order to prevent such inconsistencies.

2. Key categories

Solid waste disposal on land – CH₄

112. In response to a recommendation in the previous review report, Ukraine has applied its national multi-component FOD model with country-specific parameters and recalculated CH₄ emissions from this category for the entire time series. The method applied by Ukraine is in line with the IPCC good practice guidance. The reported uncertainty decreased significantly, from 107.1 per cent for 2009 in the 2011 annual submission to 51.8 per cent for 2010 in the 2012 annual submission. Furthermore, Ukraine has increased the transparency of its reporting by including an enhanced description of the methodology in the NIR, and by providing detailed tables of the AD and other important parameters used, such as the fractions for the different waste categories, the weighted averages of degradable organic carbon and the methane correction factor (MCF) in the annexes to the NIR. The ERT commends Ukraine for this improvement. The ERT encourages Ukraine to compare the results from the national FOD model with the default IPCC method as part of its QC activities.

113. The ERT noted that the CH₄ IEFs are very similar for managed waste disposal on land and for unmanaged waste disposal sites (the average difference is less than 0.8 per cent

for the entire time series), although the MCF values differ significantly. For the MCF, Ukraine has consistently used a value of 1.0 for managed waste disposal on land, 0.8 for deep unmanaged waste disposal sites and 0.4 for shallow unmanaged waste disposal sites, in accordance with table 5.1 of the IPCC good practice guidance. The ERT recommends that Ukraine provide an explanation in its next annual submission of the similarity of the IEF for managed and unmanaged waste disposal despite the significant difference in the reported MCF values.

114. The ERT welcomes the detailed background data provided by Ukraine in annexes 3.5.1 and 3.5.2 to the NIR. The ERT encourages Ukraine to include, in the NIR, a brief explanation of the trends for the underlying AD, including the two downward trends in the time series of waste generation in the early 1990s and after 2008, caused by economic crises and fall of the GDP as explained by the Party in response to a question raised by the ERT during the review. The ERT found some inconsistencies between the reporting in the NIR and in annex 3.5.1 to the NIR. For example, Ukraine reported in chapter 8.2.1 of the NIR that in 2010, 94 per cent of collected municipal solid waste (MSW) was sent to landfills, whereas in annex 3.5.1, Ukraine reported the fraction of disposed MSW as 92 per cent. In addition, the annual MSW at unmanaged disposal sites is reported as 8,262.62 Gg CO₂ eq for 2010 in CRF table 6.A, which does not equal the sum of the amounts reported for deep and shallow unmanaged sites (8,428.89 Gg CO₂ eq). The ERT recommends that Ukraine enhance its QC activities in order to prevent such inconsistencies in its reporting in the next annual submission. Furthermore, the ERT encourages Ukraine to reconsider the value of 90 years reported as the “time lag considered” in the additional information box of CRF table 6.A and replace it with 0.5 years, as used in its calculations.

115. The ERT welcomes Ukraine’s plans to study the composition of MSW in 10 major cities nationwide and use the results in its national multi-component FOD model, and to start applying a Monte Carlo analysis for its uncertainty estimation as noted in the NIR of its 2012 annual submission.

Wastewater handling – CH₄

116. Based on comprehensive national research on the structure of the wastewater collection and treatment, Ukraine has recalculated CH₄ emissions from domestic and commercial wastewater handling for the entire time series. The ERT welcomes the enhanced description of the methodology, especially the detailed information on wastewater flows through various treatment systems with the corresponding biochemical oxygen demand (BOD) fractions and MCF values provided in annex 3.5.3 to the NIR. In response to a question raised by the ERT during the review, Ukraine explained that a gradual increase of 9.0 per cent was observed in the fraction of domestic and commercial wastewater treated in centralized systems (from 34.1 per cent in 1990 to 43.1 per cent in 2010), whereas the share of wastewater not collected (treated in latrines) decreased by 12.2 per cent (from 54.2 per cent in 1990 to 42.0 per cent in 2010). The ERT recommends that Ukraine include such information in the NIR of its next annual submission.

117. The ERT noted that the value reported for degradable carbon for domestic and commercial wastewater (50.0 kg BOD/1,000 persons/year) in the additional information table in CRF table 6.B refers to a daily amount instead of a yearly amount of organic waste as required by the UNFCCC reporting guidelines and recommends that Ukraine amend this value accordingly in its next annual submission.

118. Ukraine has also recalculated CH₄ emissions from industrial wastewater in line with the IPCC good practice guidance, resulting in an increase in emissions of an order of magnitude in the whole time series. The increase observed in the recalculated estimates is mainly due to the higher level of organic waste produced in industrial activities. The ERT noted that the additional information table in CRF table 6.B contains more detailed data on

the amount of wastewater and its organic content compared with the same table in the previous annual submission, and the annexes to the NIR contain very detailed flowcharts on the chemical oxygen demand flows in different wastewater treatment systems with their corresponding MCF values. The ERT welcomes this improvement.

3. Non-key categories

Wastewater handling – N₂O

119. For the estimation of N₂O emissions from human sewage, Ukraine has used protein consumption data from the national statistics that are between 5 and 12 per cent lower in the period 1994–2009 than the protein consumption data published in the FAO Statistical Database food balance sheets. The ERT encourages Ukraine to analyse this discrepancy for verification and include the results of the analysis in its next annual submission. Ukraine has provided estimates of indirect N₂O emissions from industrial wastewater handling for the first time in the 2012 annual submission. The method is transparently described in the NIR. The ERT welcomes the inclusion of these additional estimates in the annual submission.

Other (waste) – CH₄ and N₂O

120. Following the recommendation in the previous review report, Ukraine has included estimates of emissions from waste composting in its annual submission in order to improve the completeness of its reporting. The calculations are well documented in the NIR. The ERT commends Ukraine for its efforts.

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

121. The ERT noted that Ukraine submitted estimates for afforestation and reforestation, and deforestation activities under Article 3, paragraph 3, of the Kyoto Protocol. The Party also submitted estimates for forest management, the only activity elected by Ukraine under Article 3, paragraph 4, of the Kyoto Protocol for the first commitment period. Ukraine has chosen to account for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol at the end of the commitment period.

122. The reporting of the KP-LULUCF activities is in line with the requirements of decision 15/CMP.1 and the IPCC good practice guidance for LULUCF in relation to the estimates of the changes in carbon stocks, non-CO₂ emissions from fires and N₂O emissions from drainage of soils. Carbon stock change in mineral soils under forest management is reported as “NO”, but Ukraine provides verifiable information that this pool is not a net source of emissions. The ERT noted an improvement in the quality and completeness of the KP-LULUCF reporting compared with the 2011 annual submission. However, Ukraine reported N₂O emissions from disturbance associated with land-use conversion to cropland as “NA”, although the Party has provided information about areas of forest land converted to cropland in CRF table 5.B and corresponding N₂O emissions in CRF table 5(III) for 1990–2010. The ERT recommends that Ukraine report N₂O emissions from disturbance associated with forest conversion to cropland in its next annual submission.

123. The Party has identified forest management and afforestation and reforestation as key categories in table NIR-3 of the KP-LULUCF CRF tables. However, according to the comments provided by Ukraine, afforestation and reforestation is not considered as a key category because it is less than the smallest category considered key by emission level in the inventory under the Convention. The ERT recommends that Ukraine exclude non-key categories from the table NIR-3 in the next annual submission.

124. Ukraine has made recalculations for the KP-LULUCF activities between the 2011 and 2012 annual submissions in response to the recommendations in the 2011 annual review report and as a result of the changes in the land-use change matrices. The impact of these recalculations on each KP-LULUCF activity for 2009 is as follows:

(a) Afforestation and reforestation: in the 2011 annual submission, Ukraine reported removals of 2,317.55 Gg CO₂ eq, compared with removals of 455.22 Gg CO₂ eq reported in the 2012 annual submission (a decrease of 80.4 per cent);

(b) Deforestation: in the 2011 annual submission, the Party reported removals of 5,819.50 Gg CO₂ eq, compared with emissions of 1.80 Gg CO₂ eq reported in the 2012 annual submission (a decrease of 100.0 per cent);

(c) Forest management: in the 2011 annual submission, Ukraine reported removals of 55,158.76 Gg CO₂ eq, compared with removals of 58,197.86 Gg CO₂ eq reported in the 2012 annual submission (an increase of 5.5 per cent).

125. The ERT noted that Ukraine has continued to develop the GIS database related to forestry activities with the aim of supplying AD for the reporting on the annual KP-LULUCF activities. The Party has used data from the GIS database in its assessment of land uses and land-use changes in its 2012 annual submission. In response to the recommendations in the previous review reports, Ukraine has provided detailed explanations of the methodology used to ensure consistency between the areas reported under the forest land category under the Convention and those reported for activities under Article 3, paragraph 4, of the Kyoto Protocol in line with the IPCC good practice guidance for LULUCF. The ERT noted that the current national system is capable of identifying the areas of land and land-use change.

126. The ERT noted that Ukraine has included detailed information in the NIR to demonstrate that afforestation and reforestation (under Article 3, paragraph 3, of the Kyoto Protocol) results from direct human-induced land-use change activities. In response to the recommendations in the previous review reports, the Party has provided additional information underlining that in the assessment of afforestation and reforestation, it considered only those areas for which documentation on the evidence of human-induced activities exists, such as some types of cutting or fire protection. The naturally regenerated areas without the presence of a directly human-induced activity aimed at managing forest growth have been excluded from the assessment. The ERT further noted that Ukraine has included detailed information in the NIR to demonstrate that forest management is also the result of human-induced activities.

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

Afforestation and reforestation – CO₂

127. Ukraine has reported the carbon stock changes in the biomass, litter, dead wood and soil pools. In response to a recommendation in the previous review report, the Party has estimated and reported in the NIR carbon stock changes for below-ground and above-ground biomass pools separately, using country-specific parameters. The ERT commends Ukraine for this improvement, which is in line with the IPCC good practice guidance for LULUCF.

128. In response to a recommendation in the previous review report, Ukraine has included explanations and background information in the NIR related to the emissions and removals from lands harvested during the first commitment period following afforestation and reforestation on these units of land since 1990. The ERT commends Ukraine for the inclusion of this information.

Deforestation – CO₂

129. Ukraine has reported carbon stock changes in the above-ground biomass, litter, dead wood and soil pools and the below-ground carbon stock changes using the notation key “IE”. The Party has reported the country-specific biomass expansion factors related to above-ground and below-ground biomass and the parameters used to estimate carbon stock changes in living biomass (i.e. above-ground and below-ground biomass pools) in the NIR. The ERT reiterates the recommendation in the previous review report that Ukraine estimate and report, in its next annual submission, the carbon stock changes for below-ground and above-ground biomass pools separately, using the country-specific parameters reported in the NIR.

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

Forest management – CO₂

130. Ukraine has reported carbon stock changes in the above-ground and below-ground biomass, litter, dead wood and organic soils. Ukraine has reported carbon stock changes in mineral soils as “NO”. The NIR provides detailed information and references to country-specific studies, which formed the basis to conclude that mineral soils are not a net source of emissions. The ERT agrees with this conclusion.

131. In response to a recommendation in the previous review report and in accordance with the IPCC good practice guidance for LULUCF, Ukraine has estimated and reported the carbon stock changes for below-ground and above-ground biomass pools separately using the country-specific parameters reported in the NIR. The ERT commends Ukraine for this improvement in the completeness of its reporting of the KP-LULUCF activities.

2. Information on Kyoto Protocol units

Standard electronic format and reports from the national registry

132. Ukraine 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.⁸ The SIAR was forwarded to the ERT prior to the review, pursuant to decision 16/CP.10. The ERT reiterates the main findings contained in the SIAR. The information reported by Ukraine on records of any discrepancies and on any records of non-replacement was found to be consistent with the information provided to the secretariat by the international transaction log (ITL).

133. 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 ITL and meets the requirements referred to in decision 22/CMP.1, annex, paragraph 88(a–j). The transactions

⁸ The SEF comparison report is prepared by the international transaction log (ITL) administrator and provides information on the outcome of the comparison of data contained in the Party’s SEF tables with corresponding records contained in the ITL.

of Kyoto Protocol units initiated by the national registry are in accordance with the requirements of the annex to decision 5/CMP.1 and the annex to decision 13/CMP.1.

134. The information reported by Ukraine on records of any discrepancies was found to be consistent with the information provided to the secretariat by the ITL. The ERT noted that Ukraine provided in its NIR information on actions undertaken to correct the administrative procedure that caused a discrepancy to occur. The ERT concluded that the national registry has adequate procedures in place to minimize discrepancies. The ERT also concluded that the Party's records on its accounting of Kyoto Protocol units contained in its national registry are consistent with the corresponding records of the ITL.

National registry

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

Calculation of the commitment period reserve

136. In its 2012 annual submission, Ukraine has reported its commitment period reserve to be 1,915,907,909 t CO₂ eq based on the national emissions in its most recently reviewed inventory (383,181.58 Gg CO₂ eq). The ERT agrees with this figure.

3. Changes to the national system

137. Ukraine reported that changes have been made to its national system since the previous annual submission. Ukraine described the following changes to its national system in its NIR: the ongoing process of administrative reform in Ukraine resulted in reorganization of the Ministry of the Protection of Natural Environment into MENR; SEIA was officially established in 2011 in accordance with decree No. 455/2011 of the President of Ukraine and has been designated as the single national entity responsible for the operation of the national system, the development and the preparation of the national inventory and its submission to the UNFCCC secretariat. The National Centre for Accounting of GHG Emissions under the SEIA was created in 2011 under the Act of the Cabinet of Ministers No. 1194-r, which is responsible for the improvement of the preparation, systematization, analysis, storage and archiving of the information for the national inventory. The ERT further noted that the functions of the Inter-Agency Commission on the Implementation of the Commitments under the Convention were updated in 2011 in accordance with the Resolution of the Cabinet of Ministers No. 1137. The ERT considers that the administrative arrangements described above have strengthened the national system and improved the performance of its functions. The ERT concluded that Ukraine's national system continues to be in accordance with the requirements of national systems outlined in decision 19/CMP.1.

4. Changes to the national registry

138. Ukraine reported that changes have been made to its national registry since the previous annual submission. Ukraine described the following changes to its national registry in its NIR: SEIA has been designated as the registry administrator in accordance with decree No. 455/2011 of the President of Ukraine; the version of the data management system has been updated; and more secure certificates are now used with the aim of

improving the security of data transfers. The ERT concluded that, taking into account the confirmed changes to the national registry, Ukraine's national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1, and continues to adhere to the technical standards for data exchange between registry systems in accordance with relevant decisions of the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol (CMP).

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

139. Ukraine did not provide information on changes in its reporting of the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol in its annual submission. However, the ERT noted that Ukraine has updated and expanded its reported information on the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol since the previous submission. The ERT recommends that Ukraine, in its next annual submission, report any change in its information provided under Article 3, paragraph 14, in accordance with chapter I.H of the annex to decision 15/CMP.1.

140. In the NIR of its 2012 annual submission, Ukraine provided information on the general framework of the national policies on energy efficiency and energy saving, which include a specific focus on enhancing the use of energy resources with low CO₂ emissions under the State Strategy for Environment Policy up to 2020. Furthermore, in 2011 Ukraine joined the Partnership for Market Readiness project initiated by the World Bank in 2010. This project is aimed at the enhancement of climate change mitigation strategies through new market mechanisms in the participating countries. In addition, Ukraine reported that 14 Ukrainian universities provide educational courses on meteorology, climatology, environmental sciences and energy efficiency for students from developing countries and other countries of the Commonwealth of Independent States. Furthermore, Ukraine reported that the Ukrainian business community and technology developing companies are involved in clean development mechanism projects and the transfer of technologies to Parties not included in Annex I to the Convention in Eastern Europe and Asia, in particular for the use of non-conventional energy resources, such as biomass. The ERT concluded that, taking into account the changes in the reporting, the information provided is complete and transparent.

III. Conclusions and recommendations

A. Conclusions

141. Ukraine made its 2012 annual submission on 13 April 2012. The annual submission contains the GHG inventory (comprising CRF tables and an NIR) and supplementary information under Article 7, paragraph 1, of the Kyoto Protocol (information on: activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, Kyoto Protocol units, changes to the national system and the national registry, and the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol). This is in line with decision 15/CMP.1.

142. The ERT concludes that the annual submission of Ukraine has been prepared and reported in accordance with the UNFCCC reporting guidelines. The inventory submission is complete and includes the CRF tables for the years 1990–2010 and an NIR. The inventory is complete in terms of geographical coverage, years, sectors, gases and categories. However, the ERT noted that several categories in the energy and industrial

processes sectors were reported using the notation key “NE” due to the lack of available IPCC methodologies and/or EFs.

143. 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.

144. 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.

145. Ukraine made recalculations for the inventory between the 2011 and 2012 annual submissions following improvements in AD, EFs and methods (the energy, industrial processes, agriculture, LULUCF and waste sectors); due to a shift to higher-tier methods (e.g. the energy, agriculture and waste sectors); and due to the provision of estimates from previously missing categories (in the energy, industrial processes, agriculture, LULUCF and waste sectors). The impact of these recalculations on the national totals is a decrease in emissions by 0.4 per cent for 1990 and by 2.4 per cent for 2009. The main recalculations took place in the following sectors/categories:

(a) CO₂ emissions from stationary combustion of gaseous fuels due to the update of the country-specific EF and taking into account the composition of natural gas mining inside the country, resulting in a decrease of 0.2 per cent for 2009;

(b) CO₂ emissions in iron and steel production due to splitting the emissions between the energy and industrial processes sectors, resulting in a decrease of 50.5 per cent for 2009;

(c) CH₄ emissions from enteric fermentation due to the use of the updated data on the amount of feed, the chemical composition and the nutrient density of the diet of dairy and non-dairy cattle for each natural zone, the age structure and milk productivity of sheep, and the inclusion of camel and buffalo populations, resulting in an increase of 1.8 per cent for 2009;

(d) CO₂ emissions from cropland due to revision of the land-use change matrix, resulting in an increase of 21.5 per cent for 2009;

(e) CH₄ emissions from solid waste disposal on land due to the introduction of a national multi-component model for landfills, which resulted in an increase of 2.3 per cent for 2009.

146. Ukraine submitted estimates for afforestation and reforestation, and deforestation activities under Article 3, paragraph 3, of the Kyoto Protocol and estimates for forest management, the only activity elected by Ukraine under Article 3, paragraph 4, of the Kyoto Protocol for the first commitment period according to the requirements of decision 15/CMP.1. The reporting on the activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol is in line with the IPCC good practice guidance for LULUCF in relation to the estimates of the carbon stock changes. The ERT noted an improvement in the quality and completeness of the KP-LULUCF reporting in comparison with the 2011 annual submission.

147. Ukraine made recalculations for the KP-LULUCF activities between the 2011 and 2012 annual submissions in response to the recommendations in the 2011 annual review report and as a result of changes in the land-use change matrices. The impact of these recalculations on each KP-LULUCF activity for 2009 is as follows:

(a) Afforestation and reforestation: in the 2011 annual submission, Ukraine reported removals of 2,317.55 Gg CO₂ eq, compared with removals of 455.22 Gg CO₂ eq reported in the 2012 annual submission, resulting in a decrease of 80.4 per cent;

(b) Deforestation: in the 2011 annual submission, the Party reported removals of 5,819.50 Gg CO₂ eq, compared with emissions of 1.80 Gg CO₂ eq reported in the 2012 annual submission, resulting in a decrease of 100.0 per cent;

(c) Forest management: in the 2011 annual submission, Ukraine reported removals of 55,158.76 Gg CO₂ eq, compared with removals of 58,197.86 Gg CO₂ eq reported in the 2012 annual submission, resulting in an increase of 5.5 per cent.

148. Ukraine 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.

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

150. 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.

151. Ukraine has reported information under decision 15/CMP.1, annex, chapter I.H, “Minimization of adverse impacts in accordance with Article 3, paragraph 14”, as part of its 2012 annual submission. The information was provided on 13 April 2012. The ERT concluded that the information provided continues to be complete and transparent.

B. Recommendations

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

Table 6
Recommendations identified by the expert review team

<i>Sector</i>	<i>Category</i>	<i>Recommendation</i>	<i>Paragraph reference</i>
Cross-cutting	General	Include, in the next inventory submission, information on how inter-agency coordination, interactions between experts and data flows are organized under the national system along with a description of the functions performed by the specific agencies responsible for the official consideration of the national inventory	12
		Enhance the consistency between the key category analysis reported in the national inventory report (NIR) and in the common reporting format (CRF) table7 in its next annual submission	15
		Exclude non-key categories from the NIR-3 table in the next annual submission.	16
		Include information in the next inventory submission on how the results of the uncertainty analysis are used to prioritize inventory improvements in its next annual submission	17
		Document the verification procedures and their outcomes in line with the Intergovernmental Panel on Climate Change (IPCC) <i>Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories</i> (the IPCC good practice guidance) in the next annual submission	19

<i>Sector</i>	<i>Category</i>	<i>Recommendation</i>	<i>Paragraph reference</i>
Energy	General	Include the energy balance for the corresponding year of the latest inventory in the next inventory submission	32
		Cross-check the AD to ensure that there is no double-counting/inconsistencies; develop a mass balance for all fuels to ensure the completeness of the AD and explain the steps taken for these actions in the NIR of its next inventory submission	33
		Explore alternative ways for estimation and appropriate allocation of emissions from petroleum refining and from manufacture of solid fuels and other energy industries for 1990–1997 using the recommendations in chapter 7 of the IPCC good practice guidance, while ensuring time-series consistency in the next inventory submission	36
		Calculate the emissions from mobile and stationary combustion under agriculture/forestry/fisheries separately in worksheets and calculate the total emissions to provide accurate and complete information in CRF table 1.A(a)	37
		Report emissions from agricultural off-road vehicles under agriculture/forestry/fisheries and emissions from other off-road vehicles under manufacturing industries and construction with the exception of emissions from ground activities in airports and harbors, which have to be reported under other (energy) and other transportation	37
	Comparison of the reference and sectoral approaches and international statistics	Cross check solid fuel (especially coke) feedstock consumption between the energy and industrial processes sectors and consider all non-energy and feedstock use of solid fuels and natural gas as carbon stored in the reference approach	41
		Improve the accuracy of the data used in the reference approach	41
		Disaggregate the data according to the different coal types in the CRF tables of its next inventory submission	42
		Ensure that the national institutions generating the data for reporting to international organizations work closely with the national inventory team	42
		Provide justification for the rate of international aviation for 1990	45
	Feedstocks and non-energy use of fuels	Improve the reporting of information on cross-cutting issues between the energy and industrial processes sectors as feedstock and those amounts in the energy sector used for the calculation of carbon stored and carbon for non-energy use	48
		Report in CRF table 1.A(d) the accurate fraction of each fuel used for feedstocks and non-energy use in the next inventory submission	48
		Report accurately non-energy use and feedstock data for refinery feedstock and naphtha for the entire time series, explore and explain, as much as possible, any differences between the information in the CRF tables and the IEA data	49

<i>Sector</i>	<i>Category</i>	<i>Recommendation</i>	<i>Paragraph reference</i>
		in its next annual submission	
	Stationary combustion: gaseous fuels – CO ₂ , CH ₄ and N ₂ O	Provide summary information on the procedures or method used to split fuel and feedstock natural gas data in the chapter on the energy sector and make clear references to the detailed information in the chapter on the industrial processes sector of the NIR	51
	Road transportation: liquid a and gaseous fuels – CO ₂	Develop a country-specific CO ₂ EF for gasoline and use it in its next annual submission or alternatively, if it is not possible, conduct a research to develop such EF and in the meantime use the IPCC CO ₂ EF for European cars from the Revised 1996 IPCC Guidelines, or provide information to justify that the IPCC default CO ₂ EF used is appropriate to the national circumstances	53
		Include a detailed explanation of the methodology used to estimate liquefied petroleum gas and compressed natural gas consumption and the mass balances for these fuels in the next inventory submission	55
	Road transportation: liquid fuels – CH ₄ and N ₂ O	Include a detailed explanation of the methodology, assumptions and AD used to split the vehicles by category in the next inventory submission	57
Industrial processes and solvent and other product use	General	Check and correct any typographical errors and inconsistencies between the NIR and the CRF tables and elaborate the descriptions on the methods and background parameters used in its next annual submission	63
		Implement the planned improvements in the next submission	68
	Limestone and dolomite use – CO ₂	Check the accuracy and applicability of the 1990 data, compare them with the value derived from the extrapolation of the national data back to 1990 and check, whether the inconsistency in the time series owing to the use of the present data could influence emission estimates for iron and steel production and, if necessary, revise the estimates accordingly	69
	Iron and steel production – CO ₂	Use the correct sub-category codes in the next NIR	72
	Aluminium and ferroalloys production – CO ₂	Provide more detailed information on the background parameters used to estimate the CO ₂ emissions from ferroalloys production	75
Agriculture	Manure management – CH ₄ and N ₂ O	Revise the values of volatile solids excreted from manure of dairy and non-dairy cattle for different types of farms using available research studies on the diet of dairy and non-dairy cattle in order to reduce the uncertainties of the estimates and improve the accuracy of the reporting in the agriculture sector	88
Land use, land-use change and forestry (LULUCF)	Grassland remaining grassland – CO ₂	Provide detailed information on the methods, EFs and AD used for the calculation of the net carbon stock changes in organic soils in the next annual submission	107
	Biomass burning – CH ₄	Collect the necessary AD and report the emissions from wildfires on grassland in the next annual submission	108

<i>Sector</i>	<i>Category</i>	<i>Recommendation</i>	<i>Paragraph reference</i>
	and N ₂ O		
Waste	General	Improve the QC activities for the next annual submission in order to prevent inconsistencies	111 and 114
	Solid waste disposal on land – CH ₄	Provide an explanation in the next annual submission of the similarity of the IEF for managed and unmanaged waste disposal sites despite the significant difference in the reported methane conversion factor values	113
	Wastewater handling – CH ₄	Include detailed information on wastewater flows through various treatment systems with the corresponding biochemical oxygen demand fractions and methane conversion factor values in the NIR of its next annual submission	116
		Replace the reported daily value for yearly amount of degradable carbon for domestic and commercial wastewater in CRF tables 6.B	117
LULUCF activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol	Overview	Report N ₂ O emissions from disturbance associated with forest conversion to cropland in its annual submission	122
		Exclude non-key categories from the table NIR-3 in the next annual submission	123
	Deforestation – CO ₂	Estimate and report, in the next annual submission, the carbon stock changes for the below-ground and above-ground biomass pools separately, using the country-specific coefficients reported in the NIR	129
Minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol		Report any change in its information provided under Article 3, paragraph 14, in accordance with chapter I.H of the annex to decision 15/CMP.1	139

IV. Questions of implementation

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

Annex I

Documents and information used during the review

A. Reference documents

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

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

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

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

“Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories”. FCCC/SBSTA/2006/9. Available at <http://unfccc.int/resource/docs/2006/sbsta/eng/09.pdf>.

“Guidelines for the technical review of greenhouse gas inventories from Parties included in Annex I to the Convention”. FCCC/CP/2002/8. Available at <http://unfccc.int/resource/docs/cop8/08.pdf>.

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

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

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

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

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

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

UNFCCC. *Standard Independent Assessment Report*, parts I and II. Available at http://unfccc.int/kyoto_protocol/registry_systems/independent_assessment_reports/items/4061.php.

B. Additional information provided by the Party

Responses to questions during the review were received from Mr. Valentin Shlikhta (State Environmental Investment Agency), including additional material on the methodology and assumptions used. The following documents¹ were also provided by Ukraine:

An informal English translation of the waste chapter was kindly provided to the NIR.

¹ Reproduced as received from the Party.

Annex II

Acronyms and abbreviations

AD	activity data
BOD	biochemical oxygen demand
CH ₄	methane
C	confidential
CMP	Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol
CNG	compressed natural gas
CO ₂ eq	carbon dioxide equivalent
CRF	common reporting format
DOC	degradable organic carbon
EF	emission factor
ERT	expert review team
FAO	Food and Agriculture Organization of the United Nations
FOD	first-order decay
GHG	greenhouse gas; unless indicated otherwise, GHG emissions are the sum of CO ₂ , CH ₄ , N ₂ O, HFCs, PFCs and SF ₆ without GHG emissions and removals from LULUCF
GIS	geographic information system
GJ	gigajoule (1 GJ = 10 ⁹ joule)
HFCs	hydrofluorocarbons
IE	included elsewhere
IEA	International Energy Agency
IEF	implied emission factor
IPCC	Intergovernmental Panel on Climate Change
ITL	international transaction log
kg	kilogram (1 kg = 1,000 grams)
KP-LULUCF	land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol
LPG	liquefied petroleum gas
LULUCF	land use, land-use change and forestry
MCF	methane correction factor
MSW	municipal solid waste
N	nitrogen
N ₂ O	nitrous oxide
NA	not applicable
NE	not estimated
NIR	national inventory report
NMVOC	non methane volatile organic compounds
NO	not occurring
PFCs	perfluorocarbons
QA/QC	quality assurance/quality control
SEF	standard electronic format
SF ₆	sulphur hexafluoride
TJ	terajoule (1 TJ = 10 ¹² joule)
UNFCCC	United Nations Framework Convention on Climate Change
VS	volatile solids