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**Report of the individual review of the annual submission of
Ukraine submitted in 2010***

* In the symbol for this document, 2010 refers to the year in which the inventory was submitted, and not to the year of publication.

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I. Introduction and summary

A. Overview

1. This report covers the centralized review of the 2010 annual submission of Ukraine, coordinated by the UNFCCC secretariat, in accordance with decision 22/CMP.1. The review took place from 30 August to 4 September 2010 in Bonn, Germany, and was conducted by the following team of nominated experts from the UNFCCC roster of experts: generalists – Ms. Anna Romanovskaya (Russian Federation) and Ms. Erasmia Kitou (European Union); energy – Mr. Hristo Vassilev (Bulgaria), Mr. Leonidas Osvaldo Girardin (Argentina), Ms. Ayse Yasemin Orucu (Turkey) and Mr. Leif Hockstad (United States of America); industrial processes – Ms. Valentina Idrissova (Kazakhstan) and Ms. Sina Wartmann (Germany); agriculture – Ms. Batima Punsalmaa (Mongolia) and Mr. Bernard Hyde (Ireland); land use, land-use change and forestry (LULUCF) – Mr. Richard Volz (Switzerland), Ms. Marina Vitullo (Italy) and Ms. Marina Shvangiradze (Georgia); and waste – Ms. Tatiana Tugui (Republic of Moldova) and Ms. Kyoko Miwa (Japan). Mr. Hockstad and Ms. Tugui were the lead reviewers. The review was coordinated by Ms. Inkar Kadyrzhanova and Mr. Javier Hanna (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 provided comments that were considered and incorporated, as appropriate, into this final version of the report.

B. Emission profiles and trends

3. In 2008, the main greenhouse gas (GHG) in Ukraine was carbon dioxide (CO₂), accounting for 76.2 per cent of total GHG emissions¹ expressed in CO₂ eq, followed by methane (CH₄) (16.9 per cent) and nitrous oxide (N₂O) (6.9 per cent). Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF₆) collectively accounted for 0.05 per cent of the overall GHG emissions in the country. The energy sector accounted for 68.4 per cent of total GHG emissions, followed by the industrial processes sector (21.2 per cent), the agriculture sector (8.1 per cent), the waste sector (2.2 per cent) and the solvent and other product use sector (0.1 per cent). Total GHG emissions amounted to 427,842.68 Gg CO₂ eq and decreased by 53.9 per cent between the base year² and 2008. The expert review team (ERT) found that the overall decreasing trends of GHG emissions in Ukraine are reasonable and comparable with those of other Parties with economies in transition.

4. Tables 1 and 2 show GHG emissions from Annex A sources of the Kyoto Protocol 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, respectively. In addition, table 2 shows emissions and removals from the LULUCF sector under the Convention. 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.

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 2008^{a, b}

	Greenhouse gas	Gg CO ₂ eq								Change	
		Base year	1990	1995	2000	2005	2006	2007	2008	Base year–2008 (%)	
Annex A sources	CO ₂	716 360.77	716 360.77	389 674.16	289 318.90	322 647.22	339 008.90	340 735.04	325 899.46	–54.5	
	CH ₄	152 239.81	152 239.81	96 803.86	77 495.60	74 323.08	74 685.17	72 458.50	72 367.12	–52.5	
	N ₂ O	59 322.55	59 322.55	38 797.90	26 207.65	25 888.18	26 513.40	27 089.72	29 376.96	–50.5	
	HFCs	NA, NE, NO	NA, NE, NO	0.00	5.98	76.69	41.41	46.24	27.48	NA	
	PFCs	203.23	203.23	153.45	99.74	122.66	95.80	133.33	150.16	–26.1	
	SF ₆	0.02	0.02	0.91	2.11	6.59	9.64	14.10	21.50	114 701.5	
KP-LULUCF	Article 3.3 ^c	CO ₂							–1 609.15		
		CH ₄							NA		
		N ₂ O							NA		
	Article 3.4 ^d	CO ₂	NA							–47 760.37	NA
		CH ₄	NA							33.60	NA
		N ₂ O	NA							8.68	NA

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

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

^b The table does not reflect the adjusted estimates for a number of categories in the industrial processes sector (see section II.G) after adjustment procedures under decision 20/CMP.1 were applied. It reflects the estimates contained in the submission of 17 October 2010 that was subject to these adjustments. The adjustments lead to an increase of total GHG emissions for 2008 by 1,104.79 Gg CO₂ eq.

^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. Ukraine has elected forest management.

Table 2

Greenhouse gas emissions by sector and activity, base year to 2008

	Sector	Gg CO ₂ eq								Change	
		Base year ^a	1990	1995	2000	2005	2006	2007	2008	Base year–2008 (%)	
Annex A	Energy	685 870.33	685 870.33	388 229.51	271 828.76	294 614.74	304 597.99	298 303.42	292 683.49	–57.3	
	Industrial processes ^b	128 712.45	128 712.45	60 344.88	75 179.29	85 626.58	92 515.95	99 778.63	90 572.96	–29.6	
	Solvent and other product use	376.80	376.80	372.11	354.89	340.38	338.52	336.35	334.73	–11.2	
	Agriculture	104 738.55	104 738.55	67 935.30	37 082.40	33 232.20	33 509.11	32 580.14	34 636.39	–66.9	
	Waste	8 428.24	8 428.24	8 548.48	8 684.65	9 250.52	9 392.75	9 478.39	9 615.11	14.1	
	Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	LULUCF	NA	–68 540.35	–46 567.02	–51 525.37	–40 087.17	–39 816.64	–50 145.46	–16 585.27	NA	
	Total (with LULUCF)	NA	859 586.02	478 863.27	341 604.62	382 977.24	400 537.68	390 331.47	411 257.42	NA	
	Total (without LULUCF)	928 126.37	928 126.37	525 430.29	393 129.99	423 064.42	440 354.32	440 476.92	427 842.68	–53.9	
KP-LULUCF	Article 3.3 ^c	Afforestation & reforestation							–1 758.93		
		Deforestation							149.77		
		Total (3.3)							–1 609.15		
	Article 3.4 ^d	Forest management								–47 718.08	
		Cropland management	NA							NA	NA
		Grazing land management	NA							NA	NA
		Revegetation	NA							NA	NA
	Total (3.4)	NA							–47 718.08	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 The table does not reflect the adjusted estimates for a number of categories in the industrial processes sector (see section II.G) after adjustment procedures under decision 20/CMP.1 were applied. It reflects the estimates contained in the submission of 17 October 2010 that was subject to these adjustments. The adjustments lead to an increase of total GHG emissions for 2008 by 1,104.79 Gg CO₂ eq.

^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. Ukraine has elected forest management.

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

Table 3

Information to be included in the compilation and accounting database in t CO₂ eq

	<i>As reported</i>	<i>Adjustment^a</i>	<i>Final^b</i>	<i>Accounting quantity^c</i>
Commitment period reserve	2 138 995 595		2 144 737 386	
Annex A emissions for current inventory year				
CO ₂	325 899 456		325 899 456	
CH ₄	72 323 560		72 367 123	
N ₂ O	29 376 965		29 376 965	
HFCs	27 478	1 074 275	1 101 753	
PFCs	150 158	30 520	180 678	
SF ₆	21 502		21 502	
Total Annex A sources	427 799 119	1 104 795	428 947 477	
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	-3 431 144		-986 842	
3.3 Afforestation and reforestation on harvested land for current year of commitment period as reported	-6 156 742		-772 085	
3.3 Deforestation for current year of commitment period as reported	1 257 463		149 775	
Activities under Article 3, paragraph 4, for current inventory year^d				
3.4 Forest management for current year of commitment period	-35 822 508		-47 718 084	
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 (ERT) has calculated one or more adjustments.

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

^c "Accounting quantity" is included in this table only for Parties that chose annual accounting for activities under Article 3, paragraph 3 and elected activities under Article 3, paragraph 4, if any.

^d Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more of these activities. Technical assessment of the annual submission

II. Technical assessment of the annual submission

A. Overview

1. Annual submission and other sources of information

6. The 2010 annual inventory submission was submitted on 12 April 2010 (national inventory report (NIR)) and 13 April 2010 (common reporting format (CRF) tables). It contains a complete set of CRF tables for the period 1990–2008 and an NIR. Ukraine resubmitted its CRF tables on 22 and 25 May 2010 and its NIR on 22 May 2010. 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 and changes in the national system and in the national registry. On 16 August 2010, Ukraine resubmitted information on accounting of Kyoto Protocol units, changes in the national system and further information on the national registry, and included information on the minimization of adverse impacts under Article 3, paragraph 14, of the Kyoto Protocol (part II of the NIR with revised and added chapters 12, 14, 15 and annex 6). The standard electronic format (SEF) tables were submitted on 12 April 2010 and resubmitted on 8 and 9 July 2010. The annual submission was submitted generally in accordance with decision 15/CMP.1.

7. Ukraine officially submitted revised emission estimates on 17 October 2010 in response to the list of potential problems and further questions raised by the ERT during the centralized review (see paras. 55 and 56 below). The overall impact of these revised estimates is an increase in total GHG emissions of 43.56 Gg CO₂ eq (0.01 per cent) in 2008 and an increase of 396.17 Gg CO₂ eq (0.04 per cent) in 1990. Ukraine also submitted revised information and data for KP-LULUCF on 17 October 2010 in response to the list of potential problems and further questions raised by the ERT during the centralized review (see paras. 141 and 149 below). Where necessary, the ERT also used the previous year's submission during the review. The values in this report are based on the submission of 17 October 2010.

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

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

Completeness of inventory

10. The inventory covers most source and sink categories for the period 1990–2008 and is complete in terms of gases, years and geographical coverage. Ukraine has included all relevant CRF tables for the period 1990–2008. The reporting in the CRF tables is complete and notation keys are used throughout. The ERT commends the efforts made by Ukraine in the current submission to improve the completeness of the reporting by including CRF table

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

8(b) with explanations of the recalculations. Ukraine has also provided the CRF tables for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol for 2008. The reporting in these CRF tables is complete and notation keys are used throughout.

11. In its 2010 submission, Ukraine reported estimates for categories previously reported as “not estimated” (“NE”) including: CO₂ emissions and removals from land converted to land-use categories other than forest land and SF₆ from electrical equipment. The ERT appreciates this improvement. However, there is still a long list of categories reported as “NE” in the GHG reporting of Ukraine. In response to questions raised by the ERT during the centralized review Ukraine noted that a number of the categories reported as “NE” had been put in a list of priority investigations for financing at the end of 2009 by the National Environmental Investment Agency (NEIA), but this plan had not been realized due to lack of finances caused by the continued economic crisis in the country.

12. The ERT noted that categories reported by Ukraine as “NE” include: fugitive CO₂ and CH₄ emissions from oil exploration (and, when relevant, N₂O emissions); CO₂ emissions from oil production; CO₂ emissions from oil refining and storage; CO₂ and CH₄ emissions from oil venting; CO₂ and N₂O emissions from oil flaring (reported as “included elsewhere” (“IE”)); CO₂ and CH₄ emissions from natural gas exploration, and CO₂ and CH₄ emissions from venting of natural gas; HFC, PFC and SF₆ emissions from foam blowing, fire extinguishers, aerosols/metered dose inhalers and solvents; CO₂ emissions from dead organic matter and mineral soils in forest land remaining forest land; CO₂, CH₄ and N₂O emissions from biomass burning on land converted to forest land, on land converted to cropland, on forest land converted to cropland, on grassland and on wetlands. The ERT strongly recommends that Ukraine include estimates for these categories in its next annual submission. The ERT noted that CO₂ emissions from natural gas transmission and HFC, PFC, and SF₆ emissions from refrigeration and air conditioning equipment (except for HFC-134a) are reported as “not occurring” (“NO”). The ERT considers that some of these emissions are likely to occur in the country and recommends that Ukraine revise its assumptions and report emissions from these categories in its next annual submission or provide in the NIR substantial explanations on the non-occurrence of these emissions.

13. As indicated above, Ukraine reported CH₄ emissions from venting of natural gas as “NE” in its 2010 submission. In response to the list of potential problems and further questions raised by the ERT, Ukraine provided revised estimates for this category (see paras. 55 and 56 below) after the centralized review. The ERT agreed with these emission estimates. In addition, Ukraine reported HFC, PFC and SF₆ emissions from foam blowing, fire extinguishers, aerosols/metered dose inhalers and solvents under the category consumption of halocarbons and SF₆ as “NO”. During the centralized review the ERT recommended that Ukraine check whether these subcategories and other subcategories and relevant related gases under consumption of halocarbons and SF₆ occur in the country (in particular, for the subcategory refrigeration and air conditioning equipment) and provide estimates for those categories and gases occurring in the country, in accordance with the IPCC good practice guidance. In response to the list of potential problems and further questions raised by the ERT, after the centralized review, Ukraine informed the ERT that, “due to the lack of activity data (AD), emissions in the categories refrigeration and air conditioning equipment, foam blowing, fire extinguishers, aerosols/metered dose inhalers and solvents are not estimated” and that “investigations aimed at evaluating the AD for these categories are planned to be executed at the expense of the assigned amount units (AAUs) sale”. Taking this information into account and in accordance with the “Guidelines for review under Article 8 of the Kyoto Protocol” (decision 22/CMP.1), the ERT decided to recommend adjustments for these categories (see paras. 110–137 below).

14. The ERT noted many gaps in the KP-LULUCF reporting, including mandatory carbon pools. Parties to the Kyoto Protocol are required to estimate carbon stock changes

for each pool unless transparent and verifiable information is provided to demonstrate that the missing pool is not a net source of emissions, in accordance with paragraph 6(e) of the annex to decision 15/CMP.1 (see paras. 144–146, 151, 154 and 155 below). The ERT strongly recommends that Ukraine complete its reporting under Article 3, paragraphs 3 and 4, of the Kyoto Protocol 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

15. The ERT concluded that the national system of Ukraine continued to perform most of its required functions in accordance with the annex to decision 19/CMP.1. However, the ERT noted that some general and specific functions of the national system are not fully operative; for example, most of recommendations made in the previous review report are still not addressed and the GHG inventory of Ukraine is not complete (see paras. 11–14 above). Furthermore, the ERT noted the lack of transparency in the descriptions of AD used for the energy and industrial processes sectors, particularly due to the absence of an energy balance (see para. 41 below) and a coke balance (which both were recommended to be provided in the previous review report), increased number of confidential AD in the industrial processes sector (see para. 64 below), as well as the lack of information and completeness in LULUCF and KP-LULUCF mandatory reporting (see paras. 89, 90, 92, 144 and 147 below). The ERT also noted that over the last few years Ukraine has not been able to collect the AD, process information and EFs necessary to estimate the relevant missing GHG emissions by sources and removals by sinks, as applicable. The ERT further noted that Ukraine has, in the past and current NIRs, consistently presented plans to estimate the missing GHG emissions, but these have not been implemented in its 2010 submission.

16. Therefore, in the list of potential problems and further questions the ERT recommended that Ukraine ensure the collection of sufficient AD, information and EFs for estimating all the missing and underestimated GHG emissions. After the centralized review, in its response, Ukraine informed the ERT that, as a result of economic crisis and limited public funds in the country, the investigations aimed to support the national system had not been funded. Currently, part of the financial resources from the sale of AAUs is planned to be used for supporting the national GHG inventory. In the ERT's view, the response provided by Ukraine does not address the potential problem and the ERT considers this problem as unresolved. The ERT concluded that the national system of Ukraine requires urgent improvements to address the issues mentioned above in order to comply with the requirements set out in the annex to decision 19/CMP.1 including: ensuring the transparency and completeness of the inventory; timeliness of submission; supporting compliance with Kyoto Protocol commitments relating to the estimation of anthropogenic GHG emissions by sources and removals by sinks under Article 3, paragraphs 3 and 4; and responding to any issues raised by the inventory review process under Article 8 of the Kyoto Protocol (decision 22/CMP.1).

17. As part of its response to the previous stages of the review, Ukraine described the changes in the legal basis of the national system since the previous annual submission and these changes are discussed in paragraph 161 of this report. In particular, the changes in the national system include the reinforcement of the powers of the single national entity that is responsible for its operation. Decree No. 325 of the Cabinet of Ministers of Ukraine "On Changes to Cabinet of Ministers of Ukraine Decrees of April 4, 2007 No. 612 and from 30 June 2007 No. 977" of 26 April 2010 defines the NEIA as an authority of the central executive power independent from the Ministry for Environmental Protection.

Inventory planning

18. The NIR and additional information submitted by Ukraine during the centralized review described the national system for the preparation of the inventory. NEIA has overall responsibility for the national inventory. In response to a question raised by the ERT during the centralized review, Ukraine noted that NEIA is now also responsible for the official approval of the annual submission. The ERT recommends that Ukraine include this information in its next annual submission. Ministries, agencies and regional administrations, the Ukrainian academy of science and related scientific institutes, the Ukrainian Hydrometeorological Research Institute, the Ukrainian Forestry Research Institute, independent experts and non-governmental organizations are also involved in the preparation of the inventory, the collection of AD, the development of country-specific emission factors (EFs) and quality assurance procedures. The team that compiles the inventory is mainly located in the Ukrainian Hydrometeorological Research Institute.

19. The ERT noted that the list and role of private companies in the national system is not clarified in the NIR, as had been recommended in the previous review report. During the centralized review, in response to a question raised by the ERT, Ukraine noted that a major private company involved in the preparation of the GHG inventory is the Environmental (Green) Investments Fund, which provides expertise relating to climate change mitigation strategies and policies for businesses, governmental and civil organizations. This organization is a subcontractor of Ukrainian Hydrometeorological Institute and it developed the Ukrainian inventory 2010 submission under contract with the Ministry for Environmental Protection of Ukraine. The structure of the national system in relation to the preparation and reporting of KP-LULUCF activities is not specified in the NIR.

20. During the centralized review, Ukraine clarified that the national system for the compilation of the KP-LULUCF inventory has the same structure as for the LULUCF inventory under the Convention and that it is under the joint responsibility of the Ministry for Environmental Protection, the Ukrainian Forestry Research Institute and NEIA. AD for the preparation of the annual GHG inventory are obtained from the State Committee on Statistics, ministries, agencies and regional administrations based on questionnaires which are sent annually by the Ukrainian Hydrometeorological Research Institute's inventory team. After the compilation of the GHG inventory, it is submitted to the Ministry for Environmental Protection, NEIA and other ministries, agencies, governmental and non-governmental organizations for comment. NEIA is responsible for the final approval and the Ministry for Environmental Protection officially submits the annual GHG inventory to the UNFCCC secretariat. The ERT recommends that Ukraine include all the necessary information regarding institutional arrangements of the national system in the NIR of its next annual submission.

Inventory preparation

Key categories

21. Ukraine has reported a key category tier 1 analysis, both level and trend assessments, as part of its 2010 submission. The key category analysis performed by the

Party and that performed by the secretariat⁴ produced the same results. The only difference is for the category road transportation (N₂O emissions), which is defined by Ukraine as key based on a qualitative analysis. Ukraine has included the LULUCF sector in its key category analysis, which was performed in accordance with the Intergovernmental Panel on Climate Change (IPCC) *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC good practice guidance) and the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF). The ERT noted that Ukraine has used the key category analysis to prioritize plans for future improvements in the inventory. The ERT encourages Ukraine to develop a tier 2 key category analysis for future submissions.

22. Ukraine has identified two key categories for activities under Article 3, paragraphs 3 and 4, under the Kyoto Protocol: forest management and afforestation and reforestation activities. This is in full agreement with the analysis performed by the secretariat and in accordance to the guidance on establishing the relationship between the activities under the Kyoto Protocol and the associated key categories in the Convention inventory as provided in chapter 5.4.4 of the IPCC good practice guidance for LULUCF.

Uncertainties

23. In its 2010 submission, Ukraine provided quantitative uncertainty estimates using the tier 1 method of the IPCC good practice guidance, including uncertainty estimates for AD and EFs. The uncertainty values used are defaults from the Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories (hereinafter referred to as the Revised 1996 IPCC Guidelines), the IPCC good practice guidance, the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the 2006 IPCC guidelines) and IPCC good practice guidance for LULUCF or based on expert assumptions, although references on the sources for uncertainty values and explanations for the assumptions made are lacking in the NIR. The LULUCF sector is included in the uncertainty analysis of the Party for the first time. The ERT appreciates this effort made by Ukraine. The cumulative uncertainty of the total GHG emissions for 2008 is 5.0 per cent without LULUCF and 6.3 per cent with the LULUCF sector. Overall uncertainties in the trend are 1.6 and 2.3 per cent, respectively, without and with the LULUCF sector. The total uncertainty is close to the value reported for 2007 in the previous annual submission (5.4 per cent without LULUCF). The increase of overall uncertainty for 2008 was clarified by Ukraine during the centralized review, as a result of updated uncertainty values for agriculture taken from the 2006 IPCC Guidelines. The ERT encourages Ukraine to provide explanatory information on the increase of the overall uncertainty in the NIR of its next annual submission.

24. The ERT noted that the recommendation from the previous review report, that the Party provide references in the NIR for the sources of the uncertainty values and the assumptions used for the uncertainty estimates in different sectors, had not been implemented. The ERT reiterates that this recommendation be implemented in Ukraine's next annual submission.

⁴ The secretariat identified, for each Party, the categories that are key categories in terms of their absolute level of emissions, applying the tier 1 level assessment as described in the Intergovernmental Panel on Climate Change *Good Practice Guidance for Land Use, Land-Use Change and Forestry*. Key categories according to the tier 1 trend assessment were also identified for Parties that provided a full set of CRF tables for the base year or period. Where the Party performed a key category analysis, the key categories presented in this report follow the Party's analysis. However, they are presented at the level of aggregation corresponding to a tier 1 key category assessment conducted by the secretariat.

Recalculations and time-series consistency

25. Recalculations have been performed in the energy, industrial processes, agriculture and LULUCF sectors and reported in accordance with the IPCC good practice guidance. The ERT noted that recalculations reported by the Party of the time series 1990 to 2007 have been undertaken to take into account improvements in AD and EFs and the reallocation of some categories of the industrial processes sector to an aggregate category in order to protect confidential data (e.g. CH₄ emissions from carbon black were reallocated to ethylene and other production). The recalculations performed in the 2010 submission had no impact on the consistency of the time series as they were made for all years of the reported period. The impact of the recalculations includes: an increase in the estimated total GHG emissions in 1990 (0.2 per cent) and an increase in 2007 (1.0 per cent). The rationale for these recalculations is provided in the sectoral chapters and chapter 10 of the NIR and in CRF table 8(b). The ERT appreciates the transparent reporting of recalculations performed by Ukraine.

26. The ERT noted that for the years 1991–1997 the inventory lacks complete data on fuel consumption by category, which the Party explained was caused by changes that occurred in the Ukrainian statistical system. For instance, in the CRF tables for this period AD, implied emission factors (IEFs) and emissions of liquid, solid, gaseous, other fuels and biomass from energy industries, manufacturing industries and construction, transport and other sectors are reported as “NE”. The ERT strongly reiterates the recommendation from previous review reports that, in its next annual submission, Ukraine use the splicing techniques recommended in the IPCC good practice guidance to make the time series consistent, thus enhancing the comparability of the emission estimates.

Verification and quality assurance/quality control approaches

27. Ukraine has provided information on quality assurance/quality control (QA/QC) procedures in the NIR, as recommended in the previous review report. This is in line with the “Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories” (hereinafter referred to as the UNFCCC reporting guidelines). Annual procedures include tier 1 and tier 2 checks, and the elaborated QA/QC plan is in accordance with decision 19/CMP.1 and the IPCC good practice guidance. However, the ERT noted that the information in the NIR does not include an annual schedule for the implementation of QA/QC procedures. During the centralized review, Ukraine provided the ERT with a decree from the Ministry for Environmental Protection of Ukraine, which includes the deadlines for the annual cycle of GHG inventory preparation, its annual checks and the responsible organizations for each stage. The ERT found that this schedule is in line with decision 19/CMP.1 and the IPCC good practice guidance. The ERT recommends that Ukraine include this information in the NIR of its next annual submission.

28. Ukraine provided information in the NIR about reviews which were conducted as a part of annual QA procedures by independent experts for the 2010 submission, covering the industrial processes sector (nitric and adipic acid production), the agriculture sector (manure management) and the waste sector (solid waste disposal). However, from the NIR it is unclear whether any recommendations for improvements were made by reviewers. In response to a question from the ERT during the centralized review, Ukraine provided the ERT with five reports from the independent national reviews, covering the industrial processes, agriculture, LULUCF and waste sectors; these contain some recommendations for future improvements, particularly on the implementation of national EFs. The ERT recommends that, in the NIR of its next annual submission, Ukraine include all related information about the recommendations made by independent reviewers and how the recommendations were addressed in the inventory compilation.

Transparency

29. The NIR provides most of the required information on the national system, key categories, QA/QC procedures, uncertainty assessment, methodologies, and AD and EFs for most categories. The ERT noted that the NIR is structured in accordance with the outline of the NIR provided in the UNFCCC reporting guidelines and the suggested annotated NIR.

30. However, the ERT noted that the reporting for the energy and industrial processes sectors still lacks transparency and a strong recommendation made in the previous review report, that the Party provide an energy balance and a coke balance, has not yet been implemented. The ERT notes that the transparency of the AD and EFs used in the industrial processes sector decreased in the 2010 submission, because limited information was provided for some categories due to the confidentiality of data, and also because of the aggregation of these categories with likely non-confidential categories, with no additional explanations on the increased confidentiality provided in the NIR (see para. 64 below). During the centralized review, in response to a question from the ERT regarding access to confidential data (e.g. carbide production, dolomite use), Ukraine explained that it is not possible for the country to make this information available and provided access to the “Law of Ukraine on State Statistics, with amendments and additions introduced by Law of Ukraine of 13 July 2000 No. 1922-III” (2006), which relates to the confidentiality of state statistics. According to this law, information on production values from industrial activities with limited number of plants remains confidential.

31. The ERT noted that, in accordance with decisions 25/CMP.1 and 18/CP.10, Parties included in Annex I to the Convention (Annex I Parties) whose inventories contain information that is designated as confidential are requested to provide this information during centralized and in-country reviews, at the request of an ERT, in accordance with the code of practice for the treatment of confidential information adopted by decision 12/CP.9. During the centralized review, in its response to the ERT’s questions, Ukraine informed the ERT that confidential information may be provided only during an in-country review. After the centralized review, in its response to the ERT’s list of potential problems and further questions, Ukraine agreed to provide the confidential information to the ERT upon official request by the secretariat. The ERT strongly recommends that Ukraine improve the transparency of the inventory in the industrial processes sector and provide the data in future reviews, at the request of the ERT.

32. The ERT further noted that the land representation in the LULUCF sector and the identification of areas under KP-LULUCF activities are not consistent and reporting in the sectoral LULUCF and KP-LULUCF CRF tables is not transparent (see paras. 89 and 139 below). Explanations for the country-specific parameters (e.g. $Frac_{GASF}$) used in the agriculture sector had not been improved, as had been recommended in the previous review report (see para. 78 below). The ERT also noted some inconsistencies between the reporting in the NIR and CRF tables in the LULUCF sector relating to different land-use categories (see para. 89 below). Furthermore, the ERT noted that there are a number of categories reported by Ukraine as “NE” (see para. 12). The ERT reiterates the strong recommendation from the previous review report that, in its next annual submission, Ukraine improve the transparency of its reporting in relation to the issues mentioned above.

Inventory management

33. In the NIR, the Party reports that it has a centralized archiving system, which includes the archiving of disaggregated EFs and AD, and documentation on how these factors and data have been generated and aggregated for the preparation of the inventory. The archived information also includes internal documentation on QA/QC procedures, external and internal reviews, and documentation on annual key categories and key

category identification and planned inventory improvements. The archive is kept at NEIA. During the centralized review, the ERT was provided with the requested additional archived information in due course (except confidential information).

3. Follow-up to previous reviews

34. The ERT noted that some recommendations of the previous review report have been addressed by Ukraine in its 2010 submission, including the reporting of previously not estimated categories in the LULUCF sector (e.g. CO₂ emissions and removals from land converted to land-use categories other than forest land) and in the industrial processes sector (SF₆ from electrical equipment), and additional explanatory information on QA/QC procedures. In response to a recommendation from the previous review report, Ukraine conducted an uncertainty analysis including LULUCF categories. The ERT appreciates these efforts made by the Party.

35. However, a number of strong recommendations in the previous review report have not yet been implemented, particularly those relating to the transparency of AD and EFs in the energy and industrial processes sectors, the provision of the energy and coke balances (see paras. 41 and 72 below), and improvements required for LULUCF and KP-LULUCF reporting (e.g. ensuring a consistent land representation and identification of areas of KP-LULUCF activities in line with the IPCC good practice guidance for LULUCF and reporting of information on the geographical location of the areas used for calculation of the units of land subject to afforestation, reforestation, deforestation and forest management activities) (see paras. 139–143 below). Furthermore, in the previous review report, Ukraine was recommended to verify its country-specific approach, based on the balance of nitrogen (N) fluxes, and to estimate emissions and removals from soils (preferably by comparing the current method with the tier 2 approach in the IPCC good practice guidance for LULUCF) for the key category cropland remaining cropland. The ERT strongly recommends that Ukraine address all the recommendations made in the current and previous review reports in its next annual submission.

4. Areas for further improvement

Identified by the Party

36. The 2010 NIR identifies several areas for improvement in the GHG inventory in the sectoral chapters. The ERT encourages Ukraine to also report planned improvements in chapter 10 of the NIR in the next annual submission. Improvements identified by the Party include:

(a) The development of country-specific EFs for a number of categories, such as CO₂ emissions from combustion of natural gas, fugitive CH₄ emissions from natural gas leakage from end-users, CO₂ emissions from cement production, CO₂ emissions from limestone and dolomite use, CO₂ emissions from aluminium production, CO₂ emissions from ferroalloys, CO₂ and N₂O emissions from manure management and direct N₂O emissions from agricultural soils;

(b) The improvement of AD and parameters for a number of categories and activities, including ammonia production, adipic acid production, refrigeration, SF₆ use in electrical equipment, N₂O use in medicine and wastewater handling; and the updating of the areas of forest land, cropland and grassland (areas of different soil types by climatic zone);

(c) The implementation of a national model for solid waste disposal on land and the use of higher tier methods for the estimation of emissions from road transportation.

Identified by the expert review team

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

(a) The improvement of completeness of the GHG inventory by estimating all categories currently reported as “NE” and those categories reported as “NO” that are likely to occur in the country (see paras. 12 and 14 above);

(b) The improvement and enhancement of the relevant functions of the national system to allow timely implementation of the recommendations made in the current and previous review reports for the GHG inventory and to ensure that the national system has the capacity to collect sufficient AD necessary to support the methods selected for estimating emissions;

(c) The provision of the information on the structure of the national system for the compilation and reporting of KP-LULUCF activities;

(d) The reporting of information on the geographical location of the areas used for calculating the units of land subject to afforestation, reforestation and deforestation and forest management activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol (see paras. 139–143 below);

(e) The provision of a schedule for the annual implementation of QA/QC procedures and additional information on the recommendations made by independent reviewers during QA checks and how those were addressed in the inventory compilation;

(f) The reporting of relevant GHG emissions and removals for all mandatory land-use conversions in the LULUCF sector (see para. 90 below);

(g) The improvement of the completeness of reporting under Article 3, paragraphs 3 and 4, of the Kyoto Protocol by reporting all missing carbon pools (see para. 14 above);

(h) The provision of a matrix of land-use conversions for the LULUCF sector for the representation of areas of land-use categories;

(i) The improvement of the national system to ensure that areas of land subject to LULUCF activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol are identifiable in accordance with paragraph 20 of the annex to decision 16/CMP.1;

(j) The improvement of the descriptions of the national system related to the role of single ministries, organizations and private companies within the national system and the institutional arrangements for the compilation and reporting of KP-LULUCF activities;

(k) The achievement of complete reporting of GHG emission and removal estimates for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, including all the mandatory missing pools identified in this report;

(l) The provision of reference sources for uncertainty values and assumptions used for the uncertainty estimates;

(m) The reporting of all relevant AD used in the inventory, particularly for the energy and industrial processes sectors (see paras. 41, 46, 62 and 72 below), including the energy and coke balances;

(n) The aggregation of confidential AD and emissions in a coherent way for confidential categories in the industrial processes sector;

(o) The enhancement of consistency of the time series and the comparability of emission estimates in the energy sector by using the splicing techniques recommended in the IPCC good practice guidance.

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

B. Energy

1. Sector overview

39. The energy sector is the main sector in the GHG inventory of Ukraine. In 2008, emissions from the energy sector amounted to 292,683.49 Gg CO₂ eq, or 68.4 per cent of total GHG emissions. Since 1990, emissions from this sector have decreased by 57.3 per cent. The key drivers for the fall in emissions are the fuel switch from residual oil to natural gas and a decrease in electricity and heat consumption by industries and the population in general because of the economic crisis following the transition of the country to a market economy. Within the sector, 37.4 per cent of the emissions were from energy industries, followed by 17.8 per cent from fugitive emissions from fuels (9.9 per cent from solid fuels and 7.9 per cent from oil and natural gas), 15.1 per cent from transport, 14.7 per cent from other sectors and 14.5 per cent from manufacturing industries and construction. The remaining 0.4 per cent was from the category other.

40. The ERT noted that Ukraine is a major producer and importer of bituminous coal and natural gas, and imports most of the crude oil and oil products used in the country. Significant amounts of natural gas are transported through the country from the Russian Federation to other European countries.

41. Reporting of the energy sector in the NIR is not fully transparent. Annex 2 of the NIR provides description of methods, EFs and parameters (oxidation factors) used in the calculations. However, actual AD used in the emission calculations are not provided in the NIR; instead there is only a detailed description of national statistical forms and their use as data sources, including precise references to them and additional bibliographic references. An energy balance is not provided in the NIR nor is there detailed energy consumption data for the entire time series (1990–2008). Ukraine explained in the NIR that energy balances are lacking in the country, except for 1990. The ERT reiterates the recommendation made in previous review reports that Ukraine provide relevant information on the national energy balance, and use the splicing techniques recommended in the IPCC good practice guidance to make the time series consistent in its next annual submission, thus enhancing the comparability of emission estimates (see para. 26 above) in the NIR of its next annual submission.

42. In addition, the ERT noted from the NIR that for all fuels, except hard coal, Ukraine uses default values for carbon content (CO₂ EFs) and oxidation factors, as well as default values for CH₄ and N₂O EFs. The ERT strongly recommends that Ukraine develop and use country-specific CO₂ EFs and oxidation factors in its estimates for its next annual submission. The ERT also encourages Ukraine to make the necessary efforts for developing and use country-specific CH₄ and N₂O EFs. In its comments on the draft annual review report, Ukraine provided additional information on AD, net calorific values, carbon contents and carbon oxidation factors used in its estimates, and indicated that a national consultation process has been initiated to improve the energy balance. The ERT encourages Ukraine to report additional details on the results of this process in its future annual submissions.

43. The ERT noted that, in the CRF tables, most of the categories for the energy sector are estimated and reported, with the exception of several categories of fugitive emissions from oil and natural gas. These include CO₂ and CH₄ emissions from oil exploration and when relevant N₂O emissions, CO₂ emissions from oil production, CO₂ emissions from oil refining and storage, CO₂ and CH₄ emissions from oil venting, CO₂ and N₂O emissions

from oil flaring (reported as “IE”), CO₂ and CH₄ emissions from natural gas exploration, CO₂ emissions from natural gas transmission (reported as “NO”) and CO₂ and CH₄ emissions from venting of natural gas. The ERT strongly recommends that, in its next annual submission, Ukraine estimate and include CO₂ and CH₄ emissions from these categories or clarify whether or not these emissions occur in the country or whether they are included under other categories. During the centralized review, the ERT recommended that Ukraine estimate and include CH₄ emissions from venting of natural gas or clarify if these emissions do not occur or are included under other category. In response to the list of potential problems and further questions raised by the ERT, after the centralized review Ukraine provided revised estimates for this category (see paras. 55 and 56 below).

44. The NIR provides information on general QA/QC procedures and verification activities for the energy sector. However, there is no indication of the implementation of tier 2 quality control (QC) procedures for key categories in the sector in line with the IPCC good practice guidance. The ERT encourages Ukraine to continue to improve the implementation of QA/QC procedures and verification activities, in particular using tier 2 QC procedures for key categories and to provide the relevant information in the NIR of its next annual submission.

45. The NIR reports that uncertainties for aggregated categories (e.g. energy industries) were assessed using a tier 1 methodology at the fuel level for each gas, in accordance with the IPCC good practice guidance, and in most cases using default uncertainty values. The ERT encourages the Party to make further improvements in its assessment of uncertainties, especially using country-specific values for uncertainty values.

46. For the calculations, a fuel losses factor is applied, together with the net calorific value, oxidation factor and carbon content of the fuels, in order to convert the fuel quantity from natural units to energy units. The origin of the losses factor and the procedures for its calculation from statistical data forms is provided in the NIR; however, the value of the losses factor for different fuels and the amount of losses in the transformation of different fuel types are not provided in the NIR. Therefore, the ERT could not assess whether they have been properly included in calculations and reported in the CRF tables. The ERT reiterates the recommendation made in previous review reports that, in its next annual submission, Ukraine explain in detail the reason and importance for these losses and provide further information on the calculation approach used for emission estimates and the allocation principles.

47. After the centralized review, in its comments on the draft annual review report, Ukraine informed the ERT that many recommendations in the 2010 annual review report and improvements for the energy sector will be implemented in its 2011 annual submission or as soon as practicable or in its future annual submissions.

2. Reference and sectoral approaches

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

48. The ERT noted that Ukraine has provided a comparison of the reference approach and the sectoral approach in the CRF tables. In the 2010 submission, in the CRF tables for the year 2008, energy consumption and CO₂ emissions from fuel combustion estimated using the reference approach were reported as 0.94 per cent higher and 2.76 per cent lower, respectively, compared with those estimated using the sectoral approach in the CRF. The difference is especially pronounced for gaseous fuels, where the consumption of gaseous fuels and CO₂ emissions reported using the reference approach is 11.59 per cent higher than that estimated using the sectoral approach. The ERT noted that the NIR briefly explains the absence of an energy balance as the main reason for the differences in CO₂ emission

estimates between these two approaches, because this absence makes it necessary to use energy consumption data that are not always consistent for calculations in both approaches.

49. The ERT reiterates the recommendation made in previous review reports that, in its next annual submission, Ukraine: further explore the possible reasons for the difference in the estimates for emissions from the consumption of solid fuels; clarify whether double counting of carbon stored in products has occurred, whether or not emission sources were included in calculations using the reference approach and whether emission estimates calculated using the sectoral approach have been overestimated; provide detailed data for the production, import, export and consumption of coke and coking coal (a coke balance is not provided in the current submission); and explain clearly and in detail the reasons for the differences between the reference and sectoral approaches. Apparent consumption in Ukraine's reference approach for year 2008 corresponds closely (5.0 per cent lower) to the International Energy Agency (IEA) data. This discrepancy is mainly due to natural gas (production and imports) and solid fossil production. The apparent consumption reported by Ukraine shows differences up to 17 per cent with the IEA data for all the years for which a reference approach is available (1990 and 1998–2007). The ERT recommends that Ukraine clarify in the NIT of its next annual submission the reasons for such discrepancies and the steps taken to minimize them.

International bunker fuels

50. The ERT noted that Ukraine estimates fuel consumption for international and civil aviation using the EMEP core inventory of air emissions (EMEP/CORINAIR) methodology, which corresponds to the IPCC tier 2b method, and uses default IPCC EFs for CO₂ and N₂O emissions and the EMEP/CORINAIR approach to estimate CH₄ emissions. Detailed data from aviation authorities are only available for 1996–2008 for international and civil aviation; data for 1990 were taken from the energy balance and based on total consumption of aviation fuels. Data for the years 1991–1995 were calculated using linear interpolation between 1990 and 1996. The ERT recommends that Ukraine continue in its efforts to improve the consistency of the time series of data and encourages the Party to develop country-specific EFs for its calculations.

51. In the NIR, Ukraine states that emissions of CO₂ from international marine bunkers and domestic navigation (including sea and river transport) are calculated on the basis of data from statistical forms. In addition, for coastal navigation between ports within the country and for international shipping it was assumed that fuel consumption is directly dependent of freight turnover. Therefore the ERT considers that the method used for splitting fuel consumption between international marine bunkers and domestic navigation is not fully transparent in the NIR and the lack of the background data used prevents the ERT from being able to fully understand and assess the estimates. The ERT recommends that Ukraine examine and improve its method and the appropriate use of AD, and report transparently and in detail the calculations made for marine bunkers and domestic navigation in the NIR of its next annual submission.

Feedstocks and non-energy use of fuels

52. The NIR provides a short description of feedstocks and non-energy use of fuels. The ERT noted that some CO₂ emissions from feedstocks and non-energy use of fuels are reported under the industrial processes sector: CO₂ emissions from coke are reported under iron and steel production and CO₂ emissions from natural gas are reported under ammonia production. From the information provided in the NIR, the ERT could not conclude that there is no double counting between the energy and the industrial processes sectors. In addition, as indicated in previous review reports, the ERT noted that inconsistent information was provided on the consumption of coke in the energy and industrial

processes sectors. In order to ensure that there is no double counting and that the emissions are reported in a transparent manner, the ERT recommends that Ukraine provide a mass balance of coking coal and coke and natural gas in its next annual submission. Also, the ERT reiterates the recommendation made in previous review reports that Ukraine provide further information on the method used to calculate and allocate emissions from coke production and use in its next annual submission. In its comments on the draft annual review report, Ukraine indicated that a mass balance of coking coal and coke will be reported in its future annual submissions.

53. Under non-energy use of fuels, the NIR explains that “losses in fuel transport, storage, transformation, processing and for other reasons” and non-energy use are defined by data in the statistical forms and for this reason, Ukraine used for the calculations, carbon storage factors equal to 1 for all fuels except lubricants. However, the NIR does not provide further information or details. The ERT reiterates the recommendation made in previous review reports that Ukraine explain more clearly the estimation methods used and include supporting background data in its next annual submission.

3. Key categories

Stationary combustion: solid fuels – CO₂

54. The ERT notes that the CO₂ IEF for solid fuels reported in 2008 under iron and steel (64.47 t/TJ) is below the IPCC default range (94.6–106.7 t/TJ). No additional information was provided in the NIR. In response to the previous stages of the review, Ukraine stated that coke oven gas is the most significant part of solid fuel used in this category (66 per cent of solid fuel consumption in 2008) as it is considered a solid fuel in the Revised 1996 IPCC Guidelines. Ukraine also indicated that it used the IPCC default CO₂ EF for coke oven gas (47.67 t/TJ). The ERT recommends that, to further improve transparency in the NIR of its next annual submission, Ukraine provide further information on how it allocates and reports fuels and their emissions under stationary combustion, in particular in the manufacturing industries and construction category and make the necessary efforts to use country-specific CO₂ EFs for key categories in accordance with the IPCC good practice guidance.

Oil and natural gas: gaseous fuels – CH₄

55. The NIR states that the country-specific CH₄ EF (6,458 m³/km) for natural gas transmission used in its calculations includes all fugitive emissions related to this activity and therefore Ukraine reports venting from natural gas as “NE” in CRF table 1.B.2. No further explanations were provided in the NIR about these assumptions. In response to a question raised by the ERT during the centralized review, Ukraine clarified to the ERT that the country-specific EF covers both fugitive and venting emissions for gas transmission, citing language in table 2.16 of the IPCC good practice guidance on natural gas production, and affirming that venting emissions were indicated as “NE” in the CRF tables to avoid double counting. The ERT noted that the use of Ukraine’s country-specific EF for fugitive emissions to estimate gas transmission and venting CH₄ emissions differs from the IPCC good practice guidance, as table 2.16 provides separate EFs for fugitive emissions and venting from gas transmission. In its response to this remark Ukraine informed the ERT that the appropriate notation key for venting should be “IE”. The ERT recommends that Ukraine use the appropriate notation key for venting of natural gas in its next annual submission, as well as check the proper use of notation keys for all categories and gases in accordance with the UNFCCC reporting guidelines.

56. In response to the list of potential problems and further questions raised by the ERT, after the centralized review, Ukraine conducted a QC study of its data and methodological

approaches for the natural gas transmission category through an independent expert not involved in the development of the inventory. Using the results of this QC study, Ukraine provided a revised submission with updated emissions calculations based on the expert opinion data for the complete time series, providing separately CH₄ emissions for transmission and venting of natural gas. This resulted in an increase in emissions for the oil and natural gas category in 2008 of 43.56 Gg CO₂ eq (0.2 per cent) and an increase of 396.17 Gg CO₂ eq (0.04 per cent) in 1990. The ERT commends Ukraine for conducting this QC study and providing revised estimates based on its results and agrees with the revised estimates. The ERT recommends that Ukraine use these data sources for future annual submissions and transparently document the methodology, EFs and AD used for the revised calculations.

4. Non-key categories

Road transportation: liquid and gaseous fuels – CH₄ and N₂O

57. Ukraine uses the IPCC tier 1 method with default CH₄ EFs from the Revised 1996 IPCC Guidelines for the road transportation calculations. The ERT noted that the IEF for CH₄ for liquefied petroleum gas (LPG) in road transportation reported by Ukraine in the CRF tables is equivalent to that reported for natural gas and appears to be taken from the default EF for natural gas in table 1-7 of the Reference Manual of the Revised 1996 IPCC Guidelines (50 kg/TJ). This is not the correct EF to use for calculating CH₄ emissions from LPG used by road transportation, so the ERT recommends that Ukraine revise its approach in its next annual submission and instead use the appropriate LPG and natural gas CH₄ EFs, if possible using country-specific values or those as listed in tables 1-43 and 1-45 of the Revised 1996 IPCC Guidelines.

58. The ERT noted that the N₂O EF used in the calculations for gasoline cars (0.6 kg/TJ) for the complete time series is below the IPCC default range (1–20 kg/TJ) and that the EF used for diesel cars (0.6 kg/TJ) for the complete time series is below the IPCC default range (3–4 kg/TJ). These EFs may be appropriate to use for certain age and technology classes of vehicles; however, the ERT noted that Ukraine has not provided information in a transparent manner on the number of new and used vehicles equipped with different technologies that would justify the use of lower or higher EFs. Some age and technology classes of vehicles have significantly higher N₂O emissions and the EFs used in the inventory may not be representative of the actual condition of the vehicle fleet, and may lead to an underestimation of emissions from some vehicle age and technology classes. The ERT strongly recommends that Ukraine, in line with the IPCC good practice guidance, estimate the amount of fuel combusted by vehicle type and in particular assign EFs in line with the number of vehicles by each age class and technology class, then revise its N₂O emission estimates using appropriate N₂O EFs in its next annual submission.

C. Industrial processes and solvent and other product use

1. Sector overview

59. In 2008, emissions from the industrial processes sector amounted to 90,572.96 Gg CO₂ eq, or 21.2 per cent of total GHG emissions. Emissions from the industrial processes sector decreased by 29.6 per cent between 1990 and 2008 mainly due to the economic recession in the country following the transition to a market economy, which reduced emissions from iron and steel production by 48.5 per cent, cement production by 47.7 per cent, and ammonia production by 11.2 per cent between 1990 and 2008.

60. In 2008, emissions from the solvent and other product use sector amounted to 334.73 Gg CO₂ eq, or 0.08 per cent of total GHG emissions. Emissions from this sector

decreased by 11.2 per cent between 1990 and 2008. In this sector, Ukraine has estimated only the use of N₂O for anaesthesia category and non-methane volatile organic compound emissions from paint application, degreasing and dry cleaning, and chemical products, manufacture and processing. CO₂ emissions were reported as “NE” due to the absence of an IPCC methodology, as explained by the Party in the NIR.

61. Within the industrial processes sector, 61.6 per cent of GHG emissions were from iron and steel production, 11.9 per cent were from ammonia production, 8.8 per cent were from limestone and dolomite use and 6.9 per cent were from cement production as the main contributing categories. CO₂ emissions accounted for 95.5 per cent of the sectoral GHG emissions (mostly from metal production and mineral products) and N₂O emissions for 3.4 per cent (from adipic and nitric acid production under the chemical industry category). Emissions of CH₄ and fluorinated gases (F-gases) accounted for 0.9 and 0.2 per cent of the sectoral GHG emissions, respectively.

62. The ERT noted that Ukraine only reported actual emissions of PFCs (CF₄ and C₂F₆) from aluminium and ferroalloys production and HFC-134a emissions from refrigeration under the consumption of halocarbons and SF₆ category, while the NIR reported planned improvements to estimate emissions from air-conditioning equipment. The ERT also noted that Ukraine followed the recommendation of the previous review report and estimated actual SF₆ emissions from electrical equipment under the consumption of halocarbons and SF₆ category. There is no halocarbons and SF₆ production in Ukraine. Emissions from consumption of HFCs, PFCs and SF₆ for foam blowing, fire extinguishers, aerosols/metered dose inhalers and solvents are reported as “NE”. The NIR states that data about the use of HFCs, PFCs and SF₆ in these categories in Ukraine are absent. However, it is not clear whether AD are not available to estimate emissions or whether these substances are not used in the country. For instance, as the Party explained during the centralized review, foam materials are imported to Ukraine. Therefore, the ERT is of the view that “NO” be reported for foam blowing if all the imports are referred to open-cell foams, otherwise if at least part of the imports are referred to closed-cell foams, emissions should be estimated.

63. During the centralized review, the ERT recommended that Ukraine check whether these subcategories and other subcategories and relevant related gases under consumption of halocarbons and SF₆ occur in the country, in particular for the subcategory refrigeration and air conditioning equipment; and for those categories and gases occurring in the country provide estimates in accordance with the IPCC good practice guidance. In response to the list of potential problems and further questions raised by the ERT, after the centralized review Ukraine informed the ERT that, “due to the lack of activity data (AD), emissions in the categories refrigeration and air conditioning equipment, foam blowing, fire extinguishers, aerosols/metered dose inhalers and solvents are not estimated” and that “investigations aimed at evaluating the AD for these categories are planned to be executed at the expense of the AAUs sale”. Taking this information into account and in accordance with the guidelines for review under Article 8 of the Kyoto Protocol, the ERT decided to recommend adjustments for these categories (see paras. 110–137 below).

64. The ERT noted that Ukraine followed the recommendation of the previous review report and estimated CO₂ and CH₄ emissions from silicon carbide production. However, due to lack of transparency in the reporting, it was difficult for the ERT to assess the accuracy of the estimates. Ukraine reports as confidential (“C”) the AD for 17 categories (soda ash use, asphalt roofing, glass production, nitric acid production, adipic acid production, calcium carbide, carbon black, ethylene, methanol, ferroalloys production, aluminium production and PFCs from aluminium production, as well as dolomite use, propylene, polypropylene, phthalic anhydride and polystyrene). The number of categories reported as “C” has increased since the previous submission. Emissions from these

categories are aggregated in a manner which reduces the overall transparency of the industrial processes sector and makes it difficult for the ERT to assess the accuracy of the estimates in these categories. For example, emissions of CO₂ from asphalt roofing are reported as “NE” with AD reported as “C” and seem to be included under the aggregated category “ethylene and other production”, as indicated in the documentation box of table 2(I).A-G, whereas CO₂ emissions for this aggregated category are reported as “NO”. In other cases, such as CO₂ emissions from silicon carbide production, it is unclear if these emissions are included under an aggregated category, because the information in documentation box of table 2(I).A-G indicates that calcium carbide production is aggregated with soda ash use, but no reference is made to silicon carbide. At the same time, table 9(a) reports that CO₂ emissions from silicon carbide production are aggregated with soda ash use emissions, while CH₄ emissions from silicon carbide production are reported under the category “ethylene and other production”.

65. During the centralized review, in its responses to the questions from the ERT regarding access to confidential data, Ukraine explained that the AD used to estimate emissions in these categories are confidential and can only be provided during an in-country review and therefore did not provide the requested information. Ukraine further explained with reference to the Law on State Statistics (see para. 30 above) that AD are considered confidential due to the limited number of enterprises in these categories. The ERT notes that, in accordance with decisions 25/CMP.1 and 18/CP.10, Annex I Parties whose inventories contain information that is designated as confidential are requested to provide this information during centralized and in-country reviews, at the request of an ERT, in accordance with the code of practice for the treatment of confidential information adopted by decision 12/CP.9. The ERT strongly recommends that Ukraine aggregate emissions in a coherent and systematic way so that emissions corresponding to confidential categories are grouped under the same category where their AD are reported, that fewer categories are reported as confidential and allow provision of data in future reviews at the request of ERT.

66. After the centralized review, in its comments on the draft annual review report, Ukraine informed the ERT that many recommendations in the 2010 annual review report and improvements for the industrial processes sector will be implemented in its 2011 annual submission or as soon as practicable or in its future annual submissions.

2. Key categories

Lime production – CO₂

67. The ERT noted that for 1990–2003 data for lime production disaggregated into types of lime were not available and the country-specific ratio for hydrated/quicklime of 2004 (55/45) was used for all these years. However, since 2004, data disaggregated by type of lime have been available and applied, resulting in some CO₂ IEF fluctuations after 2004 (0.6–2.5%). However, these data were not provided in the NIR. During the centralized review, Ukraine provided to the ERT the country-specific ratios used, showing that they are consistent with the 1990–2003 time series. The ERT recommends that Ukraine include data on hydrated/quicklime production in the NIR of its next annual submission to increase the transparency of the report. After the centralized review, in its comments on the draft annual review report, Ukraine informed the ERT that it will report additional information on lime production for key years in its 2011 submission.

68. According to the explanations in the NIR, the IPCC tier 2 method with default EFs was used. However, the CRF tables report an IEF of 0.6526 t/t for lime production in 2008, which is lower than the default values (0.75 t/t for high-calcium quicklime and 0.86 t/t for dolomitic lime). The ERT understood and Ukraine confirmed that, in the CRF tables,

Ukraine reported total lime production as AD which led to a low IEF. Though emissions were estimated using a default water content correction factor for the country-specific share of hydrated lime, as recommended in the IPCC good practice guidance. The ERT recommends that Ukraine provide a detailed description of the calculation method in its next annual submission.

Limestone and dolomite use – CO₂

69. The NIR explains that Ukraine estimated emissions from limestone and dolomite use in metal production and glass production. However, the CRF tables present only limestone use as AD under this category. During the centralized review, in its response to the ERT questions regarding the provision of data on dolomite use, Ukraine explained that because glass production is confidential, dolomite data are also confidential and thus cannot be reported or provided. This exclusion of the amount of dolomite used led to a higher CO₂ IEF (0.4845 t/t), although default EFs were used to estimate emissions (0.440 t/t for limestone and 0.477 t/t for dolomite). The ERT recommends that Ukraine report the total amount of limestone and dolomite used as AD in the CRF tables of its next annual submission to increase transparency and comparability regarding IEFs. After the centralized review, in its comments on the draft annual review report, Ukraine informed the ERT that information about limestone and dolomite use will be taken into account in its 2011 annual submission. Furthermore, Ukraine is planning to improve transparency by reporting emissions from glass production separately.

70. The ERT noted a mistake in the estimation of total consumption of limestone in table 4.2 of the NIR, which might have led to an underestimation of emissions. However, during the centralized review, Ukraine explained to the ERT that although the data for export had been put into the rows for import and vice versa, the resulting figures were not affected. The ERT recommends that Ukraine improve its QC procedures and report the correct AD on limestone use in its next annual submission.

Ammonia production – CO₂

71. Ukraine used the amount of natural gas feedstock to estimate emissions from ammonia production, which is in line with the Revised 1996 IPCC Guidelines. The ERT noted that the CO₂ IEF reported by Ukraine in 2008 (2.19 t/t) is higher than the IPCC default values (1.5 and 1.6 t/t) although the value had decreased from 2.45 t/t to 2.19 t/t over the period 1990–2008. The ERT also noted that CO₂ emissions from both the energy use for the ammonia production process and for the feedstock consumption of natural gas are reported under this category. As AD are collected directly from producers, the ERT considers that energy and non-energy use of natural gas could have been separated. The ERT encourages Ukraine to report emissions from natural gas used as fuel for ammonia production under the energy sector in its next annual submission.

Iron and steel production – CO₂

72. Ukraine used the tier 2 method with IPCC default EFs and country-specific parameters (e.g. carbon content in coke and pig iron) to estimate CO₂ emissions from iron and steel production. The ERT noted that table 4.5 of the NIR reports that 8,865.5 Mt of coke was used as a reducing agent in pig iron production and 9,018.6 Mt of coke was used as fuel. However, even though disaggregated AD on coke use is available, all CO₂ emissions from coke use for both energy and non-energy purposes in iron and steel are reported under this category. The ERT encourages Ukraine to report emissions from coke used for energy for iron and steel production under the energy sector and strongly reiterates the recommendation of previous review reports that Ukraine provide a coke balance

(carbon in coke) to increase the transparency of the estimates in its next annual submission and ensure that there is no double counting or omission of emissions.

3. Non-key categories

Silicon carbide production – CO₂ and CH₄

73. Ukraine reports that the AD for silicon carbide and soda ash production are confidential. CRF table 2(I).A-G reports aggregated CO₂ emissions for soda ash use and carbide production (both silicon and calcium, as explained in the NIR). CH₄ emissions from silicon carbide production are reported under the aggregated category ethylene and other production, but the AD for this category do not include silicon carbide production. The NIR provides methodological explanations only for calcium carbide production and use. The ERT concluded that the reporting of emissions from carbide production is not transparent and not in line with the IPCC good practice guidance, and the fact that the categories were not aggregated in a systematic way makes it difficult for the ERT to assess the consistency, comparability and accuracy of estimates. The ERT recommends that Ukraine improve the transparency and appropriateness of the reporting by including all relevant explanations and any other appropriate information in the NIR of its next annual submission.

Nitric acid production – N₂O

74. The ERT noted that the AD for nitric acid production and adipic acid production are reported as “C”, while N₂O IEFs are reported as “IE”. N₂O emissions for these two categories are reported aggregated under one category. The NIR reports that the IPCC default EF was used to estimate emissions from adipic acid production and country-specific EFs were used for nitric acid production, which the Party states are in line with the average of the IPCC default range (2–19 kg/t). During the centralized review, Ukraine provided the ERT with the country-specific EF of 4.5 t/t, which is equal to the default value in the IPCC good practice guidance for atmospheric pressure plants. The NIR reports that emission estimates were assessed by an independent expert, although no further information or descriptions are provided, for example on the abatement technology used in the country. The ERT recommends that Ukraine include transparent descriptions on the production technology used in the country to support the use of this country-specific EF in its next annual submission.

D. Agriculture

1. Sector overview

75. In 2008, emissions from the agriculture sector amounted to 34,636.39 Gg CO₂ eq, or 8.1 per cent of total GHG emissions. Since 1990, emissions have decreased by 66.9 per cent. The key drivers for the fall in emissions are decreases in livestock population, fertilizer application, cultivated land and changes in practice for animal waste management systems (AWMS). Within the sector, 59.1 per cent of the emissions were from agricultural soil, followed by 26.3 per cent from enteric fermentation, 12.6 per cent from manure management, 1.7 per cent from other (indirect N₂O emissions from manure management) and 0.2 per cent from rice cultivation.

76. The inventory is complete in terms of gases, categories, years and geographical coverage. For its emission estimates, Ukraine has used country-specific methodologies which are consistent with the IPCC good practice guidance, using a combination of country-specific EFs and IPCC default EFs, except for the estimates from rice cultivation. Ukraine reported indirect N₂O emissions from manure management systems under the

category other, which is an additional category to those listed in the Revised 1996 IPCC Guidelines.

77. Prescribed burning of savannas does not occur in the country and field burning of agricultural residues is prohibited by law in Ukraine; thus these categories were reported as “NO”.

78. In general, descriptions of the AD, methodologies and EFs used which are provided in the NIR are transparent, but there was not sufficient information on the methodologies used to estimate country-specific EFs and parameters (e.g. $Frac_{GASF}$). Ukraine has implemented most of the recommendations made in the previous review report regarding transparency. However, the ERT noted that explanations on fluctuations of emissions time series are still lacking in the NIR. Thus the ERT recommends that Ukraine provide justifiable explanations on fluctuations of emissions time series with supporting charts or tables when necessary in its next annual submission.

79. There is no descriptive information on uncertainty analysis or on the methodologies used for calculating the uncertainties of estimates performed using tier 3 methods for CH_4 emissions from enteric fermentation, even though it was recommended in the previous review report to provide such information. Therefore the ERT reiterates that this recommendation be implemented in Ukraine’s next annual submission.

80. Recalculations performed in the 2010 submission relate to the use of updated AD for all types of animal populations, cultivated and harvested areas, nitrogen (N) fixed by N-fixing crops, area of organic soils, national allocation of manure for sheep, horses and goats to AWMS and the inclusion of emissions from by-products in the inventory. These recalculations resulted in an increase in emissions from the agriculture sector of 0.9 per cent in 1990 and an increase of 13.2 per cent in 2007. Also, the recalculation led to an increase in total emissions of 0.05 per cent (with and without LULUCF) in 1990 and an increase of 0.78 per cent excluding LULUCF and 0.88 per cent including LULUCF in the year 2007. The ERT noted that Ukraine reports in the NIR the result of recalculations as a change, but it did not indicate whether the recalculations result in a decrease or an increase in emissions. The ERT recommends that, in its next annual submission, Ukraine report clearly and accurately the increase or decrease resulting from the recalculations for categories and for the sector, as well as the impact on the national total.

81. After the centralized review, in its comments on the draft annual review report, Ukraine informed the ERT that many recommendations in the 2010 annual review report for the agriculture sector will be implemented in its 2011 annual submission or as soon as practicable.

2. Key categories

Enteric fermentation – CH_4

82. Ukraine used a country-specific methodology to estimate CH_4 emissions for dairy and non-dairy cattle. The country-specific methodology estimates gross energy in feed intake which takes into account the amount, chemical composition and structure of feed. This allows Ukraine to estimate CH_4 emissions independently of livestock performance characteristics. Ukraine used enhanced characterization of cattle for its estimates. The population of animals has been updated for all types of animals using annual averaged data, as recommended in the previous review report. Following the recommendation of the previous review report, Ukraine has corrected milk production for suckling lambs on the base of expert judgement and provided references to this in its NIR. Emissions from poultry are reported using the notation key “NA”, as there is no IPCC methodology to estimate emissions from this category.

83. Ukraine developed country-specific EFs for rabbits and fur animals using parameters described in the 2006 IPCC Guidelines. EFs for fur farming were adjusted using EFs for swine and the EFs for rabbits were adjusted using EFs for mules and asses taking into account their similarity in digestibility. The ERT welcomes the Party's efforts to develop country-specific EFs and encourages Ukraine to provide more detailed explanations in methodologies used to estimate the EFs. The ERT also encourages Ukraine to conduct a peer review of country-specific EFs and document the results in the NIR of its next annual submission.

Manure management – CH₄ and N₂O

84. Ukraine used the IPCC tier 2 method for estimating CH₄ emissions for cattle, swine and poultry and the tier 1 method for other animal categories. This is in line with the IPCC good practice guidance. Ukraine identified the types of AWMS that are used in the country and developed country-specific data on the allocation of manure to different types of AWMS on the base of expert judgement. The CH₄ IEFs for non dairy cattle for 1990–2008 (ranging from 0.87 to 15.14 kg/head/year) fluctuate every year. The 2008 value (2.17 kg/head/year) is 85.6 per cent lower than the value in 1990. As explained in the NIR, this is due to changes of AWMS practices, mainly in modern dairy farms which have been built in recent years; however, the ERT notes that the explanation is not sufficiently clear. Therefore, the ERT recommends that Ukraine improve the explanation of the fluctuations in EFs in the NIR of its next annual submission, in particular, by including supporting tables or charts when necessary to increase the transparency of the information.

Direct soil emissions – N₂O

85. In the 2009 submission, Ukraine used a country-specific methodology to estimate N fixation by pulses. During the previous review it was noted that the amount of N in the roots of all pulses is also estimated under the subcategory crop residues left on fields and the Party was recommended to investigate a potential double counting. In its 2010 submission, Ukraine has included all emissions from N-fixing crops in the crop residue subcategory, as the country-specific methodology includes the amount of N in roots of N-fixing crops that are estimated under the subcategory crop residue. The ERT welcomes this correction of emission estimates and the improvement in the completeness of the inventory.

86. Ukraine has used the IPCC default fraction of livestock N-excretion that volatilizes as NH₃ and NO_x instead of the country-specific fraction ($Frac_{GASM} = 0.33$) which resulted in the double counting in the 2009 submission, and the Party has corrected the formula used for the calculation of N₂O emissions from synthetic fertilizers and provided explanations on this, as recommended in the previous review report and in line with the IPCC good practice guidance.

87. Ukraine has updated the area of cultivated organic soils for the entire time series using data provided by the National Water Committee for the period 2000–2008, and in order to obtain a complete time series it extrapolated linearly for 1990–1999, excluding the available data for 1994 (148,100 ha) which were reported in the previous NIR. Accordingly, the area of cultivated organic soil increased by 4.1–8.1 per cent throughout the time series. The ERT noted that no explanations have been provided in the NIR on the differences of area cultivated organic soils or on the reliability of the data used for the current inventory. The ERT recommends that Ukraine provide a detailed description on the differences of area cultivated organic soils and the reliability of the data on area of cultivated organic soils in its next annual submission.

E. Land use, land-use change and forestry

1. Sector overview

88. In 2008, net removals from the LULUCF sector amounted to 16,585.27 Gg CO₂ eq. Since 1990, net removals have decreased by 75.8 per cent. The key reason for the fall in removals is the growth in emissions from soils in cropland (cropland soils were responsible for the removal of 11,349.37 Gg CO₂ in 1990, while in 2008 the emissions from cropland soils were equal to 41,848.90 Gg CO₂, not taking into account liming). Within the sector, net removals from forest land accounted for 55,378.51 Gg CO₂ eq, followed by emissions from cropland accounting for 36,397.54 Gg CO₂ eq, 2,302.13 Gg CO₂ eq from grassland, 39.98 Gg CO₂ eq from wetlands and 41.77 Gg CO₂ eq from settlements. The remaining 11.83 Gg CO₂ eq were emissions from other land.

89. The ERT noted that land representation remains a critical issue for the Party's reporting for the LULUCF sector. Discrepancies were identified between land-use areas reported in the NIR and those reported in the CRF tables. In response to a question raised by the ERT during the centralized review, Ukraine clarified that different sources of information were used to identify land-use areas (annual statistics form "6-zem" and form "3-ig" concerning reforestation area). Regional land-use area assessments have been carried out and reported in the NIR (table П3.2.4) but the ERT noted that the national land representation seems to be inconsistent, as double counting or omission of an area might have occurred, leading to the incorrect estimation of emissions or removals. In response to a question raised by the ERT during the centralized review, Ukraine stated that, in its next annual submission, inconsistencies will be resolved, although the Party did not provide details of the methods it plans to use. In addition, Ukraine ensured the ERT that it will provide, in its next annual submission, summary tables on the land-use areas under different land categories for each year of the reported period for the entire country and land-use changes matrices related to the reported period. The ERT welcomes these planned improvements, which are critical for reporting the LULUCF sector in accordance with the IPCC good practice guidance for LULUCF.

90. Among the categories of land converted to other land uses, only conversion to forest land was reported in the 2010 submission, while for all the remaining land uses the notation key "NE" was used. The Party explained in the CRF tables that the use of "NE" was due to a lack of AD or because of the assumption that land-use changes were realized by conversion to unmanaged areas. In response to a question raised by the ERT during the centralized review, Ukraine stated that management of lands included in each land use category constantly decreased (i.e. arable land decreased during the reporting period, therefore, it was assumed that the conversion results in a change to unmanaged land). The ERT notes that the land representation has to cover the total national territory; managed and unmanaged lands have to be accounted for in the LULUCF sector. Ukraine also clarified that land converted to forest land was deduced using data from a special programme conducted by the Ukrainian Government ("Forests of Ukraine 2010–2015"), which is still ongoing. The ERT recommends that Ukraine provide, in its next annual submission, a detailed explanation on the assumptions and approaches used to detect land converted to forest land. Furthermore, the ERT strongly recommends that Ukraine include in its reporting all mandatory land-use conversions in its next annual submission.

91. Ukraine reported in the NIR national definitions for land-use categories and their relationship to the IPCC categories definitions. The ERT noted that Ukraine classified temporary fallow (class 10 of tables П3.2.1 of the NIR) in the grassland category, which is different from the definitions applied to the grassland and cropland categories in the IPCC good practice guidance for LULUCF. In response to a question raised by the ERT during the centralized review, Ukraine stated that fallow lands are reported, in national statistics,

as annual and perennial grasses. The ERT recommends that, in its next annual submission, Ukraine classify temporary fallow under the cropland category in accordance with the IPCC good practice guidance for LULUCF.

92. The ERT noted that direct N₂O emissions from N fertilization of forest land are reported as “NE”, following the assumption that N₂O emissions from N fertilization of forest land were negligible. CO₂ emissions from the application of limestone on grassland have been reported also as “NE”, and the Party explained in the CRF tables that the data for the application of limestone on grassland are not available. In the previous review report it was recommended that Ukraine estimate and report all mandatory categories reported as “NE” in its next annual submission. The ERT reiterates this recommendation. After the centralized review, in its comments on the draft annual review report, Ukraine informed the ERT that inquiries were made to ascertain that no lime application on grassland neither N fertilization of forest land have taken place in Ukraine. The ERT recommends that Ukraine include this information in the NIR of its next annual submission and use the appropriate notation key for these categories in the CRF tables.

93. Ukraine reported an uncertainty assessment for all land use categories, following the tier 1 approach, on the basis of expert judgement. In response to a question raised by the ERT during the centralized review, Ukraine stated that calculations were carried out following the methodology described in the IPCC good practice guidance for LULUCF. The ERT recommends that Ukraine provide, in its next annual submission, additional information on the method and assumptions used in the uncertainty assessment, to clarify how values, especially those based on expert judgement, are selected, considering that the reported values are considerably lower than the uncertainty default values.

94. After the centralized review, in its comments on the draft annual review report, Ukraine informed the ERT that many recommendations in the 2010 annual review report and improvements for the LULUCF sector will be implemented in its 2011 annual submission or in its future annual submissions.

2. Key categories

Forest land remaining forest land – CO₂

95. The ERT noted discrepancies between that forest land areas reported in the NIR (table II3.2.20) and those reported in the CRF tables; for example, in the CRF tables a forest land area of 10,025 kha in 1990 was reported, while in the NIR the area was reported to be 10,195 kha; similarly, in 2000, 9,969 kha was reported under the forest land category in the CRF tables, while 10,413 kha was reported in the NIR; and finally, in the CRF tables a forest land area of 9,960 kha was reported for 2008 compared with the 10,570 kha reported in NIR. In response to a question regarding this issue raised by the ERT during the centralized review, Ukraine stated that these discrepancies, which were due to a mistake in table II3.2.20, will be corrected in its next annual submission. The ERT strongly recommends that Ukraine verify the effectiveness of the land uses assessment used by the Party, at regional and national level, assuring consistency between different data sources and coherence of the reported data in its next annual submission.

96. Ukraine estimated carbon stock changes from forest land remaining forest land using national statistical data and country-specific parameters. The country-specific data on biomass increment and root-to-shoot ratio are reported for major forest types and natural zones. The ERT noted that the NIR does not report details on the used methodology to estimate carbon stock changes, or on biomass expansion factors and ratio; therefore, during the centralized review, the ERT asked Ukraine to clarify whether the carbon stock changes assessment for biomass was done at the national level or, if otherwise, it results from the sum of district level assessments, detailing also how the administrative districts (reported in

table II3.2.20) are grouped into the different ecological zones reported in table II3.2.21). In response to this question, Ukraine provided a table showing distribution of administrative districts by the different natural zones. The ERT recommends that Ukraine include this table in the NIR of its next annual submission. Nevertheless, the ERT notes that the information provided is not sufficient to allow an evaluation of the carbon stock changes estimates and strongly reiterates the recommendation from the previous review report that Ukraine further verify its set of biomass expansion factors and ratios and recommends that Ukraine provide, in its next annual submission, information on the emissions/removals estimation process (use of growth equations, model approaches or other) in order to improve transparency.

Cropland remaining cropland – CO₂

97. Ukraine used a country-specific approach, based on the balance of N fluxes, to estimate emissions and removals from soils. The ERT noted an increasing trend in the total emissions in cropland remaining cropland, not taking into account liming: in 1990 the category was reported as a removal of 14,668.07 Gg CO₂, while an emission of 36,240.18 Gg CO₂, was reported for 2008 (essentially related to the increase of emissions in the soil pool: soil removals were equal to 11,349.37 Gg CO₂ in 1990, while in 2008 the emissions from soils were equal to 41,848.90 Gg CO₂), resulting in a decrease in total removals of 347.1 per cent. In the NIR, Ukraine explained that this significant change was a consequence of the variation of several factors, such as the volume of harvested crops, the amount of added organic residues and fertilizers and the dynamics of garden planting. The ERT notes that this change is mainly occurring in mineral soils. The ERT also notes that, in the period 1990–2008, the Party reported a decrease of 2.1 per cent in cropland area.

98. The previous review report recommended that Ukraine verify its estimates (preferably by comparing the current method with the tier 2 approach in the IPCC good practice guidance for LULUCF) in order to increase transparency. The ERT notes that the recommendation has not been implemented and, during the centralized review, asked Ukraine to provide additional information so that it could better understand the methodology used in the estimates, focussing on the relation C:N used. In response to the question from the ERT during the centralized review, Ukraine informed the ERT that it used a country-specific approach to estimate emissions and removals from cropland soils, based on the N fluxes balance, an approach that is different from the methods proposed in the IPCC good practice guidance for LULUCF. Ukraine stated that the applied methodology utilizes the same approach and parameters used in the estimation of N₂O from soils in the agriculture sector, and it is connected with the calculation of N₂O emission from soil for land converted to cropland. The ERT considers that the information provided does not properly address the issue raised and strongly recommends that Ukraine provide, in its next annual submission, additional information explaining the emissions/removals trend of cropland soils and the methodology used in the estimates, focussing on the relation C:N used, reiterating the recommendation from the previous review report that the Party compare the current method with the tier 2 approach in the IPCC good practice guidance for LULUCF, in order to increase transparency.

Grassland remaining grassland – CO₂

99. Ukraine used a country-specific approach, based on the balance of N fluxes, to estimate emissions and removals from soils, similar to the approach used for the cropland remaining cropland category. The ERT noted a significant difference (300.6 per cent of decrease) in the estimate of CO₂ emissions and removals from the grassland remaining grassland category in 2007, between the 2009 and 2010 submissions. In response to a question on this issue raised by the ERT during the centralized review, Ukraine clarified that the main reason for the recalculation was the availability of updated AD for grassland

remaining grassland area, and the revision of the time series of organic soils area. The ERT considers that the information reported in NIR and the additional information provided during the centralized review does not properly address the raised issue and strongly recommends that Ukraine provide detailed explanations on the recalculations in its next annual submission.

100. Ukraine reported carbon stock changes in living biomass and in dead organic matter (not mandatory) as “NE” for the period 1990–2008, explaining that data on perennial trees do not exist in Ukraine. The ERT recommends that Ukraine use the notation key “NO” instead of “NE”.

F. Waste

1. Sector overview

101. In 2008, emissions from the waste sector amounted to 9,615.11 Gg CO₂ eq, or 2.2 per cent of total GHG emissions. Since 1990, emissions have increased by 14.1 per cent. The key driver for the rise in emissions is the increase in solid waste disposed on landfills, which resulted in an increase in CH₄ emissions (by 33.9 per cent) since 1990. Emissions from wastewater handling have decreased by 19.0 per cent since 1990 due to the transition to a market economy reducing the wastewater streams and strong decrease in population of the country and protein consumption.

102. Within the sector, 73.4 per cent of the emissions were from solid waste disposal on land, followed by 26.6 per cent from emissions from wastewater handling. Emissions from waste incineration for the purpose of energy recovery are reported in the energy sector.

103. The information in the NIR covers emissions from all categories and describes the methods and assumptions, and AD and EFs used for estimating emissions. The CRF tables include estimates of all gases and categories of emissions from the waste sector; however, CH₄ emissions from incineration and N₂O emissions from wastewater handling are not estimated due to the lack of IPCC methods and/or EFs. The ERT noted that no recalculations have been performed since the last submission, and also noted that no further improvements to emission estimates are planned for the waste sector. The ERT encourages Ukraine to make further efforts to improve the inventory for the waste sector as it considers there is room for improvements as identified by the ERT in paragraphs 105 and 109 below.

104. Ukraine used the tier 1 method from the IPCC good practice guidance for the uncertainty estimates for the waste sector, including uncertainty estimates for AD and EFs. Tier 1 QA/QC activities were applied for emission estimates in the waste sector and tier 2 QC procedures were applied for the key category solid waste disposal on land. The ERT commends Ukraine for implementing these activities.

2. Key categories

Solid waste disposal on land – CH₄

105. CH₄ emissions from solid waste disposal on land is a key category by level and trend and amounted to 7,058.48 Gg CO₂ eq in 2008. Ukraine applies the IPCC first order decay (FOD) method and IPCC default EFs and parameters to estimate CH₄ emissions from solid waste disposal on land. The ERT welcomes the provision in the 2010 submission of detailed information on the collection and calculation of AD and references for this, however the ERT recommends that Ukraine enhance its efforts and use country-specific parameters and EFs for its estimates in its next annual submission.

106. In its previous submission, Ukraine had used one of the lowest coefficients of waste density (250 kg/m^3) of all reporting Parties to convert the volume of waste generated into mass units of waste. In the previous review report it was encouraged that Ukraine use weighed quantities of disposed municipal solid waste for reporting the amount of waste. In its 2010 submission, Ukraine used weighed quantities of disposed municipal solid waste, for the years 2006–2008, based on AD from the State Committee on Statistics. The ERT agreed that these data, which reflect real disposed waste quantities, are in line with the IPCC good practice guidance.

3. Non-key categories

Wastewater handling – CH₄ and NO₂

107. Emissions from wastewater handling amounted to 2,556.64 Gg CO₂ eq in 2008. Emissions from wastewater handling have decreased by 19.9 per cent since the base year, mainly due to a reduction of wastewater streams and industry's collapse during the transition period to market economy. In the 2010 submission no methodological changes have been made for this category, and Ukraine used country-specific EFs and the tier 2 method to estimate CH₄ emissions. N₂O emissions from wastewater handling are not estimated due to the lack of IPCC methods and/or EFs. No recalculations have been performed since the last submission for the wastewater handling category.

108. N₂O emissions from human sewage have been estimated based on population data. As the population has decreased between 1990 and 2008, by 10 per cent, and protein consumption has also decreased, from 105.2 g/person/day in 1990 to 80.3 g/person/day in 2008, N₂O emissions have decreased by 32.3 per cent during this period.

Waste incineration – CO₂

109. Emissions from waste incineration are reported under the energy sector, as all energy obtained from the incinerated waste is recovered and used for heating purposes. The NIR contains a description of the AD and EFs used. The differentiation between biogenic and non-biogenic waste is made based on the default values of carbon content and the percentage share of the carbon of fossil origin in the incinerated waste. Given that the data on the composition of waste are available, the ERT reiterates the recommendation from the previous review report that Ukraine use these data to differentiate biogenic and non-biogenic waste and estimate emissions accordingly in its next annual submission.

G. Adjustments

110. The ERT identified and recommended four adjustments in the industrial processes sector for 2008 of the 2010 annual submission of Ukraine. The ERT calculated these adjustments in accordance with the technical guidance on methodologies for adjustments under Article 5, paragraph 2 of the Kyoto Protocol (annex to decision 20/CMP.1). Also, in accordance with the guidelines for review under Article 8 of the Kyoto Protocol (annex to decision 22/CMP.1), the ERT prepared the adjustments in consultation with Ukraine and officially notified Ukraine of the calculated adjustments. The ERT recommended adjustments for the following subcategories of the consumption of halocarbons and SF₆ category of the industrial processes sector for 2008: HFC and PFC emissions from refrigeration and air-conditioning equipment; HFC emissions from foam blowing; HFC and PFC emissions from fire extinguishers; and HFC emissions from aerosols/metered dose inhalers. The solvents subcategory was also taken into consideration by the ERT; however, it concluded that it will not recommend an adjustment for this subcategory, following an analysis on the likelihood of these emissions occurring in the country.

111. The adjusted estimate for GHG emissions from the industrial processes sector in 2008 amounts to 91,677.755 Gg CO₂ eq, compared with 90,572.960 Gg CO₂ eq originally reported by Ukraine in its 2010 annual submission (a 1.2 per cent increase). The application of the adjustments leads to an increase in the estimated total GHG emissions for 2008 of 0.3 per cent (1,104.795 Gg CO₂ eq), from 427,842.682 Gg CO₂ eq as reported by Ukraine to 428,947.477 Gg CO₂ eq as calculated by the ERT.

112. In its response to the draft annual review report Ukraine notified the secretariat of its intention to accept the calculated adjustments.

113. The ERT notes that Ukraine may submit revised estimates for a part of its inventory to which adjustments were applied, in conjunction with its next annual inventory, or at the latest with the inventory for the year 2012. The revised estimates will be part of the Article 8 review and if accepted by the ERT the revised estimates will replace the adjustments.

1. The original estimate provided by the Party

114. In its 2010 annual submission, Ukraine reported 48.98 Gg CO₂ eq for 2008 under the category consumption of halocarbons and SF₆ (see CRF table Summary 2); of this, 27.48 Gg CO₂ eq corresponded to HFC emissions (HFC-134a) from refrigeration and air conditioning equipment and 21.50 Gg CO₂ eq to SF₆ emissions from electrical equipment.

2. The underlying problem

115. In its 2010 inventory submission, for 2008 Ukraine did not report either actual or potential emissions of HFCs, PFCs and SF₆ from refrigeration and air conditioning equipment (all gases were reported as “NO” with the exception of HFC-134a), foam blowing (all gases were reported as “NE”), fire extinguishers (all gases were reported as “NE”), aerosols/metered dose inhalers (all gases were reported as “NE”) and solvents (all gases were reported as “NE”). These subcategories probably would not be key categories, although emissions of F-gases are increasing rapidly in many countries in recent years.

116. During the centralized review, in the list of potential problems and further questions, the ERT recommended that Ukraine check whether these activities do occur in the country for all subcategories and relevant gases under the category consumption of halocarbons and SF₆. If there were cases where these activities and gases do not occur, Ukraine was recommended to change the notation keys used to “NO” and provide supporting information. For the remaining activities and gases that occur in Ukraine, the ERT recommended that Ukraine collect relevant AD and estimate HFCs, PFCs and SF₆ emissions using the approaches recommended in chapter 3.7 of the IPCC good practice guidance.

3. The rationale for the adjustment

117. In its response to the list of potential problems and further questions raised by the ERT, Ukraine informed the ERT that: “Due to the lack of activity data, emissions in categories «Consumption of Halocarbons and SF₆: Refrigeration and air conditioning (2.F.1), Foam Blowing (2.F.2.), Fire extinguishers (2.F.3.), Aerosols/Metered dose inhalers (2.F.4.), Solvents (2.F.5)» are not estimated. Investigations aimed at evaluation of activity data for above mentioned categories are planned to be executed at the expense of the AAUs sale”. In addition, Ukraine informed the ERT that HFCs, PFCs and SF₆ are not produced in the country.

118. The ERT assessed the information provided by Ukraine in response to the identified potential problem and concluded that the information provided does not adequately correct the problem because the Party did not provide estimates or made changes in the notation keys. The ERT considered the explanation provided insufficient and decided to recommend

adjustments for the identified subcategories with potential problems. The ERT noted the methodological guidance from the IPCC good practice guidance (page 3.79) indicating that: “*Good practice is to use the tier 2 actual method for all sub-source categories within this source category.*” and “*If an inventory agency is unable to implement actual methods for all sub-source categories, it is good practice to calculate and report potential estimates for all sub-source categories...*”.

119. The rationale for the adjustment is that the inventory data submitted by Ukraine are incomplete due to missing and incomplete estimates of emissions for the year 2008 for the identified subcategories.

4. The assumptions, data and methodology used to calculate the adjustment

120. In accordance with paragraph 80(c) of the annex to decision 22/CMP.1, the ERT asked Ukraine to provide information on the F-gases used in Ukraine, data on production, export and import of equipment containing HFCs and PFCs, as well as proxy data, including the numbers of households and vehicles with air-conditioning equipment for the calculation of adjustments. The ERT also asked Ukraine to state which countries the Party considers are comparable with Ukrainian circumstances regarding the considered uses of F-gases. However, in its response to the ERT on 21 November 2011, Ukraine was not able to provide the data requested, explaining that special research aimed at obtaining data had not been performed at the time of the ERT’s request. Ukraine named Belarus, Kazakhstan and Romania as countries with comparable national circumstances (technologies and equipment).

121. In accordance with table 1 of the technical guidance on methodologies for adjustments under Article 5, paragraph 2 of the Kyoto Protocol (annex to decision 20/CMP.1), the ERT decided to use adjustment method 5: “Average emission rate from a cluster of countries based on a driver” for calculating the missing emission estimates for the identified subcategories.

122. In accordance with the technical guidance on methodologies for adjustments under Article 5, paragraph 2, of the Kyoto Protocol, the cluster of countries should cover a minimum number of countries and, to the extent possible, take into account similar national circumstances. In order to choose the cluster of countries, the ERT considered the information provided by Ukraine as well as the climate and geographic conditions, population, economic indicators (gross domestic product (GDP) per capita and gross national income per capita based on purchasing power parity) estimated by the World Bank⁵ and the availability of emission estimates for each country.

123. The ERT considered data on emissions of HFCs, PFCs and SF₆ from the relevant subcategories available in the latest year (2007) of the reviewed 2009 annual submissions of the Annex I Parties with economies in transition, namely Belarus, Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Russian Federation, Slovakia and Slovenia.

124. The ERT concluded that Belarus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Russian Federation, Slovakia and Slovenia are the countries to be included in the cluster for the calculations in line with paragraphs 35–40 of the technical guidance on methodologies for adjustments under Article 5, paragraph 2, of the Kyoto Protocol, which provide guidance on the choice of drivers and clusters. Bulgaria and Croatia did not report emissions for the considered subcategories in their 2009 submissions and therefore were not taken into account in the cluster.

⁵ <<http://data.worldbank.org/indicator/NY.GDP.PCAP.CD>>.

