Advance Version

COMPLIANCE COMMITTEE

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3 July 2015

Report on the individual review of the annual submission of Ukraine submitted in 2014

Note by the secretariat

The report on the individual review of the annual submission of Ukraine submitted in 2014 was published on 3 July 2015. For purposes of rule 10, paragraph 2, of the rules of procedure of the Compliance Committee (annex to decision 4/CMP.2, as amended by decisions 4/CMP.4 and 8/CMP.9), the report is considered received by the secretariat on the same date. This report, FCCC/ARR/2014/UKR, contained in the annex to this note, is being forwarded to the Compliance Committee in accordance with section VI, paragraph 3, of the annex to decision 27/CMP.1.

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Report on the individual review of the annual submission of Ukraine submitted in 2014*

* In the symbol for this document, 2014 refers to the year in which the inventory was submitted, and not to the year of publication.

Contents

I. Introduction and summary

1. This report covers the review of the 2014 annual submission of Ukraine, coordinated by the UNFCCC secretariat, in accordance with the "Guidelines for review under Article 8 of the Kyoto Protocol" (decision 22/CMP.1) (hereinafter referred to as the Article 8 review guidelines). The review took place from 8 to 13 September 2014 in Bonn, Germany, and was conducted by the following team of nominated experts from the UNFCCC roster of experts: generalists – Ms. Elena Gavrilova (the former Yugoslav Republic of Macedonia) and Ms. Batimaa Punsalmaa (Mongolia); energy – Ms. Lea Kai Aboujaoudé (Lebanon), Ms. Rana Humbatova (Azerbaijan), Ms. Lungile Manzini (South Africa) and Mr. Ioannis Sempos (Greece); industrial processes and solvent and other product use – Ms. Valentina Idrissova (Kazakhstan) and Mr. Mauro Meirelles de Oliveira Santos (Brazil); agriculture – Ms. Yauheniya Bertash (Belarus) and Mr. Sorin Deaconu (Romania); land use, land-use change and forestry (LULUCF) – Mr. Sandro Federici (San Marino), Mr. Markus Haakana (Finland) and Ms. Takako Ono (Japan); and waste – Mr. Pavel Gavrilita (Republic of Moldova) and Ms. Detelina Petrova (Bulgaria). Ms. Batimaa and Mr. Sempos were the lead reviewers. The review was coordinated by Mr. Tomoyuki Aizawa (UNFCCC secretariat).

2. In accordance with the Article 8 review guidelines, a draft version of this report was sent to the Government of Ukraine, which provided comments that were considered and incorporated, as appropriate, into this final version of the report. All encouragements and recommendations in this report are for the next annual submission, unless otherwise specified.

3. All recommendations and encouragements included in this report are based on the expert review team's (ERT's) assessment of the 2014 annual submission against the Article 8 review guidelines. The ERT has not taken into account the fact that Parties will prepare the submissions due by 15 April 2015 using the revised "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual greenhouse gas inventories" adopted through decision 24/CP.19. Therefore, when preparing the 2015 annual submissions, Ukraine should evaluate the implementation of the recommendations and encouragements in this report, in the context of those guidelines.

4. In 2012, the main greenhouse gas (GHG) emitted by Ukraine was carbon dioxide (CO_2), accounting for 75.6 per cent of total GHG emissions[1] expressed in CO_2 equivalent (CO_2 eq), followed by methane (CH_4) (16.4 per cent) and nitrous oxide (N_2O) (7.8 per cent). Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6) collectively accounted for 0.2 per cent of the overall GHG emissions in the country. The energy sector accounted for 76.8 per cent of total GHG emissions, followed by the industrial processes sector (11.4 per cent), the agriculture sector (8.9 per cent), the waste sector (2.8 per cent) and the solvent and other product use sector (0.04 per cent). Total GHG emissions amounted to 402,665.95 Gg CO_2 eq and decreased by 57.4 per cent between the base year[2] and 2012. The ERT concluded that the description in the national inventory report (NIR) of the trends for the different gases and sectors is reasonable.

5. Tables 1 and 2 show GHG emissions from sources included in Annex A to the Kyoto Protocol (hereinafter referred to as Annex A sources), emissions and removals from

[1] In this report, the term "total GHG emissions" refers to the aggregated national GHG emissions expressed in terms of CO_2 eq excluding LULUCF, unless otherwise specified.

[2] "Base year" refers to the base year under the Kyoto Protocol, which is 1990 for all gases. The base year emissions include emissions from sources included in Annex A to the Kyoto Protocol only.

the LULUCF sector under the Convention and emissions and removals from activities under Article 3, paragraph 3, and, if any, elected activities under Article 3, paragraph 4, of the Kyoto Protocol (KP-LULUCF), by gas and by sector and activity, respectively.

6. Information to be included in the compilation and accounting database can be found in annex I to this report.

Table 1

Greenhouse gas emissions from Annex A sources and emissions/removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol by gas, base year[a] to 2012

			Gg CO_2 eq								*Change (%)*
		Greenhouse gas	*Base year[a]*	*1990*	*1995*	*2008*	*2009*	*2010*	*2011*	*2012*	*Base year–2012*
Annex A sources		CO_2	723 085.64	723 085.64	362 624.58	326 011.17	275 876.31	292 138.26	306 534.39	304 395.38	–57.9
		CH_4	162 337.84	162 337.84	115 212.25	72 983.55	66 726.92	66 474.49	70 388.22	66 165.91	–59.2
		N_2O	58 725.93	58 725.93	38 722.28	29 372.28	26 843.58	28 758.67	31 869.15	31 366.94	–46.6
		HFCs	NA, NE, NO	NA, NE, NO	NA, NE, NO	571.58	586.03	658.05	717.42	726.20	NA
		PFCs	203.23	203.23	153.45	150.16	46.49	22.98	IE, NA, NO	NA, NO	NA
		SF_6	0.01	0.01	0.07	9.79	9.81	10.18	8.82	11.52	141 664.7
KP-LULUCF	Article 3.3[b]	CO_2				–93.93	–453.86	–506.07	–665.52	–764.03	
		CH_4				0.68	0.37	0.63	0.01	NA, NO	
		N_2O				0.19	0.11	0.18	0.02	0.01	
	Article 3.4[c]	CO_2	NA			–55 486.14	–57 267.36	–54 895.72	–60 415.72	–60 018.22	NA
		CH_4	NA			32.92	14.76	22.63	0.78	19.56	NA
		N_2O	NA			17.45	13.18	15.21	9.72	11.37	NA

Abbreviations: Annex A sources = source categories included in Annex A to the Kyoto Protocol, IE = included elsewhere, 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] The base year for Annex A sources refers to the base year under the Kyoto Protocol, which is 1990 for all gases. For activities under Article 3, paragraph 3, of the Kyoto Protocol and forest management under Article 3, paragraph 4, of the Kyoto Protocol, only the inventory years of the commitment period must be reported.

[b] Activities under Article 3, paragraph 3, of the Kyoto Protocol, namely afforestation and reforestation, and deforestation.

[c] Elected activities under Article 3, paragraph 4, of the Kyoto Protocol, including forest management, cropland management, grazing land management and revegetation.

Table 2
Greenhouse gas emissions by sector and activity, base year[a] to 2012

			Gg CO_2 eq							*Change (%)*
		Sector	*Base year[a]*	*1990*	*1995*	*2008*	*2009*	*2010*	*2011*	*2012*	*Base year–2012*
Annex A sources		Energy	750 348.41	750 348.41	404 401.80	326 779.16	283 355.89	294 651.07	312 943.98	309 081.09	–58.8
		Industrial processes	79 842.20	79 842.20	35 681.43	56 152.75	42 100.52	47 676.67	48 862.58	46 009.22	–42.4
		Solvent and other product use	4.69	4.69	3.72	30.82	104.54	123.07	178.56	176.44	3 664.3
		Agriculture	103 602.53	103 602.53	66 469.10	35 283.89	33 610.32	34 563.26	36 298.60	36 033.19	–65.2
		Waste	10 554.82	10 554.82	10 156.58	10 851.90	10 917.87	11 048.56	11 234.29	11 366.02	7.7
		LULUCF	NA	–69 737.10	–48 747.64	–10 407.14	–18 257.25	–37 993.13	–6 487.43	–27 240.83	NA
		Total (with LULUCF)	**NA**	**874 615.54**	**467 964.99**	**418 691.39**	**351 831.89**	**350 069.50**	**403 030.57**	**375 425.12**	**NA**
		Total (without LULUCF)	**944 352.64**	**944 352.64**	**516 712.63**	**429 098.53**	**370 089.14**	**388 062.63**	**409 518.00**	**402 665.95**	**–57.4**
		Other[b]	NA	NA	NA	NA	NA	NA	NA	NA	NA
KP-LULUCF	Article 3.3[c]	Afforestation and reforestation				–420.34	–455.22	–505.41	–671.92	–803.36	
		Deforestation				327.28	1.84	0.14	6.43	39.35	
		Total (3.3)				**–93.06**	**–453.38**	**–505.27**	**–665.49**	**–764.01**	
	Article 3.4[d]	Forest management				–55 435.76	–57 239.42	–54 857.88	–60 405.21	–59 987.29	
		Cropland management	NA			NA	NA	NA	NA	NA	NA
		Grazing land management	NA			NA	NA	NA	NA	NA	NA
		Revegetation	NA			NA	NA	NA	NA	NA	NA
		Total (3.4)	**NA**			**–55 435.76**	**–57 239.42**	**–54 857.88**	**–60 405.21**	**–59 987.29**	**NA**

Abbreviations: Annex A sources = source categories included in Annex A to the Kyoto Protocol, KP-LULUCF = LULUCF emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, LULUCF = land use, land-use change and forestry, NA = not applicable.

[a] The base year for Annex A sources refers to the base year under the Kyoto Protocol, which is 1990 for all gases. For activities under Article 3, paragraph 3, of the Kyoto Protocol and forest management under Article 3, paragraph 4, of the Kyoto Protocol, only the inventory years of the commitment period must be reported.

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

[c] Activities under Article 3, paragraph 3, of the Kyoto Protocol, namely afforestation and reforestation, and deforestation.

[d] Elected activities under Article 3, paragraph 4, of the Kyoto Protocol, including forest management, cropland management, grazing land management and revegetation.

II. Technical assessment of the annual submission

A. Overview

1. Annual submission and other sources of information

7. The 2014 annual submission was submitted on 12 April 2014; it contains a complete set of common reporting format (CRF) tables for the period 1990–2012 and an NIR. Ukraine submitted a revised NIR on 15 April 2014. Ukraine also submitted the information required under Article 7, paragraph 1, of the Kyoto Protocol, including information on: activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, accounting of Kyoto Protocol units, changes in the national system and in the national registry and the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol. The standard electronic format (SEF) tables were submitted on 12 April 2014 and resubmitted on 15 April 2014. The annual submission was submitted in accordance with decision 15/CMP.1.

8. Ukraine submitted revised emission estimates on 25 October and 1 November 2014 in response to the list of potential problems and further questions raised by the ERT during the review (see paras. 27–28, 33–34, 45, 48, 49, 89, 91, 93 and 95 below). The total impact of the revised estimates was an increase of the total emissions by 1,646.49 Gg CO_2 eq and 0.4 per cent in reference to the national total, for the year 2012. The values used in this report are those submitted by Ukraine on 1 November 2014.

9. The list of other materials used during the review is provided in annex II to this report.

2. Questions of implementation raised in the 2013 annual review report

10. The ERT noted that no questions of implementation have been raised in the 2013 annual review report.

3. Overall assessment of the inventory

11. Table 3 contains the ERT's overall assessment of the annual submission of Ukraine. For recommendations for improvements for specific categories, please see the paragraphs cross-referenced in the table.

Table 3
The expert review team's overall assessment of the annual submission

Issue	*Expert review team assessment*	*General findings and recommendations*
The ERT's findings on completeness		
Annex A sources[a]	Complete	Mandatory: none
		Non-mandatory: N_2O emissions from coal mining and handling; N_2O emissions from solid fuel transformation; CO_2 emissions from underground mines: post-mining activities; CO_2 emissions from surface mines; CO_2 and N_2O emissions from oil refining/storage; CO_2 and CH_4 emissions from distribution of oil products; CO_2 emissions from asphalt roofing; CO_2 emissions from road

Issue	*Expert review team assessment*	*General findings and recommendations*
		paving with asphalt; CH_4 and N_2O emissions from ammonia production; CO_2 emissions from adipic acid production; CH_4 emissions from calcium carbide; CO_2 and N_2O emissions from ethylene; CH_4 emissions from steel; CH_4 emissions from sinter; CO_2 emissions from coke; CH_4 emissions from ferroalloys production; CO_2 emissions from paint application; CO_2 and N_2O emissions from degreasing and dry cleaning; CO_2 emissions from chemical products, manufacture and processing; N_2O emissions from fire extinguishers; N_2O emissions from aerosol cans; N_2O emissions from other use of N_2O; CH_4 emissions from enteric fermentation – poultry; CH_4 emissions from direct soil emissions; CH_4 emissions from indirect emissions from soil; and CH_4 emissions from waste incineration The ERT encourages the Party to estimate and report emissions from all non-mandatory categories
Land use, land-use change and forestry[a]	Complete	Mandatory: none Non-mandatory: none
KP-LULUCF	Complete	
The ERT's findings on recalculations and time-series consistency		
Transparency of recalculations	Sufficiently transparent, except the LULUCF sector	Please see paragraph 61 below for category-specific findings
Time-series consistency	Not sufficiently consistent	Please see paragraphs 25, 26, 33, 34, 38, 62, 66, 68, 69, 78 and 80 below for category-specific findings
The ERT's findings on QA/QC procedures	Not sufficient	Ukraine has elaborated a QA/QC plan and has implemented tier 1 QA/QC procedures in accordance with that plan. However, the ERT noted a number of mistakes (e.g. incorrect units in tables), inconsistencies (within or between the reporting in the CRF tables and the NIR) that suggest that tier 1 QC procedures are not implemented in a fully appropriate manner and for all sectors. Moreover, there is a lack of sector-specific QC procedures in the LULUCF sector Please see paragraphs 43, 46, 62, 69, 80, 84 and 85 below for category-specific recommendations
The ERT's findings on transparency	Not sufficiently transparent	Please see table 4 and paragraphs 25, 36, 43, 63, 64, 65, 79, 86, 90 and 94 below for category-specific recommendations

Abbreviations: Annex A sources = source categories included in Annex A to the Kyoto Protocol, CRF = common reporting format, ERT = expert review team, KP-LULUCF = LULUCF emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, LULUCF = land use, land-use change and forestry, NIR = national inventory report, QA/QC = quality assurance/quality control.

[a] The assessment of completeness by the ERT considers only the completeness of reporting of mandatory categories (i.e. categories for which methods and default emission factors are provided in the Intergovernmental Panel on Climate Change (IPCC) *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*, the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* or the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry*).

4. Description of the institutional arrangements for inventory preparation, including the legal and procedural arrangements for inventory planning, preparation and management

Inventory planning

12. The NIR and additional information provided by the Party during the review described the national system for the preparation of the inventory. There were changes to the national system for the 2014 annual submission, as identified by the Party in response to questions raised by the ERT during the review. The National Centre for the GHG Emissions Inventory was established as a substructure of State Environmental Investment Agency (SEIA), with a main competence for inventory preparation, including data collection and processing. In accordance with Order of State No. 121, concerning the Environmental Investment Agency of Ukraine, of 30 April 2013, the responsibilities of the National Centre for the GHG Emissions Inventory were increased in terms of the collection, processing, systematization, analysis, choice of methods and emission factors (EFs), and the archiving of the information necessary to prepare the national GHG inventory, and also with regard to the improvement of the national GHG emissions evaluation system. SEIA has special agreements on regular data provision with major government entities, such as the State Statistics Service, the Ministry of Fuel and Coal Industry, the Ministry of Industrial Policy, the State Forest Resources Agency and the State Water Resources Agency. Other ministries, agencies and institutions are also involved in the preparation of the inventory, such as the State Agency for Land Resources, the National Academy of Sciences of Ukraine (NASU), the Environmental Investment Fund, Ukrtransgaz (Ukraine's system of trunk natural gas pipelines and underground natural gas depots) the Ukrainian Hydrometeorological Institute and the State Road Transport Research Institute. These organizations provide activity data (AD) on request by SEIA, develop national methodologies and participate in the collection and pre-processing of data.

Inventory preparation

13. Table 4 contains the ERT's assessment of Ukraine's inventory preparation process. For improvements related to specific categories, please see the paragraphs cross-referenced in the table.

Table 4
Assessment of inventory preparation by Ukraine

Issue	*ERT assessment*	*ERT findings and recommendations*
Key category analysis		
Was the key category analysis performed in accordance with the IPCC good practice guidance and the IPCC good practice guidance for LULUCF?	Yes	Level and trend analysis performed, including and excluding LULUCF

Issue	*ERT assessment*	*ERT findings and recommendations*
Approach followed?	Tier 1	
Were additional key categories identified using a qualitative approach?	Yes	CRF table 7 reports N_2O emissions from road transportation as a key category for 2012, using qualitative criteria. However, it is not reported as a key category in the NIR. The ERT reiterates the recommendation made in previous review reports that Ukraine enhance the consistency between CRF table 7 and the NIR
Has the Party identified key categories for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol following the guidance on establishing the relationship between the activities under the Kyoto Protocol and the associated key categories in the UNFCCC inventory?	Yes	
Does the Party use the key category analysis to prioritize inventory improvements?	Yes	
Assessment of uncertainty analysis		
Approach followed?	Tier 1	
Was the uncertainty analysis carried out in accordance with the IPCC good practice guidance and the IPCC good practice guidance for LULUCF?	Yes	The ERT recommends that Ukraine improve the transparency of the uncertainty analysis for the LULUCF sector in terms of the data sources and methods applied to derive the uncertainties (see paragraph 65)
Quantitative uncertainty (including LULUCF)	Level = 4.9% Trend = 2.4%	
Quantitative uncertainty (excluding LULUCF)	Level = 4.1% Trend = 1.0%	

Abbreviations: CRF = common reporting format, ERT = expert review team, IPCC good practice guidance = Intergovernmental Panel on Climate Change (IPCC) *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*, IPCC good practice guidance for LULUCF = IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry*, LULUCF = land use, land-use change and forestry, NIR = national inventory report.

Inventory management

14. Ukraine has a centralized archiving system, which includes the archiving of disaggregated EFs and AD, and documentation on how these factors and data have been generated and aggregated for the preparation of the inventory. The archived information also includes internal documentation on quality assurance/quality control (QA/QC) procedures, external and internal reviews, and documentation on annual key categories and key category identification and planned inventory improvements. The National Centre for the GHG Emissions Inventory is responsible for archiving the inventory data. There were no changes to the inventory management process carried out by the Party for the 2014 annual submission. The description of the inventory management process, as contained in

the report of the individual review of the annual submission of Party submitted in 2013[3], remains relevant.

5. Follow-up to previous reviews

15. The ERT commends Ukraine for a number of improvements undertaken in response to the recommendations made in previous review reports. For example, the Party has developed and applied a country-specific approach for the estimation of fugitive CO_2 and CH_4 emissions from the transmission and distribution of natural gas in its 2014 annual submission which covers the whole time series (see para. 40).

16. Recommendations from previous reviews that have not yet been implemented, as well as issues the ERT identified during the 2014 annual review, are discussed in the relevant sectoral chapters of the report and in table 9 below.

B. Energy

1. Sector overview

17. The energy sector is the main sector in the GHG inventory of Ukraine. In 2012, emissions from the energy sector amounted to 309,081.09 Gg CO_2 eq, or 76.8 per cent of total GHG emissions. Since 1990, emissions have decreased by 58.8 per cent. The key drivers for the fall in emissions are the economic restructuring during the transition to a market economy in the country, and the switch in fuel used for energy production from liquid to gaseous. Since 2006, however, there has been a shift from the use of natural gas to coal owing to the rise in gas prices. In 2012, emissions from energy industries reached their highest level since 1996. The rise in emissions from energy industries is due to an increase in the use of solid fuels (an increase of up to 22.6 per cent since 2010) and of residual fuel oil, which have replaced the use of natural gas. There was a decrease in emissions from the energy sector, from 326,779.16 Gg CO_2 eq in 2008 to 283,355.89 Gg CO_2 eq in 2009 (13.3 per cent), mainly owing to a decrease in emissions from manufacturing industries and construction from 73,861.35 Gg CO_2 eq to 54,987.31 Gg CO_2 eq (25.6 per cent), which occurred as a result of the global financial crisis of 2007–2008. Although total emissions from the energy sector increased by 9.1 per cent in 2012 compared with 2009, energy emissions are still 5.4 per cent lower than in 2008. However, in the category energy industries, emissions have shown an increasing trend since 2009 and are 12.3 per cent higher in 2012 than in 2008. Within the sector, 38.6 per cent of the emissions were from energy industries, followed by 20.8 per cent from manufacturing industries and construction, 15.1 per cent from other sectors and 10.8 per cent from transport. Oil and natural gas accounted for 7.9 per cent and solid fuels accounted for 6.6 per cent. The remaining 0.4 per cent of emissions were from other (fuel combustion).

18. Ukraine has made recalculations between the 2013 and 2014 annual submissions for this sector. The most significant recalculations made by Ukraine between the 2013 and 2014 annual submissions were for fugitive emissions from natural gas and, more specifically, with regard to the following subcategories: gas – flaring, and transmission, distribution and other leakage under natural gas. The recalculations were made in response to recommendations made in the 2013 annual review report (see para. 40) and in order to rectify identified errors. Compared with the 2013 annual submission, the recalculations increased emissions in the energy sector in 2011 by 7,718.62 Gg CO_2 eq (2.5 per cent) and increased total national emissions by 1.9 per cent. The recalculations were adequately explained in the NIR.

[3] FCCC/ARR/2013/UKR, para 13.

19. In response to recommendations made in the 2013 annual review report, Ukraine has also performed improvements since the previous annual submission. The ERT commends Ukraine for making the following improvements:

(a) The reallocation of emissions from petroleum refining and manufacture of solid fuels and other energy industries from the category public electricity and heat production to the appropriate category in the CRF tables for the years 1990–1997;

(b) The reallocation of emissions from off-road agricultural vehicles from the category other transportation to the category other sectors – agriculture/forestry/fisheries;

(c) The inclusion of a mass balance for liquefied petroleum gas (LPG) in the NIR.

20. The ERT acknowledges the planned inventory improvements reported in the 2014 NIR, which correspond to recommendations made in the previous review report, and reiterates these recommendations, namely that Ukraine:

(a) Develop country-specific CO_2 EFs for motor fuels (i.e. gasoline, diesel oil and LPG) and fuel oil used under the residential category;

(b) Develop country-specific EFs for fugitive CH_4 emissions from natural gas leakage from end-users;

(c) Disaggregate the data in the reference approach according to the different coal types for the years 1990–2011;

(d) Allocate the emissions from corresponding off-road vehicles to manufacturing industries and construction for the years 1990–2011;

(e) Include a detailed explanation of the methodology, assumptions and AD used to split vehicles by category (see para. 36 below).

2. Reference and sectoral approaches

21. Table 5 provides a review of the information reported under the reference approach and the sectoral approach, as well as comparisons with other sources of international data. Issues identified in table 5 are more fully elaborated in paragraphs 22–29 below.

Table 5
Review of reference and sectoral approaches

Issue	*Expert review team assessment*	*Paragraph cross references*
Difference between the reference approach and the sectoral approach in 2012	Energy consumption: –67.04 PJ, –1.86% CO_2 emissions: –7 622.04 Gg CO_2, –2.90%	
Are differences between the reference approach and the sectoral approach adequately explained in the NIR and the CRF tables?	No	See paragraphs 22 and 23 below
Are differences with international statistics adequately explained?	No	See paragraph 24 and 29 below
Is reporting of bunker fuels in accordance with the UNFCCC reporting guidelines?	No	See paragraphs 25 and 26 below

Issue	*Expert review team assessment*	*Paragraph cross references*
Is reporting of feedstocks and non-energy use of fuels in accordance with the UNFCCC reporting guidelines?	Yes	See paragraph 27, 28 and 29 below

Abbreviations: CRF = common reporting format, NIR = national inventory report, UNFCCC reporting guidelines = "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories".

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

22. The difference between the reference and sectoral approaches for CO_2 emissions for 1990–2012 is very high and ranges from –2.9 per cent in 2012 to 21.4 per cent in 1995 for the national total, from –12.6 per cent in 2012 to 25.9 per cent in 1991 for liquid fuels, from –4.7 per cent in 2012 to 42.0 per cent in 1992 for solid fuels and from 3.4 per cent in 1994 to 20.8 per cent in 1996 for gaseous fuels. The difference between the two approaches for CO_2 emissions for 2012 is –5.21 per cent for the national total, –12.3 per cent for liquid fuels, –9.0 per cent for solid fuels and 3.5 per cent for gaseous fuels. Ukraine reported in the NIR that the differences are attributed to the large statistical differences in fuel consumption reported in the national energy balance. In response to a question raised by the ERT during the review, Ukraine provided additional information on the difference between the two approaches. The fuel consumption calculated using the sectoral approach is based on the statistical form "4-MTP" from the State Statistics Service, which is considered to be a more reliable and accurate data source compared with the national energy balance, on which the reference approach is based. Moreover, Ukraine replied that the difference between the reference and sectoral approaches for gaseous fuels is also attributed to fugitive emissions, which are implicitly accounted for in the reference approach, but not in the sectoral approach. The ERT noted that the difference between the two approaches could also be attributed to: the net calorific value (NCV) for crude oil used by Ukraine (41.82–42.96 TJ/kt) in the reference approach, which is lower compared with those of other reporting Parties (38.61 – 43.98 TJ/kt); and the fact that the fuel consumption for road transportation under the sectoral approach is not based on the energy balance, as for the reference approach, but is estimated using the COPERT model (see paras. 33–39 below). The ERT recommends that Ukraine further investigate the difference between the two approaches and include in the NIR of its next annual submission a comprehensive analysis that justifies the differences for all types of fuels.

23. Ukraine reported in the documentation box of CRF table 1.A(b) that for 2011 and 2012, part of coking coal, which corresponds to coke for non-energy use in iron production (reported under iron and steel production in the industrial processes sector), and part of natural gas for non-energy use in ammonia production (reported under ammonia production in the industrial processes sector) were subtracted from the total coking coal and natural gas production, respectively, in the reference approach, in order to improve the comparability of the two approaches. The ERT noted that this approach is not in line with the Intergovernmental Panel on Climate Change (IPCC) *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Revised 1996 IPCC Guidelines), because all coking coal and natural gas used in the country should be accounted for under apparent consumption. These fuels should be subtracted from apparent consumption in order to calculate the apparent energy consumption excluding non-energy use and feedstocks in CRF table 1.A(c). Moreover, the coke and natural gas fuel quantities reported under the industrial processes sector should be reported in CRF table 1.A(d) with the value 100 per cent given to the parameter "fraction of carbon stored". By using this reporting method, the difference in energy consumption and CO_2 emissions between the sectoral and reference approaches will not be affected by the coke and natural gas reported

under the industrial processes sector. The ERT reiterates the recommendation made in the previous review report that Ukraine in its next annual submission revise the apparent consumption for coking coal and natural gas for 2011 and 2012 using total production data and follow the Revised 1996 IPCC Guidelines for the apparent consumption calculations, as was done by the Party for the years 1990–2010.

24. As identified in the previous stages of the review, the ERT noted that the apparent consumption reported to the UNFCCC is lower compared with the International Energy Agency (IEA) data for most years of the time series (13 per cent lower for 2012), while it is 8 per cent higher for 1990. In response to a question raised by the ERT during the review, Ukraine explained that the difference between the two data sets is attributed to: the different NCVs used in the CRF tables compared with those used for the IEA data; the subtraction of the amount of fuel reported under the industrial processes sector from the apparent consumption reported in CRF table 1.A(b) for 2011 and 2012 (coke and natural gas); the reported AD for coal production, which are based on raw coal production for the CRF tables, but on saleable coal for the IEA data; the fact that the volume of natural gas was reported to IEA on the basis of national statistics, but reported in the CRF tables on the basis of customs data; and the fact that the natural gas volume reported in the national statistics is measured at different temperature and pressure conditions compared with the volume reported to IEA. The ERT recommends that Ukraine include these explanations in the NIR of its next annual submission, but also recommends that the Party investigate further the underlying reasons for the discrepancies between the CRF table and IEA data sets and include in the NIR a comprehensive analysis that justifies the deviation between the two data sets.

International bunker fuels

25. As explained in the previous review report, the detailed specification of flight types, destinations and characteristics, which are used to separate domestic and international aviation, are not available for the period 1990–1995, but are available for the years 1996–2011. Ukraine has therefore calculated aviation bunker emissions for 1990 using an average share (22.0 per cent) of domestic flights over the total amount of fuel consumed for national and international aviation for the period 1996–2006. The emissions for the period 1991–1995 were calculated by using an interpolation method based on data for 1990 and 1996. The ERT noted that the above information is not included in the NIR of the 2014 annual submission. Moreover, Ukraine did not explain the rationale behind the method and assumptions that have been applied regarding the calculation of aviation bunker emissions for 1990. To increase transparency, the ERT recommends that Ukraine include this information in the NIR of its next annual submission. The ERT also reiterates the recommendation made in previous review reports that Ukraine provide in its NIR explanations for the calculation of emissions of international aviation for 1990–1995, including justification for the rate of international aviation for the period.

26. As identified in the previous stages of the review, the ERT noted that the international marine bunker emissions are reported as "NE" (not estimated) for the years 1991–1997. In response to a question raised by the ERT during the review, Ukraine explained that because the data regarding the turnover of domestic navigation and international marine bunkers for the period 1991–1997 are not available, international marine bunker emissions are reported as "NE" for those years. The ERT recommends that Ukraine estimate these emissions in its next annual submission by using one of the estimation techniques described in section 7.3.2.2 of the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC good practice guidance).

Feedstocks and non-energy use of fuels

27. The ERT noted that Ukraine did not include in the national totals any CO_2 emissions from the following non-energy uses of fuels, which are reported in CRF table 1.A(d): natural gas, gas/diesel oil and LPG. In response to questions raised by the ERT during the review week, Ukraine did not provide a justification indicating that the final use of these fuels is not associated with the release of CO_2 emissions. The ERT is of the view that in cases where the final non-energy use of fuels is not known, the reporting of no emissions for these fuels could result in a potential underestimation of emissions. The ERT also noted that, according to the Revised 1996 IPCC Guidelines, there is a tier 1 method to account for the CO_2 emissions of the non-energy use of fuels under the sectoral approach, which is included in (a) Volume 3, Reference Manual, page 1.32, paragraph entitled "Carbon release during the non-energy-use of fuels"; and (b) Volume 2, Workbook, section 1.2.2 entitled "CO_2 Emissions by Source Categories", pages 1.9-1.14; and Workbook 1-2, pages 1.38-1.53. The ERT considered that this could be a potential underestimation of emissions. This issue was included in the list of potential problems and further questions raised by the ERT during the review.

28. In response to the list of potential problems and further questions raised by the ERT during the review, Ukraine provided a revised time series of CO_2 emission estimates for the category chemicals on 1 November 2014, which now included the emissions of the non-energy use of natural gas, gas/diesel oil and LPG. In accordance with the Revised 1996 IPCC Guidelines, the default fraction of carbon stored factors have been used (0.67 for natural gas, 0.5 for gas/diesel oil and 0.2 for LPG). The tier 1 method has been used to account for the CO_2 emissions of the non-energy use of these fuels. The revision resulted in an increase in emissions for the whole time series, which amounts to 855.07 Gg CO_2 eq or 10.5 per cent of the category chemicals of manufacturing industries and construction for 2012. The ERT agrees with the revised estimates.

29. The ERT noted that import/export data for refinery feedstocks (1996–2009 and 2012) and naphtha (2006–2008) are reported to IEA but are not given in the CRF tables. In response to a question raised by the ERT during the review, Ukraine explained that these products are processed in the refineries along with crude oil to manufacture gasoline, diesel oil and other secondary liquid fuels. For that reason, these fuels were not included in CRF table 1.A(d) as non-energy use. The ERT agrees with the justification provided by Ukraine, but recommends that the Party, in its next annual submission, report the imported and exported refinery feedstocks and naphtha under the reference approach by including the amounts of these fuels in CRF table 1.A(b).

3. Key categories

Stationary combustion: liquid, solid and gaseous fuels – CO_2

30. Ukraine reported in the NIR that country-specific carbon contents for natural gas for the years 2004–2012 were used. The carbon content of natural gas for the period 1998–2003 was taken as the mean value for the years 2004–2010 (15.18 t C/TJ). For 1990, the IPCC default carbon content was used (15.3 t C/TJ). The carbon content of natural gas for the period 1991–1997 was calculated by interpolation of the years 1990 and 1998. The ERT considers that the use of the country-specific carbon content, which was used for the period 1998–2003, will provide more accurate CO_2 emission estimates for the years 1990–1997 compared with the IPCC default carbon content, since, as reported in the NIR, the variability of the carbon content of natural gas during the period 2004–2012 was extremely low and the sources of natural gas supply to Ukraine have remained unchanged over the past decades. The ERT recommends that Ukraine use the mean value of country-specific carbon content reported for the years 1998–2003 for the years 1990–1997 in its next annual submission.

31. The ERT noted that CO_2 emissions from liquid fuels used in stationary combustion is a key category. According to the IPCC good practice guidance, it is good practice to apply country-specific CO_2 EFs. However, Ukraine applies IPCC default CO_2 EFs. In response to a question raised by the ERT during the review, Ukraine replied that, in accordance with its inventory improvement plan, the elaboration of country-specific EFs for residual fuel oil is planned for future inventories. The ERT recommends that the Party develop and use country-specific CO_2 EFs for liquid fuels (i.e. residual fuel, diesel oil, LPG, petroleum coke and refinery gases), which have a significant share in the fuel mix of stationary combustion, in order to enhance the accuracy of the inventory of its next annual submission in line with the IPCC good practice guidance.

32. During the review, the ERT, in cooperation with the Ukrainian inventory team, prepared a carbon mass balance for the coke production of Ukraine for 2012. Based on the results of this verification exercise, the carbon contained in the input was calculated to be around 2,000 kt C (10 per cent) higher than the carbon in the following products of the coke oven process: coke, coke oven gas and tar. The 10 per cent difference was attributed to the carbon contained in the other products of the coke-oven process, such as benzene, and fugitive emissions, which were not included in the calculation. The ERT recommends that Ukraine calculate and report, in the NIR of its next annual submission, the carbon mass balance for coke production, ensuring that all inputs and outputs of the process are included, in order to ensure accuracy of the estimates of this category.

Road transportation: liquid and gaseous fuels – CO_2, CH_4 and N_2O[4]

33. Ukraine used AD from different data sources and applied a different methodology, including EFs, to estimate CO_2 emissions from road transportation for the years 1990–2010 compared with the years 2011–2012. More specifically, for the years 1990–2010, the CO_2 emission estimates are based on liquid fuel consumption obtained from the national statistics, while for the years 2011 and 2012, the fuel consumption was calculated by applying the COPERT IV model (tier 3 bottom-up model). During the review, the Party confirmed that, owing to a significant increase in the statistical difference (up to 30 per cent) for motor fuels for recent years, it used data on fuel consumption calculated by the COPERT IV model for 2011 and 2012. For the years 1990–2010, the IPCC default EFs for the reference approach were applied (68.61 t CO_2/TJ and 73.33 t CO_2/TJ for gasoline and diesel oil, respectively), while for the years 2011–2012, the emissions were calculated based on the CO_2 EFs from the COPERT IV model (72.20 t CO_2/TJ and 74.24 t CO_2/TJ for gasoline and diesel oil, respectively). The ERT concluded that the reported emission estimates have not been prepared according to the IPCC good practice guidance for the following reasons: (a) the reported CO_2 emissions are not time-series consistent, as required by the IPCC good practice guidance, because AD from different sources and different methodologies/EFs have been applied across the time series; (b) since CO_2 emissions from road transportation is a key category, it is good practice to use a country-specific carbon content of fuels to estimate the emissions; and (c) the CO_2 EFs used for the years 1990–2010 for gasoline and diesel oil are lower than the IPCC default EFs for the sectoral approach (73.0 t CO_2/TJ and 74.0 t CO_2/TJ for gasoline and diesel oil, respectively), and no justification has been provided for this choice. The ERT included these issues in its list of potential problems and further questions raised during the review.

34. In response to the list of potential problems and further questions raised by the ERT during the review, Ukraine provided revised CO_2 emission estimates for combustion of gasoline and diesel oil for the category road transportation on 1 November 2014. The

[4] CH_4 and N_2O emissions from this category are not key. However, since all issues related to this category are discussed as a whole, the individual gases are not assessed in separate sections.

emissions were revised for the years 1990–2010 based on the EFs of 72.20 t CO_2/TJ and 74.24 t CO_2/TJ for gasoline and diesel oil (assuming 100 per cent oxidation), respectively, which were determined by applying the COPERT IV model for the years 2011 and 2012. The revision resulted in an increase in emissions for the years 1990–2010, amounting to 1,031.59 Gg CO_2 for 2008, 944.46 Gg CO_2 for 2009 and 901.34 Gg CO_2 for 2010, or 3.2 per cent, 3.1 per cent and 3.0 per cent of the category road transportation for the years 2008, 2009 and 2010, respectively. The ERT is of the view that the revised estimates have improved the accuracy and time-series consistency of the inventory. However, the ERT strongly recommends that Ukraine further improve the accuracy and time-series consistency of the emission estimates for road transportation by following the recommendations made in paragraphs 35–39 below.

35. Ukraine identified CO_2 emissions from road transportation as a key category. The ERT noted that, according to the IPCC good practice guidance, it is a good practice to apply CO_2 EFs that are developed on the basis of the carbon content of the fuel, and to use country-specific EFs. In response to questions raised by the ERT during the review, Ukraine replied that the elaboration of country-specific EFs for motor fuels, in cooperation with appropriate scientific research institutes, is included in the inventory improvement plan. The ERT reiterates the strong recommendation made in previous reviews reports that Ukraine develop country-specific CO_2 EFs for motor fuels based on their carbon content and provide an explanation of the methodology used in the NIR of its next annual submission. The ERT also strongly recommends that the Party carefully consider the issue raised in this paragraph in the context of its next annual submission.

36. Ukraine uses the COPERT IV model to estimate fuel consumption and the associated GHG emissions from road transportation. The vehicle fleet structure is based on data from the State Statistics Service (statistical form "4-MTP") and other organizations, including the electronic database of the State Automobile Inspectorate, data on sales, production, import, export and retirement of vehicles, and vehicle refurbishing from the Ministry of the Interior, and data from insurance companies. However, the ERT noted that Ukraine did not include either the methodology and assumptions used to split vehicles by category, or any of the AD and parameters used as input variables to the COPERT IV model, such as details of the vehicle fleet and its distribution into vehicle types, the mileage per vehicle class and road class, or the average speed per vehicle type and per road. The ERT strongly recommends that Ukraine include this information in the NIR of its next annual submission, in order to increase the transparency of the reporting of the methodology applied to estimate emissions from road transportation.

37. In addition, Ukraine reported in the NIR that a detailed categorization of the vehicle fleet for 2012 was not provided to the inventory team by the Ministry of the Interior. As a result, the emissions in 2012 were calculated by using CO_2, CH_4 and N_2O implied emission factors (IEFs) and a proportional increase of the fuel consumption that was obtained from the statistical form 4-МТП based on the output of the COPERT IV model for 2011. The ERT strongly recommends that Ukraine make the appropriate arrangements concerning the delivery of the input parameters and AD for road transportation to the inventory team by the respective data providers, in order to ensure the timely preparation of the emission estimates.

38. The ERT noted that, as identified in the previous stages of the review, the inter-annual changes in fuel consumption for road transportation are significantly large, without justification in the NIR. For 2012 in particular, the fuel consumption is 5.1 per cent lower than for 2011. In response to the identification of this issue in the previous stages of the review, Ukraine replied that the inter-annual changes may be attributed to the imperfect system of statistical reporting concerning the consumption of motor fuels. The Party also explained that the emissions from road transportation are not calculated based on the fuel

consumption obtained from national statistics; instead, the fuel consumption determined by the COPERT IV model, which is higher, is used for the years 2011 and 2012. Ukraine explained that the motor fuel consumption obtained from the national statistics contains significant statistical discrepancies. For example, the statistical difference of gasoline for 2012 is –995 kt. The Party also informed the ERT that the Ukrainian Energy Statistical Authority is planning to improve the system of statistical reporting, but because of a lack of funds this process may take a long time. The ERT strongly recommends that Ukraine further investigate the differences between the results of the top-down and bottom-up approaches, following the guidance provided in section 2.3.3 of the IPCC good practice guidance, in order to improve the accuracy and time-series consistency of the inventory, and report accordingly in the NIR of its next annual submission.

39. The ERT noted that the CH_4 IEF for gasoline decreased by 44 per cent during the years 2007–2012 (from 21.65 kg/TJ in 2007 to 12.13 kg/TJ in 2011–2012) and the CH_4 IEF for diesel oil decreased by 24 per cent during the years 2007–2012 (from 7.16 kg/TJ in 2007 to 5.42 kg/TJ in 2011–2012). In response to a question raised by the ERT during the review, Ukraine replied that this decreasing trend in the IEFs is attributed to the increasing quantity of vehicles with three-way catalysts. However, the Party did not provide any quantitative data to the ERT that support this argument. The ERT recommends that Ukraine provide a quantitative analysis in the NIR that justifies the decreasing trend in the CH_4 IEFs for gasoline and diesel oil, by interpreting the AD, parameters and emissions calculated by the COPERT IV model.

Oil and natural gas: gaseous fuels – CO_2 and CH_4[5]

40. In response to a recommendation made in the previous review report, Ukraine has developed and applied a country-specific approach for the estimation of fugitive CO_2 and CH_4 emissions from the transmission and distribution of natural gas in its 2014 annual submission that covers the whole time series. The methodology was recommended by the National Academy of Sciences of Ukraine and the Bureau of Complex Analysis and Forecasts. As input data, the methodology requires the CO_2 and CH_4 concentrations in natural gas, which are available from the natural gas supply companies, and data related to consumption and losses, which are provided by the State Statistics Service of Ukraine (statistical form "4-MTP") and the *Statistical Yearbook* of Ukraine. The ERT commends Ukraine for enhancing the accuracy of the inventory in line with the IPCC good practice guidance.

C. Industrial processes and solvent and other product use

1. Sector overview

41. In 2012, emissions from the industrial processes sector amounted to 46,009.22 Gg CO_2 eq, or 11.4 per cent of total GHG emissions, and emissions from the solvent and other product use sector amounted to 176.44 Gg CO_2 eq, or 0.04 per cent of total GHG emissions. Since 1990, emissions have decreased by 42.4 per cent in the industrial processes sector, and increased by 3,664.3 per cent in the solvent and other product use sector. The key drivers for the fall in emissions in the industrial processes sector in the early 1990s (until 1996) are a decrease in industrial activities as a result of the transition to a market based economy, after which emissions peaked in 2007 before falling again as a result of the international economic crises in 2008–2009, and the discontinuation of aluminium production in 2011. Within the industrial processes sector, 54.4 per cent of the emissions

[5] CO_2 emissions from this category are not key. However, since all issues related to this category are discussed as a whole, the individual gases are not assessed in separate sections.

were from metal production, followed by 22.1 per cent from mineral products, 21.9 per cent from chemical industry and 1.6 per cent from consumption of halocarbons and SF_6.

42. Ukraine has made recalculations between the 2013 and 2014 annual submissions for the solvent and other product use sector but not for the industrial processes sector. The only recalculation made by Ukraine between the 2013 and 2014 annual submissions was in the category use of N_2O for anaesthesia for the whole time series. The recalculation was made in response to the 2013 annual review report following changes in AD resulting from the completion of a national survey to obtain actual consumption data, thereby avoiding the Party's previous practice of calculating the emission estimates based on the national population and other countries' per capita usage of N_2O. Compared with the 2013 annual submission, the recalculation decreased emissions in the solvent and other product use sector in 2011 by 152.51 Gg CO_2 eq (46.0 per cent) and decreased total national emissions by 0.04 per cent. The ERT commends Ukraine for the improvement and encourages the Party to expand its research for other possible sources of N_2O in the solvent and other product use sector. The recalculation was adequately explained.

43. The ERT noted that the transparency of Ukraine's reporting is diminished because of some QC issues, such as incorrect references in the main text of the NIR to table numbers in the annex to the NIR (e.g. the reference to "table P3.5.2", which should read "table P3.1.5.2"), and the use of incorrect units in the tables of the NIR (e.g. table P3.1.1.9, where the unit 10^3 t should be 10^6 t, and the unit TJ/10^6 m^3 should be TJ/10^3 m^3). The ERT recommends that Ukraine improve its QC procedures in order to increase the transparency of its reporting.

2. Key categories

Cement production – CO_2

44. Ukraine estimates CO_2 emissions from cement production using country-specific EFs, taking into account the cement kiln dust correction factor and based on national statistics and information from manufacturers. The ERT noted that this category has a generally decreasing CO_2 IEF. The CO_2 IEF in 2012 (0.53 t/t) is 3.7 per cent lower than the CO_2 IEF in 1990 (0.51 t/t). In response to questions raised by the ERT during the review, Ukraine informed the ERT that a number of improvements have been implemented in the country regarding slag usage, technology changes and energy efficiency, mainly since 2008, with three joint implementation (JI) projects developed among the cement plants in the country. The ERT is of the opinion that the information provided explains the inter-annual changes in the emission estimates and recommends that Ukraine include information on the above-mentioned projects in the NIR of its next annual submission.

Limestone and dolomite use – CO_2

45. Ukraine uses a country-specific EF for this category (0.43 t/t), which is slightly lower than the IPCC default EF (0.44 t/t). The ERT noted that, in response to recommendations made in previous review reports, Ukraine has reported an estimate of CO_2 emissions from limestone and dolomite use in ceramic production for 2012 in the 2014 NIR (table 4.6). In response to questions raised by the ERT during the review, Ukraine explained that the CO_2 process emissions from ceramic production, presented in table 4.6 of the NIR, were not included in the national GHG inventory. Therefore, the ERT concluded that there is a missing estimate of CO_2 emissions from limestone and dolomite use in ceramic production. This issue was included in the list of potential problems and further questions raised by the ERT during the review. In its response to this list, Ukraine submitted revised estimates for this category on 25 October 2014, including a complete time series of CO_2 emissions from limestone and dolomite use in ceramic production, using the same proportional uses of limestone and dolomite as those reported for 2012 in the NIR

applied for the whole time series of ceramic production. The revision resulted in an increase in emissions for the whole time series, which amounts to 7.92 Gg CO_2 eq for 2012 or 0.02 per cent of the total emissions of the industrial processes sector. The ERT agrees with the revised estimates.

Ammonia production – CO_2

46. Emissions from ammonia production are estimated from the amount of natural gas used in the process. The ERT noted that the NIR (table P3.1.1.9) provides values for the natural gas used in ammonia production using incorrect units: the volume of natural gas is provided in 10^6 m^3, rather than in 10^3 m^3, and the related NCV is provided in TJ/10^3 m^3, rather than in TJ/10^6 m^3. The correct values are provided in tables 3.5 and P2.17 of the NIR, respectively. However, these mistakes did not affect the final emission estimates. The ERT recommends that Ukraine improve its QC procedures regarding the units reported in the NIR tables, especially in table P3.1.1.9.

Nitric acid production – N_2O

47. Following a recommendation made in the previous review report and in order to provide more details of planned improvements, Ukraine provided in its NIR information on the research project entitled "Development of methods of calculation and determination of GHG emissions in the chemical industry with the construction of a particular time series" conducted by the "Ukrainian Research Institute of Transport Medicine". As stated in the NIR, this work allowed the EF of 4.5 kg N_2O/t nitric acid (HNO_3) obtained from manufacturers as well as the appropriateness of using the IPCC methodology to calculate emissions to be confirmed. In order to gain a different perspective on this information, the ERT looked at two JI projects in the nitric acid production industry in Ukraine, because such projects are subjected to a third-party verification process. The JI projects were "The abatement of N_2O emissions from nitric acid production at CJSC[6] Severodonetsk Azot Association" and "Reduction of N_2O emissions from nitric acid production at OJSC[7] 'AZOT', Cherkasy", and they use the ex-ante baseline EFs 4.5 and 4.23 kg N_2O/t HNO_3, respectively, as stated in the project design documents of these two JI projects, before their abatement processes begin to measure the unabated EFs, which are necessary to calculate the proposed N_2O reductions. These values are consistent with the data Ukraine presented in the NIR. The Party also states that this information will be used by Ukraine in future annual submissions. The ERT encourages Ukraine to continue its research in this area in conjunction with analysis of JI project data.

Iron and steel production – CO_2

48. Most of the emissions from this category originate from iron production. Ukraine reports the emissions from the part of coke used in blast furnaces in the category iron and steel (fuel combustion) in the energy sector and the remaining part in iron and steel production in the industrial processes sector, with the separation made by the manufacturers. The IEF for pig iron decreased by 20.6 per cent between 2009 and 2012, mainly due to the wider application in metallurgical enterprises of pulverized coal after the global economic crisis of 2008–2009, as introduced by several JI projects in Ukraine. The ERT noted that CO_2 emissions from this category are based on the carbon balance of blast furnaces, as shown in the 2014 NIR (annex 3, tables P3.1.5.1 and P3.1.5.2, page 464). By making a comparison of data in the 2014 NIR, the ERT identified that the amount of coke used as reductant for pig iron production is 7,222.78 kt according to table 4 (annex 4, table 4 "Consumption of coke in 2012", page 528), which is higher compared with the coke used

[6] Close Joint Stock Company.
[7] Open Joint Stock Company.

as reductant in blast furnaces (6,992.93 kt coke), according to table P3.1.5.1. In response to questions raised by the ERT during the review, Ukraine confirmed that a similar discrepancy was found for 2010. Therefore, the ERT considers that this is a potential underestimation of emissions. This issue was included in the list of potential problems and further questions raised by the ERT during the review. In response to the list, Ukraine submitted revised estimates correcting the amount of coke used as reductant that is accounted for in the iron production process in accordance with the amount deducted from the energy sector, for the years 2010 and 2012. The impact of this revision on total CO_2 emissions from the category iron and steel production (pig iron) in the industrial processes sector is an increase of 1189.77 kt CO_2 eq (5.7 per cent) and 719.23 kt CO_2 eq (4.1 per cent), respectively, for 2010 and 2012. The ERT agrees with the revised estimates.

3. Non-key categories

Lime production – CO_2

49. The emissions from lime production are estimated using country-specific EFs, which are determined in accordance with national standards, according to the NIR. The CO_2 IEF for this category decreased by 5.3 per cent between 2010 and 2011, which was not transparently explained in the NIR. In response to a question raised by the ERT during the review, Ukraine provided a spreadsheet showing the amounts of the different types of lime with their related EFs for the time series. The ERT was able to reproduce Ukraine's estimates for this category. However, the ERT noted that the 'wet basis' EF (0.51025 t CO_2/t produced lime) was incorrectly used for 2011 and 2012, instead of the 'dry basis' EF (0.73048 t CO_2/t produced lime) according to the AD. The ERT considers that this leads to an underestimation of emissions. This issue was included in the list of potential problems and further questions raised by the ERT during the review. In response to the list, Ukraine submitted revised estimates, correcting the EF for the production of hydraulic lime measured on a wet basis (0.73048 t CO_2/t produced lime) for 2011 and 2012. The impact of the revised estimates on total CO_2 emissions from the lime production category is an increase of 71.14 kt CO_2 eq (2.5 per cent) and 64.27 kt CO_2 eq (2.3 per cent), respectively, for 2011 and 2012. The ERT agrees with the revised estimates.

Soda ash production – CO_2

50. During the previous annual review, the ERT recommended that Ukraine provide estimates of CO_2 emissions from soda ash production, for which the Solvay process is used, based on possible use of coke in excess of the process needs. Ukraine reported in its 2013 NIR that coke is not used in soda ash production. Based on the guidance contained in the Revised 1996 IPCC Guidelines (volume 2, page 2.8), which states that there are no methodologies available to estimate CO_2 emissions from the Solvay process, the ERT concluded the issue was resolved. However, Ukraine reports "NO" (not occurring) for the soda ash AD and "NA" (not applicable) for CO_2 emissions. The ERT recommends that Ukraine report soda ash production AD and change the notation key for CO_2 emissions from "NA" to "NO", because from stoichiometric considerations, the industrial process emission of CO_2 associated with the Solvay process is zero (Revised 1996 IPCC Guidelines, volume 2, page 2.12).

Consumption of halocarbons and SF_6 – HFCs

51. Ukraine has estimated emissions from consumption of halocarbons and SF_6 using a tier 2a methodology regarding the product manufacturing and operation periods based on two studies referred to in the NIR. The ERT noted that the AD and emissions of industrial refrigeration have not been reported in the CRF tables with adequate transparency. For example, the reported 160,08 t HFC-134a in operating systems (average annual stocks), with 25 per cent product life factor per annum should lead to emissions from stocks of

40.0 t HFC-134a and not 31.3 t HFC-134a as stated in the CRF Table2(II).Fs1 in 2012. The ERT noted that this happened because "industrial refrigeration" and "semi-industrial and industrial air conditioners" were considered in the same line of the CRF tables, despite having different EFs. The ERT recommends that, in such cases, Ukraine split the information over more than one row in the CRF tables to increase transparency, while ensuring consistency among the AD, IEFs and emission estimates in every line of CRF table 2(II).F, or use a weighted EF. The ERT also noted that emissions from disposal of equipment containing fluorinated gases were reported as "NO" for all subcategories. During the review, the ERT received information from Ukraine explaining that this equipment overall had not reached the end of its life cycle. The ERT encourages Ukraine to undertake further research to obtain more accurate results in this area, and recommends that the Party include additional information in the NIR with regard to the end of the life cycle of the equipment.

D. Agriculture

1. Sector overview

52. In 2012, emissions from the agriculture sector amounted to 36,033.19 Gg CO_2 eq, or 8.9 per cent of total GHG emissions. Since 1990, emissions have decreased by 65.2 per cent. The key drivers for the fall in emissions are the decrease in the livestock population, the reduction in the amount of fertilizer applied to soils and the area of crop cultivation, as well as further changes in manure management practices owing to the economic downturn following the disintegration of the Soviet Union. Within the sector, 60.3 per cent of the emissions were from agricultural soils, followed by 24.6 per cent from enteric fermentation, 13.0 per cent from manure management and 1.7 per cent from other (indirect N_2O emissions from manure management). Rice cultivation accounted for 0.3 per cent. The remaining 0.1 per cent of agriculture emissions were from field burning of agricultural residues.

53. Ukraine has made recalculations between the 2013 and 2014 annual submissions for this sector. The recalculations made by Ukraine between the 2013 and 2014 annual submissions were in the field burning of agricultural residues category. The recalculations were made in response to the 2013 annual review report following the recommendation made in relation to the LULUCF sector regarding the collection of AD for wildfires on grassland. Compared with the 2013 annual submission, the recalculations increased emissions in the agriculture sector by 108.3 Gg CO_2 eq (0.3 per cent), and increased total national emissions by 0.03 per cent. The recalculations were adequately explained.

54. The inventory for the agriculture sector is complete in terms of categories, gases, and geographical coverage. Ukraine has provided estimates for all mandatory categories in the agriculture sector for 2012. In addition, Ukraine has provided estimates for a category supplementary to those listed in the Revised 1996 IPCC Guidelines, namely indirect N_2O emissions from manure management, and has reported them under the category other in the CRF tables. The ERT welcomes these estimations.

55. The ERT notes that Ukraine has used country-specific and IPCC tier 2 methodologies with a combination of country-specific EFs and parameters and IPCC default EFs to estimate emissions from the key categories in accordance with the IPCC good practice guidance. The key categories include: CH_4 emissions from enteric fermentation; CH_4 and N_2O emissions from manure management; and N_2O emissions from agricultural soils. Ukraine has used an IPCC tier 1 method to estimate emissions from the non-key categories, such as rice cultivation and field burning of agricultural residues. The indirect N_2O emissions from manure management were estimated according to the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the

2006 IPCC Guidelines) using country-specific data on nitrogen excretion rates per animal, fraction of manure per management system and default EFs. These country-specific parameters are consistent with those used for the estimation of N_2O emissions from manure. The ERT welcomes the Party's efforts to complete the inventory to the extent possible, as well as to develop country-specific EFs and methodologies, and to derive country-specific parameters and data for the agriculture sector. The ERT also noted that Ukraine has provided the results of QC and verification activities for each category in the agriculture sector. The category-specific QC procedures include a comparative analysis of the country-specific EFs with the relevant IPCC default EFs and the EFs used by other reporting Parties, as well as a cross-check of the AD used for the emission estimates with comparable data from international databases (e.g. the database of the Food and Agriculture Organization of the United Nations). The QA activities related to the country-specific EFs and methodologies are performed by independent peer review by experts from National University of Biological Resources and Institute of Arable Farming.

2. Key categories

Manure management – CH_4

56. The ERT noted that the CH_4 IEFs for manure management for dairy and non-dairy cattle dropped significantly between 1990 and 2012. The CH_4 IEF for mature dairy cattle decreased by 87.5 per cent, from 48.6 kg CH_4/head/year in 1990 to 6.1 kg CH_4/head/year in 2012, while the CH_4 IEF for mature non-dairy cattle decreased in the same period by 76.6 per cent, from 36.48 kg CH_4/head/year to 8.52 kg CH_4/head/year. The CH_4 IEF for young cattle also showed a decreasing trend during the period 1990–2012: it decreased by 84.1 per cent, from 15.59 kg CH_4/head/year in 1990 to 2.48 kg CH_4/head/year in 2012. According to the clarification provided in the NIR (page 226) the IEFs for dairy and non-dairy cattle mainly depend on the proportion of manure treated in anaerobic lagoons, the use of which has decreased since the dissolution of the Soviet Union in 1991. Solid storage of manure now prevails in Ukraine. The ERT also notes that the IEFs for mature dairy cattle, mature non-dairy cattle and young cattle are within the ranges of 5.8–6.2 kg CH_4/head/year, 8.2–8.5 kg CH_4/head/year and 2.3–2.5 kg CH_4/head/year, respectively, over the period 2008–2012. The ERT was satisfied with the explanations provided by Ukraine in its NIR.

57. As noted in previous review reports, Ukraine uses the same values of volatile solids (VS) excreted for dairy and non-dairy cattle, both for agricultural enterprises and private households using dietary norms developed for agricultural enterprises, to calculate the country-specific CH_4 EF for manure management. Based on the data provided in the NIR, the feed intake for dairy and non-dairy cattle in agricultural enterprises is higher than for private households; therefore, this could lead to an overestimation of emissions from manure in private households. In response to a question raised by the ERT during the review, Ukraine provided the ERT with disaggregated data on the gross energy intake by age structure and type of farm. The ERT recalculated the values of VS for mature dairy cattle using the IPCC tier 2 method (equation 4.16 from the IPCC good practice guidance) and applied country-specific data on the gross energy intake and ash content of manure, as well as default data on the digestibility of feed (60 per cent). As a result of its calculations, the ERT concluded that its estimated values amounted to 5.31 and 5.23 kg dry matter/day for mature dairy cattle for agricultural enterprises and private households, respectively and these estimated values of VS are lower than the reported in the NIR county-specific VS value of 5.36 kg dry matter/day for mature dairy cattle. The ERT recommends that Ukraine further investigate this issue and, if necessary, revise the values of VS excreted for each type of farm and per cattle animal species in the next annual submission.

Direct soil emissions – N_2O

58. In response to a recommendation made in the previous review report, Ukraine provided information in its NIR on the verification activities implemented for the data on the area of organic soils, following the reported decrease in the area of histosols which led to a significant drop in N_2O emissions from the cultivation of histosols between 2010 and 2011 (13.9 per cent). The data were verified using statistical data on the area of organic soils provided by the State Water Agency and the significant fall in the cultivated area of histosols was confirmed. Additionally, Ukraine explained in the NIR that the decrease in the area of organic soils was caused by insufficient financing of peatland management. The ERT considered that the explanation provided in the NIR is sufficiently transparent.

3. Non-key categories

Field burning of agricultural residues – CH_4 and N_2O

59. In its 2013 annual submission, Ukraine reported CH_4, N_2O, nitrogen oxide (NO_x) and carbon monoxide (CO) emissions from burning of biomass from wildfires on cropland as "NO", with an explanation that the burning of any type of vegetation in Ukraine is forbidden by law. In the 2014 annual submission, Ukraine has reported these emissions in the category field burning of agricultural residues under the agriculture sector. To estimate the emissions, Ukraine used an IPCC tier 1 method and data on the area of cropland and grassland affected by wildfires provided by the State Service for Emergency Situations. Although the emissions from burning of biomass from wildfires on cropland were reported in the agriculture sector, the Party reported the burning of biomass on grassland in the LULUCF sector. The ERT noted that, according to the IPCC guidelines: (1) the emissions from cropland affected by wildfires should be reported in the LULUCF sector; and (2) the emissions associated with the field burning of agricultural residues should be reported in the agriculture sector. Therefore, the ERT recommends that Ukraine reallocate the emissions associated with wildfires on cropland to the LULUCF sector in order to improve the comparability of its inventory.

E. Land use, land-use change and forestry

1. Sector overview

60. In 2012, net removals from the LULUCF sector amounted to 27,240.83 Gg CO_2 eq. Since 1990, net removals have decreased by 60.9 per cent. The key driver for the fall in removals is soil organic matter (SOM) in mineral soils on cropland, which was a sink equivalent to 0.2 Mg/ha/year in 1990 and was a source equivalent to 0.27 Mg/ha/year in 2012; the decrease is determined by a fall in crop productivity associated with a reduction of nitrogen inputs. Within the sector, 63,123.44 Gg CO_2 eq of net removals were from forest land. Net emissions were reported from cropland (32,563.92 Gg CO_2 eq) and from grassland (3,272.88 Gg CO_2 eq). Settlements accounted for net emissions of 39.31 Gg CO_2 eq. The remaining net emissions of 6.49 Gg CO_2 eq were from wetlands.

61. Ukraine has made recalculations between the 2013 and 2014 annual submissions for this sector. The most significant recalculation made by Ukraine between the 2013 and 2014 annual submissions was for carbon stock changes in dead organic matter (DOM) on forest land. The main recalculation was made following changes in the carbon stock change factors. Compared with the 2013 annual submission, the recalculations for 2011 decreased net removals in the LULUCF sector by 802.32 Gg CO_2 eq (11.0 per cent). The reasons for the recalculations are not clearly explained in the NIR or in CRF table 8(b). For example, although in the NIR (section 7.3.5) it is stated that the carbon stock change factor for DOM has been recalculated, the reason why it has been recalculated is not given. The ERT

recommends that Ukraine provide information on the reasons for the recalculation of carbon stock change in DOM on forest land in its next annual submission.

62. The LULUCF sector is complete, although there are some problems related to time-series consistency, which may also require the performance of sector-specific QC procedures aimed at checking consistency of AD time series; specific recommendations on sector-specific QC are provided in the paragraphs 69 and 80 below.

63. The ERT noted that there is a lack of transparency in the NIR tables where, in many cases, the source of data is not indicated and the units are not properly reported (e.g. the carbon stock change data should be indicated in t C/ha/year or Mg C/ha/year). The ERT recommends that Ukraine report in the NIR, for each data type, the source of the information, and for each numerical value the metric unit of that value, in its next annual submission.

64. The ERT also noted that transparency of the information on land representation could be further enhanced by reporting in a tabular format the following information for each land category: data sources; the time series of raw data; the methodology applied for filling in gaps in the raw data (if any); the methodology applied (including assumptions and inferences) to derive the land category areas from the raw data; the methodology applied for filling in gaps in the time series of areas (if any); the transition time of the land category for all land conversion categories; and other information (if any). The ERT encourages Ukraine to report in the NIR all information listed above in its next annual submission.

65. The ERT noted that the information on the uncertainty analysis for the sector is not transparent, because the following reporting elements remain unclear: the source of information for the uncertainties of various data used to estimate the GHG emissions and removals for each category; and information on how uncertainties of AD and EFs have been calculated. Therefore, the ERT recommends that Ukraine improve the transparency of the uncertainty analysis in terms of the data sources and methods applied to calculate the uncertainties, in its next annual submission.

66. The ERT noted that the land representation reported by Ukraine is not fully consistent. Indeed, in NIR table 7.4, the value reported as the total area under a category at the beginning of year x does not equal the area reported under the same category at the end of year x–1. For example, in NIR table 7.4, the total area reported under forest land at the beginning of 1991 is 10,231.33 kha, although at the end of 1990 the total area reported under forest land is 10,221.50 kha. A potential cause of such kind of discrepancies is the incorrect reporting of land-use changes: as explained by Ukraine during the review in response to a question raised by the ERT, the areas where the land use changed in a generic year x are reported for the first time in the corresponding "land-use converted to new land-use" category in the year x+1; for example, the areas of land converted to forest land during the year 1990 have been reported for the first time under the category land converted to forest land in the year 1991. The ERT recommends that Ukraine correctly apply the IPCC methodology on land transition in its next annual submission by reporting in the generic year x under the relevant land conversion category for all land converted, in that year x, to that category and to continue reporting the area under that category for 20 years (i.e. until the year x+19), or another transition period as selected by the country to better reflect the SOM carbon stock dynamic of that category. Further, the ERT recommends that Ukraine revise the methodology applied for land representation with the aim of ensuring time-series consistency.

67. Ukraine uses a model based on the nitrogen balance to calculate the net changes in SOM and the associated CO_2 emissions/removals. Although the model has been published in peer-reviewed journals, the model outputs are not routinely verified by Ukraine. The ERT noted some unusual trends and inconsistencies in the SOM carbon stocks in some land

categories that may have been derived from a lack of accuracy in the model's outputs and/or discrepancies between the soil model and IPCC methodologies applied for estimating the net carbon stock changes in other land-use categories. For example, although mineral soils in the category cropland remaining cropland have been reported as a continuous net source of carbon from the year 2000 onwards a net carbon stock loss in SOM is reported for the conversion of forest land to cropland; also for the first years of conversion of cropland to forest land a decrease in the SOM carbon stock is reported. The ERT considers that the latter decrease is an unusual trend and it appears to be inconsistent with the reported decrease in the SOM carbon stock associated with conversions of forest land to cropland. In practice, if the cultivation of soils can result in a net loss of SOM carbon stock, the conversion to forest land (which determines the end of ploughing and the increase of carbon inputs) should determine an increase in SOM carbon stock, especially when the soil is losing carbon under previous cultivation practices. Also, for grassland, the ERT noted that SOM carbon stock change trends appear to be inconsistent; for example, for both forest land converted to grassland and grassland converted to forest land, a net carbon stock loss in SOM is reported. Considering that the use of a model does not replace the need to collect measurements, the ERT recommends that Ukraine verify the model's outputs with measurements annually conducted in the country. Further, the ERT recommends that Ukraine in its next annual submission ensure consistency among the different methods used, including consistency of the soil depth for which the soil organic carbon and associated carbon stock changes are calculated, for the different land-use categories, especially for the transfer of land between categories for which different methods are applied.

68. The ERT noted that for some land-conversion categories, Ukraine does not report the net carbon stock change in SOM for the entire transition period, although it is good practice to apportion the total carbon stock loss associated with a land-use conversion. For instance, for forest land converted to cropland, the net carbon stock losses in SOM are not reported (using notation key "NO") for the years 1998, 2002, 2006, 2007, 2008, 2010, 2011 and 2012; for forest land converted to grassland, the net carbon stock losses in SOM are not reported for the years 2003, 2004, 2008, 2009, 2011 and 2012; for forest land converted to settlements, the net carbon stock losses in SOM are not reported for the years 1997, 2000 and 2003; and for forest land converted to other land, the net carbon stock losses in SOM are not reported for the years 1998, 2002, 2005, 2008, 2011 and 2012. The ERT recommends that Ukraine ensure the consistency of the time series of carbon stock changes in SOM for the entire transition period in the land-conversion categories in its next annual submission.

2. Key categories

Forest land remaining forest land – CO_2

69. Although from 1990 to 2010 the net carbon gain per hectare in DOM in the sub-category "managed forest land remaining forest land" is relatively constant (0.18 Mg C/ha), the ERT noted that in 2011 it became 66.7 per cent larger (0.30 Mg C/ha) and in 2012 it became 83.3 per cent larger (0.33 Mg C/ha). No large disturbances have been reported in the NIR for 2011 and 2012 that could explain such a high transfer rate from the biomass carbon pool to the DOM carbon pool. The ERT recommends that Ukraine revise the estimates of DOM and establish sector-specific QC procedures to check the time-series consistency of the estimates and their coherence among carbon pools and categories in its next annual submission.

70. The ERT noted that Ukraine applies the value of 0.1, corresponding to temperate intensively managed forest, for the IPCC default factor f_{BL} (fraction of biomass left to decay in forest, i.e. transferred to DOM) that it is used for estimating biomass carbon stock

losses. However, the methodology applied by Ukraine calculates net DOM carbon stock changes in DOM on the basis of age classes and it is based on factors included in the NIR (tables 3.3.8 and 3.3.9), and does not require specific information on the fraction of biomass lost from harvest and left on decay on forest (i.e. biomass harvested quantities multiplied by f_{BL}). Further, Ukraine is not estimating as a biomass carbon stock loss the fraction of biomass transferred to DOM as a consequence of harvesting. The ERT recommends that Ukraine reports as biomass carbon stock loss any carbon stock lost as a consequence of harvesting, even if it is left to decay in the forest, in its next annual submission.

71. The ERT noted that, to calculate the total above-ground biomass from the data on harvesting, Ukraine applies a unique value of 1.15 for the biomass expansion factor for conversion of merchantable volume to above-ground tree biomass(BEF_2), which corresponds to the lower boundaries of the ranges of values provided by the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF) for conifers and broadleaves in temperate forests, respectively (1.15–4.2), and that no information has been reported in the NIR to justify this selection. The ERT recommends that Ukraine either report information in the NIR to justify the selection of any value different from the central value of the ranges provided as the IPCC default values, or always apply the central value of those ranges.

72. The ERT noted that although Ukraine reports the forest area data stratified by age class and calculates the DOM carbon stock changes according to forest type and age class, the biomass carbon increment is calculated on the basis of forest types, without consideration of the forest age. To enhance the accuracy of the estimates, the ERT encourages Ukraine to improve the current methodology by calculating the biomass carbon increments and allocating the biomass carbon losses associated with harvesting on the basis of the age class structure in its next annual submission.

Cropland remaining cropland – CO_2

73. As also noted in the previous review report, Ukraine has divided the cropland remaining cropland category into managed and unmanaged cropland. The ERT noted that, according to the definition provided in the IPCC good practice guidance for LULUCF, cropland cannot be subdivided into managed and unmanaged cropland. Therefore, the ERT reiterates the recommendation made in the previous review report that Ukraine reallocate in its next annual submission all land currently reported as unmanaged cropland to the subcategories unmanaged grassland, land converted to unmanaged grassland, unmanaged forest land or land converted to unmanaged forest land, depending on the type of vegetation and transition period chosen, in accordance with the definitions provided in the IPCC good practice guidance for LULUCF. If Ukraine considers that the land currently reported as unmanaged cropland corresponds to the definition for cropland provided in the IPCC good practice guidance for LULUCF, the ERT recommends that Ukraine transparently report in the NIR on the specific management practices on these lands. Further, the ERT notes that when cropland is transferred to an unmanaged category, the carbon stock changes should be reported until equilibrium in the carbon stock associated with the new land use is achieved.

Grassland remaining grassland – CO_2

74. As also noted in the previous review report, the carbon stock change factor in mineral soils shows sudden inter-annual changes. In particular, the net carbon stock change in mineral soils per area in the years 2011 and 2012 (0.0053 and 0.0046 Mg C/ha) is almost 10 times smaller than in the previous years of the time series (ranging between 0.039 and 0.088 Mg C/ha). The ERT reiterates the recommendation made in the previous review report that Ukraine check the calculation of the carbon stock change in mineral soils in its next annual submission. Further, considering that grassland includes different types of

management systems, including former cropland and managed grassland, for which the carbon stock changes should be estimated until equilibrium in the carbon stock associated with the new land-use management system is achieved, the ERT encourages Ukraine to report estimates of the carbon stock changes in this category stratified by the various management types.

3. Non-key categories

Forest land converted to wetlands – CO_2

75. Ukraine reports net SOM carbon stock losses for forest land converted to wetlands for the years 1990–1993, 1995–2003, 2005, 2007 and 2010. Considering that a rise in the water table in an area usually results in a decrease in soil respiration and, therefore, an accumulation of organic matter, it is unclear to the ERT why the conversion of forest land to wetlands results in the reported net carbon stock loss in soils. Further, in NIR table 3.3.10, peat soils are reported with a higher carbon stock content than forest soils. The ERT recommends that Ukraine revise the methodology and carbon stock change factors applied, in particular ensuring consistency between information reported in NIR table 3.3.10 and the CRF tables, in its next annual submission.

Other land – CO_2

76. As reported in table 7.1 of the NIR, category 66 ("dry open lands with special vegetation cover") is classified under the IPCC category other land, although it contains significant carbon stocks in SOM and biomass. The ERT encourages Ukraine to revise this classification in its next annual submission, noting that category 66 appears to more closely match the definition of the IPCC category grassland.

CO_2 emissions from agricultural lime application – CO_2

77. During the review, Ukraine informed the ERT that the reported AD for the estimation of CO_2 emissions from lime application are three orders of magnitude smaller than they actually are. The ERT acknowledges Ukraine's plans to correct this error in its next annual submission.

Biomass burning – CO_2, CH_4 and N_2O

78. The ERT noted that Ukraine reports GHG emissions from biomass burning in grassland only from 2005 onwards. Further, CO_2 emissions are reported as "NO" because the Party has assumed that these emissions are equivalent to CO_2 uptake from subsequent biomass regrowth. To ensure the time-series consistency of the GHG emission estimates for biomass burning, the ERT recommends that Ukraine estimate the emissions for the years 1990–2004 by applying one of the estimation techniques described in section 7.3.2.2 of the IPCC good practice guidance (or Volume 1, chapter 5, of the 2006 IPCC Guidelines).

79. Ukraine has reported in the NIR (page 500) that it applies the IPCC default values contained in table 3A.1.3 of the IPCC good practice guidance for LULUCF to estimate the standing biomass in forest areas affected by disturbances. Considering that Ukraine has data on forest biomass stratified by climatic region, the ERT recommends that Ukraine use its country-specific data instead of the IPCC default values to calculate the emission estimates. Further, to improve transparency, the ERT recommends that Ukraine provide, in the NIR, a table with the average biomass carbon stocks (above-ground and below-ground) in forest land stratified by climatic region and, if possible, by age class.

80. Although Ukraine consistently applies the same IPCC default factors and the same assumption of complete oxidation of fuel (i.e. biomass plus DOM) across the entire time series to estimate GHG emissions from biomass burning in forest land, the CO_2, CH_4 and N_2O IEFs for biomass burning are not constant across the time series (i.e. the CO_2 IEF

ranges from 1.7 Mg/kg dry matter in 2012 to 11.4 Mg/kg dry matter in 2009; the CH_4 IEF ranges from 0.008 Mg/kg dry matter in 2012 to 0.05 Mg/kg dry matter in 2004; and the N_2O IEF ranges from 0.00005 Mg/kg dry matter in 2012 to 0.0009 Mg/kg dry matter in 2004). The ERT recommends that Ukraine revise the calculation method used and implement sector-specific QC procedures to ensure the consistency of the emission estimates across the time series and among different gases in its next annual submission.

F. Waste

1. Sector overview

81. In 2012, emissions from the waste sector amounted to 11,366.02 Gg CO_2 eq, or 2.8 per cent of total GHG emissions. Since 1990, emissions have increased by 7.7 per cent. The key driver for the rise in emissions is the increase in solid waste disposal on land owing to the economic growth in the country and an increase in the consumption level of the population, in particular since 2000. Within the sector, 66.9 per cent of the emissions were from solid waste disposal on land, followed by 33.1 per cent from wastewater handling and 0.003 per cent from waste incineration.

82. Ukraine has made recalculations between the 2013 and 2014 annual submissions for this sector. The most significant recalculation made by Ukraine between the 2013 and 2014 annual submissions was in the solid waste disposal on land category: The recalculation was made following improvements in the morphological composition of landfilled waste where hygienic means, rubber and leather were added in the national FOD model. Compared with the 2013 annual submission, the recalculation increased emissions in the waste sector by 188.17 Gg CO_2 eq (1.7 per cent) in 2011, and increased total national emissions by 0.05 per cent. The recalculations were adequately explained.

83. The ERT noted that all of the sector-specific recommendations made in the 2013 annual review report have been addressed. Ukraine has improved the AD for solid waste disposal sites by collecting data from regional housing and communal services authorities for the years 2006–2012 and has included two new biodegradable components (rubber and leather, and personal hygiene products) following the completion of a new study. The new data were presented in the relevant tables in the NIR. The ERT commends Ukraine for these improvements.

84. The ERT noted that several references have not been correctly placed in the NIR. In response to a question raised by the ERT during the review, Ukraine explained that a technical error had occurred when linking chapter 8 with annex 8 (references) to the NIR and one reference was missed and consequently the subsequent references did not match with their numbers. The ERT recommends that Ukraine improve the accuracy of the NIR and its sector-specific QC procedures in its next annual submission.

2. Key categories

Solid waste disposal on land – CH_4

85. The ERT noted that Ukraine reported the degradable organic carbon (DOC) for garden waste as 0.00 for the years 1990–1995 in annex 3.4.2 to its NIR. In response to a question raised by the ERT during the review, Ukraine provided the values used in the calculation and explained that a technical error had occurred when transferring the data on the biodegradable component content of municipal solid waste (MSW) from the calculation tables to the NIR. The ERT recommends that Ukraine improve its QC activities in order to prevent such inconsistencies in its reporting.

86. The ERT found some inconsistencies between the reporting in the NIR and the CRF tables. According to the CRF tables, a total of 15,620.17 Gg of waste was disposed at solid waste disposal sites in 2012; however, in chapter 8.2.1 of the NIR Ukraine reported 13.23 Mt of MSW, which represents 93.8 per cent of the total collected waste. In response to a question raised by the ERT during the review, Ukraine explained that the data provided in chapter 8.2.1 are not used directly to calculate the mass of MSW that is officially landfilled because the values first have to be completed by the data provided by the regional housing and communal services authorities. The ERT recommends that Ukraine report the data which are used for the calculation of emissions and that Ukraine further improve the transparency and accuracy of its NIR in its next annual submission.

G. Supplementary information required under Article 7, paragraph 1, of the Kyoto Protocol

1. Information on activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol

Overview

87. Table 6 provides an overview of the information reported and parameters selected by Ukraine under Article 3, paragraphs 3 and 4, of the Kyoto Protocol.

Table 6
Supplementary information reported under Article 3, paragraphs 3 and 4, of the Kyoto Protocol

Issue	*Expert review team assessment, if applicable*	*Findings and recommendations*
Assessment of Ukraine's reporting in accordance with the requirements in paragraphs 5–9 of the annex to decision 15/CMP.1	Sufficient	See paragraphs 89, 91, 93 and 95
Activities elected under Article 3, paragraph 4, of the Kyoto Protocol	Activities elected: forest management Years reported: 2008, 2009, 2010, 2011 and 2012	
Period of accounting	Commitment period accounting	
Ukraine's ability to identify areas of land and areas of land-use change in accordance with paragraph 20 of the annex to decision 16/CMP.1	Sufficient	

88. Chapter G.1 includes the ERT's assessment of the 2014 annual submission against the Article 8 review guidelines and decisions 15/CMP.1 and 16/CMP.1. In accordance with decision 6/CMP.9, Parties will begin reporting of KP-LULUCF activities in the submissions due by 15 April 2015 using revised CRF tables, as contained in the annex to decision 6/CMP.9. Owing to this change in the CRF tables for KP-LULUCF activities, and the change from the first commitment period to the second commitment period, paragraphs 89–95 below contain the ERT's assessment of Ukraine's adherence to the current reporting guidelines (decisions 15/CMP.1 and 16/CMP.1) and do not provide specific recommendations for reporting these activities in the next annual submission.

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

Afforestation and reforestation – CO_2, CH_4 and N_2O

89. The ERT noted that Ukraine reported under the Kyoto Protocol a total area of managed forests in 2011 and 2012, 9,639,087 ha and 9,656,648 ha, respectively, (i.e. areas under forest management plus areas under afforestation and reforestation) that is larger than the area reported under the Convention, 9,639,077 ha and 9,656,290 ha respectively, (i.e. areas under managed forest land remaining forest land plus areas under land converted to forest land); however, because the same definition applies, the total areas reported under the Kyoto Protocol and under the Convention should be identical. The ERT also noted that the discrepancy may be the consequence of the incorrect implementation of the IPCC methodology for land representation. As explained by Ukraine during the review, areas where the use changed in a generic year x are reported by Ukraine for the first time in the corresponding "land-use converted to new land-use" category in the year x+1; for example, the areas of land converted to forest land during the year 1990 have been reported for the first time under the category land converted to forest land in the year 1991. However, the ERT noted that when the IPCC methodology is implemented correctly, in the generic year x all areas of land converted in the generic year x to a new land use are reported under the relevant land conversion category in that year x, and should be reported under that category for 20 years (i.e. until the year x+19), or another transition period as selected by the country to better reflect the SOM carbon stock dynamic of the category. This issue was included in the list of potential problems and further questions raised by the ERT during the review, and the ERT asked Ukraine to revise the estimates of the carbon stock changes in afforested/reforested lands for 2008–2012. In response to the list of potential problems and further questions raised by the ERT during the review, Ukraine clarified that the error was in the AD of forest management and submitted revised estimates of the carbon stock changes in lands under forest management for 2008–2012, applying AD from the corrected land representation. The ERT welcomes the revised estimates submitted by Ukraine, which are in accordance with the reporting requirements for KP-LULUCF activities described in the annex to 15/CMP.1 and the annex to 16 CMP.1, and the IPCC good practice guidance for LULUCF.

90. The ERT noted that in afforested and reforested land not subject to harvesting, as reported by Ukraine, the SOM is a net carbon source, while in afforested and reforested land subject to harvesting, the SOM is a net carbon sink. Further, as noted in the paragraph 67 above, conversions of managed grassland and cropland to forest land are reported with a loss of SOM carbon stock in the first years. During the review, Ukraine provided additional reference material for the information to justify the net source reported for SOM in afforested and reforested land not subject to harvesting. To enhance the transparency of the estimates, the ERT recommends that Ukraine report in the NIR of its next annual submission additional information on the model applied to estimate the SOM carbon stock changes in land converted to forest land, as well as a table where the areas converted to forest land and the carbon stock changes in each carbon pool are reported, stratified by land-use conversion type, climatic zone and year of conversion.

Deforestation – CO_2, CH_4 and N_2O

91. The ERT noted that Ukraine reports CO_2 emissions associated with lime application in lands subject to deforestation as "NA" for the entire time series (2008–2012) in CRF table 5(KP-II)4. However, the ERT also noted that Ukraine reports CO_2 emissions from lime application in the corresponding CRF table 5(IV) under the Convention for the category cropland. Ukraine did not report information, either in the NIR or in response to a question raised by the ERT during the review, to demonstrate that, unlike other cropland, liming is not applied in cropland that originates from deforestation. Consequently, this issue was included in the list of potential problems and further questions raised by the ERT

during the review, wherein the ERT asked Ukraine to submit revised estimates of CO_2 emissions from lime application in deforested lands for 2008–2012. In response to the list of potential problems and further questions raised by the ERT during the review, Ukraine submitted revised estimates of CO_2 emissions from lime application in deforested lands converted to cropland for 2008–2012, applying a statistical approach based on the proportion of cropland areas among deforested lands.

92. The ERT welcomes the revised estimates submitted by Ukraine, which are in accordance with reporting requirement for KP-LULUCF activities described in the annex to 15/CMP.1 and the annex to 16 CMP.1, and the IPCC good practice guidance for LULUCF. The revised estimates increase net GHG emissions from deforestation by 0.01 per cent for the year 2012.

93. The ERT noted that Ukraine reports direct N_2O emissions from disturbance associated with land-use conversion to cropland for 2009 only, for which new conversions of forest land areas to cropland have been reported, while for the other years of the time series the notation key "NO" has been used. In response to a question raised by the ERT during the review, Ukraine explained that it reported N_2O emissions from disturbance associated with land-use conversion to cropland only in the year in which the land-use conversion occurred. The ERT notes that, according to the IPCC good practice guidance for LULUCF, N_2O emissions from disturbance associated with land-use conversion to cropland originate from the oxidation of SOM and therefore need to be estimated for the entire transition period during which the carbon stock losses from SOM are estimated. Consequently, this issue was included in the list of potential problems and further questions raised by the ERT during the review, wherein the ERT asked Ukraine to submit revised estimates of N_2O emissions from disturbance associated with land-use conversion to cropland in deforested lands for 2008–2012. In response to the list of potential problems and further questions raised by the ERT during the review, Ukraine submitted revised estimates of N_2O emissions from the mineralization of SOM in deforested lands converted to cropland for 2008–2012, applying a statistical approach based on the proportion of cropland areas among deforested lands. The ERT welcomes the revised estimates submitted by Ukraine, which are in accordance with reporting requirement for KP-LULUCF activities described in the annex to 15/CMP.1 and the annex to 16 CMP.1, and the IPCC good practice guidance for LULUCF; and which increase net GHG emissions from deforestation by 0.03 per cent for the year 2012.

94. The ERT noted from CRF tables 5(KP-I)A.2 that net biomass carbon stock losses per hectare vary considerably from –1.50 Mg C/ha/year for the aboveground biomass and –0.29 Mg C/ha/year for the belowground biomass in the year 2008 to –0.005 Mg C/ha/year and –0.0009 Mg C/ha/year in the year 2009 for above- and below-ground biomass respectively. During the review, Ukraine provided additional information on the carbon stock changes in deforested land to clarify their variability across the time series and climatic zones. To enhance the transparency of the estimates, the ERT recommends that Ukraine report in the NIR of its next annual submission additional information on how the carbon stock change factors applied to estimate the carbon stock changes in forest land converted to other land use are calculated, as well as a table where the areas converted from forest land and the carbon stock changes in each carbon pool are reported, stratified by land-use conversion type, climatic zone and year of conversion.

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

Forest management – CO_2, CH_4 and N_2O

95. The ERT noted that a net carbon stock increase has been reported for SOM in organic soils. During the review, Ukraine explained that the mathematical sign used to represent the net carbon stock change in SOM in organic soils is positive although it should

be negative. In response to the list of potential problems and further questions raised by the ERT during the review, Ukraine corrected this error in its revised submission of GHG estimates for KP-LULUCF activities (forest management) and submitted revised estimates of the carbon stock changes in afforested/reforested lands for 2008–2012, applying AD from the corrected land representation. The ERT welcomes the revised estimates submitted by Ukraine, which are in accordance with the reporting requirement for KP-LULUCF activities described in the annex to 15/CMP.1 and in the annex to 16/CMP.1, and the IPCC good practice guidance for LULUCF, and which decrease net GHG removals from forest management by 1.6 per cent for the year 2012.

2. Information on Kyoto Protocol units

Standard electronic format and reports from the national registry

96. Ukraine has reported information on its accounting of Kyoto Protocol units in the required SEF tables, as required by decisions 15/CMP.1 and 14/CMP.1. The ERT took note of the findings included in the standard independent assessment report (SIAR) on the SEF tables and the SEF comparison report.[8] The SIAR was forwarded to the ERT prior to the review, pursuant to decision 16/CP.10. The ERT reiterated the main findings contained in the SIAR.

97. Information on the accounting of Kyoto Protocol units has been prepared and reported in accordance with decision 15/CMP.1, annex, chapter I.E, and reported in accordance with decision 14/CMP.1 using the SEF tables. This information is consistent with that contained in the national registry and with the records of the international transaction log (ITL) and the clean development mechanism registry and meets the requirements referred to in decision 22/CMP.1, annex, paragraph 88(a–j). The transactions of Kyoto Protocol units initiated by the national registry are in accordance with the requirements of the annex to decision 5/CMP.1 and the annex to decision 13/CMP.1. No discrepancy has been identified by the ITL and no non-replacement has occurred. The national registry has adequate procedures in place to minimize discrepancies.

Accounting of activities under Article 3, paragraph 3, of the Kyoto Protocol

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

99. Table 7 shows the accounting quantities for KP-LULUCF as reported by the Party and the final values after the review.

Table 7
Accounting quantities for activities under Article 3, paragraph 3, and, if any, activities under Article 3, paragraph 4, of the Kyoto Protocol, in t CO_2 eq

	2014 annual submission[a]		
	As reported	*Revised estimates*	*Final accounting quantity*[b]
Afforestation and reforestation			
Non-harvested land	–513 874		–513 874

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

	2014 annual submission[a]		
	As reported	*Revised estimates*	*Final accounting quantity*[b]
Harvested land	–2 361 569		–2 361 569
Deforestation	376 762	375 025	375 025
Forest management	–20 350 000	–20 350 000	–20 350 000
Article 3.3 offset[c]	0		0
Forest management cap[d]	–20 350 000		–20 350 000
Cropland management	NA		NA
Grazing land management	NA		NA
Revegetation	NA		NA

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

[a] The values included under the 2014 annual submission are the cumulative accounting values for 2008, 2009, 2010, 2011 and 2012, as reported in the accounting table of the KP-LULUCF CRF tables for the inventory year 2012.

[b] The "final accounting quantity" is the quantity of Kyoto Protocol units that the Party shall issue or cancel under each activity under Article 3, paragraph 3, and paragraph 4, if relevant, based on the final accounting quantity in the 2014 annual submission.

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

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

100. Based on the information provided in table 7 for the activity afforestation and reforestation, Ukraine shall: for non-harvested land, issue 513,874 removal units (RMUs) in its national registry; and for harvested land, issue 2,361,569 RMUs in its national registry.

101. Based on the information provided in table 7 for the activity deforestation, Ukraine shall cancel 375,025 assigned amount units, emission reduction units, certified emission reduction units and/or RMUs in its national registry.

102. Based on the information provided in table 7 for the activity forest management, Ukraine shall issue 20,350,000 RMUs in its national registry.

Calculation of the commitment period reserve

103. Ukraine has reported its commitment period reserve in its 2014 annual submission. Ukraine reported its commitment period reserve to be 2,005,097,291 t CO_2 eq based on the national emissions in its most recently reviewed inventory (401,019.458 Gg CO_2 eq). The ERT notes that based on the submission of revised emission estimates by Ukraine during the review of the 2014 annual submission, the commitment period reserve changed, and the new commitment period reserve is reported as 2,013,329,750 t CO_2 eq based on the revised national emissions in its most recently reviewed inventory (402,665.950 Gg CO_2 eq). The ERT agrees with this figure.

3. Changes to the national system

104. Ukraine reported that there is a change in its national system since the previous annual submission. The Party described the change on the procedures for the provision and request of information for the inventory by SEIA in its NIR. In response to an additional question raised by the ERT, Ukraine replied that there have been further changes in its national system since the previous annual submission. More specifically, in accordance with Order of State No. 121, State Environmental Investment Agency of Ukraine, of 30 April 2013, the responsibilities of the National Centre for GHG Emission Inventory were increased with respect to the collection, processing, systematization, analysis and archiving of information necessary for the preparation of the national GHG inventory, as well as its evaluation and improvement. The ERT concluded that Ukraine's national system continues to be in accordance with the requirements of national systems outlined in decision 19/CMP.1. The ERT recommends that Ukraine report in its annual submission any change(s) in its national system in accordance with decision 15/CMP.1, annex, chapter I.F, and/or further relevant decisions of the Conference of the Parties serving as the meeting of the Parties to the Kyoto protocol (CMP).

4. Changes to the national registry

105. Ukraine reported that there are no changes in its national registry since the previous annual submission. The ERT concluded that the Party's national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1, and continues to adhere to the technical standards for data exchange between registry systems in accordance with relevant CMP decisions.

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

106. Consistent with paragraph 23 of the annex to decision 15/CMP.1, Ukraine provided information relating to how it is striving, under Article 3, paragraph 14, of the Kyoto Protocol, to implement its commitments in such a way as to minimize adverse social, environmental and economic impacts on developing country Parties, particularly those identified in Article 4, paragraphs 8 and 9, of the Convention.

107. Ukraine did not provide information on changes in its reporting of the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol in its annual submission. However, in response to questions raised by the ERT during the review, Ukraine acknowledged the following changes in its reporting under Article 3, paragraph 14, of the Kyoto Protocol: Ukraine reported that as it is not a Party included in Annex II to the Convention, it has no relevant financial obligations in accordance with Article 4, paragraphs 3 to 5, of the Kyoto Protocol. Nevertheless, Ukraine has contributed and continues to contribute to capacity-building for climate change prevention in developing countries by training qualified specialists in the areas of ecology, climatology, meteorology and energy efficiency (NIR, page 351). Ukraine's economy largely depends on export, import and consumption of fossil fuels and energy-intensive products. Taking that into account, the Cabinet of Ministers of Ukraine approved the Energy Strategy of Ukraine until 2030. The Strategy is one of the steps taken by Ukraine in implementing Article 3, paragraph 14, of the Kyoto Protocol, and one of the main objectives of the Strategy is to decrease anthropogenic effects on the environment (NIR, page 350). The ERT concluded that, taking into account the confirmed changes in the reporting, the information provided is complete and transparent. The ERT recommends that the Party, in its annual submission, report any change(s) in its information provided under Article 3, paragraph 14, in accordance with decision 15/CMP.1, annex, chapter I.H, and/or further relevant decisions of the CMP.

III. Conclusions and recommendations

A. Conclusions

108. Table 8 summarizes the ERT's conclusions on the 2014 annual submission of Ukraine, in accordance with the Article 8 review guidelines.

Table 8
Expert review team's conclusions on the 2014 annual submission of Ukraine

Issue	*Expert review team assessment*	*Paragraph cross references for identified problems*
The ERT concludes that the inventory submission of Ukraine is complete with regard to categories, gases, years and geographical boundaries and contains both an NIR and CRF tables for 1990–2012		
Annex A sources[a]	Complete	
LULUCF[a]	Complete	
KP-LULUCF	Complete	
The ERT concludes that the inventory submission of Ukraine has been prepared and reported in accordance with the UNFCCC reporting guidelines	Generally	See table 3 above (time-series consistency, QA/QC and transparency)
Ukraine's inventory is in accordance with the Revised 1996 IPCC Guidelines, the IPCC good practice guidance and the IPCC good practice guidance for LULUCF	Generally	See paragraphs 23, 25, and 26
The submission of information required under Article 7, paragraph 1, of the Kyoto Protocol has been prepared and reported in accordance with decision 15/CMP.1	Yes	
Ukraine has reported information on its accounting of Kyoto Protocol units in accordance with decision 15/CMP.1, annex, chapter I.E, and used the required reporting format tables as specified by decision 14/CMP.1	Yes	
The national system continues to perform its required functions as set out in the annex to decision 19/CMP.1	Yes	See paragraph 104 above
The national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1 and continues to adhere to the technical standards for data exchange between registry systems in accordance with relevant CMP decisions	Yes	
Did Ukraine provide information in the NIR on changes in its reporting of the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol?	No	See paragraphs 106–107 above

Abbreviations: Annex A sources = source categories included in Annex A to the Kyoto Protocol, CMP = Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol, CRF = common reporting format, ERT = expert review team,

IPCC = Intergovernmental Panel on Climate Change, IPCC good practice guidance = IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*, IPCC good practice guidance for LULUCF = IPCC *Good Practice Guidance for 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, LULUCF = land use, land-use change and forestry, NIR = national inventory report, Revised 1996 IPCC Guidelines = *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*, UNFCCC reporting guidelines = "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories".

[a] The assessment of completeness by the ERT considers only the completeness of reporting of mandatory categories (i.e. categories for which methods and default emission factors are provided in the Revised 1996 IPCC Guidelines, the IPCC good practice guidance or the IPCC good practice guidance for LULUCF).

B. Recommendations

109. The ERT identified the issues for improvement listed in table 9. All recommendations are for the next annual submission, unless otherwise specified. The ERT notes that this review report of the 2014 annual submission will be published after 15 April 2015. Where recommendations cannot be fully implemented in time for the 2015 annual submission, the ERT recommends that Ukraine provide an update on progress of implementation in the NIR.

Table 9
Recommendations identified by the expert review team

Sector	*Category/cross-cutting issue*	*Recommendation*	*Reiteration of previous recommendation?*	*Paragraph cross references*
Cross-cutting	General	Enhance the consistency between CRF table 7 and the NIR	Yes	Table 4
		Improve the transparency of the uncertainty analysis for the LULUCF sector in terms of the data sources and methods applied to derive the uncertainties	No	Table 4 65
		Develop country-specific CO_2 EFs for motor fuels (i.e. gasoline, diesel oil and LPG) and fuel oil used under the residential category	Yes	20
		Develop country-specific EFs for fugitive CH_4 emissions from natural gas leakage from end-users	Yes	20
		Disaggregate the data in the reference approach according to the different coal types for the years 1990–2011	Yes	20
		Allocate the emissions from corresponding off-road vehicles to manufacturing industries and construction for the years 1990–2011	Yes	20
		Include a detailed explanation of the methodology, assumptions and AD used to split vehicles by category	Yes	20
Energy	Reference and sectoral approaches	Further investigate the difference between the reference approach and the sectoral approach and include in the NIR of its next annual submission a comprehensive analysis that justifies the differences for all types of fuels	No	22

Sector	*Category/cross-cutting issue*	*Recommendation*	*Reiteration of previous recommendation?*	*Paragraph cross references*
		Revise the apparent consumption for coking coal and natural gas for 2011 and 2012 using total production data and follow the Revised 1996 IPCC Guidelines for the apparent consumption calculations	Yes	23
		Include the explanations on the discrepancies between the CRF table and IEA data sets in the NIR of its next annual submission	No	24
		Investigate further the underlying reasons for the discrepancies between the CRF table and IEA data sets and include in the NIR a comprehensive analysis that justifies the deviation between the two data sets	No	24
	International bunker fuels	Include the information on the detailed specification of flight types, destinations and characteristics, which are used to separate domestic and international aviation in the NIR of its next annual submission	Yes	25
		Provide in the NIR explanations for the calculation of emissions of international aviation for 1990–1995, including justification for the rate of international aviation for the period	Yes	25
		Estimate the international marine bunker emissions for the years 1991–1997 in its next annual submission by using one of the estimation techniques described in section 7.3.2.2 of the IPCC good practice guidance	No	26
	Feedstocks and non-energy use of fuels	Report the imported and exported refinery feedstocks and naphtha under the reference approach by including the amounts of these fuels in CRF table 1.A(b)	No	29
	Stationary combustion: gaseous fuels – CO_2	Use the mean value of country-specific carbon content reported for the years 1998–2003 for the years 1990–1997	No	30
	Stationary combustion: liquid fuels – CO_2	Develop and use country-specific CO_2 EFs for liquid fuels in order to enhance the accuracy of the inventory of its next annual submission in line with the IPCC good practice guidance	No	31
	Stationary combustion: solid fuels – CO_2	Calculate and report, in the NIR, the carbon mass balance for coke production, ensuring that all inputs and outputs of the process are included, in order to ensure accuracy of the estimates of this category	No	32
	Road transportation: liquid and gaseous fuels –	Further improve the accuracy and time-series consistency of the emission estimates for road transportation	No	34

Sector	*Category/cross-cutting issue*	*Recommendation*	*Reiteration of previous recommendation?*	*Paragraph cross references*
	CO_2, CH_4 and N_2O	Develop country-specific CO_2 EFs for motor fuels based on their carbon content and provide an explanation of the methodology used in the NIR	Yes	35
		Carefully consider the issue regarding country-specific EFs for motor fuels in the context of its next annual submission	No	35
		Include in the NIR information on the methodology and assumptions used to split vehicles by category, or any of the AD and parameters used as input variables to the COPERT IV model	No	36
		Make the appropriate arrangements concerning the delivery of the input parameters and AD for road transportation to the inventory team by the respective data providers, in order to ensure the timely preparation of the emission estimates	No	37
		Further investigate the differences between the results of the top-down and bottom-up approaches, following the guidance provided in section 2.3.3 of the IPCC good practice guidance and report accordingly in the NIR	No	38
		Provide a quantitative analysis in the NIR that justifies the decreasing trend in the CH_4 IEFs for gasoline and diesel oil, by interpreting the AD, parameters and emissions calculated by the COPERT IV model	No	39
Industrial processes and solvent and other product use	General	Improve QC procedures in order to increase the transparency of the reporting	No	43
	Cement production – CO_2	Include in the NIR information on the joint implementation projects developed among the cement plants in the country	No	44
	Ammonia production – CO_2	Improve the QC procedures regarding the units reported in the NIR tables, especially in table P3.1.1.9	No	46
	Soda ash production – CO_2	Report soda ash production AD and change the notation key for CO_2 emissions from “NA” to “NO”	No	50
	Consumption of halocarbons and SF_6 – HFCs	Split the information over more than one row in the CRF tables to increase transparency, while ensuring consistency among the AD, IEFs and emission estimates in every line of CRF table 2(II).F, or use a weighted EF	No	51
		Include additional information in the NIR with regard to the end of the life cycle of the equipment	No	51

Sector	*Category/cross-cutting issue*	*Recommendation*	*Reiteration of previous recommendation?*	*Paragraph cross references*
Agriculture	Manure management – CH_4	Further investigate the issue on values of volatile solids excreted for dairy and non-dairy cattle, both for agricultural enterprises and private households and, if necessary, revise the values of VS excreted for each type of farm and per cattle animal species	No	57
	Field burning of agricultural residues – CH_4 and N_2O	Reallocate the emissions associated to wildfires of cropland to the LULUCF sector, in order to improve the comparability of the inventory	No	59
LULUCF	General	Provide information on the reasons for the recalculation of carbon stock change in DOM on forest land	No	61
		Report in the NIR, for each data type, the source of the information, and for each numerical value the metric unit of that value	No	63
		Improve the transparency of the uncertainty analysis in terms of the data sources and methods applied to calculate the uncertainties	No	65
		Correctly apply the IPCC methodology on land transition in its next annual submission by reporting in the generic year x under the relevant land conversion category for all land converted, in that year x, to that category and to continue reporting the area under that category for 20 years (i.e. until the year x+19), or another transition period as selected by the country to better reflect the SOM carbon stock dynamic of that category	No	66
		Revise the methodology applied for land representation with the aim of ensuring time-series consistency	No	66
		Verify the outputs of the model with measurements annually conducted in the country	No	67
		Ensure consistency among the different methods used, including consistency of the soil depth for which the soil organic carbon and associated carbon stock changes are calculated, for the different land-use categories, especially for the transfer of land between categories for which different methods are applied	No	67
		Ensure the consistency of the time series of carbon stock changes in SOM for the entire transition period in the land-conversion categories	No	68

Sector	*Category/cross-cutting issue*	*Recommendation*	*Reiteration of previous recommendation?*	*Paragraph cross references*
	Forest land remaining forest land – CO_2	Revise the estimates of DOM and establish sector-specific QC procedures to check the time-series consistency of the estimates and their coherence among carbon pools and categories	No	69
		Reports as biomass carbon stock loss any carbon stock lost as consequence of harvesting, even if is left to decay in the forest	No	70
		Either report information in the NIR to justify the selection of any value different from the central value of the ranges provided as the IPCC default values, or always apply the central value of those ranges	No	71
		Reallocate all land currently reported as unmanaged cropland to the subcategories unmanaged grassland, land converted to unmanaged grassland, unmanaged forest land or land converted to unmanaged forest land, depending on the type of vegetation and transition period chosen, in accordance with the definitions provided in the IPCC good practice guidance for LULUCF	Yes	73
		Transparently report in the NIR on the specific management practices on these lands	No	73
	Grassland remaining grassland – CO_2	Check the calculation of the carbon stock change in mineral soils	Yes	74
	Forest land converted to wetlands – CO_2	Revise the methodology and carbon stock change factors applied, in particular ensuring consistency between information reported in NIR table 3.8.10 and the CRF tables	No	75
	Biomass burning – CO_2, CH_4 and N_2O	Estimate the emissions for the years 1990–2004 by applying one of the estimation techniques described in section 7.3.2.2 of the IPCC good practice guidance for LULUCF (or volume 1, chapter 5, of the 2006 IPCC Guidelines)	No	78
		Use country-specific data instead of the IPCC default values to calculate the emission estimates	No	79
		Provide, in the NIR, a table with the average biomass carbon stocks (above-ground and below-ground) in forest land stratified by climatic region and, if possible, by age class	No	79
		Revise the calculation method used and implement sector-specific QC procedures to ensure the consistency of the emission estimates across the time	No	80

Sector	*Category/cross-cutting issue*	*Recommendation*	*Reiteration of previous recommendation?*	*Paragraph cross references*
		series and among different gases		
Waste	General	Improve the accuracy of the NIR and its sector-specific QC procedures in its next annual submission	No	84
	Solid waste disposal on land – CH_4	Improve its QC activities in order to prevent such inconsistencies in its reporting	No	85
		Report the data which are used for the calculation of emissions and further improve the transparency and accuracy of the NIR	No	86
KP-LULUCF	Afforestation and reforestation – CO_2, CH_4 and N_2O	Report in the NIR additional information on the model applied to estimate the SOM carbon stock changes in land converted to forest land, as well as a table where the areas converted to forest land and the carbon stock changes in each carbon pool are reported, stratified by land-use conversion type, climatic zone and year of conversion	No	90
	Deforestation – CO_2, CH_4 and N_2O	Report in the NIR additional information on how the carbon stock change factors applied to estimate the carbon stock changes in forest land converted to other land use are calculated, as well as a table where the areas converted to forest land and the carbon stock changes in each carbon pool are reported, stratified by land-use conversion type, climatic zone and year of conversion	No	94
National system		Report in its annual submission any change(s) in its national system in accordance with decision 15/CMP.1, annex, chapter I.F, and/or further relevant decisions of the CMP	No	104
Article 3, paragraph 14		Report any change(s) in its information provided under Article 3, paragraph 14, in accordance with decision 15/CMP.1, annex, chapter I.H, and/or further relevant decisions of the CMP	No	107

Abbreviations: AD = activity data, CMP = Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol, CRF = common reporting format, DOM = dead organic matter, EF = emissions factor, IEA = International Energy Agency, IEF = implied emissions factor, IPCC good practice guidance = Intergovernmental Panel on Climate Change (IPCC) *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*, IPCC good practice guidance for LULUCF = IPCC *Good Practice Guidance for 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, LPG = liquefied petroleum gas, LULUCF = land use, land-use change and forestry, NIR = national inventory report, Revised 1996 IPCC Guidelines = *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*, QC = quality control, SOM = soil organic matter, VS = volatile solids.

IV. Questions of implementation

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

Annex I

Information to be included in the compilation and accounting database

Table 10
Information to be included in the compilation and accounting database in t CO_2 eq for 2012, including the commitment period reserve

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Commitment period reserve	2 005 097 291	2 013 329 750		2 013 329 750
Annex A emissions for 2012				
CO_2	302 748 889	304 395 381		304 395 381
CH_4	66 165 909			66 165 909
N_2O	31 366 938			31 366 938
HFCs	726 202			726 202
PFCs	NA, NO			NA, NO
SF_6	11 520			11 520
Total Annex A sources[c]	**401 019 458**	**402 665 950**		**402 665 950**
Activities under Article 3, paragraph 3, for 2012				
3.3 Afforestation and reforestation on non-harvested land for 2012	–240 831			–240 831
3.3 Afforestation and reforestation on harvested land for 2012	–562 530			–562 530
3.3 Deforestation for 2012	39 314	39 349		39 349
Activities under Article 3, paragraph 4, for 2012[d]				
3.4 Forest management for 2012	–60 968 288	–59 987 292		–59 987 292
3.4 Cropland management for 2012				
3.4 Cropland management for the base year				
3.4 Grazing land management for 2012				
3.4 Grazing land management for the base year				
3.4 Revegetation for 2012				
3.4 Revegetation for the base year				

Abbreviations: Annex A sources = source categories included in Annex A to the Kyoto Protocol, NA = not applicable, NO = not occurring.

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

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

[c] The values for "Total Annex A sources" in the columns "As reported", "Revised estimates" and "Final" may not equal the sum of the values for the gases in those columns owing to rounding.

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

Table 11
Information to be included in the compilation and accounting database in t CO_2 eq for 2011

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Annex A emissions for 2011				
CO_2	305 464 491	306 534 392		306 534 392
CH_4	70 388 217			70 388 217
N_2O	31 869 153			31 869 153
HFCs	717 421			717 421
PFCs	IE, NA, NO			IE, NA, NO
SF_6	8 819			8 819
Total Annex A sources[c]	**408 448 101**	**409 518 002**		**409 518 002**
Activities under Article 3, paragraph 3, for 2011				
3.3 Afforestation and reforestation on non-harvested land for 2011	–160 317			–160 317
3.3 Afforestation and reforestation on harvested land for 2011	–511 605			–511 605
3.3 Deforestation for 2011	6 399	6 430		6 430
Activities under Article 3, paragraph 4, for 2011[d]				
3.4 Forest management for 2011	–61 339 283	–60 405 213		–60 405 213
3.4 Cropland management for 2011				
3.4 Cropland management for the base year				
3.4 Grazing land management for 2011				
3.4 Grazing land management for the base year				
3.4 Revegetation for 2011				
3.4 Revegetation for the base year				

Abbreviations: Annex A sources = source categories included in Annex A to the Kyoto Protocol, IE = included elsewhere, NA = not applicable, NO = not occurring.

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

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

[c] The values for "Total Annex A sources" in the columns "As reported", "Revised estimates" and "Final" may not equal the sum of the values for the gases in those columns owing to rounding.

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

Table 12
Information to be included in the compilation and accounting database in t CO_2 eq for 2010

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Annex A emissions for 2010				
CO_2	289 664 423	292 138 265		292 138 265
CH_4	66 483 429	66 474 488		66 474 488
N_2O	28 762 011	28 758 673		28 758 673
HFCs	658 046			658 046
PFCs	22 982			22 982
SF_6	10 179			10 179
Total Annex A sources[c]	**385 601 069**	**388 062 633**		**388 062 633**
Activities under Article 3, paragraph 3, for 2010				
3.3 Afforestation and reforestation on non-harvested land for 2010	–57 798			–57 798
3.3 Afforestation and reforestation on harvested land for 2010	–447 611			–447 611
3.3 Deforestation for 2010	105	135		135
Activities under Article 3, paragraph 4, for 2010[d]				
3.4 Forest management for 2010	–55 816 816	–54 857 880		–54 857 880
3.4 Cropland management for 2010				
3.4 Cropland management for the base year				
3.4 Grazing land management for 2010				
3.4 Grazing land management for the base year				
3.4 Revegetation for 2010				
3.4 Revegetation for the base year				

Abbreviation: Annex A sources = source categories included in Annex A to the Kyoto Protocol.

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

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

[c] The values for "Total Annex A sources" in the columns "As reported", "Revised estimates" and "Final" may not equal the sum of the values for the gases in those columns owing to rounding.

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

Table 13
Information to be included in the compilation and accounting database in t CO_2 eq for 2009

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Annex A emissions for 2009				
CO_2	274 587 683	275 876 308		275 876 308
CH_4	66 734 110	66 726 919		66 726 919
N_2O	26 846 614	26 843 578		26 843 578
HFCs	586 032			586 032
PFCs	46 493			46 493
SF_6	9 810			9 810
Total Annex A sources[c]	**368 810 742**	**370 089 140**		**370 089 140**
Activities under Article 3, paragraph 3, for 2009				
3.3 Afforestation and reforestation on non-harvested land for 2009	–27 351			–27 351
3.3 Afforestation and reforestation on harvested land for 2009	–427 867			–427 867
3.3 Deforestation for 2009	1 804	1 835		1 835
Activities under Article 3, paragraph 4, for 2009[d]				
3.4 Forest management for 2009	–58 197 855	–57 239 418		–57 239 418
3.4 Cropland management for 2009				
3.4 Cropland management for the base year				
3.4 Grazing land management for 2009				
3.4 Grazing land management for the base year				
3.4 Revegetation for 2009				
3.4 Revegetation for the base year				

Abbreviation: Annex A sources = source categories included in Annex A to the Kyoto Protocol.

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

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

[c] The values for "Total Annex A sources" in the columns "As reported", "Revised estimates" and "Final" may not equal the sum of the values for the gases in those columns owing to rounding.

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

Table 14
Information to be included in the compilation and accounting database in t CO_2 eq for 2008

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Annex A emissions for 2008				
CO_2	324 496 897	326 011 169		326 011 169
CH_4	72 995 372	72 983 550		72 983 550
N_2O	29 376 546	29 372 282		29 372 282
HFCs	571 577			571 577
PFCs	150 158			150 158
SF_6	9 788			9 788
Total Annex A sources[c]	**427 600 339**	**429 098 525**		**429 098 525**
Activities under Article 3, paragraph 3, for 2008				
3.3 Afforestation and reforestation on non-harvested land for 2008	–27 578			–27 578
3.3 Afforestation and reforestation on harvested land for 2008	–392 761			–392 761
3.3 Deforestation for 2008	329 140	327 277		327 277
Activities under Article 3, paragraph 4, for 2008[d]				
3.4 Forest management for 2008	–56 351 813	–55 435 763		–55 435 763
3.4 Cropland management for 2008				
3.4 Cropland management for the base year				
3.4 Grazing land management for 2008				
3.4 Grazing land management for the base year				
3.4 Revegetation for 2008				
3.4 Revegetation for the base year				

Abbreviation: Annex A sources = source categories included in Annex A to the Kyoto Protocol.

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

[b] "Final" includes revised estimates if any and/or adjustments if any.

[c] The values for "Total Annex A sources" in the columns "As reported", "Revised estimates" and "Final" may not equal the sum of the values for the gases in those columns owing to rounding.

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

Annex II

Documents and information used during the review

A. Reference documents

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

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

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

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

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

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

"Guidelines for national systems for the estimation of anthropogenic greenhouse gas emissions by sources and removals by sinks under Article 5, paragraph 1, of the Kyoto Protocol". Decision 19/CMP.1. Available at <http://unfccc.int/resource/docs/2005/cmp1/eng/08a03.pdf#page=14>.

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

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

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Synthesis and assessment report on the greenhouse gas inventories submitted in 2014. Available at <http://unfccc.int/resource/webdocs/sai/2014.pdf>.

FCCC/ARR/2013/UKR. Report of the individual review of the annual submission of Ukraine submitted in 2013. Available at <http://unfccc.int/resource/docs/2014/arr/ukr.pdf>.

Standard independent assessment report template, parts 1 and 2. Available at <http://unfccc.int/kyoto_protocol/registry_systems/independent_assessment_reports/items/4061.php>.

B. Additional information provided by the Party

Responses to questions during the review were received from Mr. Valentin Shlikhta (State Environmental Investment Agency of Ukraine), including additional material on the methodology and assumptions used.

Annex III

Acronyms and abbreviations

AD	activity data
BEF_2	biomass expansion factor for conversion of merchantable volume to above-ground tree biomass, dimensionless
C	carbon
CH_4	methane
CMP	Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol
CO	carbon monoxide
CO_2	carbon dioxide
CO_2 eq	carbon dioxide equivalent
CRF	common reporting format
DOC	degradable organic carbon
DOM	dead organic matter
EF	emission factor
ERT	expert review team
f_{BL}	fraction of biomass left to decay in forest
GHG	greenhouse gas; unless indicated otherwise, GHG emissions are the sum of CO_2, CH_4, N_2O, HFCs, PFCs and SF_6 without GHG emissions and removals from LULUCF
HFCs	hydrofluorocarbons
ha	hectare
IE	included elsewhere
IEA	International Energy Agency
IEF	implied emission factor
IPCC	Intergovernmental Panel on Climate Change
ITL	international transaction log
JI	joint implementation
kg	kilogram (1 kg = 1,000 grams)
KP-LULUCF	land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol
kt	kilotonne
LPG	liquefied petroleum gas
LULUCF	land use, land-use change and forestry
m^3	cubic metre
Mg	megagram (1 Mg = 1 tonne)
MSW	municipal solid waste
Mt	million tonnes
N_2O	nitrous oxide
NA	not applicable
NCV	net calorific value
NE	not estimated
NIR	national inventory report
NO	not occurring
NO_X	nitrogen oxide
PFCs	perfluorocarbons
PJ	petajoule (1 PJ = 10^{15} joule)
QA/QC	quality assurance/quality control
RMU	removal unit
SEF	standard electronic format

SF_6	sulphur hexafluoride
SIAR	standard independent assessment report
SOM	soil organic matter
t	tonne
TJ	terajoule (1 TJ = 10^{12} joule)
UNFCCC	United Nations Framework Convention on Climate Change
VS	volatile solids