Advance Version

COMPLIANCE COMMITTEE **CC/ERT/ARR/2014/2**
22 January 2014

Report of the individual review of the annual submission of Ukraine submitted in 2013

Note by the secretariat

The report of the individual review of the annual submission of Ukraine submitted in 2013 was published on 22 January 2014. 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 -/CMP.9[*]), the report is considered received by the secretariat on the same date. This report, FCCC/ARR/2013/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.

[*] Compliance Committee.

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Report of the individual review of the annual submission of Ukraine submitted in 2013*

* In the symbol for this document, 2013 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 2013 annual submission of Ukraine, coordinated by the UNFCCC secretariat, in accordance with decision 22/CMP.1. The review took place from 9 to 14 September 2013 in Bonn, Germany, and was conducted by the following team of nominated experts from the UNFCCC roster of experts: generalists – Ms. Leena Raittinen (Finland) and Mr. Dennis Rudov (Belarus); energy – Ms. Lindiwe Chola Dlamini (Swaziland), Ms. Veronika Ginzburg (Russian Federation) and Ms. Inga Konstantinaviciute (Lithuania); industrial processes and solvent and other product use – Ms. Siriluk Chiarakorn (Thailand) and Mr. Thapelo C.M. Letete (South Africa); agriculture – Ms. Yauheniya Bertash (Belarus) and Ms. Hongmin Dong (China); land use, land-use change and forestry (LULUCF) – Ms. Maria Fernanda Alcobé (Argentina) and Mr. Vladimir Korotkov (Russian Federation); and waste – Mr. Pavel Gavrilita (Republic of Moldova) and Ms. Tatiana Tugui (Republic of Moldova). Mr. Rudov and Ms. Tugui were the lead reviewers. The review was coordinated by Ms. Suvi Monni (UNFCCC secretariat).

2. In accordance with the "Guidelines for review under Article 8 of the Kyoto Protocol" (decision 22/CMP.1) (hereinafter referred to as the Article 8 review guidelines), a draft version of this report was communicated to the Government of 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. The expert review team (ERT) notes that the 2012 annual review report of Ukraine was published after the submission of the 2013 annual submission.

3. In 2011, the main greenhouse gas (GHG) in Ukraine was carbon dioxide (CO_2), accounting for 76.1 per cent of total GHG emissions[1] expressed in CO_2 equivalent (CO_2 eq), followed by methane (CH_4) (15.8 per cent) and nitrous oxide (N_2O) (8.0 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 76.0 per cent of total GHG emissions, followed by the industrial processes sector (12.1 per cent), the agriculture sector (9.0 per cent), the waste sector (2.8 per cent) and the solvent and other product use sector (0.1 per cent). Total GHG emissions amounted to 401,576.28 Gg CO_2 eq and decreased by 56.8 per cent between the base year[2] and 2011. The ERT concludes that the description in the national inventory report (NIR) of the trends for the different gases and sectors is reasonable.

4. 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 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. In table 1, CO_2, CH_4 and N_2O emissions included in the rows under Annex A sources do not include emissions and removals from the LULUCF sector.

5. Additional background data on recalculations by Ukraine in the 2013 annual submission, as well as information to be included in the compilation and accounting database, can be found in annex I to this report.

[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 Annex A sources only.

Table 1

Greenhouse gas emissions from Annex A sources and emissions/removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, by gas, base year[a] to 2011

			Gg CO_2 eq							*Change (%)*
		Greenhouse gas	*Base year[a]*	*1990*	*1995*	*2000*	*2008*	*2009*	*2010*	*2011*	*Base year–2011*
Annex A sources		CO_2	718 951.47	718 951.47	360 356.18	293 541.68	324 540.64	274 633.14	289 707.97	305 463.58	–57.5
		CH_4	151 640.82	151 640.82	98 963.32	75 605.82	66 337.03	62 995.26	63 859.24	63 329.94	–58.2
		N_2O	59 098.04	59 098.04	39 093.28	26 487.97	29 651.83	27 035.90	28 952.98	32 056.52	–45.8
		HFCs	NA, NE, NO	NA, NE, NO	NA, NE, NO	14.12	571.58	586.03	658.05	717.42	NA
		PFCs	203.23	203.23	153.45	99.74	150.16	46.49	22.98	IE, NA, NO	NA
		SF_6	0.01	0.01	0.07	0.44	9.79	9.81	10.18	8.82	108 429.4
KP-LULUCF	Article 3.3[b]	CO_2					–92.05	–453.88	–506.09	–595.01	
		CH_4					0.68	0.37	0.63	0.01	
		N_2O					0.17	0.10	0.16	0.00	
	Article 3.4[c]	CO_2	NA				–56 402.19	–58 225.79	–55 854.65	–61 283.23	NA
		CH_4	NA				32.92	14.76	22.63	0.78	NA
		N_2O	NA				17.45	13.18	15.21	0.36	NA

Abbreviations: 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] "Base year" for Annex A sources refers to the base year under the Kyoto Protocol, which is 1990 for all gases. The "base year" for cropland management, grazing land management and revegetation under Article 3, paragraph 4, of the Kyoto Protocol is 1990. For activities under Article 3, paragraph 3, of the Kyoto Protocol and forest management under Article 3, paragraph 4, 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 2011

			Gg CO_2 eq							*Change (%)*
	Sector	*Base year[a]*	*1990*	*1995*	*2000*	*2008*	*2009*	*2010*	*2011*	*Base year–2011*
Annex A	Energy	735 556.41	735 556.41	386 146.51	305 878.26	318 755.30	278 484.40	290 857.51	305 225.35	–58.5
	Industrial processes	79 841.03	79 841.03	35 680.17	42 278.99	56 147.47	42 095.19	46 480.58	48 783.74	–38.9
	Solvent and other product use	376.80	376.80	372.11	354.89	334.73	333.42	332.01	330.77	–12.2
	Agriculture	103 602.53	103 602.53	66 469.10	37 372.46	35 176.48	33 484.87	34 507.43	36 190.30	–65.1
	Waste	10 516.80	10 516.80	9 898.41	9 865.17	10 847.05	10 908.77	11 033.86	11 046.12	5.0
	LULUCF	NA	–69 737.11	–48 757.12	–50 840.12	–10 417.35	–18 267.80	–37 955.08	–7 289.75	NA
	Total (with LULUCF)	**NA**	**860 156.45**	**449 809.18**	**344 909.64**	**410 843.68**	**347 038.84**	**345 256.31**	**394 286.53**	**NA**
	Total (without LULUCF)	**929 893.57**	**929 893.57**	**498 566.30**	**395 749.77**	**421 261.03**	**365 306.64**	**383 211.39**	**401 576.28**	**–56.8**
	Other[b]	NA	NA	NA	NA	NA	NA	NA	NA	NA
KP-LULUCF	Article 3.3[c] Afforestation and reforestation					–420.34	–455.22	–505.41	–601.40	
	Article 3.3[c] Deforestation					329.14	1.80	0.10	6.40	
	Total (3.3)					**–91.20**	**–453.42**	**–505.30**	**–595.00**	
	Article 3.4[d] Forest management					–56 351.81	–58 197.86	–55 816.82	–61 282.08	
	Article 3.4[d] Cropland management	NA				NA	NA	NA	NA	NA
	Article 3.4[d] Grazing land management	NA				NA	NA	NA	NA	NA
	Article 3.4[d] Revegetation	NA				NA	NA	NA	NA	NA
	Total (3.4)	**NA**				**–56 351.81**	**–58 197.86**	**–55 816.82**	**–61 282.08**	**NA**

Abbreviations: 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] "Base year" for Annex A sources refers to the base year under the Kyoto Protocol, which is 1990 for all gases. The "base year" for cropland management, grazing land management and revegetation under Article 3, paragraph 4, of the Kyoto Protocol is 1990. For activities under Article 3, paragraph 3, of the Kyoto Protocol and forest management under Article 3, paragraph 4, 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

6. The 2013 annual inventory submission was submitted on 15 April 2013; it contains a complete set of common reporting format (CRF) tables for the period 1990–2011 and an NIR. 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 2013. The annual submission was submitted in accordance with decision 15/CMP.1.

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

2. Overall assessment of the inventory

8. Table 3 contains the ERT's overall assessment of the annual submission of Ukraine. For recommendations for improvements related to cross-cutting issues 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

		General findings and recommendations
The expert review team's (ERT's) findings on completeness of the 2013 annual submission		
Annex A sources[a]	Complete	Mandatory: None Non-mandatory: "NE" is reported for: CO, NO_X, NMVOCs and SO_2 from fuel combustion (1991–1997) and fugitive emissions; 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, CH_4 and N_2O emissions from marine bunkers: gas/diesel oil (1991–1997), residual fuel oil (1991–1997) and lubricants (1990–2011); CO_2, CH_4 and N_2O emissions from multilateral operations (1990–2006), biomass (1991–2011), crude oil export (1993–1996) and crude oil stock change (1993–1997) in the reference approach; CO_2 emissions from asphalt roofing; CO_2 emissions from road paving with asphalt; CH_4 and N_2O emissions

		General findings and recommendations
		from glass production; 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; N_2O emissions from metal production; CH_4 emissions from steel; CH_4 emissions from sinter; CO_2 emissions from coke; CH_4 emissions from ferroalloys production; potential HFC-23 emissions: import – bulk; 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; CH_4 emissions from waste incineration
Land use, land-use change and forestry[a]	Not complete	Mandatory: Reporting of "NO" for: N_2O emissions from disturbance associated with land-use conversion to cropland where the ERT believes the correct notation key is "NE" (see para. 66 below), CO_2, CH_4 and N_2O from biomass burning: grassland (see para. 67 below)
		Non-mandatory: None
KP-LULUCF	Not complete	Reporting of "NA" for: N_2O emissions from disturbance associated with land-use conversion to cropland although the Party has provided information suggesting these exist (see para. 82 below)
The ERT's findings on recalculations and time-series consistency in the 2013 annual submission	Generally consistent	In several cases an updated method, EF or change in allocation between categories was made only for 2011, leading to inconsistency of the time series (see paras. 22, 33, 35, 36 below). Other category-specific findings and recommendations addressing time-series consistency are in paragraphs 23, 27 and 42 Minor recalculations have been performed only in the agriculture and waste sectors. Transparent explanations have been provided in the NIR
The ERT's findings on verification and quality assurance/quality control procedures in the 2013 annual submission	Not sufficient	The process of QA/QC is well documented in the NIR. However, the ERT noted a number of misprints, errors and inconsistencies in or between reporting in the CRF tables and the NIR (see paras. 25, 39, 56, 72, 76, 77, 78, 80, 84 below). Other findings and recommendations related to QA/QC are presented in table 4 and paragraphs 20, 38 and 45
The ERT's findings on the transparency of the 2013 annual submission	Sufficient	Recommendations addressing transparency are in paragraphs 21, 36, 54 and 70

Abbreviations: Annex A sources = sources included in Annex A to the Kyoto Protocol, CRF = common reporting format, CO = carbon monoxide, EF = emission factor, 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, NIR = national inventory report, NMVOCs = non-methane volatile organic compounds, NO = not occurring, NO_X = nitrogen oxides, SO_2 = sulphur dioxide, 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*).

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

Inventory planning

9. The NIR and additional information provided by the Party in response to questions raised by the ERT during the review described the national system for the preparation of the inventory. The Ministry of the Environment and Natural Resources of Ukraine is the national focal point for climate change issues, and the State Environmental Investment Agency (SEIA) is the single national entity responsible for: the national system operation; inventory development; the implementation of the quality assurance/quality control (QA/QC) procedures; the submission of the national inventory to the UNFCCC secretariat; and providing support to the review process. In 2011, by the Act of the Cabinet of Ministers No. 1194-r, the National Center for GHG Emission Inventory was established. It is a substructure of SEIA and has the main responsibility for inventory preparation, including data collection and processing. Furthermore, 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), Environmental investment fund, Ukrtransgaz, 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.

10. It was recommended in the previous review report that Ukraine include in the NIR additional information on the roles and responsibilities of the organizations involved in the inventory preparation, as well as on inter-agency coordination. In the 2013 annual submission, Ukraine has provided sufficient and transparent information on this matter in sections 1.2–1.6 of the NIR. The ERT commends the Party for this improvement.

11. In the NIR, Ukraine described its well-developed QA/QC system. The plan for the preparation of the GHG inventory, including all QA/QC procedures, is set by the order of SEIA annually. The NIR describes the general (tier 1) and category-specific (tier 2) QA/QC activities that are performed according to the QA/QC plan. Sectoral and external experts are involved in the QA/QC process, which is coordinated by a designated QA/QC manager. Finalized draft versions of the NIR and the CRF tables are published on the SEIA website for a month so that all the interested organizations and experts can provide their comments. The final version of the NIR has to be approved by the Science and Engineering Board of SEIA and the Inter-Agency Commission on the Implementation of the Commitments under the Convention. After the submission of the inventory to the UNFCCC secretariat all the

information related to the inventory preparation is stored in the archive (see para. 13 below).

Inventory preparation

12. Table 4 contains the ERT's assessment of Ukraine's inventory preparation process.

Table 4
Assessment of inventory preparation by Ukraine

		General findings and recommendations
Key category analysis		
Was the key category analysis performed in accordance with the Intergovernmental Panel on Climate Change (IPCC) *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC good practice guidance) and the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF)?	Yes	Level and trend key category analysis performed, including and excluding LULUCF
Approach followed?	Tier 1	
Were additional key categories identified using a qualitative approach?	Yes	CRF table 7 reports N_2O from road transportation as a key category by qualitative criteria in 2011. However, it is not reported as a key category in the NIR. The ERT reiterates the recommendation made in the previous review report 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	
Are there any changes to the key category analysis in the latest submission?	No	Ukraine corrected KP-LULUCF CRF table NIR-3. The ERT welcomes this improvement
Assessment of uncertainty analysis		
Approach followed?	Tier 1	The overall uncertainty of the submission decreased compared with the previous submission by 0.3% and the trend uncertainty decreased by 0.1%. The ERT noted that the description of fluctuations in uncertainties has

		General findings and recommendations
		remained unchanged since the previous annual submission. The ERT recommends that Ukraine enhance QC procedures, in order to keep the reported information updated
Was the uncertainty analysis carried out in accordance with the IPCC good practice guidance and the IPCC good practice guidance for LULUCF?	Yes	Level and trend uncertainties (including LULUCF) reported in the main text of the NIR are different from the values reported in annex 7 on uncertainties. Ukraine explained that the uncertainty values reported in annex 7 are the correct ones. The ERT recommends that Ukraine strengthen the QC procedures in order to improve the consistency of the NIR Ukraine reported in the NIR on the use of the results of the uncertainty analysis for prioritizing the improvements of the inventory. The ERT commends the Party for this improvement
Quantitative uncertainty (including LULUCF)	Level = 4.1% Trend = 1.0%	
Quantitative uncertainty (excluding LULUCF)	Level = 4.0% Trend = 1.0%	

Abbreviations: 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, QC = quality control.

Inventory management

13. Ukraine has a centralized archiving system at SEIA, which includes the archiving of disaggregated emission factors (EFs) and AD, and documentation on how these factors and data have been generated and aggregated for the preparation of the inventory. The archived information also includes internal documentation on QA/QC procedures, external and internal reviews, and documentation on annual key categories and key category identification and planned inventory improvements. During the inventory cycle all data and corresponding information are stored in the special digital repository. After the inventory cycle is over, all information is archived: digital information is stored on the hard drives and backed up, and hard copies are stored in the rack storage. During the review, the ERT was provided with the requested additional archived information, such as the energy balance and additional information on the methodology and assumptions used.

4. Follow-up to previous reviews

14. The ERT commends Ukraine for a number of improvements undertaken in response to the recommendations made in the previous review reports. For example, the Party continued to improve the transparency of the NIR by including additional information on methodology and parameters (see paras. 46, 70 and 79 below) and on the roles and responsibilities of the organizations involved in the inventory preparation, as well as on inter-agency coordination (see para. 10 above). The implemented recommendations and planned improvements are presented in the tables in annex 8 to the NIR.

15. The ERT reiterates the recommendations made in the previous review report that were not addressed in the 2013 annual submission:

(a) Develop country-specific EFs and parameters (see paras. 24, 33 and 51 below);

(b) Report disaggregated data instead of using the notation key included elsewhere ("IE") (see paras. 23 and 81 below);

(c) Improve the completeness of the reporting (see paras. 31, 67 and 82 below);

(d) Include more information in the NIR regarding energy and mass balances and methodologies used (see paras. 19, 24 and 29 below);

(e) Improve the consistency of reporting in the NIR and CRF tables (see table 4 above and paras. 39 and 72 below);

(f) Ensure time-series consistency (see para. 42 below);

(g) Report any change in the information provided under Article 3, paragraph 14 (see para. 91 below).

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

16. During the review, the ERT identified a number of areas for improvement, including some related to specific categories. These are listed in the relevant chapters of this report and in table 8.

B. Energy

1. Sector overview

17. The energy sector is the main sector in the GHG inventory of Ukraine. In 2011, emissions from the energy sector amounted to 305,225.35 Gg CO_2 eq, or 76.0 per cent of total GHG emissions. Since 1990, emissions have decreased by 58.5 per cent. The key drivers for the fall in emissions are the economic crisis during the transition of the country to a market economy, and the switch from liquid to gaseous fuels used for energy production. In more recent years, however, there has been a shift from the use of natural gas to coal due to the rise in gas prices since 2006. A significant decrease in emissions from the sector, from 318,755.30 Gg CO_2 eq in 2008 to 278,484.40 Gg CO_2 eq in 2009 (a 12.6 per cent decrease), mainly because of a decrease in emissions from manufacturing industries and construction (a decrease of 25.5 per cent), occurred due to the economic crisis. During 2009–2011 emissions from the energy sector increased. Total emissions from the energy sector increased by 4.9 per cent in 2011 compared with 2010, but the emissions are still somewhat lower than in 2008. However, in energy industries, emissions were higher in 2011 (112,052.59 Gg CO_2 eq) than in 2008 (106,085.76 Gg CO_2 eq). In 2011, emissions from energy industries were at their highest level since 1996. The reason for such an increase in emissions from energy industries is an increased use of coal (up to 12.4 per cent since 2010) and residual fuel oil, which have replaced the use of natural gas.

18. Within the sector, in 2011, 36.7 per cent of the emissions were from energy industries, followed by 21.4 per cent from manufacturing industries and construction, 15.6 per cent from other sectors, and 12.0 per cent from transport. The share of fugitive emissions was 13.9 per cent, including oil and natural gas (7.3 per cent) and solid fuels (6.6 per cent). The remaining 0.4 per cent was from the category other (fuel combustion).

19. The energy balance for 2011 was not included in the 2013 NIR although it had been strongly recommended in the previous review report. Ukraine explained that the energy

balance was not ready at the time of inventory submission. During the review, Ukraine provided the energy balance for 2011 in response to a question raised by the ERT. The ERT noted some inconsistencies between the energy balance and fuel consumption data reported in the CRF tables, for example for apparent natural gas and crude oil consumption. As explained by the Party during the previous review, the energy balance is not used for the inventory because experts from the State Statistics Service had identified inaccuracies in the energy balance and suggested the use of statistical forms as a more reliable and accurate data source. The ERT reiterates the strong recommendation made in the previous review report that Ukraine include the energy balance (at least for the year previous to the last inventory year) in the NIR and provide an explanation of the inconsistencies between the energy balance and the CRF tables. The ERT also encourages Ukraine to closely communicate with the State Statistics Service and try to avoid the above-mentioned inconsistencies between the next energy balance and annual submission.

20. The ERT noted from the NIR that Ukraine has used AD from different providers, such as Ukrtransgaz, the customs service, industrial enterprises and the state statistical forms. It was recommended in the previous review report that Ukraine: cross-check the AD to ensure that there is no double counting or inconsistencies; develop a mass balance for all fuels in order to ensure the completeness of the AD; and explain the steps taken for these actions in the NIR. In the present annual submission, Ukraine has provided mass balances for natural gas and coal in the annex to the NIR. The ERT commends Ukraine for this improvement. However, the ERT noted that the amount of natural gas production used for the reference approach calculation differs from the amount presented in the natural gas balance in the NIR (table 4.1 in the annex). In response to a question raised by the ERT during the review, Ukraine explained that there was a mistake in the table in the NIR. In addition, mobile combustion of natural gas was included in the fuel used in stationary combustion in table 4.1 in the annex, which led to a discrepancy between the stationary combustion amount in the natural gas balance and the sectoral approach AD reported in the CRF tables. The ERT recommends that Ukraine continue cross-checking the AD and develop mass balances for all fuels and use them in QA/QC procedures to ensure the completeness of the AD.

21. The ERT noted that the NIR for the energy sector is very detailed and has many subchapters and annexes. However, the NIR of the 2013 annual submission is less transparent than that of the 2012 annual submission. For example, the annex 2.4.1, "Estimation of carbon content in natural gas", was significantly reduced in the present annual submission compared with the previous year, without any reference to the original research presented in the 2012 NIR. In addition, there are no explanations in the 2013 NIR about the new methods and calculation parameters which were applied for the 2011 emissions calculations while the rest of the time series were calculated using different methods and parameters (see paras. 22, 33, 35 and 36 below). The ERT recommends that Ukraine improve the transparency of the NIR and provide sufficient explanations for all new methods and calculation parameters, and give all relevant references for country-specific research presented in the previous NIRs.

22. In response to a recommendation made in the previous review report, Ukraine has reported emissions from agricultural off-road vehicles under agriculture/forestry/fisheries for 2011. The ERT commends Ukraine for this improvement. However, the ERT noted that AD and emissions for agriculture/forestry/fisheries are correctly allocated only for 2011, while in the rest of the time series they are still reported under other transportation. This leads to inconsistency of the time series. Also, emissions from other off-road vehicles were allocated by Ukraine to the road transportation category, which is not in line with the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Revised 1996 IPCC Guidelines). In response to a question raised by the ERT during the review, Ukraine explained that off-road transport AD and emissions will be

allocated to manufacturing industries and construction in the 2014 annual submission. However, emissions from ground activities in airports and harbours will continue to be reported under other (fuel combustion) and other transportation, as recommended in the previous review report. This issue is also included in the improvement plan provided in the NIR. The ERT recommends that Ukraine undertake the relevant allocations for agriculture/forestry/fisheries and off-road transport for the entire time series to avoid inconsistency of the time series.

23. As noted in the previous review report, the emissions from petroleum refining and manufacture of solid fuels and other energy industries continue to be included under public electricity and heat production for the period 1990–1997 and reported in a disaggregated manner under the corresponding categories from 1998 onwards. The ERT noted that this leads to an inconsistency in the time series. In response to a question raised by the ERT during the review, Ukraine explained that there were no AD available from the State Statistics Service for these subcategories for the years 1990–1997. The ERT reiterates the recommendation made in the previous review report that Ukraine explore alternative ways for estimating and appropriately allocating the emissions from petroleum refining and from the manufacture of solid fuels and other energy industries for the period 1990–1997 using the guidance in chapter 7 of the *IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC good practice guidance), while ensuring time-series consistency.

24. Ukraine has addressed some of the recommendations made in the previous review report and listed others as planned improvements. The ERT acknowledges the planned improvements and reiterates the following recommendations made in the previous review report:

(a) Develop country-specific CO_2 EFs for motor fuels and residential fuel oil;

(b) Develop country-specific fugitive CH_4 EFs for end users;

(c) Disaggregate the data in the reference approach according to the different coal types;

(d) Include a detailed explanation of the methodology used to estimate liquefied petroleum gas (LPG) and compressed natural gas consumption and the mass balance for LPG;

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

25. The ERT noted inconsistencies between annexes 8.1, "Implementation of ARR 2012 recommendations in the inventory 2013", and 8.2, "Improvement plan". For example, according to annex 8.1, the data in the reference approach will be disaggregated according to the different coal types (see para. 24 above) in the next annual submission, but this improvement is not included in the improvement plan (annex 8.2). The ERT recommends that Ukraine ensure the consistency of these two annexes.

2. Reference and sectoral approaches

26. 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 27–31 below.

Table 5
Review of reference and sectoral approaches

		Paragraph cross-references
Difference between the reference approach and the sectoral approach	Energy consumption: 43.03 PJ, 1.18 % CO_2 emissions: 1,845.47 Gg CO_2, 0.71 %	27
Are differences between the reference approach and the sectoral approach adequately explained in the NIR and the CRF tables?	No	27
Are differences with international statistics adequately explained?	No	28
Is reporting of bunker fuels in accordance with the UNFCCC reporting guidelines?	Yes	29
Is reporting of feedstocks and non-energy use of fuels in accordance with the UNFCCC reporting guidelines?	No	30–31

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

27. Ukraine has provided apparent consumption data and CO_2 emission estimates calculated using the reference approach for the entire time series. The difference between the reference and sectoral approaches in CO_2 emissions is lowest in 2011 (0.7 per cent) compared with 7.6–21.7 per cent for the other years. In response to a question raised by the ERT during the review, Ukraine explained that for 2011, 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 other bituminous coal and natural gas production, respectively, in the reference approach. This is also explained in the documentation box in CRF table 1.A(b). The ERT noted that this approach is not in line with the Revised 1996 IPCC Guidelines, as all coal and natural gas used in the country should be accounted for under apparent consumption. The ERT recommends that Ukraine recalculate coal and natural gas apparent consumption for 2011 using total production data and follow the Revised 1996 IPCC Guidelines for apparent consumption calculations, as was done for the years 1990–2010.

28. Ukraine used the natural gas production amount from the national statistical report form, which is equal to 20,646 million m^3 instead of International Energy Agency (IEA) questionnaire data, which is equal to 20,294 million m^3. The ERT noted that the use of statistical form data is not justified in the NIR and it is not clear whether the same approach was applied for the previous years or not. In response to a question raised by the ERT during the review, Ukraine explained that the difference between natural gas production in the statistical form and in the IEA questionnaire arises because of the differences in natural

gas conditions (such as temperature) used for statistical forms and IEA reporting. The ERT recommends that Ukraine provide the explanations in the NIR clarifying the selection of natural gas production data used in the inventory and ensure that AD are consistent for the entire time series.

International bunker fuels

29. As explained in the previous review report, the detailed specification of flight types, destinations and characteristics, which is used to separate domestic and international aviation, is not available for the period 1991–1995, but is available for the years 1996–2011. Ukraine has therefore calculated aviation bunker emissions in 1990 using an average rate (22 per cent) of domestic flights for 1996–2006. Emissions for the period 1991–1995 were calculated by using an interpolation method based on 1990 and 1996 data. However, a justification for the rate used for 1990 is not provided in the NIR. The ERT reiterates the recommendation made in the previous review report that Ukraine provide justification for the rate of international aviation for 1990.

Feedstocks and non-energy use of fuels

30. According to the information reported in the NIR, Ukraine took into consideration all natural gas and coke used as feedstock in the energy sector when calculating the amount of carbon stored and carbon for non-energy use, consistent with recommendations made in the previous review report. In response to a question raised by the ERT during the review, Ukraine explained that natural gas for non-energy use in ammonia production was subtracted from the total natural gas production and reported under ammonia production (industrial processes sector). In addition, the same amount was subtracted from the total feedstock and non-energy use of natural gas. The ERT noted that this is not in line with the Revised 1996 IPCC Guidelines and recommends that Ukraine account for the total amount of natural gas allocated for feedstock and non-energy use in the calculations on carbon stored.

31. Refinery feedstock (1996–2008) and naphtha (2006–2008) data are reported in the IEA data but not in the CRF tables. In response to questions raised during a previous review, Ukraine had explained that these data were not included in the CRF tables because of their non-energy use. The ERT noted that this is not in line with the Revised 1996 IPCC Guidelines, which require that fuels used for non-energy purposes and as feedstock are included in the calculation of carbon stored and reported in CRF table 1.A(d) and excluded from the energy sector. The ERT reiterates the recommendation made in the previous review report that Ukraine accurately report non-energy use and feedstock data for refinery feedstock and naphtha for the entire time series, and explore and explain, as much as possible, any differences between the information in the CRF tables and the IEA data.

3. Key categories

Stationary combustion: gaseous fuels – CO_2, CH_4 and N_2O[3]

32. In the 2013 annual submission, following a recommendation in the previous review report, Ukraine provided in the NIR information on the split of natural gas use in ammonia production between fuel and feedstock uses. These data are based on the information provided by all six ammonia-producing enterprises. The ERT commends Ukraine for this improvement.

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

Road transportation: liquid fuels – CO_2

33. In the previous review report, it was strongly recommended that Ukraine develop a country-specific CO_2 EF for gasoline, taking into account that CO_2 from road transportation is a key category and that the implied emission factor (IEF) of the 2012 annual submission for 2010 (68.61 t CO_2/TJ) was identified as being among the lowest of the reporting Parties (64.60–73.90 t CO_2/TJ). Ukraine indicated in the NIR of the 2013 annual submission that it intends to carry out this task in 2013 and include the results in the 2014 annual submission. However, during the previous stages of this review, several step changes in CO_2 IEFs for road transportation were identified between the period 1990–2010 and 2011. The identified changes were: diesel oil, from 73.33 t/TJ in 1990–2010 to 76.08 t/TJ in 2011; gasoline, from 68.61 t/TJ in 1990–2010 to 76.07 t/TJ in 2011: and LPG, from 62.44 t/TJ in 1990–2010 to 69.96 t/TJ in 2011. All the IEFs for 2011 are the highest among reporting Parties. In response to questions raised during the previous stages of the review, Ukraine referred to the use of the COPERT IV model, but did not provide sufficient explanations of the increase in the IEFs. The ERT recommends that Ukraine review the CO_2 EFs used for road transportation in 2011, and revise them, if appropriate, and ensure time-series consistency. In addition, the ERT reiterates the strong recommendation made in the previous review report that the Party develop a country-specific CO_2 EF for gasoline based on the carbon content of the fuel and provide a detailed explanation of the methodology used, in the NIR.

34. In the 2013 NIR, following the encouragement in the previous review report, Ukraine provided a comparison between the COPERT IV road transportation emissions estimations applied in the national inventory submission and those calculated using a tier 1 bottom-up approach. The difference in CO_2 emissions for these two approaches is 6.1 per cent for 2011 with the higher emissions estimated by the COPERT IV model. The ERT welcomes the provision of the information in the NIR.

Oil and natural gas: gaseous fuels – CO_2, CH_4 and N_2O[4]

35. In the previous stages of the review, a decrease of 12.7 per cent in CH_4 emissions from natural gas distribution from 305.27 Gg in 2010 to 266.53 Gg in 2011 was identified. The EF is constant from 1990 to 2010 (820,000.00 kg/10^3 km) but decreases to 710,000.00 kg/10^3 km in 2011. The ERT noted that the EF used for 2011 is the highest CH_4 EF from the IPCC good practice guidance table 2.16. In response to a question raised by the ERT during the review, Ukraine explained that the country-specific CH_4 EF used for the period 1990–2010 was calculated on the basis of research performed in the period 1996–2000, but the EF was not considered representative for 2011 due to decreased leakage. To justify the decreased leakage rate, Ukraine provided the ERT with a list of joint implementation projects with references to online reports confirming a significant reduction of leakages in the gas distribution system. Ukraine also explained that, according to the experts' evaluations, leaks have reduced since 2000 by about 15 per cent. The ERT considers that the provided documents confirm the reduction of CH_4 from natural gas distribution. However, the ERT noted that the use of the default IPCC EF for 2011 corresponds to the use of a tier 1 method; however, CH_4 from natural gas distribution is a key category, and, therefore, it is good practice to use a higher tier method (as was done for the rest of the time series). In addition, the ERT noted that the use of an EF for one year which is significantly different from the rest of the time series leads to inconsistency of the time series. The ERT strongly recommends that Ukraine develop a new country-specific CH_4 EF for natural gas

[4] Not all emissions related to all gases under this category are key categories, particularly CO_2 and N_2O emissions. However, since the calculation procedures for the issues related to this category are discussed as a whole, the individual gases are not assessed in separate sections.

distribution and ensure the consistency of the time series by applying a gradual reduction of the EF from 2000. The ERT also recommends that the Party include clear explanations justifying the reduction of leakages with references to the original documents and provide the description of the methodology used in the NIR.

36. At the previous stages of the review it was noted that the CH_4 IEF for flaring (gas) decreased by 54.2 per cent from about 24.00 kg/10^6m^3 in 1990–2010 to 11.00 kg/10^6m^3 in 2011. The CO_2 IEF decreased from about 3,900 kg/10^6m^3 in 1990–2010 to 1,800.00 kg/10^6m^3 in 2011, and the N_2O IEF decreased from 0.046 kg/10^6m^3 in 1990–2010 to 0.021 kg/10^6m^3 in 2011. In response to a question raised by the ERT during the review, Ukraine explained that, in the previous annual submission, an error occurred in the unit conversion. According to the explanation of the Party, for example, the country-specific CO_2 EF for natural gas combustion (55.35 t CO_2/TJ as reported in CRF table 1.A(a)) is equivalent to the CO_2 EF of 1,800.00 kg/10^6m^3 which was used for gas flaring in the inventories before 2012 and is used for the year 2011 in the 2013 annual submission. This value is also equal to the default EF presented in table 2.16 of the IPCC good practice guidance. The ERT considers that the EFs used for 2011 are in line with good practice. However, the ERT noted that the incorrect EFs are still used for the other years in the time series, and recommends that the Party correct the EFs for 1990–2010 to improve accuracy and time-series consistency. Furthermore, the ERT recommends that Ukraine provide clear explanations of the country-specific EFs, unit conversions and any recalculations in the NIR to improve transparency.

C. Industrial processes and solvent and other product use

1. Sector overview

37. In 2011, emissions from the industrial processes sector amounted to 48,783.74 Gg CO_2 eq, or 12.1 per cent of total GHG emissions, and emissions from the solvent and other product use sector amounted to 330.77 Gg CO_2 eq, or 0.1 per cent of total GHG emissions. Since the base year, emissions have decreased by 38.9 per cent in the industrial processes sector, and decreased by 12.2 per cent in the solvent and other product use sector. The key driver for the fall in emissions in the industrial processes sector is a decrease in industrial activities as a result of the transition to a market economy in the early 1990s. Within the industrial processes sector, in 2011, 54.4 per cent of the emissions were from metal production, followed by 22.5 per cent from mineral products, 21.6 per cent from chemical industry and 1.5 per cent from consumption of halocarbons and SF_6. Within the solvent and other product use sector, only emissions from the use of N_2O for anaesthesia were reported.

38. The Party's general QA/QC approach with regard to the industrial processes sector is to collect the data from different sources (e.g. national statistics, directly from enterprises, the Ministry of Industrial Policy) and compare the AD between them. The country-specific EFs (e.g. for limestone and dolomite use, adipic acid production, iron and steel production and ferroalloys production) come from research projects. The country-specific EFs were compared with the IPCC default values and with the country-specific EFs from other Parties. The verification by external experts not involved in the preparation of the inventory was carried out for some categories (e.g. nitric acid production, adipic acid production, iron and steel production and ferroalloys production). The ERT encourages Ukraine to continue implementing verification activities for the other categories.

39. The ERT noted that there are errors and inconsistencies in the information reported in the NIR and in the CRF tables. For example, the notation key "IE" was used for the emissions of HFC-152a from manufacturing, stock and disposal of metered dose inhalers in CRF table 2(II).F, whereas the emissions were reported as not occurring ("NO") in CRF table 2(II); and there were differences in the category code used for pig iron production in

the CRF tables and in annex 3.2.6 of the NIR, as noted also in the previous review report. The ERT reiterates the recommendation made in the previous review report that Ukraine improve consistency within and between the NIR and the CRF tables, in order to improve transparency.

40. In the NIR, Ukraine reported on the progress of the planned improvement in adipic acid production, including scientific research carried out in the project "Development of methodology for calculation and determination of CO_2 emissions in chemical industry", by the Cherkassy Research Institute. In addition, planned improvements in several other categories (e.g. asphalt roofing, glass production, ammonia production, nitric acid production, ferroalloys production, pulp and paper, and consumption of halocarbons and SF_6) were mentioned in the NIR, but no details of the improvements were presented. The ERT recommends that Ukraine provide more details of the planned improvements for these categories in the NIR.

2. Key categories

Lime production – CO_2

41. Ukraine used country-specific EFs for this category for the first time in the 2012 annual submission (0.51–0.71 t CO_2/t). However, it was noted in the previous review report that the ratio of high-calcium lime and dolomitic lime was based on the default ratio (85/15) from the IPCC good practice guidance, and Ukraine was encouraged to collect data in order to obtain a country-specific ratio. The ERT reiterates the encouragement made in the previous review report.

Limestone and dolomite use – CO_2

42. As explained in the previous review report, the amount of limestone used per tonne of pig iron produced in 1990 was very high (151 kg/t of pig iron), compared with the rest of the time series (mainly between 30 and 50 kg/t of pig iron). The data used by Ukraine were based on data from the former Soviet Union. The present ERT noted that the step change in the amount of limestone used per tonne of pig iron produced has remained in the 2013 annual submission. Therefore, the ERT reiterates the recommendation made in the previous review report that Ukraine extrapolate the amount of limestone used per tonne of pig iron produced, compare the value obtained with the one currently used in the inventory, and check whether the inconsistency in the time series owing to the use of the present data could influence emission estimates for iron and steel production and, if necessary, revise the estimates.

43. As noted in the previous review report, Ukraine did not report CO_2 from ceramic production. In the previous review report, Ukraine was encouraged to provide a basic overview of the use of limestone and dolomite as components of raw materials in ceramic production. In response to a question raised by the ERT during the review, Ukraine explained that, according to the technology used for ceramic production in Ukraine, limestone and dolomite are not used as raw materials whereas chalk is used for ceramic production. The ERT noted that calcium carbonate, which is the main component of limestone, is also the main component of chalk. The ERT encourages Ukraine to explore the possibilities of estimating and reporting CO_2 from ceramic production.

3. Non-key categories

Soda ash production and use – CO_2

44. According to the NIR, soda ash is produced in Ukraine using the Solvay process. As noted in the previous review report, the Party has reported CO_2 emissions from soda ash production using the notation key "NA" (not applicable) because, according to the

stoichiometry consideration, CO_2 emissions from soda ash production are equal to zero. However, according to the Revised 1996 IPCC Guidelines, an excess of CO_2 emissions is formed as a result of the coke used for thermal decomposition of limestone. The ERT recommends that the Party report these emissions in the industrial processes sector in line with the Revised 1996 IPCC Guidelines.

Ferroalloys production – CO_2, CH_4 and N_2O

45. For the years 1990–2010, CO_2 emissions from ferroalloys production and from aluminium production were reported as an aggregated value in the category other (metal production) due to confidentiality of aluminium production data. Since May 2010, aluminium production has been discontinued. As a result, for 2011, CO_2 emissions from ferroalloys production were reported separately in the category ferroalloys production, in line with the Revised 1996 IPCC Guidelines. However, the ERT noted that the reporting in the CRF tables does not fully reflect the changed reporting for 2011 in comparison to the other years. CO_2, CH_4, N_2O emissions from the category other (metal production) are reported as "NE" for 2011. Nitrogen oxides (NO_X) and carbon monoxide (CO) from other (metal production) are reported as "IE" and sulphur dioxide (SO_2) emissions as "C" (confidential), whereas these emissions from ferroalloys production are reported as "NO". Furthermore, notation keys "IE" and "C" are used to report NO_X, CO and SO_2 emissions from aluminium production in 2011, even though the activity is not occurring. The ERT recommends that Ukraine correct the notation keys and improve its QC procedures to avoid such inconsistencies.

46. In the 2013 annual submission, Ukraine provided more detailed information on the background parameters for ferroalloys production in the NIR, consistent with recommendations made in the previous review report. The ERT commends Ukraine for the improvement in transparency.

Solvent and other product use – N_2O and NMVOCs

47. To estimate emissions from the use of N_2O for anaesthesia, Ukraine has used data on its national population and the average value of the use of N_2O for anaesthesia per capita in Belarus. In the previous review report, Ukraine was encouraged to develop a country-specific EF for the category and report thereon. According to the NIR, Ukraine is planning to develop a country-specific EF on the use of N_2O for anaesthesia by conducting a research project, "Development guidelines on the measurement of the use of nitrous oxide for medical purposes". The ERT welcomes this planned improvement and encourages Ukraine to report on the progress of the project in the NIR.

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

D. Agriculture

1. Sector overview

49. In 2011, emissions from the agriculture sector amounted to 36,190.30 Gg CO_2 eq, or 9.0 per cent of total GHG emissions. Since 1990, emissions have decreased by 65.1 per cent. The key drivers for the fall in emissions are the decreases in the livestock population, in the amount of fertilizer applied to soils and the area of crop cultivation, and the changes

in manure management practices due to economic recession after the disintegration of the Soviet Union in the early 1990s. Within the sector, in 2011, 61.0 per cent of the emissions were from agricultural soils, followed by 24.2 per cent from enteric fermentation, 12.8 per cent from manure management and 1.7 per cent from indirect N_2O from manure management reported in the category other (agriculture). The remaining 0.3 per cent was from rice cultivation.

2. Key categories

Enteric fermentation – CH_4

50. Ukraine applied an enhanced livestock characterization and country-specific method for cattle and the IPCC tier 2 method for sheep to estimate CH_4 emissions from enteric fermentation. The country-specific method provides for the estimates of gross energy intake for cattle taking into account the amount of feed and the chemical composition and the nutrient density of the diet for each natural zone in Ukraine, which is in line with the IPCC good practice guidance. For other livestock categories, such as buffalo, goats, camels, horses, mules and asses, and swine, the IPCC tier 1 method and default EFs were used. Ukraine also estimated CH_4 emissions from fur farming and rabbits, for which the Revised 1996 IPCC Guidelines does not provide EFs, by deriving the relevant EFs based on the method described in the *2006 IPCC Guidelines for National Greenhouse Gas Inventories*. The ERT acknowledges the efforts made by Ukraine to complete the inventory of the agriculture sector and develop country-specific EFs and methodologies. As a follow-up to improve the inventory, the ERT reiterates the encouragement made in the previous review report that Ukraine conduct a peer review of the country-specific methods by their publication in international scientific literature.

Manure management – CH_4 and N_2O

51. To estimate CH_4 emissions from cattle, the IPCC tier 2 method was applied. As noted in the previous review report, for the estimation of emissions from dairy and non-dairy cattle, the same values of volatile solids (VS) excreted were applied for both animals bred in agricultural enterprises and those bred in private households using the diet norms developed for agricultural enterprises. However, based on the data provided in the NIR, feeding practices in the two types of farms are different. For example, cattle in the agricultural enterprises mainly get rations in the form of concentrates and succulents, whereas roughage and green fodder are mainly used for cattle in the households. The ERT concluded that this leads to an overestimation of emissions from manure of the dairy and non-dairy cattle bred in the private households. The ERT noted that according to the improvement plan, Ukraine plans to conduct research on VS excreted by dairy and non-dairy cattle separately for each type of farm. The ERT welcomes the planned improvement and reiterates the recommendation made in the previous review report that the Party revise the values of VS excreted, as planned.

Direct soil emissions – N_2O

52. To estimate N_2O emissions from the application of crop residues and nitrogen (N)-fixing crops, Ukraine used a country-specific method, which takes into account roots and stubble, their N content and a default EF. Taking into consideration that all N fixed by the N-fixing bacteria is accumulated in the roots of legumes, the AD and N_2O emissions from N-fixing crops were accounted for under the crop residue category and the notation key "IE" was used for N-fixing crops in the CRF tables. The ERT concluded that this approach to estimate emissions from N-fixing crops avoids double counting of N_2O emissions in the agriculture sector.

53. The ERT noted that Ukraine has included the development of country-specific N_2O EFs from agricultural soils in its improvement plan and is going to conduct empirical

research in order to improve the inventory for the agriculture sector. The ERT encourages Ukraine to continue its efforts and report on progress in the NIR.

54. The ERT noted that a decrease of 13.9 per cent in N_2O emissions from cultivation of histosols occurred in 2011 (6.00 Gg N_2O) in comparison with 2010 (6.96 Gg N_2O). However, the NIR does not provide any explanations of the reasons for such an unusual trend. In response to a question raised by the ERT during the review, Ukraine explained that the decrease in N_2O emissions from cultivation of histosols is caused by a decrease in the area of histosols due to insufficient financing of histosols management. The ERT also noted that data on the area of histosols were provided by the State Water Agency for the period 2000–2011. For 1990–1999, the above-mentioned data on the area of histosols were extrapolated. The ERT recommends that Ukraine verify the data on the area of histosols and provide explanations on the fluctuations of the trend of N_2O emissions from cultivation of histosols to improve transparency.

E. Land use, land-use change and forestry

1. Sector overview

55. In 2011, net removals from the LULUCF sector amounted to 7,289.75 Gg CO_2 eq. Since 1990, net removals have decreased by 89.5 per cent. The key driver for the fall in removals is the growth in emissions from cropland (see para. 60 below). Within the sector, in 2011, net removals of 61,891.40 Gg CO_2 eq were from forest land, followed by net emissions of 51,340.40 Gg CO_2 eq from cropland, 3,248.66 Gg CO_2 eq from grassland and 6.40 Gg CO_2 eq from settlements. The remaining 6.18 Gg CO_2 eq were from wetlands. The trend in the LULUCF sector is unstable and depends on a significant variation in net CO_2 emissions from cropland, as clearly explained in the NIR.

56. The ERT found some inconsistency between the areas of forest land converted to other land (i.e. areas of deforestation) reported in the annual land-use change matrices (table 7.4 in the NIR), table 7.5 in the NIR and the CRF tables. In response to a question raised by the ERT during the review, Ukraine explained that the land transition matrix (table 7.4 in the NIR) shows the differences in areas between the previous year and the year of calculation according to the national statistical form 6-zem, which was provided by the State Agency of Land Resources. In addition, Ukraine explained that table 7.5 and the CRF tables show actual data on deforestation, as well as afforestation and reforestation, provided by the State Forest Resources Agency of Ukraine. The ERT recommends that Ukraine revise the annual land-use change matrices and include in them all conversions between land-use categories. The ERT further recommends that the Party check and correct annual land-use change matrices for consistent land presentation in accordance with the CRF tables.

57. The ERT noted that Ukraine has conducted additional scientific research to develop EFs for the different climatic zones. The Party is also planning to continue its work on a geographic information system (GIS) database related to forestry activities. The ERT commends Ukraine for these efforts.

2. Key categories

Forest land remaining forest land – CO_2

58. Ukraine has used the information contained in the GIS database, forest inventory data and accounts from the State Forest Resources Agency of Ukraine as the main data sources for the forest land area assessment, together with data from the national statistical form. The Party has provided a detailed and clear explanation of the methodology used to ensure consistency between the areas reported under the forest land category and the areas

reported for activities under Article 3, paragraph 4, of the Kyoto Protocol. Ukraine also reported detailed information on the methodology and parameters used to estimate the carbon stock changes. The country-specific data on biomass increment and root-to-shoot ratio are reported for the major forest types and natural zones.

59. The net carbon stock changes in mineral soils are reported using the notation key "NO" together with detailed information explaining why mineral soils are not a net source of emissions, including references to published results of scientific investigations. The ERT encourages the Party to estimate and report the emissions and removals from this pool.

Cropland remaining cropland – CO_2

60. The ERT noted the change from removals to emissions from cropland remaining cropland over the period 1990–2011. In 1990, net removals of 13,193.44 Gg CO_2 eq were reported for cropland remaining cropland, while in 2011 emissions of 51,340.40 Gg CO_2 eq were reported. The increase in net emissions is essentially related to the increase in emissions in the mineral soil pool: removals were equal to 25,466.12 Gg CO_2 eq in 1990, while in 2011 the emissions amounted to 52,827.15 Gg CO_2 eq. The ERT also noted that, during the period 1990–2011, the Party reported a decrease in the area of cropland remaining cropland of 3.1 per cent. In the NIR, Ukraine explained that this significant change in net emissions from cropland remaining cropland was a consequence of the variation of several factors, such as the amounts of harvested crops, organic residues and fertilizers applied to soils, and the dynamics of garden planting.

61. Ukraine used a country-specific approach, based on the balance of N fluxes, to estimate emissions and removals from soils. In the NIR, Ukraine provided a detailed explanation of the country-specific factors and parameters used to estimate carbon content in soils, using the N inputs and outputs (e.g. the inputs from dead organic matter and organic fertilizer humification and crop N mineralization). The NIR also notes that the methodology was discussed at a scientific conference and was published in national peer-reviewed journals. In addition, Ukraine included in the improvement plan further investigation for improving national EFs for cropland. The ERT welcomes these efforts.

62. In the CRF tables, Ukraine divided cropland remaining cropland into managed and unmanaged cropland. The ERT noted that, according to the definition in the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF), cropland is not subdivided into managed and unmanaged land. Therefore, the ERT recommends that the Party reallocate lands currently reported as unmanaged croplands to the subcategory 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 definitions provided in the IPCC good practice guidance for LULUCF. If the Party considers that land currently reported as unmanaged cropland corresponds to the definition for cropland in the IPCC good practice guidance for LULUCF, the ERT recommends that the Party transparently report in the NIR on the specific management practices on these lands.

Grassland remaining grassland – CO_2

63. The ERT noted an increasing trend in total emissions from grassland remaining grassland. In 1990, emissions from this category amounted to 606.79 Gg CO_2 eq, but in 2011 they increased to 3,248.66 Gg CO_2 eq, owing to the increase in emissions from organic soils and the decrease in removals from mineral soils. The ERT also noted that, during the period 1990–2011, Ukraine reported an increase in the grassland remaining grassland area of 1.3 per cent and a decrease in the managed grassland area of 63.6 per cent. The Party used a country-specific approach, based on the balance of N fluxes, to estimate emissions and removals from mineral soils, in line with the IPCC good practice

guidance for LULUCF. In the NIR, Ukraine explained that this fluctuation in emissions was a consequence of the variation of several factors, such as changes in management practices.

64. In response to a recommendation made in the previous review report, Ukraine provided the information on methods, EFs and AD used for the calculation of net carbon stock changes in organic soils. The ERT welcomes these efforts.

65. As indicated in the previous stages of the review, the net carbon stock change in mineral soils per area fluctuates and some large inter-annual changes were identified. For example, the net carbon stock change in mineral soils decreased from 0.039 Mg C/ha in 2010 to 0.005 Mg C/ha in 2011 (decrease of 86.5 per cent). From 2007 (0.052 Mg C/ha) to 2008 (0.039 Mg C/ha) the decrease was 25.3 per cent. In response to a question raised during the previous stages of the review, the Party explained the trend by the decreasing crop volume which has resulted in a reduction in the organic input to soil. The ERT considers that the response given by the Party did not fully explain the issue, and recommends that Ukraine verify its calculation of carbon stock change in mineral soils.

3. Non-key categories

N_2O emissions from disturbance associated with land-use conversion to cropland – N_2O

66. Ukraine reported N_2O emissions from disturbance associated with land-use conversion to cropland as "NO", although the Party has provided information about areas of land converted to cropland in CRF tables 5.B and 5(III) for 1990–2011. The ERT recommends that Ukraine report N_2O emissions from disturbance associated with land-use conversion to cropland.

Biomass burning – CO_2, CH_4 and N_2O

67. Ukraine has significant areas of grassland remaining grassland, amounting to 7,127.73 kha in 2011. As noted in the previous review report, an independent source[5] provides information on the areas of grassland burned in Ukraine during the period 2000–2006. The Party has reported biomass burning on grassland using the notation key "NO". Ukraine provided an explanation in the NIR and the CRF tables that the national statistical reports do not contain data on fires on grassland and that the burning of vegetation is officially prohibited by the Code of Ukraine on Administrative Offences. In response to a question raised by the ERT during the review, Ukraine confirmed that no data that could be used as AD for biomass burning on grassland are collected by the national statistics. The Party further explained that considering the recommendation made in the previous review report, the Party plans to contact Ukraine's State Service for Emergency Situations to help to collect the AD needed for the inventory and will estimate emissions from wildfires on grassland in the next annual submission. The ERT welcomes this planned improvement and reiterates the recommendation made in the previous review report that Ukraine collect the necessary AD and report the emissions from wildfires on grassland.

F. Waste

1. Sector overview

68. In 2011, emissions from the waste sector amounted to 11,046.12 Gg CO_2 eq, or 2.8 per cent of total GHG emissions. Since 1990, emissions have increased by 5.0 per cent. The key driver for the rise in emissions is the increase of solid waste disposal on land due

[5] <http://www.iki.rssi.ru/eng/>.

to economic growth and an increase in the consumption level of the population. Within the sector, in 2011, 65.9 per cent of the emissions were from solid waste disposal on land, followed by 34.1 per cent from wastewater handling. The share of waste incineration was 0.004 per cent and the category other (waste composting) represented 0.002 per cent of the sectoral emissions. The emissions from hospital waste incineration and the mobile incinerator in Kharkiv city are reported in the waste sector, whereas emissions from the waste incinerators in Kiev and Dnepropetrovsk are reported in the energy sector, in accordance with the IPCC good practice guidance.

69. Almost all of the recommendations in the 2012 annual review report have been addressed. Ukraine has provided revised estimates for solid waste disposal on land and wastewater handling. Improved AD on industrial waste disposal were used in the 2013 annual submission, and industrial wastewater data were improved by adding new streams such as chemical wood, construction material and food industries. The new data were presented in the relevant tables in the NIR. The ERT commends the Party for these improvements.

70. The ERT commends Ukraine for the improved transparency that has been achieved since the previous annual submission through the reporting of the key parameters for the estimation of emissions in the documentation boxes of the CRF tables and by adequately referencing these key parameters in the NIR. The ERT recommends that Ukraine further improve the transparency of the NIR by providing all the key AD, EFs and other parameters used in the NIR.

2. Key categories

Solid waste disposal on land – CH_4

71. In the 2013 annual submission, Ukraine has continued to improve its reporting of the waste sector by providing country-specific values for the methane correction factor (MCF) (1.0, 0.8 and 0.4) for each category of waste disposal sites (managed, unmanaged deep and unmanaged shallow, respectively), which replaced the average value of 0.726 used for the MCF in the previous annual submission. As a result of the recalculation, CH_4 emissions from solid waste disposal on land increased by 0.4–1.9 per cent during 1990–1994, and decreased by 0.01–3.4 per cent during the time series 1995–2010. The ERT welcomes this improvement.

72. The ERT found some inconsistencies between the reporting in the NIR and the CRF tables similar to those already raised in the previous review report. For example, Ukraine reported in chapter 8.2.1 of the NIR that in 2011, 94 per cent of collected municipal solid waste (MSW) was sent to landfills, whereas in CRF table 6.A, Ukraine reported the fraction of disposed MSW as 92 per cent. The ERT reiterates the recommendation made in the previous review report that Ukraine improve its QC activities in order to prevent such inconsistencies in its reporting.

Wastewater handling – CH_4 and N_2O[6]

73. Ukraine provided recalculated estimates for CH_4 and N_2O from industrial wastewater for the entire time series, using updated values for the biochemical oxygen demand fractions and N content, based on improved statistical data on industrial production. As explained in the NIR, corrections were done for 2007–2011, due to a mistake that occurred in the 2012 annual submission, resulting in double counting of the

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

volume of several products. In addition, data on product production were updated based on the gross domestic product values for 1990–2011. The ERT welcomes the efforts made to improve the accuracy of emission estimates, which are in line with the IPCC good practice guidance. The ERT particularly welcomes the detailed information on the chemical oxygen demand and methane conversion factor values in different wastewater treatment systems.

74. For the estimation of N_2O emissions from human sewage, Ukraine has used protein consumption data from the national statistics. As noted in the previous review report, the national protein consumption data are between 5 and 12 per cent lower in the period 1994–2009 than the protein consumption data published in the statistical database of the Food and Agriculture Organization of the United Nations (FAOSTAT) food balance sheets. The ERT recommends that Ukraine analyse this discrepancy for verification purposes and include the results of the analysis in the NIR.

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

75. Table 6 provides an overview of the information reported and parameters selected by the Party 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

		Findings and recommendations
Has the Party reported information in accordance with the requirements in paragraphs 5–9 of the annex to decision 15/CMP.1?	Sufficient	
Identify any elected activities under Article 3, paragraph 4	Activities elected: forest management Years reported: 2008, 2009, 2010, 2011	
Identify the period of accounting	Commitment period accounting	
Assessment of the Party's ability to identify areas of land and areas of land-use change	Sufficient	76, 77, 80, 84

76. Inconsistencies in the reporting of total area between 2010 and 2011 in KP-LULUCF CRF table NIR-2 were identified. The total area reported in table NIR-2 for 2011 is 60,345.25 kha and the total area for 2010 is 60,356.22 kha. According to the footnote of table NIR-2, this value should be constant for all years. In response to a question raised during the previous stages of the review, the Party explained that the problem occurred due to an afforestation/reforestation area in 1990 which was included as a forest management area in 2011, but could not be included in table NIR-2 for technical reasons (see also para. 84 below). The ERT recommends that the Party improve the land transition matrix to include all areas of land.

77. Inconsistencies in the reporting of the area of the category other in KP-LULUCF CRF table NIR-2 between the current year and the previous year were identified in the previous stages of the review. In CRF table NIR-2 for 2011 the area of the category other in

the beginning of the current inventory year was 50,688.61 kha. However, the corresponding value reported for 2010 as total area at the end of the current inventory year was 50,841.65 kha (difference of 0.3 per cent). There were also small discrepancies between the end of 2009 and beginning of 2010 and the end of 2008 and beginning of 2009. The ERT recommends that Ukraine correct the area reported for the category other in the land transition matrix.

78. During the previous stages of the review, it was noted that in CRF table NIR-1, some GHG activities were indicated as "NO", whereas they were reported as "NA" in the corresponding KP-LULUCF CRF tables. These include N_2O emissions from fertilization in afforestation/reforestation and forest management; N_2O emissions from disturbance associated with land-use conversion to cropland in deforestation; CO_2 from liming in afforestation/reforestation, deforestation and forest management; and CO_2, CH_4 and N_2O from biomass burning in deforestation. In response to a question raised by the ERT during the previous stages of the review, Ukraine explained that this problem does not influence the calculations of net carbon stock change and it plans to correct the use of notation keys. The ERT recommends that the Party carry out this correction.

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

Afforestation and reforestation – CO_2

79. Ukraine has reported the carbon stock changes in below-ground and above-ground biomass, litter, dead wood and soil pools by using country-specific parameters in line with the IPCC good practice guidance for LULUCF. Ukraine has included explanations and background information in the NIR related to the emissions and removals from lands harvested during the first commitment period following afforestation and reforestation on these units of land since 1990. The ERT commends Ukraine for the inclusion of this information in the NIR.

80. During the previous stages of the review, the ERT found some inconsistencies in the reporting of the area of afforestation/reforestation in KP-LULUCF CRF table NIR-2 between 2010 and 2011. Ukraine reported the area of afforestation/reforestation in the beginning of the current inventory year as 232.55 kha for 2011. However, the corresponding value reported for 2010 as total area at the end of the current inventory year was 242.10 kha (difference of 4.1 per cent). In response to a question raised by the ERT during the previous stages of the review, Ukraine provided an explanation that for the time period for conversion from afforestation/reforestation to forest management, the default value (20 years) was chosen, and therefore afforestation/reforestation areas converted in 1990 (9.55 kha) were included in forest management in 2011 (NIR, page 301). The ERT recommends that Ukraine report in table NIR-2 the total area of afforestation/reforestation since 1990 without conversion to forest management land in accordance with the annex to decision 16/CMP.1.

Deforestation – CO_2 and N_2O

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

82. Ukraine reported N_2O emissions from disturbance associated with land-use conversion to cropland as "NA", although the Party has provided information about areas of forest land converted to cropland in CRF tables 5.B and 5(III) for 1990–2011. The ERT also noted that N_2O emissions from forest land converted to cropland continue after the year of deforestation due to the 20-year transition period according to the IPCC good practice guidance for LULUCF. The ERT reiterates the recommendation made in the previous review report that Ukraine estimate and report N_2O emissions from disturbance associated with forest conversion to cropland.

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

Forest management – CO_2

83. Ukraine has reported carbon stock changes in mineral soils as "NO". The NIR provides detailed information and references to country-specific studies, which formed the basis for the conclusion that mineral soils are not a net source of emissions. The ERT agrees with this conclusion.

84. An inconsistency in the area of forest management reported in KP-LULUCF CRF table NIR-2 between the current year and the previous year was identified during the previous stages of the review. The area of forest management for 2011 in the beginning of the current inventory year is 9,374.64 kha. However, the corresponding value reported for 2010 as total area at the end of the current inventory year is 9,223.02 kha (difference of 1.6 per cent). There are also small discrepancies in the forest management area reported between the end of 2009 and beginning of 2010 and the end of 2008 and beginning of 2009. In response to a question raised by the ERT during the previous stages of the review Ukraine provided an explanation that the forest management area is equal to the area of managed forest land reported under the Convention and the differences in areas of forest management between the current year and the previous year depend on the conversion from unmanaged to managed forest. The ERT recommends that the Party include conversion from unmanaged forest (the category other in table NIR-2) to managed forest in table NIR-2 for consistent land representation.

2. Information on Kyoto Protocol units

Standard electronic format and reports from the national registry

85. 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.[7] The SIAR was forwarded to the ERT prior to the review, pursuant to decision 16/CP.10.

86. 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.

[7] 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.

87. Information reported by Ukraine on records of any discrepancies and on any records of non-replacement was found to be consistent with the information provided to the secretariat by the ITL. The national registry has adequate procedures in place to minimize discrepancies.

Calculation of the commitment period reserve

88. In its 2013 annual submission, Ukraine reported its commitment period reserve to be 1,915,907,909 t CO_2 eq based on the national emissions in its most recently reviewed inventory (383,181.58 Gg CO_2 eq). The Party based the calculation of its commitment period reserve on its 2012 annual submission. In response to a question raised by the ERT during the review, explaining that when the annual review report is published the most recently reviewed inventory will be 2013, Ukraine recalculated its commitment period reserve to be 2,007,881,402 t CO_2 eq. The ERT agrees with this figure.

3. Changes to the national system

89. Ukraine reported that there is a change in its national system since the previous annual submission. The Party described the change, which is related to a change in the Act of the Cabinet of Ministers No. 554 of 26 April 2006, in its NIR. The change, initiated by SEIA, is related to clarifying the procedure for querying the information necessary for inventory preparation: now all organizations and enterprises, independent of type of ownership, are obliged to provide this information within a 30-day period. The ERT concluded that this change improves the interaction between entities involved in the inventory preparation process and that the Party's national system continues to be in accordance with the requirements of national systems outlined in decision 19/CMP.1.

4. Changes to the national registry

90. 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 decisions of the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol.

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

91. 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. In response to questions raised by the ERT during the review, Ukraine explained that it continues to perform its activities reported under Article 3, paragraph 14, as described in the 2012 annual submission, particularly through the training activities for developing countries. Ukraine further confirmed that there were no additional activities reported under Article 3, paragraph 14, thus no changes were made in the 2013 annual submission compared with the 2012 annual submission. The ERT concluded that, taking into account the response provided, the information is complete and transparent. The ERT reiterates the recommendation made in the previous review report that Ukraine report any change in its information provided under Article 3, paragraph 14, in accordance with decision 15/CMP.1, annex, chapter I.H.

92. In the NIR of its 2013 annual submission, Ukraine reported that 14 Ukrainian universities provide educational courses on meteorology, climatology, environmental sciences and energy efficiency for students from developing countries and other countries of the Commonwealth of Independent States. Furthermore, Ukraine reported that the

Ukrainian business community and technology development companies are involved in clean development mechanism projects and the transfer of technologies to Parties not included in Annex I to the Convention in Eastern Europe and Asia, in particular for the use of non-conventional energy resources, such as biomass.

III. Conclusions and recommendations

A. Conclusions

93. Table 7 summarizes the ERT's conclusions on the 2013 annual submission of Ukraine, in accordance with the Article 8 review guidelines.

Table 7
Expert review team's conclusions on the 2013 annual submission of Ukraine

		Paragraph cross-references
The ERT concludes that the inventory submission of Ukraine is complete (categories, gases, years and geographical boundaries and contains both an NIR and CRF tables for 1990–2011)		
Annex A sources[a]	Complete	
LULUCF[a]	Not complete	66, 67
KP-LULUCF	Not complete	82
The ERT concludes that the inventory submission of Ukraine has been prepared and reported in accordance with the UNFCCC reporting guidelines	Yes	30–31
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	88, 91
The Party's inventory is in accordance with the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*, the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* and the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry*	Yes	30–31, 62
Ukraine has reported information on Article 3, paragraphs 3 and 4, of the Kyoto Protocol	Yes	
The Party 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	86
The national system continues to perform its required functions as set out in the annex to decision 19/CMP.1	Yes	89
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	90
Did the Party provide information in the NIR on changes in its reporting of the minimization of adverse impacts in accordance with Article 3,	No	91

	Paragraph cross-references
paragraph 14, of the Kyoto Protocol?	

Abbreviations: Annex A sources = sources 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, KP-LULUCF = land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, LULUCF = land use, land-use change and forestry, 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".

[a] The assessment of completeness by the expert review team 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 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*).

B. Recommendations

94. The ERT identified the issues for improvement listed in table 8. All recommendations are for the next annual submission, unless otherwise specified.

Table 8
Recommendations identified by the expert review team

Sector	*Category*	*Recommendation*	*Paragraph cross-reference*
Cross-cutting	Key categories	Enhance the consistency between CRF table 7 and the NIR	Table 4
	Uncertainty analysis	Keep the reported information on uncertainty fluctuations updated	Table 4
	Quality control	Strengthen the QC procedures in order to improve consistency of the NIR	Table 4
Energy	General	Include the energy balance in the NIR (at least for the year previous to the last inventory year) and provide an explanation of the inconsistencies between the energy balance and the CRF tables	19
		Continue cross-checking the AD and develop mass balances for all fuels and use them in QA/QC procedures to ensure the completeness of the AD	20
		Improve the transparency of the NIR and provide sufficient explanations for all new methods and calculation parameters, and give all relevant references for country-specific research presented in the previous NIRs	21
		Undertake the relevant allocations for agriculture/forestry/fisheries and off-road transport for the entire time series to avoid inconsistency of the time series	22
		Explore alternative ways for estimating and appropriately allocating the emissions from petroleum refining and from the manufacture of solid fuels and other energy industries for the period 1990–1997, while ensuring time-series	23

Sector	*Category*	*Recommendation*	*Paragraph cross-reference*
		consistency	
		Carry out the improvements included in the annex 8.1 in the NIR based on the recommendations made in the previous review report	24
		Ensure the consistency between annexes 8.1 and 8.2, in the NIR	25
	Comparison of the reference approach with the sectoral approach and international statistics	Recalculate coal and natural gas apparent consumption for 2011 using total production data and follow the Revised 1996 IPCC Guidelines for apparent consumption calculations	27
		Provide the explanations clarifying the selection of natural gas production data used in the inventory and ensure that AD are consistent for the entire time series	28
	International bunker fuels	Provide justification for the fraction of international aviation for 1990	29
	Feedstocks and non-energy use of fuels	Account for the total amount of natural gas allocated for feedstock and non-energy use in the calculations on carbon stored	30
		Accurately report non-energy use and feedstock data for refinery feedstock and naphtha for the entire time series, and explore and explain, as much as possible, any differences between the information in the CRF tables and the IEA data	31
	Road transportation: liquid fuels – CO_2	Review the CO_2 EFs used for road transportation in 2011, revise them, if appropriate, and ensure time-series consistency	33
		Develop a country-specific CO_2 EF for gasoline based on the carbon content of the fuel and provide a detailed explanation of the methodology used, in the NIR	33
	Oil and natural gas: gaseous fuels – CO_2, CH_4 and N_2O	Develop a new country-specific CH_4 EF for natural gas distribution and ensure the consistency of the time series by applying a gradual reduction of the EF from 2000	35
		Include clear explanations justifying the reduction of leakages with references to the original documents and provide the description of the methodology used in the NIR	35
		Correct the EFs for 1990–2010 to improve accuracy and time-series consistency	36

Sector	*Category*	*Recommendation*	*Paragraph cross-reference*
		Provide clear explanations of the country-specific EFs, unit conversions and any recalculations	36
Industrial processes and solvent and other product use	General	Improve consistency within and between the NIR and the CRF tables	39
		Provide more details of the planned improvements for asphalt roofing, glass production, ammonia production, nitric acid production, ferroalloys production, pulp and paper, and consumption of halocarbons and SF_6	40
	Limestone and dolomite use – CO_2	Extrapolate the amount of limestone used per tonne of pig iron produced for 1990, compare the value obtained with the one currently used in the inventory, and check whether the inconsistency in the time series owing to the use of the present data could influence emission estimates for iron and steel production and, if necessary, revise the estimates	42
	Soda ash production and use – CO_2	Report CO_2 emissions from coke used for thermal decomposition of limestone in the industrial processes sector in line with the Revised 1996 IPCC Guidelines	44
	Ferroalloys production – CO_2, CH_4 and N_2O	Correct the notation keys and improve QC procedures to avoid inconsistencies	45
Agriculture	Manure management – CH_4 and N_2O	Revise the values of VS excreted by dairy and non-dairy cattle separately for each type of farm	51
	Direct soil emissions – N_2O	Verify the data on the area of histosols and provide explanations on the fluctuations of the trend of N_2O emissions from cultivation of histosols	54
LULUCF	General	Revise the annual land-use change matrices and include in them all conversions between land-use categories	56
		Check and correct annual land-use change matrices for consistent land presentation in accordance with the CRF tables	56
	Cropland remaining cropland – CO_2	Reallocate lands currently reported as unmanaged croplands 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, or transparently report in the NIR on the specific management practices on these lands	62
	Grassland remaining	Verify the calculation of carbon stock change in mineral	65

Sector	*Category*	*Recommendation*	*Paragraph cross-reference*
	grassland – CO_2	soils	
	N_2O emissions from disturbance associated with land-use conversion to cropland – N_2O	Report N_2O emissions from disturbance associated with land-use conversion to cropland	66
	Biomass burning – CO_2, CH_4 and N_2O	Collect the necessary AD and report the emissions from wildfires on grassland	67
Waste	General	Further improve the transparency of the NIR by providing all the key AD, EFs and other parameters used in the NIR	70
	Solid waste disposal on land – CH_4	Improve the QC activities in order to prevent inconsistencies between the reporting in the NIR and the CRF	72
	Wastewater handling – CH_4 and N_2O	Analyse the discrepancy between protein consumption data from the national statistics and published in the FAOSTAT food balance sheets for verification purposes and include the results of the analysis in the NIR	74
KP-LULUCF	General	Improve the land transition matrix to include all areas of land	76
		Correct the area reported for the category other in the land transition matrix	77
		Use the correct notation keys in CRF table NIR-1	78
	Afforestation and reforestation – CO_2	Report in table NIR-2 the total area of afforestation/reforestation since 1990 without conversion to forest management land in accordance with the annex to decision 16/CMP.1	80
	Deforestation – CO_2 and N_2O	Estimate and report the carbon stock changes for below-ground and above-ground biomass pools separately, using the country-specific parameters reported in the NIR	81
		Estimate and report N_2O emissions from disturbance associated with forest conversion to cropland	82
	Forest management – CO_2	Include conversion from unmanaged forest (the category other in table NIR-2) to managed forest in table NIR-2 for consistent land representation	84
Article 3, paragraph 14		Report any change in information provided under Article 3, paragraph 14, in accordance with decision 15/CMP.1, annex, chapter I.H.	91

Abbreviations: AD = activity data, CRF = common reporting format, EF = emission factor, FAOSTAT = statistical database of the Food and Agriculture Organization of the United Nations , IEA = International Energy Agency, IPCC = Intergovernmental Panel on Climate Change, KP-LULUCF = land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, LULUCF = land use, land-use change and forestry, NIR = National inventory report, QA = quality assurance, QC = quality control, VS = volatile solids.

IV. Questions of implementation

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

Annex I

Background data on recalculations and information to be included in the compilation and accounting database

Table 9
Recalculations in the 2013 annual submission for the base year and the most recent year

	1990	*2010*	*1990*	*2010*	
Greenhouse gas source and sink categories	*Value of recalculation (Gg CO_2 eq)*		*Per cent change*		*Reason for the recalculation*
1. Energy					
A. Fuel combustion (sectoral approach)					
1. Energy industries					
2. Manufacturing industries and construction					
3. Transport					
4. Other sectors					
5. Other					
B. Fugitive emissions from fuels					
1. Solid fuels					
2. Oil and natural gas					
2. Industrial processes					
A. Mineral products					
B. Chemical industry					
C. Metal production					
D. Other production					
E. Production of halocarbons and SF_6					
F. Consumption of halocarbons and SF_6					
G. Other					
3. Solvent and other product use					
4. Agriculture					
A. Enteric fermentation					
B. Manure management					
C. Rice cultivation					
D. Agricultural soils					
E. Prescribed burning of savannas					
F. Field burning of agricultural residues					
G. Other					
5. Land use, land-use change and forestry					
A. Forest land					
B. Cropland					
C. Grassland					

Greenhouse gas source and sink categories	*1990*	*2010*	*1990*	*2010*	*Reason for the recalculation*
	Value of recalculation (Gg CO_2 eq)		*Per cent change*		
D. Wetlands					
E. Settlements					
F. Other land					
G. Other					
6. Waste	316.80	29.81	3.1	0.3	Changed EFs and AD
A. Solid waste disposal on land	105.63	–134.27	1.9	–1.8	
B. Wastewater handling	211.16	164.08	4.7	4.6	
C. Waste incineration					
D. Other					
7. Other					
Total CO_2 equivalent without LULUCF	316.80	29.81	0.0	0.0	
Total CO_2 equivalent with LULUCF	316.80	29.81	0.0	0.0	

Abbreviations: AD = activity data, EFs = emission factors, LULUCF = land use, land-use change and forestry.

Table 10
Information to be included in the compilation and accounting database in t CO_2 eq for 2011, including the commitment period reserve

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Commitment period reserve	1 915 907 909	2 007 881 402		2 007 881 402
Annex A emissions for 2011				
CO_2	305 463 582			305 463 582
CH_4	63 329 941			63 329 941
N_2O	32 056 517			32 056 517
HFCs	717 421			717 421
PFCs	IE, NA, NO			IE, NA, NO
SF_6	8 819			8 819
Total Annex A sources	401 576 280			401 576 280
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	–441 079			–441 079
3.3 Deforestation for 2011	6 399			6 399
Activities under Article 3, paragraph 4, for 2011[c]				
3.4 Forest management for 2011	–61 282 085			–61 282 085
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 in the base year				

Abbreviations: 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] 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 2010

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Annex A emissions for 2010				
CO_2	289 707 966			289 707 966
CH_4	63 859 236			63 859 236
N_2O	28 952 983			28 952 983
HFCs	658 046			658 046
PFCs	22 982			22 982
SF_6	10 179			10 179
Total Annex A sources	383 211 391			383 211 391
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			105
Activities under Article 3, paragraph 4, for 2010[c]				
3.4 Forest management for 2010	–55 816 816			–55 816 816
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 in the base year				

[a] "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).
[b] "Final" includes revised estimates, if any, and/or adjustments, if any.
[c] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

Table 12
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	274 633 145			274 633 145
CH_4	62 995 260			62 995 260
N_2O	27 035 899			27 035 899
HFCs	586 032			586 032
PFCs	46 493			46 493
SF_6	9 810			9 810
Total Annex A sources	365 306 639			365 306 639
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	1 802			1 802
Activities under Article 3, paragraph 4, for 2009[c]				
3.4 Forest management for 2009	–58 197 855			–58 197 855
3.4 Cropland management for 2009				
3.4 Cropland management for 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 in the base year				

[a] "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).
[b] "Final" includes revised estimates, if any, and/or adjustments, if any.
[c] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

Table 13
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	324 540 642			324 540 642
CH_4	66 337 034			66 337 034
N_2O	29 651 831			29 651 831
HFCs	571 577			571 577
PFCs	150 158			150 158
SF_6	9 788			9 788
Total Annex A sources	421 261 030			421 261 030
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			329 140
Activities under Article 3, paragraph 4, for 2008[c]				
3.4 Forest management for 2008	–56 351 813			–56 351 813
3.4 Cropland management for 2008				
3.4 Cropland management for 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 in the base year				

[a] "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).
[b] "Final" includes revised estimates, if any, and/or adjustments, if any.
[c] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

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>.

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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>.

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

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FCCC/ARR/2012/UKR. Report of the individual review of the annual submission of Ukraine submitted in 2012. Available at <http://unfccc.int/resource/docs/2013/arr/ukr.pdf>.

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

B. Additional information provided by the Party

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

Annex III

Acronyms and abbreviations

AD	activity data
C	confidential
CH_4	methane
CO	carbon monoxide
CO_2	carbon dioxide
CO_2 eq	carbon dioxide equivalent
CRF	common reporting format
EF	emission factor
ERT	expert review team
FAOSTAT	statistical database of the Food and Agriculture Organization of the United Nations
GHG	greenhouse gas; unless indicated otherwise, GHG emissions are the sum of CO_2, CH_4, N_2O, HFCs, PFCs and SF_6 without GHG emissions and removals from LULUCF
GIS	geographic information system
ha	hectare
HFCs	hydrofluorocarbons
IE	included elsewhere
IEA	International Energy Agency
IEF	implied emission factor
IPCC	Intergovernmental Panel on Climate Change
ITL	international transaction log
kg	kilogram (1 kg = 1,000 grams)
kha	kilohectare
km	kilometre
KP-LULUCF	land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol
LPG	liquefied petroleum gas
LULUCF	land use, land-use change and forestry
m^3	cubic metre
MCF	methane correction factor
Mg	megagram (1 Mg = 1 tonne)
MSW	municipal solid waste
N	nitrogen
N_2O	nitrous oxide
NA	not applicable
NE	not estimated
NIR	national inventory report
NMVOCs	non-methane volatile organic compounds
NO	not occurring
NOx	nitrogen oxides
PFCs	perfluorocarbons
PJ	petajoule (1 PJ = 10^{15} joule)
QA/QC	quality assurance/quality control
SEF	standard electronic format
SF_6	sulphur hexafluoride
SIAR	standard independent assessment report
SO_2	sulphur dioxide
TJ	terajoule (1 TJ = 10^{12} joule)

UNFCCC	United Nations Framework Convention on Climate Change
VS	volatile solids