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Report of the individual review of the annual submission of Ukraine submitted in 2009*

* In the symbol for this document, 2009 refers to the year in which the inventory was submitted, and not to the year of publication.

CONTENTS

I. Overview

A. Introduction

1. This report covers the centralized review of the 2009 annual submission of Ukraine, coordinated by the UNFCCC secretariat, in accordance with decision 22/CMP.1. The review took place from 14 to 19 September 2009 in Bonn, Germany, and was conducted by the following team of nominated experts from the UNFCCC roster of experts: generalist – Ms. Katarina Mareckova (European Union); energy – Mr. Christo Christov (Bulgaria), Mr. Takeshi Enoki (Japan) and Mr. Norbert Nziramasanga (Zimbabwe); industrial processes – Mr. Riccardo De Lauretis (Italy) and Ms. Valentina Idrissova (Kazakhstan); agriculture – Mr. Jorge Alvarez (Peru) and Ms. Anna Romanovskaya (Russian Federation); land use, land-use change and forestry (LULUCF) – Mr. Emil Cienciala (Czech Republic) and Mr. Xiaoquan Zhang (China); and waste – Ms. Medea Inashvili (Georgia) and Mr. Seungdo Kim (Democratic People's Republic of Korea). Ms. Romanovskaya and Mr. Zhang were the lead reviewers. The review was coordinated by Ms. Ruta Bubniene (UNFCCC secretariat).

2. In accordance with the "Guidelines for review under Article 8 of the Kyoto Protocol" (decision 22/CMP.1), a draft version of this report was communicated to the Government of Ukraine, which provided comments that were considered and incorporated, as appropriate, into this final version of the report.

B. Emission profiles and trends

3. In 2007, the main greenhouse gas (GHG) in Ukraine was carbon dioxide (CO_2), accounting for 78.0 per cent of total GHG emissions[1] expressed in CO_2 eq, followed by methane (CH_4) (16.5 per cent) and nitrous oxide (N_2O) (5.4 per cent). Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6) collectively accounted for 0.4 per cent of the overall GHG emissions in the country. The energy sector accounted for 68.7 per cent of the total GHG emissions, followed by industrial processes (22.4 per cent), agriculture (6.6 per cent), waste (2.2 per cent), and solvent and other product use (0.07 per cent). Total GHG emissions amounted to 436,005.27 Gg CO_2 eq and decreased by 35.9 per cent between the base year[2] and 2007. The expert review team (ERT) found that the overall decreasing trends of GHG emissions in Ukraine are reasonable and comparable with that of other Parties with economies in transition.

4. Tables 1 and 2 show GHG emissions by gas and by sector, respectively. Table 1 includes emissions from Annex A sources only and excludes emissions and removals from the LULUCF sector.

[1] In this report, the term "total GHG emissions" refers to the aggregated national GHG emissions expressed in terms of 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. Total greenhouse gas emissions by gas, 1990–2007[a]

Greenhouse gas	Gg CO_2 eq							Change base year–2007 (%)
	Base year[b]	1990	1995	2000	2005	2006	2007	
CO_2	715 608.93	715 608.93	389 242.27	289 132.50	320 688.67	338 890.45	340 147.29	–52.5
CH_4	151 373.12	151 373.12	95 733.84	77 344.02	73 866.23	74 347.83	72 026.51	–52.4
N_2O	58 847.98	58 847.98	36 867.57	23 131.44	22 774.57	23 391.42	23 651.91	–59.8
HFCs	NA, NE, NO	NA, NE, NO	NA, NE, NO	5.98	76.69	41.41	46.24	NA
PFCs	203.23	203.23	153.45	99.74	122.66	95.80	133.33	–34.4
SF_6	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA

Abbreviations: NA = not applicable, NE = not estimated, NO = not occurring

[a] Total GHG emissions includes emissions from Annex A sources only (excludes emissions/removals from the LULUCF sector).

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

Table 2. Greenhouse gas emissions by sector, 1990–2007

Sector	Gg CO_2 eq							Change base year–2007 (%)
	Base year[a]	1990	1995	2000	2005	2006	2007	
Energy	685 470.59	685 470.59	387 793.51	271 664.04	294 381.93	306 239.65	299 740.32	–56.3
Industrial processes	127 953.37	127 953.37	59 909.27	74 988.28	83 656.41	90 581.17	97 669.52	–23.7
Solvent and other product use	376.80	376.80	372.11	354.89	340.38	338.52	336.35	–10.7
Agriculture	103 804.25	103 804.25	65 373.76	34 021.83	29 899.59	30 214.81	28 780.70	–72.3
LULUCF	NA	–73 146.16	–54 940.97	–51 620.20	–34 874.21	–35 239.20	–43 456.70	NA
Waste	8 428.24	8 428.24	8 548.48	8 684.65	9 250.52	9 392.75	9 478.39	12.5
Other	NA	NA	NA	NA	NA	NA	NA	NA
Total (with LULUCF)	NA	852 887.10	467 056.17	338 093.49	382 654.61	401 527.69	392 548.58	NA
Total (without LULUCF)	926 033.26	926 033.26	521 997.13	389 713.69	417 528.82	436 766.89	436 005.27	–52.9

Abbreviations: LULUCF = land use, land-use change and forestry, NA = not applicable.

[a] "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.

C. Annual submission and other sources of information

5. The 2009 annual inventory submission was submitted on 25 May 2009; it contains a complete set of common reporting format (CRF) tables for the period 1990–2007, and a national inventory report (NIR). Ukraine also submitted, in part, on a voluntary basis, information required under Article 7, paragraph 1, of the Kyoto Protocol on activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, accounting of Kyoto Protocol units, information on changes in the national system and in the national registry. The standard electronic format (SEF) tables were submitted on 14 May 2009. The annual submission was submitted in accordance with decision 15/CMP.1. The Party indicated that the 2009 submission is also its voluntary submission under the Kyoto Protocol.

6. Where necessary, the ERT also used the previous years' submission during the review. In addition, the ERT used the Standard Independent Assessment Report (SIAR), Parts I and II, to review information on the accounting of Kyoto Protocol units (including the SEF tables and their comparison report) and on the national registry.[3]

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

Completeness of the inventory

8. The inventory is complete in terms of years and geographical coverage and covers most source and sink categories. Ukraine has provided CRF tables for the years 1990–2007 and included all relevant tables. The reporting in the CRF tables is complete and notation keys are used throughout. Ukraine has submitted the CRF tables for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol for the period 2003–2007. Completeness in the coverage of sink and source categories has improved since the previous submission, as all key categories that account for a significant share of total emissions or removals are estimated. The ERT commends the efforts made by the Party.

9. However, Ukraine still reports a number of categories as "NE" including: fugitive CO_2 emissions from coal mining and handling and solid fuel transformation and from oil exploration and production, storage/refining, distribution of oil products, venting of oil and gas, PFC, HFC and SF_6 emissions from foam blowing, fire extinguishers, aerosols/metered dose inhalers and solvents, CO_2 emissions from silicon carbide production, CO_2 emissions from organic soils in forest land remaining forest land, GHG emissions and sinks in land converted to land-use categories other than forest land, GHG emissions from biomass burning on land converted to forest land and on grassland and 'other land' category.

10. In response to the questions raised by the ERT during the centralized review regarding completeness, Ukraine noted that research studies were planned for estimation of several of the above-mentioned categories, but the plans were cancelled due to lack of financial resources as a result of the economic crisis. Ukraine informed the ERT during the centralized review about its intention to take into account a number of recommendations provided by the ERT in its next annual submission. The ERT appreciates this intention of the Party. The ERT recommends that Ukraine continue improving the

[3] The SIAR, Parts I and II, is prepared by an independent assessor in line with decision 16/CP.10 (paras. 5 (a), 6 (c) and 6 (k)), under the auspices of the international transaction log (ITL) administrator using procedures agreed during the meetings of the Registry System Administrators Forum. Part I is a completeness check of the submitted information relating to the accounting of Kyoto Protocol units (including the SEF tables and their comparison report) and to national registries. Part II contains a substantive assessment of the submitted information and identifies any potential problem regarding information on the accounting of Kyoto Protocol units and the national registry. The SIAR is not publicly available.

completeness of the GHG inventory and that it in its next annual submission estimate emissions and removals for all categories for which 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) provide methodologies.

D. Main findings

11. The inventory is generally in line with the IPCC guidelines and 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) and the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Revised 1996 IPCC Guidelines). Some methods and emission factors (EFs) are used from the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* (e.g. for indirect N_2O emissions from manure management systems).

12. Most recommendations from the previous review report have been taken into account in the 2009 submission. Key categories are estimated using tier 2, tier 3 and country-specific methodologies which is good practice. However, the ERT noted that the reporting could be further improved in terms of transparency of descriptions of country-specific EFs (e.g. for $Frac_{GASF}$ and $Frac_{GASM}$ in agriculture) and activity data (AD) used (e.g. for limestone use and coke production), improving the identification of areas for land-use categories in the LULUCF sector and the description of quality assurance/quality control (QA/QC) procedures and uncertainty assessment.

13. The ERT acknowledged the timely response to the questions raised by the ERT during the review and noted Ukraine's intention to include improvements recommended by the ERT in its next annual submission. By supplying additional information requested by the ERT, Ukraine has demonstrated sufficient capacity to comply with the "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories" (hereinafter referred to as the UNFCCC reporting guidelines) and the IPCC good practice guidance.

14. The Party has submitted, in part, on a voluntary basis, supplementary information required under Article 7, paragraph 1, of the Kyoto Protocol in accordance with Part I of the annex to decision 15/CMP.1. The Party has not submitted information on the minimization of adverse impacts under Article 3, paragraph 14, of the Kyoto Protocol on a voluntary basis.

15. Ukraine has reported information on activities under Article 3, paragraph 3, and elected activities (forest management) under Article 3, paragraph 4, of the Kyoto Protocol, in accordance with section I D of the annex to decision 15/CMP.1. Ukraine has submitted the CRF tables for activities under Article 3, paragraph 3 and 4, of the Kyoto Protocol for the period 2003–2007.

16. Ukraine has reported information on its accounting of Kyoto Protocol units in accordance with section I E of the annex to decision 15/CMP.1, and used the SEF tables as required by decision 14/CMP.1.

17. The national system continues to perform its required functions as set out in the annex to decision 19/CMP.1. Ukraine reported in its 2009 submission a change to the national system, namely the adoption of the regulation, regarding preparation of national GHG inventory.

18. 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 decisions of the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol (CMP). The changes in the national registry performed by Ukraine have been reported in the NIR.

19. The ERT encourages Ukraine to explore the possibility of structuring its reporting in its next annual submission in accordance with the annotated outline of the NIR, and the guidance contained therein, which can be found on the UNFCCC website.[4]

20. In the course of the review, the ERT formulated a number of recommendations relating to the completeness (see paras. 41, 54 and 57 below), transparency (see paras. 35–37, 41, 45, 50, 62, 65, 77, 82, 88 below) and accuracy (see para. 65 below) of reporting. Recommendations are presented in the sector chapters of this report.

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

1. Overview

21. The ERT concluded that the national system and its major institutional arrangements continued to perform their required functions. The NIR and additional information provided by the Party during the centralized review describe the national system and institutional arrangements for the preparation of the inventory. The Ministry of Environment has overall responsibility for the planning, preparation and management of the national inventory. The National Environmental Investment Agency of Ukraine was established in 2007, is responsible for supporting the functionality of the national system, particularly regarding the preparation and management of the inventory. Ministries, agencies and regional administrations, the Ukrainian academy of science and related scientific institutes, Ukrainian hydrometeorological research institute, Ukrainian forestry research institute, independent experts and non-governmental organizations are also involved in the preparation of the inventory. Noting the potential for the provision of AD from private oil and gas companies, the ERT recommends that Ukraine clarify the role of these companies in the national system in its next annual submission.

22. The NIR provides information on the change made in the legal basis for the national system since the previous annual submission; these changes are discussed in paragraph 108 below. A lack of transparency in the CRF tables for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol submitted did not allow the ERT to assess the capacity of the national system to identify land areas subject to reporting under Article 3, paragraphs 3 and 4, of the Kyoto Protocol.

2. Inventory planning

23. Ministry of Environment of Ukraine is the single national entity responsible for the allocation of specific responsibilities in the inventory development process, including those related to the choice of methods, data collection (particularly AD and EFs from the statistics agency and other entities) and processing and archiving of information. The Ministry of Environment adopted a plan for the preparation of the national GHG inventory and a plan for QA/QC of the AD and emission estimates used in the annual national inventory. Ukraine has provided the QA/QC plan and related explanatory information in the NIR in accordance with the recommendations made in the previous review report.

24. The ERT noted that there is still a lack of information in the NIR on the QA procedures conducted and their results. The QA/QC plan does not include a schedule indicating dates for performing quality checks and quality assurance, and does not specify who is responsible for these tasks. The ERT strongly recommends that Ukraine provide all of the required information on its QA/QC plan, and annual QA procedures and their results in its next annual submission. The ERT concluded that the

[4] <http://unfccc.int/files/national_reports/annex_i_ghg_inventories/reporting_requirements/application/pdf/annotated_nir_outline.pdf>.

overall organization of the national system, including institutional, procedural and legal arrangements, ensures that there is sufficient capacity for the estimation and timely reporting of GHG emissions.

3. Inventory preparation

Key categories

25. Ukraine has reported a key category tier 1 analysis, both level and trend assessments, as part of its 2009 submission for the years 1990 and 2007. The key category analysis performed by the Party and that performed by the secretariat[5] produced similar results. Minor differences for CH_4 emissions from oil and natural gas could be explained by a higher level of disaggregation used by Ukraine. In addition to the key categories identified in the key category analysis performed by the secretariat, Ukraine identified N_2O emissions from road transportation as a key category in 2007.

26. Ukraine has provided key category analyses, including and excluding the LULUCF sector, which is in accordance with the IPCC good practice guidance and the IPCC good practice guidance for LULUCF. The ERT noted that Ukraine is using the key category analysis to prioritize improvements in the inventory.

27. Ukraine has identified two key categories for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, namely forest management as well as afforestation and reforestation. The analysis was performed in accordance with the guidance on establishing the relationship between activities under the Kyoto Protocol and the associated key categories in the UNFCCC inventory (CO_2 from forest land remaining forest land) as provided in chapter 5.4.4 of the IPCC good practice guidance for LULUCF.

Uncertainties

28. In the 2009 submission, Ukraine provided quantitative tier 1 level and trend uncertainty assessment following the IPCC good practice guidance, and reported uncertainty estimates for AD and EFs. Uncertainty in the LULUCF sector is not included in the uncertainty analysis of the overall inventory, but is reported separately as 11.7 per cent in the NIR. The ERT recommends that Ukraine conduct an uncertainty assessment including the LULUCF sector in addition to existing analyses and that it reports the results in its next annual submission.

29. Cumulative uncertainty of total GHG emissions for 2007 is 5.4 per cent, which is lower than that reported in the previous annual submission for 2006 (7.3 per cent). Ukraine explained that this is the result of increased accuracy in the estimations following the development of a country-specific EF for solid waste disposal on land. The ERT noted that only uncertainties for total sectoral AD and EFs are reported in sectoral chapters of the NIR but sources of information are not referenced. The ERT recommends that Ukraine provide references for sources of the uncertainty ranges used and assumptions applied.

Recalculations and time-series consistency

30. Recalculations have been performed and reported in accordance with the IPCC good practice guidance. The ERT noted that recalculations reported by Ukraine for the period 1990–2006 have been

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

undertaken following the inclusion of categories that were previously "NE" (e.g. CO_2 and CH_4 emissions from oil and gas exploration, N_2O emissions from manure management).

31. Also, recalculations reported took into account updated AD (e.g. stationary combustion of fuels, transport, fugitive emissions from oil and natural gas, lime production, metal production, livestock populations for 2005 and 2006, and the area of organic soils) and improved EFs or parameters (e.g. the correction of a mistake in the EF for nitric and adipic acid production). The ERT noted the application of higher tiers methods for CH_4 from enteric fermentation of sheep, N_2O emissions from nitrogen (N) fixation and for carbon stock changes in mineral soils in croplands and grasslands. The ERT commends the efforts of Ukraine to improve the transparency and completeness of its inventory since its previous annual submission.

32. The recalculations performed in the 2009 submission had no impact on the consistency of the time series. These recalculations resulted in a decrease in total GHG emissions by 0.3 per cent in 1990 and by 2.2 per cent in 2006. The rationale for these recalculations is provided in the NIR but CRF table 8(b) has not been completed. The ERT reiterates the recommendation made in the previous review report that Ukraine provides all relevant explanations of recalculations in CRF table 8(b).

33. The ERT noted that major recalculations made in the LULUCF sector for the categories cropland and grassland resulted in a decrease in emissions of the sector for the year 2006 of 2,614.2 Gg CO_2 eq (12.8 per cent) since the previous submission. However, the lack of transparency in the explanatory information for these recalculations, particularly for updated areas of organic soils, did not allow the ERT to assess the correctness of their rationale (see para. 88). The ERT recommends that Ukraine elaborate on the rationale for the recalculations made in its next annual submission.

Verification and quality assurance/quality control approaches

34. Ukraine has provided information on QA/QC procedures that is in line with the UNFCCC reporting guidelines. The Party has an elaborated QA/QC plan in place in accordance with decision 19/CMP.1 and the IPCC good practice guidance. However, the ERT noted that information on QA procedures conducted for specific categories and the results of independent reviews are not reported in the NIR. The QA/QC plan needs further elaboration by including a schedule for quality checks and quality assurance, and by specifying who is responsible for the QA/QC of the inventory. The ERT reiterates the recommendation made in the previous review report that Ukraine provides all of the required information on its QA/QC plan, QA procedures and the results of these procedures in its next annual submission.

Transparency

35. The NIR provides most of the required information on the national system, key categories, QA/QC procedures, uncertainty assessment, methodologies, and AD and EFs for all categories. The ERT commends the efforts made by Ukraine to improve the transparency of the information in the NIR (particularly for the energy sector) since its previous submission.

36. However, the ERT noted that a recommendation made in the previous review report that the Party provide further AD, such as for the limestone use and the coke balance, has not yet been implemented. The ERT strongly recommends that Ukraine report all relevant AD and explanatory information for the energy and industrial processes sectors in its next annual submission (see paras. 50 and 66 below).

37. The ERT also noted that there is a lack of transparency in reporting of the energy sector (namely with regard to provision of the energy balance) and the LULUCF sector, namely in representation of land areas (see para. 82 below). The ERT recommends that Ukraine improve the transparency of the

description of country-specific EFs (e.g. for fuel losses in stationary fuel combustion (see para. 54 below), $Frac_{GASF}$ and $Frac_{GASM}$ (see para.77 below)), the AD used (e.g. for limestone use and coke used in pig iron production under iron and steel production (see paras. 65–66 below) and the rationale for recalculations (particularly in the LULUCF sector (see para. 33 above)). The ERT encourages Ukraine to improve the transparency of descriptions of QA procedures (see para. 34 above) and uncertainty assessment (see para. 28 above). The ERT noted that the structure of the NIR could be improved by moving the lists of references from the end of the NIR to end of the corresponding sectoral chapter.

4. Inventory management

38. According to the NIR, Ukraine has a centralized archiving system at the National Environmental Investment Agency of Ukraine, which includes the archiving of disaggregated EFs and AD, and documentation of how these EFs and AD have been identified and aggregated for inclusion in the inventory. The archived information also includes internal documentation on QA/QC procedures, external and internal reviews, annual key categories and key categories identification, and planned inventory improvements.

F. Follow-up to previous reviews

39. The ERT commends the efforts made by Ukraine regarding the implementation of recommendations made in previous review reports, particularly regarding the estimation of emissions from categories that were previously not reported; improving the transparency of country-specific EFs used in the energy sector and for the iron and steel production category; and providing more explanatory information on recalculations in the NIR. However, the ERT noted that some of the recommendations have not yet been implemented and therefore the ERT reiterates the recommendations made in previous review reports that Ukraine include all AD used in the inventory of the in industrial processes, EFs disaggregated for fuel combustion categories, provide further information on the QA procedures implemented and that it complete the section on explanatory information on recalculations in CRF table 8(b).

G. Areas for further improvement

1. Identified by the Party

40. The 2009 NIR identifies the following areas for improvement:

(a) The development of a number of country-specific EFs, such as for CO_2 emissions from combustion of natural gas, CO_2 emissions from cement production, CO_2 emissions from limestone and dolomite use, CO_2 emissions from aluminium production, CO_2 emissions from adipic acid production and N_2O emissions from agricultural soils;

(b) The improvement of AD and parameters for a number of categories, including limestone and dolomite use; paint application; refrigeration and of air-conditioning equipment; cropland and grassland (areas of different soil types by climatic zone); and wastewater handling;

(c) The implementation of a national model for solid waste disposal on land.

2. Identified by the expert review team

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

(a) The provision of quantified uncertainty estimates for the total inventory, including the LULUCF sector; the provision of quantified uncertainty estimates for each sector with relevant explanations of and references for uncertainty information;

(b) The reporting of explanatory information on recalculations in the NIR, particularly for the LULUCF sector (see para. 87 below) and in CRF table 8(b);

(c) The improvement of descriptions of QA procedures implemented and the results of independent reviews of specific categories;

(d) The reporting of all AD used in the inventory, particularly for the energy and industrial processes sectors (see paras. 50 and 66 below).

(e) The provision of more precise information on country-specific EFs, particularly for fuel combustion categories (see para. 54 below), and $Frac_{GASF}$ and $Frac_{GASM}$ (see para. 77 below);

(f) The improvement of transparency in description of land areas in line with the IPCC good practice guidance for LULUCF (see para. 82 below);

(g) The reporting of information on the geographical location of the areas used for calculation of the units of land subject to afforestation and reforestation and forest management activities under Articles 3 and 4 of the Kyoto Protocol (see paras. 100–102 below);

(h) The reporting of CO_2 emissions from deforestation activities or justification for an absence of such activity in the country (see para. 100 below).

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

II. Energy

A. Sector overview

43. The energy sector is the main sector in the GHG inventory of Ukraine. In 2007, emissions from the energy sector amounted to 299,740.32Gg CO_2 eq, or 76.4 per cent of total GHG emissions. Since 1990, emissions from this sector have decreased by 56.3 per cent. The key drivers for the fall in emissions are the fuel switch from residual oil to natural gas and a decrease in electricity and heat consumption. Within the sector, 37.0 per cent of the emissions were from energy industries, followed by 17.2 per cent from fugitive emissions from fuels, 16.2 per cent from manufacturing industries and construction, and 14.8 per cent from transport. Other sectors accounted for 14.0 per cent and the remaining 0.5 per cent were from the category other.

44. The ERT noted that Ukraine is a major producer and importer of bituminous coal, and imports almost all crude oil and natural gas used in the country. More than one third of coal mines in the country have been recently closed. Significant amounts of natural gas are transported through the country from the Russian Federation to other European countries.

45. Reporting of the energy sector lacks transparency. Detailed energy consumption data are not provided for the entire time-series (1990–2007). In response to the ERT questions raised during the centralized review, Ukraine noted its intention to provide a natural gas balance including production, import, export, storage and gas consumption for energy and non energy use in its next annual submission.

The ERT reiterates the recommendation made in previous review reports that Ukraine provides an energy balance in the NIR of its next annual submission.

46. The ERT noted that most of the categories are estimated in the energy sector with the exception of CO_2 emissions from coal mining and handling, CH_4 emissions from closed mines, and CO_2 and CH_4 emissions from oil, natural gas and combined venting. The ERT recommends that Ukraine estimate and include these emissions in its next annual submission for those categories where IPCC methodologies are provided.

47. The NIR provides some information on QA/QC and verification procedures for the energy sector. The NIR reports on the uncertainties associated with the energy sector and sub-sectors in accordance with the IPCC good practice guidance. The ERT commends the efforts made by the Party and encourages it to make further improvements in the inventory.

48. A fuel losses factor is applied together with the net calorific value, oxidation factor and carbon content of the fuels to convert the fuel quantity from natural units to energy units. The NIR states that the fuel losses should be considered non-energy fuel use. The origin and value of the losses factor and the amount of losses for different fuel types are not provided in the NIR and it is not clear whether they have been reported in the CRF tables. In response to the question raised by the ERT during the centralized review, Ukraine noted that a loss factor is applied in order to exclude non-energy related losses of fuel during transformation (such as loss of coal and peat in brown coal/peat briquettes production, loss of coal in coking process, losses of oils at treatment facilities, etc.) and that associated emissions are reported under fugitive emissions. The ERT recommends that Ukraine explain the reason for these losses and provide further information on the calculation approach for emission estimates and allocation principles in its next annual submission.

B. Reference and sectoral approaches

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

49. The ERT noted that in the year 2007, energy consumption and CO_2 emissions from fuel combustion estimated using the reference approach were 6.1 per cent and 7.5 per cent lower, respectively, than those estimated using the sectoral approach. The consumption of solid fuels estimated using the reference approach is 14.0 per cent lower than that estimated using the sectoral approach. Emissions of CO_2 from solid fuels estimated using the reference approach are 15.3 per cent lower than those estimated using the sectoral approach. The ERT noted that the NIR briefly explains the absence of an energy balance as the main reason for the differences in CO_2 emission estimates between these two approaches.

50. The ERT recommends that Ukraine explore the possible reasons for the difference in estimates for emissions from the consumption of solid fuels; clarify whether double counting of carbon stored in products has occurred, whether emission sources were not included in calculations using the reference approach and emission estimates calculated using the sectoral approach have been underestimated; provide detailed data for the production, importation, exportation and consumption of coke, coking coal, the coke balance and emissions from coke production and coke consumption; explain the reasons for the difference between the reference and sectoral approaches in the next annual submission. In response to the questions raised by the ERT during the centralized review, Ukraine noted its intention to carry out relevant research, if funding permits, and to provide data on coke balance in its next annual submission.

2. International bunker fuels

51. Emissions of CO_2 from international bunker fuels have decreased by 83.1 per cent between the base year and 2007. The ERT noted that Ukraine estimates fuel consumption using the

EMEP/CORINAIR methodology, which is equivalent to the IPCC tier 2b, and uses EMEP/CORINAIR and default IPCC EFs to estimate CH_4 and N_2O emissions from international bunker fuels.

3. Feedstocks and non-energy use of fuels

52. The NIR provides a short description of feedstock and non-energy use of fuels. The ERT noted that CO_2 emissions from feedstock and non-energy use of fuels are reported under the industrial processes sector: CO_2 emissions from coke are reported under iron and steel production in manufacturing industries and construction and emissions from natural gas combustion in ammonia (NH_3) production are reported under NH_3 production. From the information provided in the NIR and during the review, the ERT could not conclude that there is no double counting between the energy and the IP sectors. In order to ensure that there is no double counting and that the emissions are reported in a transparent manner, the ERT recommends that Ukraine provide the energy balance and coal and coke balances in its next annual submission.

53. The ERT noted that inconsistent information was provided on the calculation and allocation of emissions from coke in the energy and industrial processes sectors of the CRF tables and annex 2 of the NIR. Using the information provided by the Party, the ERT could not assess whether the amount of emissions excluded from the energy sector is estimated correctly. The ERT recommends that Ukraine provide further information on the method used to calculate and allocate emissions from coke production in its next annual submission.

54. Under non-energy use of fuels, the NIR mentioned 'losses in fuel transformation, storage, processing and for other reasons' but does not report the amount of losses, and whether and how the corresponding emissions were estimated. The losses could originate from oxidation of the fuel stored or be a result of fuel theft. The ERT also recommends that Ukraine explain the source of these emissions and the estimation methods used, and include these explanations in its next annual submission.

C. Key categories

1. Stationary combustion: solid – CO_2

55. The NIR reports variations (from 0.95 to 0.98) in oxidation factors for coal in public electricity and heat production for the years 1990–2005 and does not report oxidation factors for the years 2006 and 2007. The ERT recommends that Ukraine report these factors for the latest years and provide an explanation for the values chosen in its next annual submission.

2. Coal mining and handling: solid – CH_4

56. One hundred and nineteen out of 305 existing coal mines in Ukraine are closed or in the process of closing; CH_4 emissions emitted during the closure of mines and from closed mines are "NE". The ERT considers that these emissions may be significant and encourages Ukraine estimate these emissions based on the experiences of other countries and that it report them in its next annual submission.

3. Oil and natural gas: natural gas – CH_4

57. The Party uses very extensive natural gas and oil transport pipelines and transmission networks equipped with a significant number of gas compressor stations and oil pumping stations. The 2008 submission provides an analysis of the results of the measurements in natural gas pipelines in Ukraine. The NIR of the 2008 submission also states that based on the results of this analysis and on expert judgment, Ukraine has identified country-specific EFs for CH_4 from gas systems, which includes venting emissions at compressor stations. However, in the 2009 submission, the CH_4 emissions from venting are reported as "NE" and no explanation of the former study is provided. The ERT recommends that Ukraine report these emissions in its next annual submission.

III. Industrial processes and solvent and other product use

A. Sector overview

58. In 2007, emissions from the industrial processes sector accounted for 97,669.52 Gg CO_2 eq, or 22.4 per cent of total GHG emissions. Emissions of CO_2 represented 95.3 per cent of emissions from the sector (mostly from iron and steel production, NH_3 production and mineral products), and N_2O accounted for 3.5 per cent of sectoral emissions (nitric and adipic acid production). Emissions of CH_4, HFCs and PFCs accounted for 1.0, 0.05 and 0.1 per cent of sectoral emissions, respectively. Within the industrial processes sector, 64.9 per cent of GHG emissions were from the metal production, 19.5 per cent were from mineral products, 15.5 per cent were from chemical industry, and 0.05 per cent were from consumption of halocarbons and SF_6. Between 1990 and 2007, sectoral emissions decreased by 23.7 per cent, which was mainly due to the reduction in production of iron and steel and in the production of cement.

59. In 2007, emissions from the solvent and other product use sector amounted to 336.35 Gg CO_2 eq, or 0.07 per cent of total GHG emissions. Emissions from this sector decreased by 10.7 per cent between 1990 and 2007. In this sector, Ukraine estimated only N_2O emissions used for anesthesia and emissions of non-methane volatile organic compounds from paint application, degreasing and dry-cleaning, and the manufacture and processing of chemical products, manufacture and processing. The remaining categories are reported as "NE" and "NO".

60. Emissions of PFCs (tetrafluoroethane and hexafluoroethane) were reported under metal production (aluminium and ferroalloy production). Following recommendations made in the previous review report, Ukraine estimated for the first time actual emissions of HFCs (1, 1, 1, 2-Tetrafluoroethane) from refrigeration and air conditioning equipments under the category consumption of halocarbons and SF_6; however, only production of domestic and commercial refrigeration equipment is covered. The NIR explains that no reliable data exist to estimate GHG emissions for other sources of HFCs, PFCs and SF_6. The NIR states that several improvements are planned for the category consumption of halocarbons and SF_6 in refrigeration and air-conditioning equipment. In response to a question raised by the ERT during the centralised review, Ukraine replied that high-voltage equipment is produced only at one factory in Ukraine. The Party informed the ERT that SF_6 emissions would be reported in the NIR of its next annual submission.

61. Also, in response to the questions raised by the ERT during the centralized review, Ukraine noted that relevant research to collect data on consumption of halocarbons and SF_6 was planned although this has not been implemented due to the lack of financial resources as a result of the economic crisis in the country. The ERT recommends that Ukraine strengthen its efforts in collecting AD and estimating emissions from use of halocarbons in various activities, including mobile sources.

62. The ERT noted that Ukraine followed most of the recommendations made in the previous review report and that it improved the completeness and structure of the NIR. Uncertainty estimates are provided for most categories and a detailed higher tier methodology was used to estimate emissions from the key categories (iron and steel production, NH_3 production and ferroalloys production). The ERT commends the efforts made by the Party. However, the ERT noted that AD, EFs and descriptions of how they were obtained and determined are still not provided, particularly for categories where AD are linked to several sources (limestone and dolomite use, coke production and use, natural gas consumption). The ERT strongly recommends that Ukraine improve the transparency of the NIR and that it include all relevant information in its next annual submission.

63. Ukraine has performed recalculations for the whole time-series for limestone and dolomite use, with the aim of avoiding double counting, and for pig iron production for the period 1991–2006 and for

NH_3 production and ferroalloys production as a result of the application of a tier 2 approach following the recommendations made in the previous review report. The ERT noted that recalculations resulted in a reduction in total sectoral emissions by 7.1 per cent for the year 2006 since the previous submission (caused mostly by a 13.4 per cent reduction in emissions from iron and steel production), whereas emission estimates increased by 0.85 per cent for the year 1990. The ERT encourages Ukraine to review and explain the recalculations performed for pig iron production and to provide information on AD and EFs in its next annual submission.

B. Key categories

1. Ammonia production – CO_2

64. The ERT noted that the EF applied by Ukraine (2.19 t/t) is higher than the default value (1.5 t/t). The Party explained that both CO_2 emissions from natural gas combustion for energy purposes and CO_2 emissions from natural gas used as feedstock are reported under the industrial processes sector. This is not in line with the IPCC good practice guidance. Some discrepancies were found in the NIR between the relevant descriptions under the industrial processes and energy sectors. The ERT recommends that Ukraine report CO_2 emissions from natural gas use for energy purposes under the energy sector and that it include further explanations on the emission allocation in its next annual submission.

2. Iron and steel production – CO_2

65. The ERT noted that the description in the NIR of accounting of emissions from coke used in pig iron production under industrial processes is not supported by data. The implied emission factor for CO_2 emissions from pig iron production was 1.71 t/t in 1990 but this decreased to 1.53 t/t in 2007. Ukraine explained that the reason for this decrease was reduced production in 1991–1998. In response to the question raised by the ERT during the centralized review, the Party further explained that it intends to provide more information on coke use in its next annual submission. The ERT encourages Ukraine to check the coke balance for the entire time-series (1990–2007) and to provide all AD on coke used for pig iron production, including for energy purposes, in order to increase transparency in the NIR and avoid any possible underestimation of emissions.

3. Limestone and dolomite use – CO_2

66. The ERT noted that recalculations performed to avoid double counting of emissions from limestone use in the LULUCF sector resulted in an increase in CO_2 emissions from this category. The approach used by the Party to calculate emissions estimates is rather inconsistent and no AD are provided in the NIR. In response to the question raised by the ERT during the centralized review and suggestions to perform limestone balance check, Ukraine noted that relevant research to collect data was planned although this has not been implemented due to the lack of financial resources as a result of the economic crisis in the country. The ERT recommends that Ukraine collect and report in its next annual submission more precise data on the amount and characteristics of limestone and/or dolomite use in the country and plant-specific information on the purity of limestone and/or dolomite used in order to allow the Party to apply a higher tier methodology.

IV. Agriculture

A. Sector overview

67. In 2007, emissions from the agriculture sector amounted to 28,780.70 Gg CO_2 eq, or 6.6 per cent of total GHG emissions. Since 1990, emissions have decreased by 72.3 per cent. The key drivers for the fall in emissions are the reduction in livestock populations and a decrease in the area of cultivated soils and in the use of N fertilizers. Within the sector, 52.2 per cent of the emissions were from agricultural

soils, followed by 32.6 per cent from enteric fermentation, 13.4 per cent from manure management and 1.5 per cent from the category other (indirect N_2O emissions from manure management systems). The remaining 0.3 per cent was from rice cultivation.

68. The GHG inventory of the agriculture sector is complete with regard to years and categories. In the 2009 submission, Ukraine reported indirect N_2O emissions from manure management systems, which is an additional category to those listed in the Revised 1996 IPCC Guidelines. Most categories are estimated using tier 2, tier 3 or country-specific methodologies and EFs. The ERT acknowledges the efforts made by the Party to improve the quality of estimates of GHG emissions from the agriculture sector.

69. Descriptions of methodologies, AD and EFs provided in the NIR are generally transparent. The ERT recommends that Ukraine provide more information, including relevant references to the expert judgement used (e.g. for composition of fodder for cattle, N fixation in soils), disaggregated AD (e.g. mineral fertilizer input by region) and background research data used to develop country-specific parameters (e.g. fraction of N leaching from soils).

70. The ERT noted the following inconsistency: in CRF table 4Ds2 the fraction of livestock N excreted and deposited onto soil during grazing is reported as "NA" while CRF table 4B(b) reports that 214,234,740.20 kg /N per year (41.5 per cent of N from all animal waste management systems (AWMS)) are excreted on pasture range and paddock. The ERT also noted an incorrect estimation of the share of nitrogen per different AWMS per type of animal: in CRF table 4B(a)s2 the sum of the share of N per different AWMS makes more than 100 per cent. The ERT recommends that Ukraine correct these inaccuracies in the CRF tables in its next annual submission.

71. The EFs used to estimate emissions from enteric fermentation and manure of rabbits and fur animals are taken from inventories of other countries; however, justifications for the choice of these EFs are not provided. The ERT encourages Ukraine to investigate the appropriateness of these EFs and to provide relevant explanations in its next annual submission.

72. The recalculations made by Ukraine in 2009 relate to the development of tier 2 estimations for the enteric fermentation of sheep, update of AD (e.g. population of mules and asses in the period 2005–2006 and a new split of swine manure by manure management system), inclusion of "NE" categories (e.g. a small number of crop species and indirect N_2O emissions from manure management systems), development of country-specific fractions for indirect N_2O emissions from agricultural soils and a country-specific methodology for N fixation. Recalculations resulted in an increase in emission estimates from the agriculture sector of 3.0 per cent in 1990 and a decrease of 0.8 per cent in the year 2006.

B. Key categories

1. Enteric fermentation – CH_4

73. The ERT noted that AD on livestock populations refers to data as at 1 January of the reported year of the reported year and not to annual average livestock populations. This is not in line with the IPCC good practice guidance and may lead to a potential underestimation of CH_4 emissions from enteric fermentation, CH_4 and N_2O emissions from manure management and N_2O emissions from agricultural soils. In response to a question raised by the ERT during the centralized review, Ukraine noted its intention to apply the annual average livestock population in its next annual submission. The ERT recommends that Ukraine investigate ways to avoid this possible underestimation and supports the intention of the Party to adjust the numbers of livestock populations in its next annual submission.

74. Ukraine does not include milk production for suckling lambs in its estimations of CH_4 emissions from the enteric fermentation of sheep. Also, Ukraine incorrectly estimated average daily milk production rate, namely: to estimate average daily milk production, the total commercial milk production was divided by the number of days per year (365) and the result was then divided by 3. The latter is incorrect and led to the underestimation of this value by three times. The ERT recommends that Ukraine correct this error and that it perform the corresponding recalculations for CH_4 emissions from the enteric fermentation of sheep in its next annual submission.

2. Direct soil emissions – N_2O

75. In the 2009 submission, Ukraine used a country specific methodology to estimate N fixation by pulses. The ERT noted that the amount of N in roots of all pulses is also estimated under the subcategory crop residues left on fields. The ERT encourages Ukraine to investigate this potential double counting and that it provide all relevant explanations on country specific methodologies in the NIR.

76. The ERT noted that areas of histosols include organic soils under hay-fields and pastures. Ukraine is encouraged by the ERT to investigate whether or not this area relates specifically to cultivated soils in accordance with the IPCC good practice guidance and that it provide the relevant explanation in its next annual submission.

3. Indirect soil emissions – N_2O

77. The lack of the background information provided in the NIR for country-specific fractions of NH_3 and nitrogen oxide emissions from mineral fertilizers and animal manure ($Frac_{GASF}$ and $Frac_{GASM}$) did not allow the ERT to conclude whether N_2O emissions are excluded from these emission losses. The ERT encourages Ukraine to investigate this issue and to provide a more detailed description of the estimation methodology used in its next annual submission.

V. Land use, land-use change and forestry

A. Sector overview

78. In 2007, net removals from the LULUCF sector amounted to 43 456.70 Gg CO_2 eq. Since 1990, net removals have decreased by 40.6 per cent. The key reason for the fall in removals is growing emissions from soils in cropland. Within the sector, 98.1 per cent of the removals were from forest land, while the remaining 1.9 per cent was from grassland. Cropland was the dominant source of emissions, representing 99.6 per cent. The remaining contribution of emissions was attributed to wetlands.

79. The relative contribution of the sector to the total GHG emissions and removals has increased since 1990. It offset 10.0 per cent of the Party's total GHG emissions in 2007 compared to 7.9 per cent of total GHG emissions in 1990.

80. The Party adopts a simple land-use matrix and several assumptions for the representation of land and the identification of land-use changes. The current approach is adopted only at the country level and does not provide sufficient insight into land-use changes across the country. The ERT recommends that Ukraine revise the system of land-use representation by using a matrix at a smaller spatial scale (at the regional level or smaller administrative regions).

81. Among the categories of land converted to other land uses, only conversion to forest land was reported in the 2009 submission. In response to the question raised by the ERT during the centralized review, Ukraine noted its intention to revise the system of land-use representation so that all mandatory land-use conversions are included and corresponding emissions and removals are estimated in its next

annual submission. The ERT supports this Party's intention and recommends to include all mandatory land-use conversions into next annual submission.

82. The ERT noted that the representation of land remains problematic. Ukraine used different sources of information to identify land-use areas in the NIR and in the CRF tables that resulted in discrepancies of land areas reported in the NIR and the CRF tables. The information on land-use areas provided by Ukraine is not adequately explained in the NIR and the land-use areas reported in the NIR do not always match those reported in the CRF tables. To improve transparency in the inventory, the ERT recommends that Ukraine provide summary tables on the land-use areas under different land categories for each year of the reported period for the entire country. These areas reported in the NIR should correspond with those used in the CRF tables, with the possible exception of areas in transition reported under the land-use conversion categories. The ERT strongly recommends that Ukraine report subcategories of cropland and grassland that include set-aside land and different management intensity, and that the Party eventually cover unmanaged lands, as recommended by the IPCC good practice guidance for LULUCF in order to ensure the consistent representation of land areas.

83. The ERT noted that CO_2 emissions from application of limestone on grassland, direct N_2O emissions from N fertilization of forest land and other, carbon stock change in dead organic matter (DOM) and carbon stock change in soils have been reported as "NE". In response to the ERT questions raised during the centralized review, Ukraine noted that the emissions from the activities of fertilization, liming and the carbon stock change in DOM are negligible. Also Ukraine noted that collection of these data and research was not possible due to the economic crisis in the country. The ERT recommends that Ukraine estimate and report all mandatory categories currently reported as "NE", in its next annual submission.

B. Key categories

1. Forest land remaining forest land – CO_2

84. Ukraine applied a tier 2 IPCC default method to estimate biomass carbon stock change, using national AD and country-specific parameters. The country-specific data on biomass increment are reported for major forest types and climatic zones. However, the same expansion and conversion factors are used to estimate woody biomass from harvested wood volumes for all tree species. As recommended in the previous review report, the ERT recommends that Ukraine further verify its set of biomass expansion factors and ratios, and to apply species-specific factors for harvested wood volumes in its next annual submission.

2. Land converted to forest land – CO_2

85. The ERT identified an inconsistency in land-use areas reported in the CRF table 5A for the land-use category land converted to forest land. These cumulative areas are used for calculations on an annual basis, although a 20-year transition period has been adopted. This resulted in inconsistent emission estimates. The ERT strongly recommends that Ukraine revise its land-use identification system and the related emission estimates for this category in its next annual submission.

86. The ERT noted that the net carbon stock change per area increased by more than six times during the period 1993–2000 (from 0.25 Mg C/ha to 1.63 Mg C/ha). The ERT encourages Ukraine to verify and revise the emission estimations for this category, if needed, while revising land areas converted to forest land in its next annual submission.

3. Cropland remaining cropland – CO_2

87. Emissions from this category have an effect on the trend of emissions and removals of the entire LULUCF sector primarily due to the trend in carbon stock change in mineral soils. The Party revised its country-specific approach for mineral soils based on the balance of N fluxes and provided additional methodological information on and supporting evidence for the applicability of the approach. The ERT recommends that Ukraine verify its estimates (preferably by comparing the current method with the tier 2 approach in the IPCC good practice guidance for LULUCF) in order to increase transparency and consistency of reporting across the Parties, and that it provide an uncertainty analysis for this key category in its next annual submission.

88. Emissions from organic soil were recalculated in the 2009 submission, leading to a decrease in emission estimates since the previous submission (19,148.26 CO_2 Gg eq for 2006 in the 2008 submission and 18,656.37 CO_2 Gg eq for 2006 in the 2009 submission). However, this recalculation and the methodology applied are not documented in the NIR. The ERT recommends that Ukraine provide the relevant descriptions of recalculations and the methodology used for its estimates of organic soils in its next annual submission.

C. Non-key categories

Grassland remaining grassland – CO_2

89. The ERT noted a significant change in emission/removals estimates (1,220.46 Gg CO_2 Gg eq emissions for 2006 in 2008 submission and 901.82 CO_2 Gg eq removals in the 2009 submission) following the recalculation and revision of the country-specific methodology used to estimate soil carbon stock changes. Similarly, as for the cropland category, the ERT recommends that Ukraine verify its estimates, provide a better explanation for the underlying reasons for the change in emission estimates and trends, and that it provide a detailed evaluation of uncertainty for this category in its next annual submission.

VI. Waste

A. Sector overview

90. In 2007, emissions from the waste sector amounted to 9,478.39 Gg CO_2 eq, or 2.2 per cent of total GHG emissions. Within the sector, 73.1 per cent of the emissions were from solid waste disposal on land followed by emissions from wastewater handling, which accounted for 26.8 per cent of sectoral emissions. CH_4 emissions from solid waste disposal on land contributed 1.6 per cent to total GHG emissions in 2007, and CH_4 and N_2O emissions from wastewater handling (human sewage) contributed 0.3 and 0.2 per cent, respectively. Emissions of CO_2 and N_2O from waste incineration are reported in the energy sector under energy recovery.

91. Since 1990, emissions have increased by 12.5 per cent. The only driver for this rise is the increase in solid wasted disposed on land, which resulted in an increase in CH_4 emissions (by 31.4 per cent) since 1990. Emissions from wastewater handling have decreased by 19.3 per cent since 1990.

92. The CRF tables include estimates of most gases and categories of emissions from the waste sector and the NIR provides detailed descriptions of all the categories estimated. Only N_2O emissions from industrial wastewater and sludge handling are reported as “NE”, as there is no methodology provided in the Revised 1996 IPCC guidelines and IPCC good practice guidance. The ERT welcomes improvements in the AD collection system for solid waste and encourages Ukraine to make further efforts in this direction.

93. Ukraine applied tier 1 QA/QC activities for the GHG estimates in the waste sector as well as tier 2 QA/QC procedures for the key category solid waste disposal on land. The ERT welcomes these efforts made by the Party and encourages Ukraine to continue using the tier 2 QA/QC procedures for the key category.

B. Key categories

Solid waste disposal on land – CH_4

94. In the 2009 submission, the Party developed country-specific parameters, including the CH_4 generation rate constant and CH_4 generation potential, for the first order decay method applied for the estimation of CH_4 emissions from solid waste disposal on land. The ERT welcomes the provision in the 2009 submission of detailed information on the collection and calculation of AD and references for this.

95. The previous ERT encouraged the Ukraine to use weighed quantities of disposed municipal solid waste for reporting the amount of waste. In the 2009 submission, the Ukraine provided the source of the country-specific values used. The ERT noted that since its 2006 submission, Ukraine has used one of the lowest coefficients of waste density (250 kg/m3) of all reporting Parties to convert the volume of waste generated into mass units of waste. In response to the ERT question during the centralized review, the Ukraine provided references to the waste density used and elaborated about the method used, noting that the estimation takes into account such factors as the number of waste trucks, volume of the baskets in the truck and factor of compaction in the basket.

96. Having analyzed the reference provided[6], the ERT found useful additional information about the waste management history in the former Soviet Union. However, it could not identify sufficient substantiation for the value of waste density (0.25 t/m^3) that was used for the time series 1948–2000. The ERT noted an increasing trend of CH_4 implied EF for MSWDS. CH_4 IEF is the lowest among the reporting Parties (ranging from 0.0005–00263 t/t MSW) for 1990–2005. The ERT reiterates the recommendation of the previous review report that Ukraine analyze the coefficient of waste density applied for the entire time-series, improve documentation on the background data for waste density and provide the rationale of CH_4 implied EFs trends in its next annual submission.

C. Non-key categories

1. Wastewater handling – N_2O

97. Ukraine estimates N_2O emissions from wastewater handling only from human sewage. The ERT welcomes the efforts made by the Party to obtain the AD and country-specific EFs required to report emissions from wastewater handling. However, the reference sources for uncertainty estimates are not provided in the NIR. The ERT recommends that Ukraine improve the completeness, transparency and accuracy of reporting in the next annual submission.

2. Waste incineration – CO_2

98. Emissions from waste incineration are reported under the energy sector as all energy obtained from the incinerated waste is recovered and used for heating purposes. The NIR contains a description of AD and EFs. The differentiation between biogenic and non-biogenic waste is made based on the default values of carbon content and the percentage share of the fossil origin carbon in the incinerated waste.

[6] Гуляев Н.Ф.Санитарная очистка городов / Сбор, удаление, обезвреживание и исполь зование твердых отходов. – Москва. Из-ство литературы по строительству. – 1966. (Guliaev, N.F. 1966. Waste treatment in cities. Collection, disposal, neutralisation and reuse of solid waste. Moscow).

Given that the data on the composition of waste are available, the ERT encourages Ukraine to use this data to differentiate biogenic and non-biogenic waste and to estimate emissions accordingly.

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

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

99. In its 2009 submission, Ukraine reported, on a voluntary basis, information on activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, using years 2003–2007 to act as a five-year commitment period in the CRF tables.

100. Ukraine reported on afforestation and reforestation activities; however, deforestation was not reported in this submission. The ERT noted that deforestation is a mandatory activity under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, that has to be reported in the next annual submission. The justification provided in the NIR based on trends in forest land does not apply under the definition of forest under the Kyoto Protocol. The decreasing area of forest land remaining forest land reported in the CRF tables indicates that deforestation occurs in Ukraine and hence it should be reported. The areas of deforestation are reported in the CRF tables provided under Article 3, paragraph 3 and 4, of the Kyoto Protocol for the years 2005 and 2006; emission estimates for deforestation are reported for the year 2007, although this is not mentioned in NIR.

101. The ERT identified an error in the land areas used to estimate emissions and removals as a result of afforestation and reforestation activities. Namely, the emission estimates reported by Ukraine included only the areas under afforestation and reforestation in the reported year. The ERT recommends that all lands under afforestation and reforestation from 1990 to the reported year be included in the emission estimations for each year of the reported period in accordance with the IPCC good practice guidance for LULUCF.

102. Ukraine does not provide information on the geographical location of the areas used for the units of land subject to afforestation and reforestation and forest management activities, but the Party informed the ERT that it intends to do so in its next annual submission. During the centralized review, in response to a question raised by the ERT, Ukraine indicated its intention to provide information on boundaries and total areas of units of land subject to multiple activities in its next annual submission. The ERT supports this intention.

B. Information on Kyoto Protocol units

1. Standard electronic format and reports from the national registry

103. Ukraine has reported information on its accounting of Kyoto Protocol units in the SEF tables, as required by decisions 15/CMP.1 and 14/CMP.1. The ERT took note of the findings and recommendations included in the SIAR on the SEF tables and their comparison report.[7] The SIAR was forwarded to the ERT prior to the review, pursuant to decision 16/CP.10.

104. The ERT reiterates the main findings and recommendations contained in the SIAR that in the 2009 submission. The transactions of Kyoto Protocol units initiated by the national registry are in accordance with the requirements of the annex to decision 15/CMP.1 and the annex to the decision 13/CMP.1. No discrepancies have been identified by the international transaction log (ITL) and no non-replacement has occurred. As the Party has submitted information to the UNFCCC with delay and

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

requiring rounds of clarification, the ERT reiterates recommendation of the SIAR that Ukraine ensure that sufficient resources are available to allow the Party to report in a timely manner on Kyoto Protocol units, transactions and its national registry. The ERT further recommends that Ukraine report in its next annual submission on any actions undertaken and measures put in place to meet the deadlines of the SIAR, including ensuring that sufficient resources are available to perform the required reporting activities.

2. National registry

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

106. Ukraine has provided all of the required information requested during the previous annual review on changes in implementation, operation, maintenance and allocation of human resources for the national registry.

3. Calculation of the commitment period reserve

107. Ukraine has reported its commitment period reserve in its 2009 annual submission to be 2,215,917,400 t CO_2 eq based on the GHG inventory submitted in 2008. In the course of the review, Ukraine provided the revised estimates of its commitment period reserve based on the 2009 submission (inventory year 2007) which is 2,180,026,374 t CO_2 eq. The ERT agrees with this figure.

C. Changes to the national system

108. Ukraine reported a change in the legal basis of its national system since the previous annual submission. A decree regulating the development of the national GHG inventory was adopted by the single national entity, the National Environmental Investment Agency of Ukraine, on 24 October 2008. The ERT concluded that the Ukraine's national system continues to be in accordance with the requirements of national systems set out in decision 19/CMP.1.

D. Changes to the national registry

109. Ukraine reported a change in its national registry since the previous annual submission. Chapter 14 of the NIR provides a description of the national registry and the changes to the national registry made since the previous annual submission. Ukraine noted that the national registry was connected to the ITL on 28 October 2008. The ERT concluded that, taking into account the confirmed changes in the national registry, 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.

VIII. Conclusions and recommendations

110. Ukraine made its annual submission on 25 May 2009. The Party indicated that the 2009 annual submission is a voluntary submission under the Kyoto Protocol. The annual submission contains the GHG inventory (comprising CRF tables and an NIR) and the supplementary information under Article 7, paragraph 1, of the Kyoto Protocol (information on activities under Article 3, paragraphs 3 and 4, of the

Kyoto Protocol, information on Kyoto Protocol units, and on changes to the national system and the national registry). This is in line with decision 15/CMP.1.

111. The ERT concludes that the inventory submission of Ukraine has been prepared and reported in accordance with the UNFCCC reporting guidelines. The inventory submission is generally complete. Ukraine has submitted a complete set of CRF tables for the years 1990–2007 and an NIR; these are complete in terms of geographical coverage, years and sectors, as well as generally complete in terms of categories and gases. Some of the categories were reported as "NE", particularly in energy, industrial processes and LULUCF sectors.

112. Ukraine has submitted, in part, on a voluntary basis, the information required under Article 7, paragraph 1, of the Kyoto Protocol, which has been prepared and reported in accordance with decision 15/CMP.1. Ukraine did not report on a voluntary basis information on the minimization of adverse impacts under Article 3, paragraph 14, of the Kyoto Protocol.

113. The Party's inventory is generally in line with the UNFCCC reporting guidelines, the Revised 1996 IPCC Guidelines, the IPCC good practice guidance and the IPCC good practice guidance for LULUCF. Key categories are estimated using tier 2, tier 3 and country-specific methodologies in accordance with the IPCC good practice guidance and the ERT commends Ukraine for the efforts made. However, the ERT noted lack of transparency in describing country-specific methods and EFs.

114. Ukraine has submitted, on voluntary basis, the CRF tables for the activities under Article 3, paragraphs 3 and 4 of the Kyoto Protocol for the period 2003–2007. The information provided is not complete. The ERT noted that the Party reported on afforestation and reforestation activities, but emissions from deforestation were "NE".

115. Ukraine has reported information on its accounting of Kyoto Protocol units in accordance with section I E of the annex to decision 15/CMP.1, and used the appropriate reporting format tables as required by decision 14/CMP.1.

116. The national system continues to perform its required functions as set out in the annex to decision 19/CMP.1. In its 2009 submission Ukraine reported on changes in its national system, namely on adoption of the regulation relating to preparation of national GHG inventory.

117. 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. The changes in the national registry and transactions performed by Ukraine have been reported in the NIR.

118. In the course of the review, the ERT formulated a number of recommendations[8] relating to the completeness and transparency of the information presented in Ukraine's annual submission. The key recommendations are that Ukraine:

(a) Improve descriptions of procedures for QA and uncertainty assessment;

(b) Ensure, to the extent possible, the inclusion in its next annual submission of emissions for categories currently reported as "NE" and for which methods are provided in the Revised 1996 IPCC Guidelines, the IPCC good practice guidance and/or the IPCC good practice guidance for LULUCF. If emissions for a given category cannot be estimated, the Party should provide sufficient explanation in the NIR as to why such an estimate cannot be made;

[8] For a complete list of recommendations, the relevant chapters of this report should be consulted.

(c) Improve the transparency of descriptions of methods and country-specific EFs, particularly in the energy and agriculture sectors;

(d) Report all AD used, particularly in the industrial processes sector with regard to limestone and coke balance;

(e) Provide a matrix of land conversions in the LULUCF sector for representation of areas of land-use categories; GHG emission estimates for deforestation activities or a detailed explanation for the absence of such activity in the country.

119. The ERT encourages Ukraine to explore the possibility of structuring its reporting, in its next annual submission, following the annotated outline of the NIR, and the guidance contained therein, that can be found on the UNFCCC website.

IX. Questions of implementation

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

Annex I

Documents and information used during the review

A. Reference documents

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

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

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

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

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

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

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

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

Status report for Ukraine 2009. Available at <http://unfccc.int/resource/docs/2009/asr/ukr.pdf>.

Synthesis and assessment report on the greenhouse gas inventories submitted in 2009. Available at <http://unfccc.int/resource/webdocs/sai/2009.pdf>.

FCCC/ARR/2008/UKR. Report of the individual review of the greenhouse gas inventory of Ukraine submitted in 2007 and 2008. Available at <http://unfccc.int/resource/docs/2009/arr/ukr.pdf>.

UNFCCC. *Standard Independent Assessment Report*, Parts I and II. Unpublished document.

B. Additional information provided by the Party

Responses to questions during the review were received from Ms. NataliiaIvanenko (National Environmental Investment Agency of Ukraine), including additional material on the methodology and assumptions used. The following documents were also provided by Ukraine:

National Scientific Center Institute for Soil Science and Agrochemistry Research named after O.N.Sokolovsky. 2007. *Зауваження та пропозиції щодо проекту Національного кадастру антропогенних викидів парникових газів в Україні за 1990–2007 рр*. (Letter from National Scientific

Center “Institute for Soil Science and Agrochemistry Research named after O.N.Sokolovsky”) *Review of sector of Land Use, Land Use Change and Forestry for categories Cropland and Grassland of the project of National cadastre of anthropogenic GHG emissions for 1990–2007 years).* 2 p. In Ukraninan.

«Енергосталь». 2007. *Розглянувши категорію «Виробництво чавуну і сталі» сектору «Промислові процеси» проекту «Національного кадастру антропогенних викидів за 1990–2007 рр.»*. (Letter from Ukrainian State Scientific and Engineering Center for technology and equipment, metals working, environmental protection and secondary resources utilization for metallurgy and machine-building “Energostal” *Review of category “Iron and steel production” of sector Industry processes in the project of National cadastre of anthropogenic GHG emissions for 1990–2007 years.)* 1 p. In Ukranian.

Порядок проведення національної інвентаризації антропогенних викидів із джерел та поглинання поглиначами парникових газів. Наказ Національного агентства екологічних інвестицій України. 24.10.2008 № 58. In Ukranian. Available at: <http://neia.gov.ua/nature/control/uk/publish/article;jsessionid=2DD2C6B1DE762EC0170D4B14EF54F834/art_id=109567&cat_id=111922>.

Annex II

Acronyms and abbreviations

AD	activity data
CH_4	methane
CO_2	carbon dioxide
CO_2 eq	carbon dioxide equivalent
CMP	Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol
CRF	common reporting format
EF	emission factor
ERT	expert review team
GHG	greenhouse gas; unless indicated otherwise, GHG emissions are the sum of CO_2, CH_4, N_2O, HFCs, PFCs and SF_6 without GHG emissions and removals from LULUCF
HFCs	hydrofluorocarbons
IPCC	Intergovernmental Panel on Climate Change
ITL	international transaction log
kg	kilogram (1 kg = 1 thousand grams)
LULUCF	land use, land-use change and forestry
m^3	cubic metre
N	nitrogen
NA	not applicable
N_2O	nitrous oxide
NE	not estimated
NH_3	ammonia
NIR	national inventory report
NO	not occurring
PFCs	perfluorocarbons
QA/QC	quality assurance/quality control
SEF	standard electronic format
SF_6	sulphur hexafluoride
SIAR	Standard Independent Assessment Report
UNFCCC	United Nations Framework Convention on Climate Change

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