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COMPLIANCE COMMITTEE

CC/ERT/IRR/2007/23  
13 December 2007

## **Report of the review of the initial report of Ukraine**

### **Note by the secretariat**

The report of the review of the initial report of Ukraine was published on 13 December 2007. For purposes of rule 10, paragraph 2, of the rules of procedure of the Compliance Committee (annex to decision 4/CMP.2), the report is considered received by the secretariat on the same date. This report, FCCC/IRR/2007/UKR, contained in the annex to this note, is being forwarded to the Compliance Committee in accordance with section VI, paragraph 3, of the annex to decision 27/CMP.1.





UNITED  
NATIONS



Framework Convention  
on Climate Change

Distr.  
GENERAL

FCCC/IRR/2007/UKR  
13 December 2007

ENGLISH ONLY

## Report of the review of the initial report of Ukraine

*According to decision 13/CMP.1, each Annex I Party with a commitment inscribed in Annex B to the Kyoto Protocol shall submit to the secretariat, prior to 1 January 2007 or one year after the entry into force of the Kyoto Protocol for that Party, whichever is later, a report (the 'initial report') to facilitate the calculation of the Party's assigned amount pursuant to Article 3, paragraphs 7 and 8, of the Kyoto Protocol, and to demonstrate its capacity to account for emissions and the assigned amount. This report reflects the results of the review of the initial report of Ukraine conducted by an expert review team in accordance with Article 8 of the Kyoto Protocol.*

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## **I. Introduction and summary**

### **A. Introduction**

1. This report covers the in-country review of the initial report of Ukraine, coordinated by the United Nations Framework Convention on Climate Change (UNFCCC) secretariat, in accordance with Guidelines for review under Article 8 of the Kyoto Protocol (decision 22/CMP.1). The review took place from 16 to 21 April 2007 in Kiev, Ukraine, and was conducted by the following team of nominated experts from the roster of experts: generalist – Mr. Jan Pretel (Czech Republic); energy – Ms. Erasmia Kitou (European Community); industrial processes – Mr. Hongwei Yang (China); agriculture – Ms. Batima Punsalmaa (Mongolia); land use, land-use change and forestry (LULUCF) – Mr. Mikhail Gytarsky (Russian Federation); waste – Ms. Tatiana Tugui (Moldova). Mr. Jan Pretel and Mr. Hongwei Yang were the lead reviewers. In addition the expert review team (ERT) reviewed the national system, the national registry, and the calculations of the Party's assigned amount and commitment period reserve (CPR), and took note of the LULUCF parameters and the elected Article 3, paragraph 4 activities. The review was coordinated by Mr. Javier Hanna (UNFCCC secretariat).

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

### **B. Summary**

#### **1. Timeliness**

3. Decision 13/CMP.1 requests Parties to submit their initial report prior to 1 January 2007 or one year after the entry into force of the Kyoto Protocol for that Party, whichever is later. The initial report was submitted on 29 December 2006, which is in compliance with decision 13/CMP.1. In its initial report Ukraine refers to its 2006 greenhouse gas (GHG) inventory submission of 26 May 2006. Ukraine submitted further explanations, documentation and revised emission estimates on 2 June 2007 in response to questions raised by the ERT during the course of the in-country review, in accordance with the guidelines for review under Article 8 of the Kyoto Protocol (decision 22/CMP.1).

#### **2. Completeness**

4. Table 1 below provides information on the mandatory elements that have been included in the initial report and also reflects revised calculations of the assigned amount and commitment period reserve provided by Ukraine resulting from the review process. These revised calculations are based on revisions of the estimates of emissions of carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O) from civil aviation (see paragraph 65), CH<sub>4</sub> from coal mining and handling (for 2004 only, see paragraph 59), CO<sub>2</sub> from ammonia production (see paragraph 72) and CH<sub>4</sub> from solid waste disposal on land (see paragraphs 98 and 100) which resulted in revision of the estimates of base year emissions from 925,362,174 tonnes CO<sub>2</sub> equivalent as reported originally by the Party to 920,836,933 tonnes CO<sub>2</sub> equivalent (see paragraphs 105 and 106) and revisions of the estimates of the 2004 inventory from 413,411,238 tonnes CO<sub>2</sub> equivalent as reported originally to 411,994,095 tonnes CO<sub>2</sub> equivalent (see paragraphs 108 and 109).

**Table 1. Summary of the reporting on mandatory elements in the initial report**

Item	Provided	Value/year/comment
Complete GHG inventory from the base year (1990) to the most recent year available (2004)	Yes	Base year: 1990
Base year for HFCs, PFCs and SF <sub>6</sub>	Yes	1990
Agreement under Article 4	No	Not applicable
LULUCF parameters	Yes	Minimum tree crown cover: 30 % Minimum land area: 0.1 ha Minimum tree height: 5 m Minimum forest width: 20 m*
Election of and accounting period for Article 3, paragraphs 3 and 4, activities	Yes	Ukraine elected forest management under Article 3, paragraph 4 of the Kyoto Protocol The accounting period for activities under Article 3, paragraphs 3 and 4 of the Kyoto Protocol is the entire commitment period.
Calculation of the assigned amount in accordance with Article 3, paragraphs 7 and 8	Yes	4,626,810,872 tonnes CO <sub>2</sub> eq.
Calculation of the assigned amount in accordance with Article 3, paragraphs 7 and 8, revised value		4,604,184,663 tonnes CO <sub>2</sub> eq.
Calculation of the commitment period reserve	Yes	2,067,056,188 tonnes CO <sub>2</sub> eq.
Calculation of the commitment period reserve, revised value		2,059,970,475 tonnes CO <sub>2</sub> eq.
Description of national system in accordance with the guidelines for national systems under Article 5, paragraph 1	Yes	
Description of national registry in accordance with the requirements contained in the annex to decision 13/CMP.1, the annex to decision 5/CMP.1 and the technical standards for data exchange between registry systems adopted by the CMP	Yes	

\* Additional LULUCF parameter reported by Ukraine.

5. The information in the initial report covers the elements required by decision 13/CMP.1, section I of the decision 15/CMP.1, and relevant decisions of the Conference of the Parties serving as the Meeting of the Parties (CMP). During the in-country review, the ERT received some information on the new institutional and procedural arrangements (including a quality assurance/quality control (QA/QC) plan) and the planned structure of the national system, and therefore recognized that the national system is not fully functional as required by the guidelines for national systems under Article 5, paragraph 1, of the Kyoto Protocol (decision 19/CMP.1). The ERT during the in-country review recommended Ukraine to provide additional information on its national system. After the in-country review, Ukraine provided additional information on the institutional arrangements that cover the prescribed requirements. The ERT recognizes that the national system is functional and encourages Ukraine to maintain and enhance the operational functions of the national system as outlined in the additional information provided.

6. The ERT noted the efforts undertaken by Ukraine to develop the national registry. Although Ukraine provided information on the national registry system in its initial report, as required by the reporting guidelines under Article 7 of the Kyoto Protocol (decision 15/CMP.1) and relevant parts of decisions 13/CMP.1 and 5/CMP.1, the ERT noted that Ukraine was still in the early stages of developing its national registry and not in line with recent developments in the international community. Therefore, the ERT recognized that a thorough assessment of the Ukrainian national registry was not possible. The ERT urged Ukraine to attach high importance to the development, operation and maintenance of its national registry, thereby ensuring its timely initialization. After the in-country review, Ukraine recognized that at that stage its national registry did not meet the requirements defined by decisions 13/CMP.1 and 5/CMP.1 and decided to implement the Community Registry software of the European Commission as a base for its national registry. Ukraine notified the ERT that the initialisation test was completed on 26 November 2007. The ERT recommends Ukraine to provide detailed information on the

implementation, operation and maintenance activities of its national registry in its next inventory report under the Kyoto Protocol.

### 3. Transparency

7. The initial report is generally transparent, although information for the national system and national registry is limited. During the review the ERT identified the following improvements that would further enhance transparency: a) description of the functional structure of the national system and its institutions, including roles and responsibilities; b) a QA/QC plan; c) a centralized inventory archiving system; d) information on institutional arrangements with regard to the development, operation and management of the national registry; and e) publicly accessible information about the national registry. Certain issues on transparency are related to the GHG inventory (references and descriptions of emission estimation methodologies and data sources) and are addressed in the relevant sections of this report.

### 4. Emission profile in the base year, trends and emission reduction target

8. In the base year (1990 for all gases: CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, HFCs, PFCs, and SF<sub>6</sub>), the most important GHG in Ukraine was CO<sub>2</sub>, contributing 77.6 per cent to total<sup>1</sup> national GHG emissions expressed in CO<sub>2</sub> equivalent,<sup>2</sup> followed by CH<sub>4</sub>, 16.5 per cent, and N<sub>2</sub>O, 5.9 per cent (see figure 1). Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulphur hexafluoride (SF<sub>6</sub>) taken together contributed 0.02 per cent of the overall GHG emissions in the base year. This contribution comes only from PFCs. HFCs and SF<sub>6</sub> are reported as not applicable (“NA”), not estimated (“NE”) and not occurring (“NO”). The energy sector accounted for 74.4 per cent of total GHG emissions in the base year followed by industrial processes, 13.7 per cent, agriculture, 11.0 per cent, waste, 0.9 per cent, and solvent and other product use, 0.04 per cent (see figure 2). Total GHG emissions (excluding LULUCF) amounted to 920,836.93 Gg CO<sub>2</sub> equivalent and decreased by 55.3 per cent between the base year and 2004.

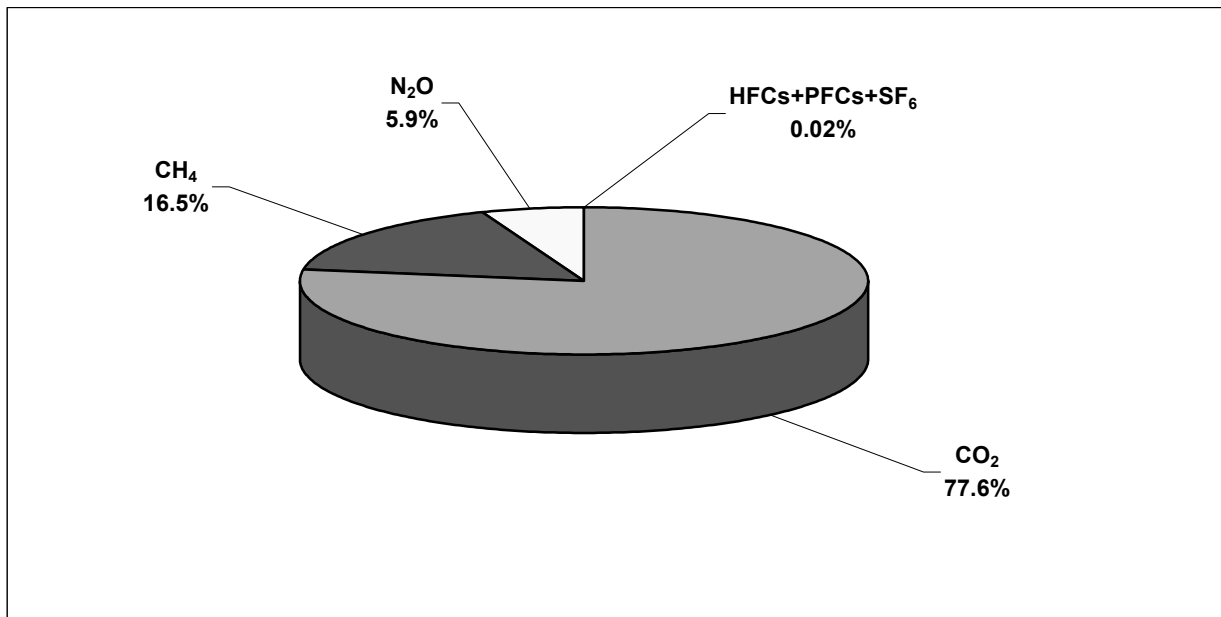
9. The LULUCF sector represented a net sink of 33,821.06 Gg CO<sub>2</sub> equivalent, off-setting 3.7 per cent of the total GHG emissions in the base year. The net sink decreased by 5.0 per cent between the base year and 2004.

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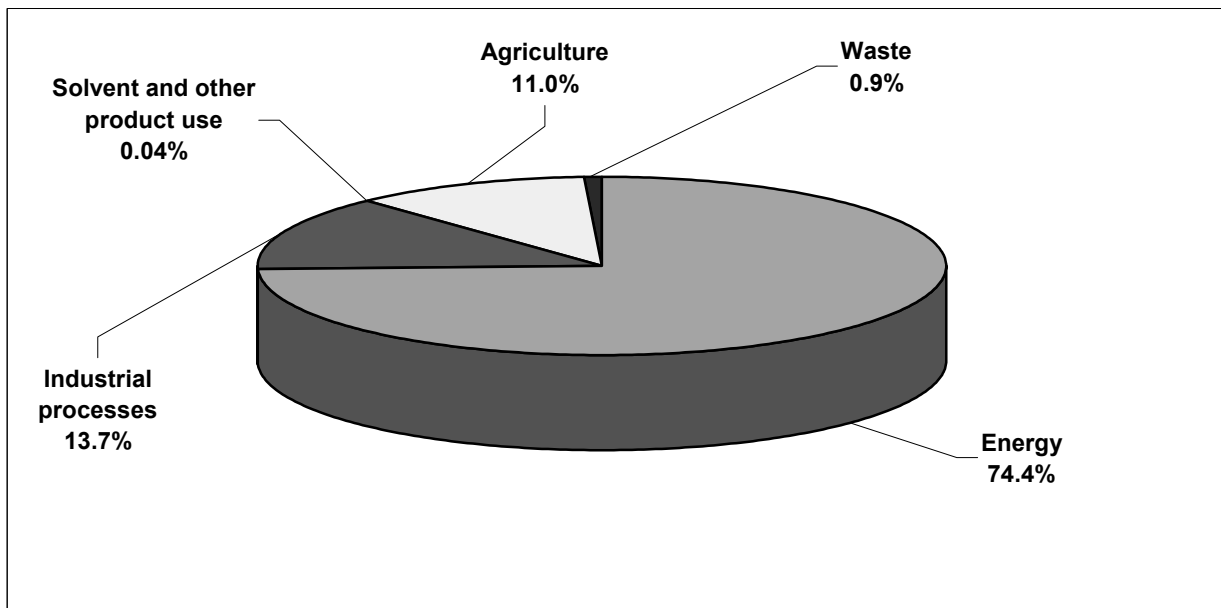
<sup>1</sup> In this report, the term total emissions refers to the aggregated national GHG emissions expressed in terms of CO<sub>2</sub> equivalent excluding LULUCF, unless otherwise specified.

<sup>2</sup> In this report, the values for total and sectoral emissions for the complete time series, and in particular for the base year and 2004, reflect the revised estimates submitted by Ukraine in the course of the review. These estimates differ from Ukraine’s GHG inventory submitted in 2006.

**Figure 1. Shares of gases in total GHG emissions, base year**



**Figure 2. Shares of sectors in total GHG emissions, base year**



10. Tables 2 and 3 show the GHG emissions by gas and by sector, respectively.

11. Ukraine's quantified emission limitation commitment is 100 per cent as included in Annex B to the Kyoto Protocol.



**Table 2. Greenhouse gas emissions by gas, 1990–2004**

GHG emissions (without LULUCF) <sup>a</sup>	Gg CO <sub>2</sub> equivalent								Change KP BY–2004 (%)
	Base year Kyoto Protocol	1990	1995	2000	2001	2002	2003	2004	
CO <sub>2</sub>	714 310.07	714 310.07	392 186.65	294 692.97	297 410.31	299 904.58	318 756.42	315 141.35	–55.9
CH <sub>4</sub>	151 717.65	151 717.65	94 686.22	77 150.59	72 398.39	75 628.80	74 681.08	74 497.89	–50.9
N <sub>2</sub> O	54 605.98	54 605.98	33 141.81	21 575.31	23 514.39	23 334.58	20 886.71	22 274.42	–59.2
HFCs	NA,NE,NO	NA,NE,NO	NA,NE,NO	NA,NE,NO	NA,NE,NO	NA,NE,NO	NA,NE,NO	IE,NA,NE,NO	NA
PFCs	203.23	203.23	153.45	99.74	96.59	85.02	66.49	80.44	–60.4
SF <sub>6</sub>	NA,NE,NO	NA,NE,NO	NA,NE,NO	NA,NE,NO	NA,NE,NO	NA,NE,NO	NA,NE,NO	IE,NA,NE,NO	NA

Note: BY = base year; LULUCF = land use, land-use change and forestry; IE = included elsewhere; NA = not applicable; NE = not estimated; NO = not occurring.

<sup>a</sup> Ukraine submitted revised estimates for the complete time series in the course of the initial review on 2 June 2007. These estimates differ from Ukraine's GHG inventory submitted in 2006.

**Table 3. Greenhouse gas emissions by sector, 1990–2004**

Sectors	Gg CO <sub>2</sub> equivalent								Change KP BY–2004 (%)
	Base year Kyoto Protocol <sup>a</sup>	1990 <sup>a</sup>	1995 <sup>a</sup>	2000 <sup>a</sup>	2001 <sup>a</sup>	2002 <sup>a</sup>	2003 <sup>a</sup>	2004 <sup>a</sup>	
Energy	684 877.96	684 877.96	387 193.54	270 267.82	266 916.66	271 904.84	286 907.23	282 289.60	–58.8
Industrial processes	125 798.64	125 798.64	62 077.65	81 325.30	82 232.84	83 055.80	87 982.18	89 761.97	–28.6
Solvent and other product use	376.80	376.80	372.11	354.89	351.51	348.22	345.45	342.97	–9.0
Agriculture	101 355.29	101 355.29	61 976.35	32 885.96	35 130.03	34 691.34	30 100.59	30 417.33	–70.0
LULUCF	NA	–33 821.06	–42 408.07	–38 036.44	–41 991.54	–37 325.57	–39 213.87	–32 137.56	NA
Waste	8 428.24	8 428.24	8 548.48	8 684.65	8 788.65	8 952.78	9 055.25	9 182.22	8.9
Other	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total (with LULUCF)	NA	887 015.87	477 760.07	355 482.16	351 428.14	361 627.40	375 176.82	379 856.53	NA
Total (without LULUCF)	920 836.93	920 836.93	520 168.14	393 518.61	393 419.68	398 952.98	414 390.69	411,994.09	–55.3

Note: BY = base year; LULUCF = land use, land-use change and forestry; NA = not applicable.

<sup>a</sup> Ukraine submitted revised estimates for the complete time series in the course of the initial review on 2 June 2007. These estimates differ from Ukraine's GHG inventory submitted in 2006.

## II. Technical assessment of the elements reviewed

### A. National system for the estimation of anthropogenic GHG emissions by sources and sinks

12. Ukraine's national system is generally prepared in accordance with the guidelines for national systems under Article 5, paragraph 1, of the Kyoto Protocol (decision 19/CMP.1). However some elements were missing; in particular, a clear description of the functional structure of the national system, and the responsibilities and roles of key institutions, as well as a clear and detailed QA/QC plan.

13. Table 4 shows which of the specific functions of the national system are included and described in the initial report.

**Table 4. Summary of reporting on the specific functions of the national system**

Reporting element	Provided	Comments
<b>Inventory planning</b>		
Designated single national entity*	Yes	See section II.A.1
Defined/allocated specific responsibilities for inventory development process*	Yes	See section II.A.1
Established process for approving the inventory*	Yes	See section II.A.1
Quality assurance/quality control plan*	Yes	See section II.A.2
Ways to improve inventory quality	Yes	See section II.B.3
<b>Inventory preparation</b>		
Key category analysis*	Yes	See section II.B.1
Estimates prepared in line with IPCC guidelines and IPCC good practice guidance*	Yes	See section II.B.2
Sufficient activity data and emission factors collected to support methodology*	Yes	See section II.B
Quantitative uncertainty analysis*	Yes	See section II.B.2
Recalculations*	Yes	See section II.B.2
General QC (tier 1) procedures implemented*	Yes	See section II.A.2
Source/sink category-specific QC (tier 2) procedures implemented	Yes	See section II.A.2
Basic review by experts not involved in inventory	Yes	See section II.A.2
Extensive review for key categories	Yes	See section II.A.2
Periodic internal review of inventory preparation	Yes	See section II.A.2
<b>Inventory management</b>		
Archive inventory information*	Yes	See section II.A.3
Archive at single location	No	See section II.A.3
Provide ERT with access to archived information*	Yes	See section II.A.3
Respond to requests for clarifying inventory information during review process*	Yes	See section II.A.1

\* Mandatory elements of the national system.

#### 1. Institutional, legal and procedural arrangements

14. During the in-country visit, Ukraine explained the institutional arrangements and the latest developments, as part of the national system, for preparation of the inventory. The Ministry of Environmental Protection of Ukraine (MEP) is the designated single national entity and implements its functions through the National Environmental Investment Agency (NEIA) and the Climate Change Centre (CCC). The Ukrainian Research Hydrometeorological Institute (URHI) (for the industrial processes, agriculture and waste sectors), the Agency for Rational Energy Use and Ecology (ARENA-ECO) (for the energy, industrial processes, solvent and other product use and LULUCF sectors), the Laboratory of Forest Monitoring and Certification of the Ukrainian Research Institute of Forestry and Forest Melioration (for the LULUCF sector), and the State Committee on Statistics (for activity data (AD)) are also involved in the preparation of the inventory, but specific responsibilities for the inventory development process were not defined and allocated sufficiently clearly. During the in-country review, the ERT recommended Ukraine to provide a description of the functional structure of the national system and the institutions involved, including roles and responsibilities.

15. After the in-country review, and in response to the ERT's recommendations, Ukraine provided information on institutional, legal and procedural arrangements and the structure of the national system in the light of the latest national activities and developments as follows:

- The single national entity with overall responsibility for Ukraine's national inventory is the MEP. It has responsibility for the inventory planning as required in the guidelines for national systems under Article 5, paragraph 1, of the Kyoto Protocol (decision 19/CMP.1). The MEP allocates annually appropriate funds for inventory planning, preparation and management financed from the State Environmental Protection Fund of Ukraine.
- The CCC was established by the MEP on 1 September 2005 by its Order of Ministry No. 313. It was created to support the MEP in fulfilling Ukraine's commitments under the UNFCCC and the Kyoto Protocol. The CCC analyses and recommends the use of national or international methodologies, taking into account the latest scientific research; prepares annual proposal for the QA/QC plan; organizes conferences, seminars and meetings about climate change and inventory system and inventory team development; and consults the specialists from other ministries and public organizations that provide initial AD.
- The NEIA was created by decree of the Cabinet of Ministers No. 612 on 4 April 2007. It is responsible for supporting the national system, especially in performing GHG inventory preparation and management in cooperation with the CCC, as required in decision 19/CMP.1. These activities will be financed from the State Environmental Protection Fund of Ukraine and include preparation of requests for initial data; consultation with specialists in ministries, state committees and local government bodies; collection, processing and verification of statistical data from the State Statistic Committee and other reports; approval of inventory methodologies and development of an inventory plan; performing calculations, uncertainty assessments and key category analyses; implementation of the QA/QC plan; performing recalculations; re-evaluation of the inventory planning process and making proposals to the MEP in order to meet established quality objectives; preparation of the national inventory report (NIR) and common reporting format (CRF) tables and submitting them to the MEP; and archiving the inventory information.
- On 31 May 2007 the MEP approved by its Order of Ministry No. 268 a plan for inventory preparation and management, and the QA/QC plan.
- During the preparation of the GHG inventory the NEIA and the CCC will closely cooperate with the URHI, ARENA-ECO and the Ukrainian Research Institute of Forestry and Forest Melioration.

16. Ukraine also provided information on the processes established for the official consideration and approval of the inventory, including recalculations, prior to its submission and for responding to any issues raised by the inventory review. The responsible organization for the official consideration is the MEP and the approval is given by the Inter-agency Commission on Climate Change, the head of which is the Vice-Prime Minister. As part of the inventory management, the NEIA is the responsible agency for providing responses to requests to clarify inventory information that result from the different stages of the review process. Ukraine can respond to requests from the ERT during and after the in-country review.

17. The ERT encourages Ukraine to maintain the operational functions of its national system as outlined in the information provided by Ukraine after the in-country review and in the plan for the inventory preparation and management (Order of MEP No. 268 of 31 May 2007); to maintain consistency in the allocated responsibilities; and enhance existing inter-institutional and inter-agency cooperation with a view to consolidating centralized inventory compilation and archiving structures, using the current expertise gained by the Ukrainian inventory experts and ensuring enough capacity for timely performance of the functions.

## 2. Quality assurance/quality control

18. Ukraine has elaborated and partially implemented QA/QC procedures 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). During the in-country review, Ukraine presented its national QA/QC plan for the 2006 inventory submission. This includes general QC procedures (tier 1) as well as some source/sink category-specific QC procedures (tier 2) for key categories. However, this plan lacks documentation on QC procedures for individual sectors and clear and detailed information on implemented QA/QC activities. The ERT suggested introducing better documentation on QC procedures at all stages of inventory preparation. The ERT recommended Ukraine to clearly define and document in the QA/QC plan the relevant responsibilities of cooperating institutions and experts and their contribution to QA/QC activities, and to present a clear and detailed QA/QC plan to be applied to its inventory development process in the next submission and thereafter.

19. Independent external review of the inventory was conducted in two stages. The first stage was performed on the preliminary emission estimates by the experts of the CCC. In addition, leading experts from relevant organizations were engaged in a preliminary review of the estimates of key categories. Experts from a European Commission project also took part in the preliminary review of the 2006 inventory submission. In addition, emission estimates by sector were presented as far as possible and discussed at sectoral seminars and conferences. As part of the second stage a public review process was performed, placing the final version of the NIR and the CRF tables as well as information for relevant experts and organizations on the website of the MEP ([www.menr.gov.ua](http://www.menr.gov.ua)).

20. After the in-country review, Ukraine provided the ERT with the QA/QC plan approved by the MEP on 31 May 2007. This plan contains most of the elements recommended by the ERT. The ERT encourages Ukraine to implement its QA/QC plan, extend its verification procedures to models, AD and estimates, further develop the plan in line with the recommendations outlined above and document all these actions in its next inventory submission.

## 3. Inventory management

21. Ukraine has a partially implemented centralized archiving system. During the in-country review, the ERT noted the efforts of Ukraine to establish a centralized archiving system, such as the centralized inventory electronic database in the MEP, which includes the archiving of disaggregated emission factors (EFs), AD, CRF tables and some documentation in particular for the 2006 inventory submission. Hard copies of relevant documentation are stored in the MEP and in the URHI, where electronic copies of most of the sources for AD, EFs and background documentation used in the inventory compilation are also available. During the in-country review, the ERT was provided with the additional archived information it requested. The ERT recommended Ukraine to finalize the establishment, as a matter of priority, of its centralized inventory archiving system, which shall contain all the information required by the guidelines for national systems (decision 19/CMP.1), and to provide the relevant documentation on the archiving system's structure and operation.

22. After the in-country review, Ukraine provided the ERT with information on the inventory centralized archiving system and its structure and operation. The information provided also indicates that, in accordance with the ERT's recommendations and the requirements for the archiving of inventory information under the guidelines for national systems (decision 19/CMP.1), Ukraine made the necessary changes in archiving hard copies of background documentation and the electronic database. The ERT encourages Ukraine to enhance and maintain its centralized archiving system and to document all these actions in its next inventory submission.

## B. Greenhouse gas inventory

23. In conjunction with its initial report, Ukraine has submitted a complete set of CRF tables for the years 1990–2004 and an NIR. Where needed the ERT also used previous years' submissions, including the CRF tables for the years 1990–2003.

24. During the review, Ukraine provided the ERT with additional information sources. These documents are not part of the initial report 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.

25. After the in-country review, following the recommendations of the ERT, Ukraine submitted a complete set of revised CRF tables for the years 1990–2004.

### 1. Key categories

26. Ukraine reported a tier 1 key category analysis, both level and trend assessment, and also applied a qualitative approach in determining its key categories as part of its initial report submission. Ukraine included the LULUCF sector in its key category analysis. The NEIA in the context of the recent development of the national system is responsible for performing the key category analysis. Ukraine is using the key category analysis to prioritize the development of its inventory. During the review, Ukraine explained that the results have had an effect on inventory planning in the context of allocating resources.

27. The key category analyses performed by Ukraine and the secretariat<sup>3</sup> produced similar results. Ukraine identified 20 key categories in 2004 compared to 27 key categories identified by the secretariat. Ukraine does not report a key category analysis for 1990, while the secretariat identified 19 key categories for this year. The ERT encourages Ukraine to report such an analysis in its next submission. Results of the analysis performed by Ukraine diverge from those of the secretariat, particularly for the LULUCF sector and the agricultural soils category, because of the different level of aggregation of source and sink categories.

### 2. Cross-cutting topics

28. The inventory is generally in line with the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Revised 1996 IPCC Guidelines), the IPCC good practice guidance and the *IPCC Good Practice Guidance for Land Use, Land-Use Change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF). The ERT noted considerable improvements in the representation of lands and sinks and source categories in the LULUCF sector since the previous submission (2005). However, the ERT identified some cases where the use of methods and EFs was not fully transparent or reported in line with the guidance mentioned above. These cases are identified in the sectoral sections of this report. The ERT also acknowledges that some of these problems were fixed during the review. The ERT recommends Ukraine to reflect these improvements and changes in its next submission.

29. The inventory is compiled in accordance with Article 7, paragraph 1, and decision 15/CMP.1.

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<sup>3</sup> The secretariat identified, for each Party, those source 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 Land Use, Land-use Change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF). Key categories according to the tier 1 trend assessment were also identified for those Parties that provided a full set of CRF tables for the base year. 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.

### Completeness

30. Ukraine provided inventory data for the years 1990 to 2004. Ukraine provided CRF tables for the whole time series, although not all the CRF tables are completely filled in and the use of notation keys needs to be improved and explanations provided in CRF table 9. Some of the categories, particularly in the energy and industrial processes sectors, were not reported (e.g. CO<sub>2</sub> fugitive emissions from solid fuels, GHG emissions from solid fuel transformation, CH<sub>4</sub> from venting, and actual emissions of HFCs, PFCs and SF<sub>6</sub> from consumption of halocarbons and SF<sub>6</sub>). Additionally, the inventory does not contain complete time series information for the energy sector, for instance, AD for the years 1991–1997, and implied emission factors (IEFs) and emissions of liquid, solid, gaseous and other fuels from energy industries, manufacturing industries and construction, transport and other sectors are reported as “NE”. The ERT recommends that Ukraine make the necessary efforts to provide data and emissions estimations for all sectors, categories and gases that have not been estimated so far (for details see the sectoral sections of this report). The ERT encourages Ukraine in its next inventory submission to use the new version of the CRF reporter software (v3.1) required for inventory submissions to the secretariat.

### Transparency

31. The NIR and the CRF tables in general are transparent. During the review Ukraine provided additional material requested by the ERT and explanations of the various calculations as needed. This significantly improved the understanding of major underlying assumptions and of the rationale behind certain choices of data, methods and other inventory parameters. Confidentiality issues are rather limited and mainly relate to some industrial processes data. The NIR and the CRF tables should be more transparent, and emission estimation methodologies and data sources should be appropriately referenced. Methodological descriptions in the NIR should be more detailed and consistent with the actual data used. The ERT recommends Ukraine to increase the NIR’s transparency in its next submission.

### Consistency

32. The reporting on methods and EFs in some cases is inconsistent between the NIR and the CRF, especially for the energy, industrial processes and waste sectors. The trends are consistent (with the exception of the energy sector), and the reported fluctuations have been justified. The ERT recommends that the consistency between the CRF and the NIR be improved, in particular in reporting the national methods and EFs used. The ERT encourages Ukraine to complete the time series for the energy sector in a consistent manner.

### Comparability

33. The inventory is broadly comparable with other Parties, except for some specific cases addressed in relevant sectoral sections of this report.

### Accuracy

34. The inventory is generally accurate as defined in 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). During the in-country review, the ERT identified a few categories where the methods or EFs used were not fully in accordance with the IPCC good practice guidance and might lead to overestimation of emissions in the base year or underestimation of emissions in the most recent year (e.g. CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O from civil aviation, CO<sub>2</sub> from ammonia production and CH<sub>4</sub> from solid waste disposal on land). The ERT recommended Ukraine to revise its estimates for these categories. After the in-country review, Ukraine provided revised estimates for these categories, in particular for the categories possibly overestimated,

for the complete time series and in accordance with the recommendations of the ERT. Further details are provided in the sectoral sections below.

### Recalculations

35. The national system can ensure that recalculations of previously submitted estimates of GHG emissions by sources and removals by sinks are prepared in accordance with the IPCC good practice guidance. The NEIA, in the light of the recent development of the national system, is responsible for performing the recalculations.

36. GHG emissions and removals for 1990–2003 were recalculated for the majority of categories in the 2006 inventory submission due to the inclusion of new sources (e.g. PFCs from aluminum production), improvements in methodologies (e.g. use of tier 2 for some categories, such as enteric fermentation – cattle, and implementation of the IPCC good practice guidance for LULUCF), and refinement of AD and EFs, including the development of national EFs for some key categories (e.g. cement production), reallocation of emissions (e.g. emissions from combustion of coke in blast furnaces are now reported in the industrial processes sector and emissions from waste incineration are reported in the energy sector). In general the recalculations were performed according to the IPCC good practice guidance and have resulted in significant improvements to the inventory. Ukraine explained the rationale and quantified the impact of the recalculations during the in-country review; nevertheless no explanations were reported in CRF table 8(b). The ERT noted that recalculations reported by Ukraine for 1990–2003 particularly affected CO<sub>2</sub> and CH<sub>4</sub> emissions from the energy sector, CO<sub>2</sub> emissions from the industrial processes sector, CO<sub>2</sub> emissions/removals from the LULUCF sector and CH<sub>4</sub> from the waste sector. The recalculations led to a decrease of total GHG emissions in individual years of between 6.7 and 21.1 per cent; and the base year recalculations led to a total decrease by 6.7 per cent in total national emissions. The ERT recommends Ukraine to report the explanatory information on recalculations in the CRF tables of its next submission and to make the tables consistent with the information provided in the NIR.

### Uncertainties

37. Ukraine provided an uncertainty analysis for each source category and for the inventory in total, following the requirements of the UNFCCC reporting guidelines and the IPCC good practice guidance; uncertainty estimates have been provided using tier 1. The NEIA, in the light of the recent development of the national system, is responsible for performing the uncertainty analysis. The ERT encourages Ukraine to use uncertainty analysis to prioritize improvements of the inventory in the future, in particular for the solvent and other product use, agriculture, LULUCF and waste sectors, where the levels of uncertainty in the estimates are very high. The information provided on uncertainties should be refined taking into account national circumstances and existing data gaps.

### 3. Areas for further improvement identified by the Party

38. The NIR identifies several areas for improvement. During the in-country review Ukraine indicated that it is working to improve its estimates of limestone and dolomite use (2.A.3) as this is a key category. Furthermore, Ukraine plans to develop a national methodology to estimate CH<sub>4</sub> emissions from enteric fermentation of cattle in the agriculture sector. Some improvements related to EFs and AD are also planned for the waste sector (solid waste disposal on land and waste water handling).

39. For the LULUCF sector, Ukraine identified AD collection and the development of national parameters as the areas for inventory improvement. Ukraine also indicated a willingness to identify AD on lands converted to croplands, grasslands, wetlands and settlements using a tier 2 approach.

#### 4. Areas for further improvement identified by the ERT

40. The ERT identifies the following cross-cutting issues for improvement. The Party should:
- (a) Maintain the operational functions of the national system and consistency in the allocated responsibilities, and enhance existing inter-institutional cooperation while ensuring enough capacity for the timely performance of its functions;
  - (b) Implement and further develop the recently approved QA/QC plan, extending its verification procedures to models, AD and estimates;
  - (c) Maintain and enhance the functions of the centralized archiving system;
  - (d) Make the necessary efforts to provide data and emissions estimations for all sectors, categories and gases that have not been estimated, in particular the missing estimates for the energy sector;
  - (e) Improve transparency and documentation on AD, parameters, emission estimates and trends, and reference them appropriately in the NIR;
  - (f) Provide more detailed and precise methodological descriptions in the NIR consistent with the AD used in the CRF tables, in particular for country-specific methods and EFs;
  - (g) Verify country-specific methodologies, in particular for the LULUCF sector;
  - (h) Report the explanatory information on recalculations in the CRF tables and make it consistent with the information provided in the NIR;
  - (i) Refine the uncertainty analysis taking into account national circumstances and existing data gaps and use it to prioritize inventory improvements, in particular for the solvent and other product use, agriculture, LULUCF and waste sectors;
  - (j) Cross-check the applicability of tier 1 for intensively managed Ukrainian lands for estimates in the LULUCF sector.
41. Recommended improvements relating to specific source categories are presented in the relevant sector sections of this report.

#### 5. Energy

##### Sector overview

42. Since the Kyoto Protocol base year (1990), energy-related emissions from Ukraine have declined by 58.8 per cent. In 1990, Ukraine's total GHG emissions from the energy sector constituted 74.4 per cent of total GHG emissions. Most of the GHG energy-related emissions in the base year were from energy industries, which constituted 39.7 per cent of the sectoral emissions, while manufacturing industries contributed 21.0 per cent, other sectors 13.9 per cent, and transport 12.7 per cent. Ukraine is a major producer of bituminous coal, but imports most of the crude oil and natural gas that it consumes. Fugitive emissions from fossil fuels in the base year contributed 12.7 per cent of total GHG energy-related emissions, 63.9 per cent of fugitive emissions were from solid fuels while 36.1 per cent was due to oil and natural gas.

43. Ukraine provided all the CRF tables. Ukraine additionally provided a table in the NIR detailing the missing source categories and the reasons behind these omissions. The NIR fails to provide a more detailed discussion of the completeness of the fuel combustion and fugitive emissions categories.



Previous review stages identified some gaps in tables 1A(b) and 1A(c). The ERT recommends Ukraine to provide a more detailed discussion on the completeness of its estimates of fuel combustion and fugitive emissions.

44. The period 1991–1997 lacks complete data on fuel consumption by categories because of changes that occurred in the Ukrainian statistical system. For instance, for this period AD, IEFs and emissions of liquid, solid, gaseous and other fuels from energy industries, manufacturing industries and construction, transport and other sectors are reported as “NE”. The ERT encourages Ukraine to use the splicing techniques recommended in the IPCC good practice guidance to make the time series consistent. It is also recommended that Ukraine provide more information regarding its particular national circumstances in its next NIR.

45. The ERT welcomes the efforts made by Ukraine to provide additional methodological information and background in the NIR and recommends that Ukraine provide a detailed overview of the assumptions made and the underlying EFs and AD used. The ERT believes that the transparency of the NIR could be further improved if Ukraine was able to provide some additional information on the steps followed to ensure time-series consistency as well as explanations of the trends observed.

46. Ukraine has provided no specific discussion of its QA/QC and verification procedures for the energy sector. The ERT was pleased to see during the in-country review of this sector that the results of a number of specific QA/QC and verification procedures conducted were readily available. However, these are not documented in the relevant energy part of the NIR. When reviewing the NIR and the CRF tables, editorial mistakes and incorrect or out-of-date values were identified, which could have been avoided by a better application of the QA/QC procedures.

47. Ukraine has provided estimates of the uncertainties associated with the energy sector following the IPCC good practice guidance. However, these uncertainties seem to be underestimated as they do not take into account the lack of data under certain source categories such as, for example, oil and natural gas. The ERT recommends that Ukraine revise its uncertainty estimates to reflect data availability for its next submission.

#### Reference and sectoral approaches

48. Ukraine provided estimates for the reference approach for the years 1990 and 1998–2004. There is good agreement between the reference approach and the sectoral approach for the base year (a –1.0 per cent difference in the CO<sub>2</sub> emission estimates and a 0.4 per cent difference in fuel consumption), but the differences are much higher in 2004 (11.0 per cent in the CO<sub>2</sub> emission estimates and 6.0 per cent in the fuel consumption). The NIR also provides a discussion on the comparison between the reference and the sectoral approach. The ERT recommends Ukraine to complete the time series using the reference approach for its next submission, to investigate further the differences reported and to reduce the gap between these two approaches, particularly as regards fuel consumption.

#### International bunker fuels

49. Ukraine assumed in its calculations that all jet kerosene consumption is related to domestic aviation. Neither AD nor emissions were reported for international aviation emissions. The ERT recommended Ukraine to collect information on the number of domestic flights in 1990 to enable the estimation of jet kerosene consumption for domestic aviation, and to subtract this amount from the total consumption to obtain the international share of jet kerosene consumption; or conversely to first collect information on the number of international flights in 1990 and estimate jet kerosene consumption for international aviation and then estimate the domestic share of jet kerosene consumption.

50. After the in-country review, Ukraine informed the ERT that it had determined the share of domestic versus international aviation fuel consumption by using an average of the share used by other countries with similar conditions (Poland, Belarus, Bulgaria and the Czech Republic) based on the AERO2K and SAGE models as well as information from document FCCC/SBSTA/2005/Misc.4.<sup>4</sup> The share of international fuel consumption was set at 94 per cent of the total jet fuel consumption in 1990 and was applied for the complete time series. Ukraine revised the CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O emission estimates for the complete time series. This revision led to an increase in estimated GHG emissions by 100.0 per cent in the base year (from “NE” as reported originally to 2,733.40 Gg CO<sub>2</sub> equivalent) and by 100.0 per cent in 2004 (from “NE” as reported originally to 1,049.92 Gg CO<sub>2</sub> equivalent).

51. The ERT agrees with the approach taken by Ukraine, as it believes it is a conservative one. However, the ERT recommends that Ukraine further investigate this issue and encourages the use of the methods recommended by the IPCC good practice guidance for its future submissions, to ensure that emissions from international aviation are systematically neither overestimated nor underestimated for the whole time series. The ERT encourages Ukraine to establish further contacts with the national aviation authorities and also to contact EUROCONTROL<sup>5</sup> or other international organizations to obtain relevant statistics.

52. The ERT welcomes Ukraine’s efforts to estimate for the first time emissions from international navigation bunkers. Ukraine explains in its NIR that an indirect methodology based on total fuel consumption by water transport (statistical reporting form 4-MTP) and turnover of goods by sea transport during coastwise trade and foreign navigation was used. The ERT recommends that Ukraine make efforts to confirm these estimates through collection of AD and revise them if necessary in its next submissions.

#### Feedstocks and non-energy use of fuels

53. The ERT welcomes the improvements made by Ukraine in reporting emissions from feedstocks and non-energy use of fuels and recognizes that comments from the previous review (2005) regarding the allocation of these emissions were taken into consideration. Ukraine clarified in the NIR which emissions related to non-energy use of fuels are now reported under the industrial processes sector. Ukraine is encouraged to increase the transparency of reporting of these emissions by providing in the NIR information on the methodologies, AD and EFs used, as this information is not currently reported.

#### Key categories

##### Stationary combustion: solid, liquid and gaseous fuels – CO<sub>2</sub>

54. For the base year, the data used for the Ukrainian inventory is based on the energy balance of Ukraine when it was part of the Soviet Union. For the years 1998–2004, statistical reporting forms were used as the source of data for fuel use. Ukraine considers these data to be of very good quality. Ukraine has applied default IPCC EFs in estimating its CO<sub>2</sub> emissions from stationary combustion, with the exception of the country-specific CO<sub>2</sub> EF for coal. As this is a key category for all fuels, the ERT recommends that Ukraine intensify its efforts to obtain and use country-specific carbon contents for all fuels used in the country for its next submission.

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<sup>4</sup> <<http://unfccc.int/resource/docs/2005/sbsta/eng/misc04.pdf>>.

<sup>5</sup> <<http://www.eurocontrol.int/statfor>>.

Road transportation: liquid and gaseous fuels – CO<sub>2</sub>

55. In the period 1990–2004, CO<sub>2</sub> emissions from road transportation have decreased by 55.3 per cent. The trend of CO<sub>2</sub> emissions fluctuates (inter-annual change for 1999–2000 is –9.7 per cent, for 2000–2001 is 9.8 per cent and for 2001–2002 is 11.8 per cent). The Party explained that this difference is due to the changes in the source of statistical data as two different agencies were responsible for their compilation. Ukraine made efforts to map the various categories between these two sources of information and to ensure that they are comparable. Economic instability could be the reason for some of the differences observed in the most recent years. The Party is recommended to use economic data and trends to compare with those data and trends observed for CO<sub>2</sub> emissions.

56. The CO<sub>2</sub> IEF for gasoline in the base year is 68.66 t/TJ and the CO<sub>2</sub> IEFs reported for 1998–2004 have a constant value of 68.61 t/TJ. Ukraine indicated that the reason for this difference in the IEFs is that some technical jet kerosene emissions were aggregated along with the gasoline ones for 1990. The Party is recommended to include this information separately under other liquid fuels in order to ensure correct allocation and the transparency of the calculations.

Coal mining and handling – CH<sub>4</sub>

57. Ukraine uses a mix of tier 3 and tier 2 methods to estimate emissions from this category. The ERT welcomes the efforts of Ukraine to apply a country-specific methodology to estimate emissions from coal mining based on research in Ukrainian mines (measurement of emissions through venting systems). The results of this research were used to estimate CH<sub>4</sub> emissions in 1990–2000 and the resulting weighted average of CH<sub>4</sub> EFs and coal production volumes from statistical reporting forms were used for estimates in 2001–2004. The ERT encourages Ukraine to make consistent use of tier 3 methods for the complete time series. The ERT recommended Ukraine to investigate and include emissions from closed mines in its next submission.

58. Volumes of recovered CH<sub>4</sub> in 1990–2000 were also obtained from the same research in Ukrainian mines. The amount of recovered CH<sub>4</sub> in 2001 was taken from an official research report and this has been extrapolated to 2002–2004 with an annual growth rate of 10 per cent. The ERT considers that recovery rates for CH<sub>4</sub> for years 2001–2004 appear to be high relative to those used in most other years between 1990 and 2000. Additionally, the extrapolation curve does not appear to match the overall trend for the time series. The ERT recommended Ukraine to document and revise if necessary the assumptions made for the estimation of CH<sub>4</sub> recovery for the years 2001–2004.

59. After the in-country review, Ukraine informed the ERT that according to expert opinion CH<sub>4</sub> utilization volumes increased in 2002–2004 compared to 2001. However, due to the lack of supporting information Ukraine revised its assumptions and used the same CH<sub>4</sub> utilization volume as in 2001. This revision led to an increase in estimated CH<sub>4</sub> emissions by 0.2 per cent in 2004 (from 1,392.03 Gg CH<sub>4</sub> as reported originally to 1,394.56 Gg CH<sub>4</sub>). The ERT recommends that Ukraine further explore this issue and provide further clarification in its next inventory submission. The ERT also recommends that Ukraine carefully examine the CH<sub>4</sub> production and utilization trends since 1990 and ensure consistency throughout the whole time series.

Oil and natural gas – CH<sub>4</sub>

60. AD and emissions of CH<sub>4</sub> for oil – exploration, oil – distribution of oil products, oil – other, natural gas – exploration, and venting and flaring – combined are reported as “NE” for the complete time series. The ERT recommended Ukraine to gather further AD from industry and provide estimates for the abovementioned categories in its next inventory submission.

61. After the in-country review, Ukraine informed the ERT that for the 2008 inventory submission an attempt will be made to collect all the necessary data from the oil and gas production companies in order to provide the missing estimates. It noted, however, that the Revised 1996 IPCC Guidelines and the IPCC good practice guidance do not make recommendations on how to estimate GHG emissions from oil – distribution of oil products (1.B.2.a.v). The ERT encourages Ukraine to continue its efforts to collect information and provide estimates for this category in its next inventory submission and to explore the methods used by other Parties or included in the international literature in order to calculate emissions from 1.B.2.a.v if possible.

#### Non-key categories

##### Stationary combustion: solid, liquid and gaseous fuels – CH<sub>4</sub>

62. This category was identified as a key category by trend in the secretariat's key category analysis for 2004 but is not reported as such by Ukraine in the NIR. The ERT recommends that Ukraine check its key category analysis to ensure that this category was not omitted by mistake.

##### Road transportation: liquid fuels – N<sub>2</sub>O

63. The IEFs for N<sub>2</sub>O emissions from gasoline (0.60 kg/TJ) reported by Ukraine for the complete time series were among the lowest of reporting Parties (0.60–15 kg/TJ in 1990) and lower than the IPCC default range (1–20 kg/TJ). As Ukraine is expected to have renewed its fleet with vehicles equipped with catalytic converters, the ERT recommended that Ukraine collect the relevant AD required to use a higher tier method as specified in the IPCC good practice guidance, and revise its estimates for N<sub>2</sub>O emissions for the whole time series accordingly (including gasoline and diesel oil and other fuels). After the in-country review, Ukraine informed the ERT that there is a study under way that should provide updated information and that the MEP included the provision of estimates for this category using the higher tier method in its work plan for inventory improvements to its 2008 inventory submission. The ERT welcomes this effort and encourages Ukraine to ensure that the planned improvements are implemented in its next submission.

##### Civil aviation: liquid – CO<sub>2</sub>

64. All jet kerosene consumption in Ukraine is currently allocated to civil aviation for the complete time series. Neither AD nor emissions were reported for international aviation emissions. Ukraine was strongly encouraged to identify the part of jet kerosene consumption that should be allocated to international aviation and to revise the civil aviation emission figures accordingly. The ERT recommended Ukraine to collect information on the number of domestic flights in 1990 to enable an estimation of jet kerosene consumption for domestic aviation, and to subtract this amount from the total consumption of jet kerosene to obtain the international share; or conversely to first collect information on the number of international flights in 1990 and estimate jet kerosene consumption for international aviation and then estimate the domestic share of jet kerosene consumption. This approach should be followed for the whole time series and the GHG estimates obtained should be cross-checked with the International Energy Agency (IEA) data to ensure full consistency.

65. After the in-country review, Ukraine informed the ERT that it could not apply the approach proposed by the ERT because, according to the Ukrainian State Aviation Service, bunker aviation fuel was not accounted for in Ukraine and no record exists of the scheduled flights in 1990. Additionally, no other source of information is available in the country. For this reason, Ukraine determined the shares of domestic and international aviation fuel consumption using an average of the share used by other countries with similar conditions (Belarus, Bulgaria, the Czech Republic and Poland). The share for these countries is based on the AERO2K and SAGE models as well as information from document

FCCC/SBSTA/2005/Misc.4.<sup>6</sup> The share of domestic fuel consumption was set at 6 per cent of total jet fuel consumption in 1990 and was applied for the complete time series. Ukraine revised the CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O emission estimates for the complete time series. This revision led to a reduction in estimated GHG emissions in the civil aviation category by 91.0 per cent in the base year (from 3,000.41 Gg CO<sub>2</sub> equivalent as reported originally to 270.70 Gg CO<sub>2</sub> equivalent) and by 76.8 per cent in 2004 (from 278.78 Gg CO<sub>2</sub> equivalent as reported originally to 64.60 Gg CO<sub>2</sub> equivalent). Aviation gasoline consumption is accounted for under domestic aviation since this fuel type is mostly used in small aircrafts that do not leave the territory of Ukraine.

66. The ERT agrees with the approach followed by Ukraine as it believes it is a conservative one. However, the ERT recommends that Ukraine further investigate this issue and encourages the use of the methods recommended by the IPCC good practice guidance in its future submissions, to ensure that emissions from civil aviation are systematically neither overestimated nor underestimated for the complete time series. The ERT encourages Ukraine to have make further contacts with the national aviation authorities and also to contact EUROCONTROL<sup>7</sup> or other relevant international organizations in order to obtain relevant statistics.

## 6. Industrial processes and solvent and other product use

### Sector overview

67. In the Kyoto Protocol base year (1990), emissions from the industrial processes sector accounted for 13.7 per cent of total national emissions. CO<sub>2</sub> represented 96.7 per cent of emissions from the sector (mostly from iron and steel production). CH<sub>4</sub>, N<sub>2</sub>O and PFC emissions accounted for 1.0, 2.1 and 0.2 per cent of sectoral emissions, respectively. In this sector, CH<sub>4</sub> emissions mainly come from iron and steel production (92.7 per cent), while N<sub>2</sub>O comes mainly from nitric acid production, and adipic acid production and PFC emissions (CF<sub>4</sub> and C<sub>2</sub>F<sub>6</sub>) as a by-product of aluminium and ferroalloys production which is the only category where they are reported. Neither actual nor potential emissions for production and consumption of halocarbons and SF<sub>6</sub> are reported for the whole time series because no reliable data are available. The ERT recommends that Ukraine investigate and report on emissions from all stages of the use of ozone depleting substance (ODS) substitutes in its next submission, especially HFCs emissions from refrigeration and air conditioning equipment.

68. Total GHG emissions from industrial processes decreased by 28.6 per cent between the base year and 2004, mainly because of the general decrease in industrial production activities. Sectoral total emissions show a decreasing trend from 1990 to 1996 (emissions in 1996 are 51.1 per cent lower than the 1990 level) and an increasing trend from 1996 to 2004 (emissions in 2004 are 45.8 per cent higher than the 1996 level).

69. Indirect GHG emissions are reported for the sector, including non-methane volatile organic compound (NMVOC) emissions from solvent and other product use.

70. The ERT recommends that transparency in the NIR be improved by including more complete descriptions of how the AD and EFs are determined and documenting the source-specific QA/QC procedures already undertaken.

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<sup>6</sup> <<http://unfccc.int/resource/docs/2005/sbsta/eng/misc04.pdf>>.

<sup>7</sup> <<http://www.eurocontrol.int/statfor>>.

Key categoriesCement production – CO<sub>2</sub>

71. Ukraine uses plant-specific data for the estimates in this category, in accordance with the IPCC Good Practice Guidance. However, the EFs declined by 1.3 per cent between 1990 and 2004 and no explanation for this is provided in the NIR. During the in-country review, it was identified that the EFs are derived from the weighted average of 12 plants in the country. Two plants with relatively higher magnesium oxide (MgO) content in clinker (hence higher EFs) were closed in 2001. The ERT encourages Ukraine to include this explanation in the NIR in order to improve transparency in its next submission.

Ammonia production – CO<sub>2</sub>

72. Ukraine assumes that 99 per cent of the non-energy consumption of natural gas by the chemical and petrochemical industries was used in ammonia production. There is no statistical data on natural gas consumption for ammonia production in Ukraine but total non-energy consumption of natural gas by the chemical and petrochemical industries is available. The ERT detected a mistake in Ukraine's calculation of the shares of the non-energy consumption of natural gas in chemical and petrochemical products, which resulted in an overestimation of CO<sub>2</sub> emissions in the base year. The ERT recommended that Ukraine use 82.5 per cent as a correct share of natural gas in ammonia production and revise the CO<sub>2</sub> emission estimates. After the in-country review, Ukraine revised the emission estimates for ammonia production in line with the ERT's recommendations, and submitted revised estimates for the period 1990–2004. This revision led to a reduction in estimated CO<sub>2</sub> emissions in the ammonia production category by 16.7 per cent in the base year (from 14,107.58 Gg as reported originally to 11,756.32 Gg) and by 13.8 per cent in 2004 (from 11,541.19 Gg as reported originally to 9,952.98 Gg). The ERT also noted that ammonia production volumes were overestimated by a factor of 3 and recommends Ukraine to correct this mistake in its next submission.

Iron and steel production – CO<sub>2</sub>

73. Ukraine reported all CO<sub>2</sub> emissions from coke use for iron and steel production under industrial processes rather than under the energy sector as it had in its previous submission (2005) and reported its recalculations accordingly. However, it is not clear how emissions from other coke production, and use of coke oven gas and furnace gas are accounted for. During the in-country review, following the ERT's recommendation, Ukraine conducted a carbon balance check for 1990, which helped to make clear that a potential double counting in the base year had been avoided. Considering the importance and complexity of emissions from this category, the ERT recommends that Ukraine apply the carbon balance check approach to the whole time series to avoid potential double counting between the energy sector and the industrial processes sector in its next submission.

Non-key categoriesNitric acid production – N<sub>2</sub>O

74. Non-concentrated nitric acid production is used as AD in the CRF tables for the complete time series, which resulted in the lowest IEF (0.00132 t/t) of reporting Parties (0.002–0.019 t/t in 1990). Data conversion from non-concentrated nitric acid to concentrated nitric acid is necessary. The ERT encourages Ukraine to use concentrated nitric acid production in the CRF tables in its next submission in order to improve comparability.

### Adipic acid production – N<sub>2</sub>O

75. There are two adipic acid production plants in Ukraine. Ukraine uses the assumptions on N<sub>2</sub>O destruction factors and abatement system utilization factors provided in the IPCC good practice guidance for the whole time series because no plant-specific data are available. The ERT encourages Ukraine to investigate relevant information from the existing plants and to include and use this information in its next submission.

### Production and consumption of halocarbons and SF<sub>6</sub> – HFCs, PFCs and SF<sub>6</sub>

76. In the CRF tables notation keys were used inappropriately for the production of halocarbons and SF<sub>6</sub> category. During the in-country review, it was clarified that there is no HCFC-22 production plant in Ukraine, hence “NO” should be used rather than “NE” for HFC-23 emissions from production of HCFC-22; while for the category refrigeration and air conditioning equipment (2.F.1), notation key “NE” should be used rather than “NO” because refrigerators are widely used in Ukraine and imported cars are equipped with air conditioners. Furthermore, there is a plant in the country that uses HFC-134a to manufacture refrigerators for export. The ERT recommends Ukraine to use notation keys appropriately in its next submission and strongly recommends that it investigate and report on emissions from all stages of the use of ODS substitutes in its next submission.

## 7. Agriculture

### Sector overview

77. In the Kyoto Protocol base year (1990) the agriculture sector accounted for 11.0 per cent of total national GHG emissions, amounting to 101,355.29 Gg CO<sub>2</sub> equivalent. Over the period 1990–2004, emissions from the sector decreased by 70.0 per cent. Agricultural soils and enteric fermentation were the major categories, contributing 40.0 per cent and 34.0 per cent, respectively, to total sectoral emissions in 1990. Emissions from the prescribed burning of savannas and field burning of agricultural residues categories are reported as not applicable (“NA”) and “NO”, respectively, as there are no savannas in Ukraine and burning of agricultural residues is prohibited. Recalculations were performed for the entire time series and for all categories because of corrected AD for livestock populations and the use of country-specific EFs and methodologies. Appropriate efforts have been made to ensure time-series consistency when the same data sources are not available for the full time series. Tier 1 general inventory level QA/QC procedures have been performed for emissions estimates, EFs and AD.

### Key categories

#### Enteric fermentation – CH<sub>4</sub>

78. Ukraine used the tier 2 method for cattle with enhanced characterization and country-specific EFs (for dairy and non-dairy cattle the EFs are 92 kg CH<sub>4</sub>/year and 46 kg CH<sub>4</sub>/year, respectively) to estimate CH<sub>4</sub> emissions from enteric fermentation for the base year. These values are within the range of EFs used by other reporting Parties. The methodology used is in line with the IPCC good practice guidance. As a result of recalculations the CH<sub>4</sub> emissions from this category decreased by 55 per cent in the base year. Country-specific EFs for dairy and non-dairy cattle are 92 kg CH<sub>4</sub>/year and 46 kg CH<sub>4</sub>/year, respectively. These values are within the limits of EFs used in Annex I countries. The State Committee on Statistics supplied agricultural data for all the years. These data were cross-checked with the United Nations Food and Agriculture Organization (FAO) data. The ERT was informed that Ukraine plans to use higher tier methodology to estimate CH<sub>4</sub> emissions from enteric fermentation of cattle. The ERT encourages Ukraine to check the consistency of the new methodology with the IPCC good practice guidance.

*Agricultural soils (direct soil emissions and indirect emissions) – N<sub>2</sub>O*

79. Ukraine used country-specific methodology to estimate emissions from animal manure applied to soils, crop residue, atmospheric deposition, and nitrogen leaching and run-off. The methodologies are in accordance with the IPCC good practice guidance. Ukraine used country-specific data for nitrogen fractions in crop residues (stubbles and roots), dry matter fractions in residues and residue/crop ratios for N-fixing crops. The State Committee on Statistics supplies the majority of the data for synthetic fertilizer and, where necessary, the missing data was taken from FAO data (1992, 1994, and 1995) to ensure time-series consistency. Ukraine in its original 2006 submission reported recalculations for the complete time series for the amount of animal waste applied to agricultural soils according to the identified types of animal waste management systems (AWMS) used in the country. These recalculations resulted in an increase of 47.5 per cent in N<sub>2</sub>O emissions from this category in the base year.

80. The ERT recommends Ukraine to make the necessary efforts to collect data from national sources for the subcategories that currently are using international data in order to ensure time-series consistency, and, because this is a key category, to apply higher tier methodologies for all the subcategories included in agricultural soils.

*Non-key categories**Manure management – CH<sub>4</sub>*

81. In accordance with the recommendations of the previous (2005) review report, Ukraine has identified the types of AWMS used in the country and developed country-specific data on the allocation of manure to different types of AWMS for cattle, swine and poultry as well as country-specific volatile solid excretion rates and EFs. The ERT welcomes the efforts made by Ukraine in implementing the recommendations from the previous review report. Ukraine provided recalculated estimates for the complete time series and CH<sub>4</sub> emissions for the base year have increased by more than 4 times because of these recalculations. The ERT welcomes the efforts made by Ukraine in implementing the recommendations from the previous review report.

*Rice cultivation – CH<sub>4</sub>*

82. Taking into account the comments of the previous (2005) review report, Ukraine for the first time used AD on organic fertilizer application for the years 1991–1992 and 1994–1995. These data were obtained using interpolation method. As well as comparing with previous submission, values for organic fertilizer applied to rice were corrected consistent with fermented fertilizers. This led to a recalculation of CH<sub>4</sub> emissions throughout the time series. As a result, the emissions in the base year as originally submitted decreased by 57.8 per cent and the value of the CH<sub>4</sub> IEF for rice fields decreased from 70 g/m<sup>2</sup> to 30 g/m<sup>2</sup>. The ERT welcomes the efforts made by Ukraine in implementing the recommendations from the previous review report.

*Field burning of agricultural residues – CH<sub>4</sub> and N<sub>2</sub>O*

83. In its 2006 submission, Ukraine does not provide estimations of GHG emissions from field burning of agricultural residues and uses the notation key “NO” in CRF table 4.F. During the in-country review, Ukraine provided details of the State Law (Code on Administration Crime, Art 77-1) that prohibits field burning of agricultural residues in Ukraine.



## 8. Land use, land-use change and forestry

### Sector overview

84. In 1990, the LULUCF sector was a net sink of 33,821.06 Gg CO<sub>2</sub> equivalent, off-setting 3.7 per cent of the total GHG emissions. The net sink in the base year was 5.0 per cent higher than in 2004. The overall trend, however, displayed significant variability, having dropped by 8.6 per cent from 1990 to 1993, increased by 69.8 per cent from 1993 to 1998 and again decreased by 38.8 per cent from 1998 to 2004. Ukraine explained fluctuations by inter-annual changes in land conversion. The ERT noted considerable improvements in the representation of lands and sinks and source categories since the previous (2005) submission. The ERT further noted that the NIR lacks documentation on AD and the parameters used, which makes it difficult to follow the calculations. To improve transparency of the reporting, the ERT encourages Ukraine to enhance the documentation in the NIR of the areas of land, methods and parameters used for GHG calculation in the LULUCF sector in its next submission.

85. In its 2006 submission Ukraine reports CO<sub>2</sub> removals for forest land (5.A), grassland (5.C) and settlements (5.E) and CO<sub>2</sub> and non-CO<sub>2</sub> emissions from forest land (5.A), cropland (5.B) and wetlands (5.D) in the NIR and the CRF tables. The areas of land were estimated using a specially developed Land-Use Conversion Matrix (LUCM), which corresponds to approach 2 in the IPCC good practice guidance for LULUCF. The 20-year transition period for land-use conversion is consistently maintained. The analysis performed by Ukraine identified the categories 5.A, 5.B, 5.C and 5.E as key categories. To estimate emissions and removals from key categories, Ukraine used a combination of tier 1 and tier 2 methods as outlined in the IPCC good practice guidance for LULUCF. However, during the in-country review, the ERT noted that tier 1 of the IPCC good practice guidance for LULUCF might be not fully applicable for categories 5.B, 5.C, 5.D and 5.E because of their intensive management. To improve completeness of the reporting, the ERT encourages Ukraine to describe its verification activities for the LUCM in its next inventory submission. The ERT further encourages Ukraine to reflect on the applicability of tier 1 for the abovementioned land categories and to change its estimation method, if appropriate.

86. The recalculations in the sector were mainly due to the introduction of the IPCC good practice guidance for LULUCF and country-specific parameters. The ERT noted that Ukraine undertook QA/QC and verification procedures for AD and parameters and documented them appropriately in the NIR. The ERT also noted that Ukraine implemented a tier 1 uncertainty assessment for the LULUCF sector and documented it in the NIR.

### Key categories

#### Forest land – CO<sub>2</sub>

87. In 1990, net CO<sub>2</sub> removals from forest land amounted to 55,408.31 Gg, off setting 6.0 per cent of total national emissions. Ukraine used tier 2 methodology and country-specific data and parameters to estimate CO<sub>2</sub> removals in biomass and litter for forest land remaining forest land and lands converted to forest land. The calculations of carbon stocks in soils were performed using tier 1 methodology, country-specific data and default parameters. The ERT noted that the weighted average of annual growth rates applied by Ukraine might underestimate overall CO<sub>2</sub> removals. To improve the precision of the estimates, the ERT encourages Ukraine to develop and use annual growth rates disaggregated by age to calculate removals in forest biomass in its future inventory submissions.

#### Cropland – CO<sub>2</sub>

88. In 1990, cropland was the major source of CO<sub>2</sub> emissions (28,948.5 Gg), equivalent to 3.1 per cent of national totals. For this category, Ukraine included emissions and removals in biomass

from fruit gardens and soil carbon stocks related to land conversion. The estimates were performed using tier 1 methods, country-specific data and default parameters. The ERT recommends Ukraine to check and report in its next inventory submission on the appropriateness of the use of tier 1 methods for calculations of emissions from this category, because tier 1 methods might not be fully applicable where intensive management of croplands occurs.

#### Grassland – CO<sub>2</sub>

89. Net CO<sub>2</sub> removals by grassland amounted to 9,046.72 Gg in 1990, offsetting 1.0 per cent of national total emissions. Under this category Ukraine estimated changes in soil carbon stocks with the use of national data and default methods and parameters. The ERT noted that for 80 per cent of the area calculations were performed following default assumptions and that the remaining 20 per cent is under woody vegetation. However, no data on woody vegetation were available during the calculations, and this remaining area was not taken into account. The ERT encourages Ukraine to perform calculations for the entire area of grassland for its next submission, unless other data are made available.

#### Settlements – CO<sub>2</sub>

90. In 1990, settlements were a minor CO<sub>2</sub> source (283.69 Gg). During the in-country review, the ERT learned that Ukraine made a mistake in its land allocation for these calculations. The ERT recommends Ukraine to correct this mistake and revise the estimates in this category for its next submission.

#### Non-key categories

##### Wetlands – CO<sub>2</sub>

91. The net CO<sub>2</sub> emissions from wetlands amounted to 1,383.64 Gg of CO<sub>2</sub>, equivalent to 0.2 per cent of national totals, in 1990. The ERT noted that the tier 1 method used might be inappropriate for this category. The ERT recommends Ukraine to check and report in its next inventory submission on the appropriateness of the method and to revise its calculations, if necessary.

##### Forest land and wetlands – CH<sub>4</sub> and N<sub>2</sub>O

92. In 1990, forest land and wetlands constituted a source of CH<sub>4</sub> and N<sub>2</sub>O emissions, together amounting to 18.10 Gg CO<sub>2</sub> equivalent, which is equivalent to less than 0.1 per cent of the national emissions. The sources of the non-CO<sub>2</sub> emissions were biomass burning and drainage of organic soils. The estimates were performed using a tier 1 method. The ERT noted that drainage of organic soils was inappropriately documented in the NIR and encourages Ukraine to document calculations from this category in its next inventory submission.

## 9. Waste

### Sector overview

93. In the Kyoto Protocol base year (1990), total GHG emissions from the waste sector amounted to 8,428.24 Gg CO<sub>2</sub> equivalent or 0.9 per cent of Ukraine's total GHG emissions. Emissions from solid waste disposal on land contributed 62.6 per cent to total waste sector emissions in the base year and emissions from wastewater handling accounted for 37.4 per cent. Emissions from waste incineration are reported in the energy sector. CH<sub>4</sub> is the predominant GHG, contributing 81.5 per cent of the emissions from the sector.

94. According to information reported in its 2006 submission, Ukraine has completely recalculated its GHG emission estimates for all categories in the waste sector. The recalculations resulted in a decrease of 64.6 per cent in the emissions for the base year, from 22,226.71 Gg CO<sub>2</sub> equivalent (in the

2005 submission) to 7,872.52 Gg CO<sub>2</sub> equivalent (in the original 2006 submission). This change is mainly due to revisions of the data on landfill waste and the data on urban population as well as more accurate choices of EFs. In addition, the accuracy of the time series on biochemical oxygen demand (BOD<sub>5</sub>) and chemical oxygen demand (COD) was improved and the country-specific share of the matter decomposed in anaerobic conditions for wastewater and sludge was defined.

95. The 2006 inventory submission is more transparent than the previous (2005) one, mainly because descriptions of the assumptions used, and of background data and studies have been included in the NIR. In addition, the general QA/QC plan has been applied to the waste sector. Some improvements in estimating emissions are summarized and described in the NIR. The ERT welcomes these efforts and encourages Ukraine to continue to improve the estimates in the waste sector in its next inventory submission.

#### Key categories

##### Solid waste disposal on land – CH<sub>4</sub>

96. Ukraine used a tier 2 first order decay (FOD) model from recently published recognized international literature with some country-specific parameters. Emissions in the base year were estimated in line with the methodology described in the IPCC good practice guidance. In the 2005 submission, Ukraine considered 56.1 per cent of landfill sites to be unmanaged and 43.9 per cent to be managed. In the 2006 submission Ukraine revised the breakdown of landfills into unmanaged shallow (19.3 per cent) and unmanaged deep (80.7 per cent) in implementing the recommendations of the previous (2005) review report. Ukraine used this assumption for the whole time series.

97. During the in-country review, the ERT found that Ukraine had at least one CH<sub>4</sub> landfill recovery facility, which means that some requirements for managed landfills are met. This suggests that the assumption that all landfills are unmanaged may not be appropriate for the entire time series. This may lead to an underestimation of CH<sub>4</sub> emissions in the later years of the time series. The ERT recommended that Ukraine conduct further studies to revise the allocation between managed and unmanaged landfills. Based on the new allocation between managed and unmanaged landfills, a methane correction factor (MCF) should be established and applied to the emission estimates in future submissions.

98. After the in-country review, and following the recommendations of the ERT, Ukraine revised its CH<sub>4</sub> emission estimates from municipal solid waste disposal sites for the 1990–2004 period to take account of the results of an Expert Conclusion that made more precise the allocation of solid waste disposal sites (SWDS) between managed, unmanaged deep and unmanaged shallow, as well as values of country typical MCF. The allocation used by Ukraine in 1990 is: managed – 0 per cent; unmanaged deep – 67.4 per cent; and unmanaged shallow – 32.6 per cent. For 2004 the allocation is: managed – 25.7 per cent; unmanaged deep – 42.5 per cent; and unmanaged shallow – 31.8 per cent. The ERT agreed with these assumptions and considered the subsequent revision of estimates to be appropriate.

99. In its 2006 submission, Ukraine used a waste density factor equal to 250 kg/m<sup>3</sup> for transforming the volume of waste into mass units. In the opinion of the ERT this value seems low. Special attention should be given to the waste amount estimated for 2000–2004, as this factor is outdated (1966). In large cities, municipal solid waste (MSW) is collected using high compacting level trucks. Therefore, the ERT considers that waste density should be higher (450–650 kg/m<sup>3</sup>) and that CH<sub>4</sub> emissions from SWDS may be underestimated for the whole times series. The ERT recommended that Ukraine revise the waste density factor for the whole time series and provide updated estimates. After the in-country review, and in response to the ERT's comments, Ukraine confirmed that the density of waste in containers was 0.25 t/m<sup>3</sup> calculated as an average for different categories of household waste, in accordance with the results of research by the Ukrainian Research Institute on Progressive Technologies in Public Facilities (UKRNII Progress). The ERT encourages Ukraine to further clarify this issue and if possible to use

weighted quantities of disposed MSW in order to avoid underestimation of CH<sub>4</sub> emissions in the future, and to report on this in its next submission.

100. Estimated CH<sub>4</sub> emissions from SWDS do not cover emissions from the disposal of industrial waste. This may lead to an underestimation of emissions for the whole times series. The ERT recommended that Ukraine explore the possibility of including CH<sub>4</sub> emissions from industrial waste disposal. After the in-country review, and following the recommendations of the ERT, Ukraine revised its estimates from this category and included a new source of CH<sub>4</sub> emissions – industrial waste. Data from the State Committee on Statistics for agricultural and food industry disposal in SWDS from 1994 onwards were used in calculations. Extrapolation was used to estimate data for the 1948–1994 period. The ERT considers this revision of estimates to be appropriate and encourages Ukraine to provide all the parameters and background information used in these estimates in the NIR of its next submission. The revisions mentioned above (paragraphs 98 and 100) led to an increase in estimated CH<sub>4</sub> emissions from the solid waste disposal on land category of 11.8 per cent in the base year (from 224.61 Gg as reported originally to 251.07 Gg) and of 5.3 per cent in 2004 (from 297.91 Gg as reported originally to 313.72 Gg).

#### Non-key categories

##### Wastewater handling – CH<sub>4</sub> and N<sub>2</sub>O

101. Emissions from wastewater handling in 2004 had decreased by 17.8 per cent since the base year, mainly due to reductions in waste-water streams. Country-specific EFs and a tier 2 method were used to estimate emissions. CH<sub>4</sub> recovered from treating domestic and commercial waste water is reported for reference purposes only and is not included in emission totals. The ERT notes and commends the huge effort that has been made by Ukraine to obtain AD and country-specific EFs.

##### Waste incineration – CO<sub>2</sub> and N<sub>2</sub>O

102. The NIR contains a detailed description of the data used for estimating emissions from incineration of MSW, which are based on the IPCC default methodology. The trend in CO<sub>2</sub> emissions from waste incineration for 1990–2004 is relatively constant; nevertheless, there are some fluctuations due to the closure of two waste incineration plants (in 1998 and 2001) out of the four that were operational in 1990. Ukraine used AD provided directly by the two operating plants and assumptions based on the installed capacity for the closed plants. CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O emissions from this category are reported in the energy sector; background information which confirms that waste is incinerated with heat recovery was provided to the ERT during the in-country review. The notation key “IE” (“included elsewhere”) is used correctly in the CRF table 6.C.

### **C. Calculation of the assigned amount**

103. The assigned amount pursuant to Article 3, paragraphs 7 and 8, is calculated in accordance with the annex to decision 13/CMP.1.

104. Ukraine’s base year is 1990 and Ukraine has chosen 1990 as the base year for HFCs, PFCs and SF<sub>6</sub>. Ukraine’s quantified emission limitation commitment is 100 per cent as included in Annex B to the Kyoto Protocol.

105. Based on Ukraine’s base year emissions (925,362.174 Gg CO<sub>2</sub> equivalent) and its Kyoto Protocol quantified emission limitation commitment (100 per cent), Ukraine in its initial report originally calculated its assigned amount to be 4,626,810,872 tonnes CO<sub>2</sub> equivalent.

106. In response to inventory issues identified during the review and in accordance with the recommendations of the ERT, Ukraine submitted revised estimates of its base year inventory – 920,836.933 Gg CO<sub>2</sub> equivalent – which resulted in a recalculation of the assigned amount. Based on the revised estimates, Ukraine calculates its assigned amount to be 4,604,184,663 tonnes CO<sub>2</sub> equivalent. The ERT agrees with this figure.

#### **D. Calculation of the commitment period reserve**

107. The recalculation of the required level of the commitment period reserve is in accordance with paragraph 6 of the annex to decision 11/CMP.1.

108. In its initial report, based on its national emissions in the most recently reviewed (2004) inventory – 413,411.238 Gg CO<sub>2</sub> equivalent – Ukraine originally calculated its commitment period reserve to be 2,067,056,188 tonnes CO<sub>2</sub> equivalent.

109. In response to inventory issues identified during the review, Ukraine submitted revised estimates of its most recently reviewed (2004) inventory – 411,994.095 Gg CO<sub>2</sub> equivalent – which resulted in a recalculation of the commitment period reserve. Based on the revised estimates, Ukraine calculates its commitment period reserve to be 2,059,970,475 tonnes CO<sub>2</sub> equivalent. The ERT agrees with this figure.

#### **E. National registry**

110. Ukraine provided information on the national registry system as required by the reporting guidelines under Article 7, paragraphs 1 and 2, of the Kyoto Protocol (decision 15/CMP.1) in its initial report. The information provided is transparent to some extent and broadly follows the reporting guidelines requirements. The ERT noted the efforts made by Ukraine to develop the national registry by using a national company to develop the software and implementation of the registry. However, the ERT noted that Ukraine was still in the early stages of developing its national registry and at this stage it was impossible for the ERT to assess and review it thoroughly. During the in-country review, the following aspects of the national registry were not yet in place:

- (a) The names of the other Parties with which Ukraine cooperates by maintaining their national registries in a consolidated system or any changes to this information since the submission of the initial report;
- (b) A description of the database structure and capacity of the national registry;
- (c) A description of how the national registry conforms to the technical standards for data exchange between registry systems for the purpose of ensuring the accurate, transparent and efficient exchange of data between national registries, the clean development mechanism registry and the transaction log;
- (d) A description of the procedures employed in the national registry to minimize discrepancies in the issuance, transfer, acquisition, cancellation and retirement of ERUs, CERs, tCERs, ICERs, AAUs and/or RMUs, and replacement of tCERs and ICERs, and of the steps taken to terminate transactions where a discrepancy is notified and to correct problems in the event of a failure to terminate the transactions;
- (e) An overview of security measures employed in the national registry to prevent unauthorized manipulation and operator error, and of how these measures are kept up to date;
- (f) A list of the information publicly accessible by means of the user interface to the national registry or any changes to this information since the submission of the initial report;

- (g) The Internet address of the interface to its national registry;
- (h) A description of the measures taken to safeguard, maintain and recover data in order to ensure the integrity of data storage and the recovery of registry services in the event of a disaster;
- (i) The results of any test procedures that might be available or developed with the aim of testing the performance, procedures and security measures of the national registry undertaken pursuant to the provisions of decision 19/CP.7 relating to the technical standards for data exchange between registry systems.

111. After the in-country review Ukraine informed the ERT that these aspects were implemented. The ERT recommends that Ukraine provide more complete and detailed information about the national registry, and in particular on the elements listed above, in its next inventory report under the Kyoto Protocol.

112. The ERT noted that the administrator and data storage for a national registry were not established at the time of the in-country review. During the in-country review, the ERT was provided with additional information on the general plan to establish the national registry of Ukraine. After the in-country review Ukraine informed the ERT that the administrator (JSC Softline) and data storage for its national registry were established. The ERT recommends Ukraine to provide this information in its next inventory report under the Kyoto Protocol.

113. Table 5 summarizes the information on the mandatory reporting elements of the national registry system as stipulated by decision 15/CMP.1, which describes how the national registry performs the functions defined in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1.

**Table 5. Summary of information on the national registry system**

Reporting element	Provided in the initial report	Comments
<b>Registry administrator</b>		
Name and contact information	Yes	
<b>Cooperation with other Parties in a consolidated system</b>		
Names of other Parties with which Ukraine cooperates, or clarification that no such cooperation exists.	Yes	Ukraine uses the Community Registry software and has signed a licence agreement with the European Commission, however is not operated in a consolidated form with the registries of other Parties.
<b>Database structure and capacity of the national registry</b>		
Description of the database structure	No	Summary information provided after the in-country review.
Description of the capacity of the national registry	Yes	
<b>Conformity with data exchange standards (DES)</b>		
Description of how the national registry conforms to the technical DES between registry systems	Yes	Covered in the independent assessment report (IAR) <sup>a</sup>
<b>Procedures for minimizing and handling of discrepancies</b>		
Description of the procedures employed in the national registry to minimize discrepancies in the transaction of Kyoto Protocol units	Yes	
Description of the steps taken to terminate transactions where a discrepancy is notified and to correct problems in the event of a failure to terminate the transaction	No	Information provided after the in-country review.
<b>Prevention of unauthorized manipulations and operator error</b>		
An overview of security measures employed in the national registry to prevent unauthorized manipulations and to prevent operator error	Yes	Covered in the IAR
An overview of how these measures are kept up to date	No	Information provided after the in-country review.
<b>User interface of the national registry</b>		
A list of the information publicly accessible by means of the user interface to the national registry	Yes	Covered in the IAR
The Internet address of the interface to Ukraine's national registry	No	Information provided after the in-country review: <a href="http://www.carbonunitsregistry.gov.ua/">http://www.carbonunitsregistry.gov.ua/</a>
<b>Integrity of data storage and recovery</b>		
A description of measures taken to safeguard, maintain and recover data in order to ensure the integrity of data storage and the recovery of registry services in the event of a disaster	Yes	Covered in the IAR
<b>Test results</b>		
The results of any test procedures that might be available or developed with the aim of testing the performance, procedures and security measures of the national registry undertaken pursuant to the provisions of decision 19/CP.7 relating to the technical standards for data exchange between registry systems.	No	Test results covered in the IAR

<sup>a</sup> Pursuant to decision 16/CP.10, the administrator of the international transaction log (ITL), once registry systems become operational, is requested to facilitate an interactive exercise, including with experts from Parties to the Kyoto Protocol not included in Annex I to the Convention, demonstrating the functioning of the ITL with other registry systems. The results of this exercise will be included in an independent assessment report (IAR). They will also be included in the annual report to the CMP.

114. During the in-country review, the ERT was informed that Ukraine's national registry would be fully operational by the end of the first half of 2007 (June). However, the development of the national registry in Ukraine was at an early stage and not in line with recent progress in the international community.

115. During the in-country review, Ukraine showed a web-based national registry interface to the ERT. However, information on the registry was not publicly available through the Internet. The ERT was informed that testing the performance, procedures and security measures of the national registry will

be addressed in the framework of the terms of reference for development of the national registry as soon as possible after start of the international transaction log (ITL) operation. Additional testing procedures are envisaged in the domestic requirements for acceptance of the complex information security system.

116. The ERT welcomed the efforts of Ukraine to put in place some security measures to safeguard, maintain and recover data in order to ensure the integrity of data storage and the recovery of registry services in the event of a disaster. The ERT found that the security measures for back-up storage reported by Ukraine should be strengthened and fully implemented. After the in-country review Ukraine informed the ERT that all these measures were implemented.

117. Also after the in-country review, Ukraine recognized that at the time of the in-country review its national registry did not meet the requirements as defined by decisions 13/CMP.1 and 5/CMP.1. Ukraine decided to use a registry software from an international provider. Furthermore, Ukraine informed the ERT that it had decided to implement the Community Registry software of the European Commission as a basis for its national registry, which expedited the process.

118. In addition, on 13 September 2007 and 16 November 2007, Ukraine provided updated information on its national registry which indicates the following progress and improvements since the in-country review:

- (a) Ukraine confirmed that implemented the Community Registry software of the European Commission as the basis for its national registry. A license agreement on the use the Community Registry software was signed between the European Commission and the MEP. The Ukrainian IT-consulting company JSC Softline is designated as the national registry administrator;
- (b) The structure and capacity of the database of Ukraine's national registry are the same as those of the Community Registry;
- (c) Ukraine's national registry is based on the Community Registry software, which conforms to the technical standards for data exchange for ensuring accurate, transparent and efficient exchange of data between national registries, the clean development mechanism registry and the transaction log;
- (d) Ukraine has applied testing procedures for its national registry, which include checks on ways to minimize data discrepancies during data exchange;
- (e) Ukraine has established a security plan to prevent unauthorized manipulation and operator errors;
- (f) Information on Ukraine's national registry is placed on the Internet, which Ukraine established for users of the national register. The Internet address of the national registry is <http://www.carbonunitsregistry.gov.ua/>. The national registry administrator required that a password authorization procedure be put in place for those wishing to gain access to this website;
- (g) Ukraine developed a Disaster Recovery Plan containing measures taken to safeguard, maintain and recover data in order to ensure the integrity of data in the event of a disaster;
- (h) Several tests were performed with the aim of testing the performance, procedures and security measures of the national registry pursuant to the provisions of decision 19/CP.7 relating to the technical standards for data exchange between registry systems. A connectivity test was done on 11 September 2007. Deployment of the national registry on main servers has been done according to instructions contained in the document "Version Change Management". A final test of the operation and data exchange between Ukraine's national registry and the ITL was performed during August/November 2007.



119. The ERT took note of the results of the technical assessment of the national registry, including the results of standardized testing, as reported in the independent assessment report that was forwarded to the ERT by the administrator of the international transaction log, pursuant to decision 16/CP.10, on 11 December 2007.

120. The ERT reiterated the main findings of this report, including that the registry has fulfilled all of its obligations regarding conformity with the DES. These obligations include having adequate transaction procedures; adequate security measures to prevent and resolve unauthorized manipulations; and adequate measures for data storage and registry recovery.

121. Based on the results of the technical assessment, as reported in the independent assessment report, the ERT concluded that Ukraine's national registry is fully compliant with the registry requirements as defined by decisions 13/CMP.1 and 5/CMP.1, noting that registries do not have obligations regarding operational performance or public availability of information prior to the operational phase.

122. The ERT recommends Ukraine to provide detailed information on human resources allocated to its national registry and the development, establishment, operation and maintenance of its national registry in its next inventory report under the Kyoto Protocol.

#### **F. Land use, land-use change and forestry parameters and election of activities**

123. Table 6 shows Ukraine's choice of parameters for forest definition as well as elections for Article 3, paragraphs 3 and 4, activities in accordance with decision 16/CMP.1.

**Table 6. Selection of LULUCF parameters**

<b>Parameters for forest definition</b>		
Minimum tree cover	30 %	
Minimum land area	0.1 ha	
Minimum tree height	5 metres	
Minimum value of forest width*	20 metres	
<b>Elections for Article 3, paragraphs 3 and 4, activities</b>		
<b>Article 3.3 activities</b>	<b>Election</b>	<b>Accounting period</b>
Afforestation and reforestation	Mandatory	Commitment period
Deforestation	Mandatory	Commitment period
<b>Article 3.4 activities</b>		
Forest land management	Elected	Commitment period
Cropland management	Not elected	Not applicable
Grazing land management	Not elected	Not applicable
Revegetation	Not elected	Not applicable

\* Additional LULUCF parameter reported by Ukraine.

124. The definition of forest in Ukraine's initial report is unclear with regard to the allocation of "areas normally forming part of the forest area which are temporarily unstocked as a result of human intervention such as harvesting or natural causes", as set out in paragraph 1 of decision 16/CMP.1. Furthermore, Ukraine set a 20 metre minimum forest width in addition to the mandatory parameters in its definition of forest, without written confirmation that this parameter is reported to the FAO as a part of its national forest data. The ERT recommended that Ukraine provide written clarification of how temporarily unstocked forest areas are referred to in the definition of forest and confirm that the minimum forest width is consistent with its national reports to the FAO.

125. After the in-country review, in response to the ERT's questions, Ukraine clarified that temporarily unstocked forest areas are included in the definition of forest in accordance with the provisions of decision 16/CMP.1. Ukraine also confirmed that the inclusion of a 20 metre minimum value of forest width is consistent with its current reporting to the FAO. Ukraine further confirmed that the definitions submitted will be used consistently for the entire commitment period. The ERT concluded that the additional information provided was adequate.

126. Ukraine selected forest land management as an additional activity for reporting under Article 3, paragraph 4, of the Kyoto Protocol. The initial report provides a broad definition of forest management activities and describes the identification of land areas subject to them. However, the initial report does not include the demonstration that selected forest management activities have occurred since 1990 and are human-induced. The ERT recommended Ukraine to describe the timeframes and the nature of forest management activities selected for reporting under Article 3, paragraph 4, of the Kyoto Protocol.

127. After the in-country review, in response to the ERT questions, Ukraine provided a detailed description of human-induced management activities, which have been consistently implemented on forest lands and included in accounting under Article 3, paragraph 4, of the Kyoto Protocol. Ukraine further indicated that ground-based management practices in combination with the data from periodic forest inventories allow for consistent tracking of forest management activities which have occurred since 1990 as outlined in decision 16/CMP.1. The ERT concluded that the additional information provided was adequate.

### **III. Conclusions and recommendations**

#### **A. Conclusions**

128. In the initial report, Ukraine has submitted all the information in accordance with the relevant provisions of paragraphs 5, 6, 7 and 8 of the annex to decision 13/CMP.1, section I of the annex to decision 15/CMP.1, and the relevant decisions of the CMP. Additional information on all elements was provided to the ERT during the in-country review.

129. Ukraine's national system was not fully established and prepared in accordance with the guidelines for national systems under Article 5, paragraph 1, of the Kyoto Protocol (decision 19/CMP.1) and reported in accordance with the guidelines for the preparation of the information required under Article 7 of the Kyoto Protocol (decision 15/CMP.1). During the in-country review the ERT asked Ukraine to provide additional information. After the in-country review, Ukraine provided the required additional information and the ERT concluded that the national system is fully in line with the guidelines for national systems, but needs to maintain and enhance its operational functions outlined in the additional information provided. The ERT noted that Ukraine provided timely and thorough replies to its questions concerning potential problems, following the ERT's recommendations and in line with the relevant reporting guidelines and CMP decisions.

130. Ukraine has provided its GHG inventory data for the years 1990 to 2004, including a full set of the CRF tables required with data on all relevant gases and categories and an NIR. Ukraine's GHG inventory is generally accurate, as defined in the UNFCCC reporting guidelines, and is consistent with the Revised 1996 IPCC Guidelines and the IPCC good practice guidance. During the in-country review the ERT identified a few categories where the methods or EFs used were not fully in accordance with the IPCC good practice guidance and this might lead to an overestimation of emissions in the base year or an underestimation of emissions in the most recent years. The ERT recommended Ukraine to revise its estimates for these categories. After the in-country review, Ukraine provided revised estimates and additional information for these categories for the complete time series in accordance with the recommendations of the ERT and in line with the IPCC good practice guidance.

131. The ERT did not recommend any adjustments to Ukraine's GHG inventory, and noted that the assigned amount pursuant to Article 3, paragraphs 7 and 8, and the commitment period reserve, as calculated to incorporate the revised estimates submitted during the review, are in accordance with the modalities for the accounting of assigned amounts under Article 7, paragraph 4, of the Kyoto Protocol (decision 13/CMP.1) and paragraph 6 of the annex to decision 11/CMP.1, respectively.

132. The ERT confirms that Ukraine's assigned amount is 4,604,184,663 tonnes CO<sub>2</sub> equivalent based on its base year emissions (920,836.933 Gg CO<sub>2</sub> equivalent, including the revised estimates provided) and its Kyoto Protocol emission limitation commitment of 100 per cent, and that Ukraine's commitment period reserve is 2,059,970,475 tonnes CO<sub>2</sub> equivalent based on its 2004 emissions (411,994.095 Gg CO<sub>2</sub> equivalent, including the revised estimates provided). The ERT agrees with these figures.

133. Ukraine has also identified all the required information on parameters and elections for LULUCF under Article 3, paragraphs 3 and 4, of the Kyoto Protocol in accordance with decision 16/CMP.1. This includes minimum tree crown cover of 30 per cent, minimum land area of 0.1 ha and minimum tree height of 5 metres. Ukraine has chosen to account for forest management under Article 3, paragraph 4, activities and has chosen to account for Article 3, paragraphs 3 and 4, activities for the entire commitment period. During the in-country review the ERT identified some questions for clarification on the parameters and elections for LULUCF chosen by Ukraine. After the in-country review, Ukraine provided the ERT with additional information and clarification, which the ERT considers adequate.

134. The ERT noted that national registry development in Ukraine during the in-country review was in its early stages and not in line with the recent progress in the international community. Hence, at that stage a thorough and comprehensive technical assessment of the national registry by the ERT was not feasible. After the in-country review, Ukraine recognized that its national registry did not meet the requirements as defined by decisions 13/CMP.1 and 5/CMP.1 and decided to implement the Community Registry software of the European Commission as a basis for its national registry. Based on the results of the technical assessment finalized on 10 December 2007, as reported in the independent assessment report, the ERT concluded that Ukraine's national registry is fully compliant with the registry requirements as defined by decisions 13/CMP.1 and 5/CMP.1.

## **B. Recommendations**

135. In the course of the review, the ERT formulated a number of recommendations relating to the completeness and transparency of the information presented by Ukraine in the initial report. Most of the recommendations were implemented during the review process, including those relating to the national system, parameters and elections for LULUCF. The potential problems that could have led to an overestimation of emissions in the base year have also been resolved. The key remaining recommendations<sup>8</sup> are that Ukraine:

- (a) Maintain the operational functions of its national system as outlined in the information provided after the in-country review and in the plan for inventory preparation and management (Order of MEP No. 268) and in accordance with the guidelines for national systems (decision 19/CMP.1);
- (b) Maintain and enhance the existing inter-institutional and inter-agency cooperation and responsibilities for inventory compilation based on the current expertise of Ukrainian experts, ensuring enough capacity for timely performance of the functions, and consolidate the archiving structures;

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<sup>8</sup> For a complete list of recommendations, the relevant sections of this report should be consulted.

- (c) Implement and further develop the recently approved QA/QC plan, extending its verification procedures to models, AD and estimates, as well as QA/QC checks for all key categories;
- (d) Enhance and further develop the centralized archiving system to make it fully compliant with the requirements of the guidelines for national systems;
- (e) Provide detailed information on the implementation of the national registry in accordance with the requirements defined by decisions 13/CMP.1 and 5/CMP.1 in its next inventory report under the Kyoto Protocol;
- (f) Include in its next submission updated information on the national system, including the information that was provided to the ERT during the review and reflecting the improvements made and planned, for example, with respect to QA/QC activities, archiving procedures, key categories analysis, completeness and transparency of the inventory and recalculations.

136. The ERT identifies the following recommendations relating to Ukraine's GHG inventory submission. The key recommendations<sup>9</sup> are that Ukraine:

- (a) Make the necessary efforts to provide data and emissions estimates for all sectors, categories and gases that have not been estimated, in particular the missing estimates for the energy sector and emissions from all stages of the use of ODS substitutes;
- (b) Improve the transparency of the NIR and of the CRF tables by providing more detailed and precise methodological descriptions and documentation on AD, parameters, emission estimates and trends and referencing them appropriately in the NIR;
- (c) Check regularly the consistency of the NIR information with the data reported in the CRF tables, in particular for AD, country-specific methods and EFs;
- (d) Verify country-specific methodologies, in particular for the LULUCF sector;
- (e) Consider carefully any implications for the consistency of the time series when introducing further improvements to the inventory related to the use of higher tier methods;
- (f) Report the explanatory information on recalculations in the CRF tables and make it consistent with the information provided in the NIR;
- (g) Refine the uncertainty analysis taking into account national circumstances and existing data gaps and use it to prioritize inventory improvements, in particular for the solvent and other product use, agriculture, LULUCF and waste sectors;
- (h) Cross-check the applicability of tier 1 for intensively managed Ukrainian lands for estimates in the LULUCF sector.

### **C. Questions of implementation**

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

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<sup>9</sup> For a complete list of recommendations, the relevant sections of this report should be consulted.

Annex I

**Documents and information used during the review**

**A. Reference documents**

- IPCC. Good practice guidance and uncertainty management in national greenhouse gas inventories, 2000. Available at: <<http://www.ipcc-nggip.iges.or.jp/public/gp/english/>>.
- IPCC. Good practice guidance for land use, land-use change and forestry, 2003. Available at: <<http://www.ipcc-nggip.iges.or.jp/public/gp/landuse/gp/landuse.htm>>.
- IPCC/OECD/IEA. Revised 1996 IPCC Guidelines for national greenhouse gas inventories, volumes 1–3, 1997. Available at: <<http://www.ipcc-nggip.iges.or.jp/public/gl/invs1.htm>>.
- UNFCCC. 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/2004/8. Available at: <<http://unfccc.int/resource/docs/2004/sbsta/08.pdf>>.
- UNFCCC. 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>>.
- UNFCCC. Guidelines for national systems under Article 5, paragraph 1, of the Kyoto Protocol. FCCC/KP/CMP/2005/8/Add.3. Available at: <<http://unfccc.int/resource/docs/2005/cmp1/eng/08a03.pdf#page=14>>.
- UNFCCC. Guidelines for the preparation of the information required under Article 7 of the Kyoto Protocol. FCCC/KP/CMP/2005/8/Add.2. Available at: <<http://unfccc.int/resource/docs/2005/cmp1/eng/08a02.pdf#page=54>>.
- UNFCCC. Guidelines for review under Article 8 of the Kyoto Protocol. FCCC/KP/CMP/2005/8/Add.3. Available at: <http://unfccc.int/resource/docs/2005/cmp1/eng/08a03.pdf#page=51>
- UNFCCC secretariat. Status report for Ukraine. 2006. Available at: <<http://unfccc.int/resource/docs/2006/asr/ukr.pdf>>.
- UNFCCC secretariat. Synthesis and assessment report on the greenhouse gas inventories submitted in 2006. FCCC/WEB/SAI/2006. Available at: <[http://unfccc.int/resource/docs/webdocs/sai/sa\\_2006.pdf](http://unfccc.int/resource/docs/webdocs/sai/sa_2006.pdf)>.
- UNFCCC secretariat. Report of the individual review of the greenhouse gas inventory of Ukraine submitted in 2005. FCCC/ARR/2005/UKR. Available at: <<http://unfccc.int/resource/docs/2006/arr/ukr.pdf>>.
- UNFCCC secretariat. Ukraine: Independent assessment report of the national registry of Ukraine. Reg\_IAR\_UKR\_2007\_1. Will be available at <[www.unfccc.int](http://www.unfccc.int)>.

## **B. Additional information provided by the Party**

Responses to questions during the review were received from Mr. Georgiy Panchenko (Ukrainian Research Hydrometeorological Institute), Mr. Oleksiy Khabatyuk and Ms. Oksana Butrim (Agency for Rational Energy Use and Ecology), Ms. Marina Beresnitska and Mr. Yuriy Pyrozhenko (Climate Change's Centre), Mr. Igor Buksha and Mr. Volodymyr Pasternak (Ukrainian Research Institute of Forestry and Forest Melioration) and Ms. Nataliya Stranadko (Ministry of Environmental Protection of Ukraine) including additional material on the methodology and assumptions used.

### National system

1. The Ukrainian responses to the Potential Problems and Questions, which were formulated by ERT in the course of the in-country review of Ukraine Initial Report under the Kyoto Protocol and 2006 Inventory Submission 16–21 April 2007.
2. Plan of the Inventory preparation and management and the QA/QC plans (in Ukrainian).
3. The structure and operation of the centralized archiving system of the national inventory system (in Ukrainian).
4. Plan of nature-conservation measures on the budgetary programme “Improvement of the atmospheric air quality” for 2006 and 2007 years (in Ukrainian).

### National registry

1. Terms of reference for technical-scientific work: “Creation of national registry for accounting GHG”. Kiev, 2006: IT Systems (in Ukrainian).
2. Agreement No. 12/1290/15/8 for creation of a technical-scientific product. Kiev, 15 December 2005: Ministry of Environmental Protection of Ukraine (in Ukrainian).
3. Technical terms of reference for Agreement No. 12/1290/15/8 for creation of a technical-scientific product. Kiev, 16 December 2005: Ministry of Environmental Protection of Ukraine (in Ukrainian).
4. Addenda No. 1 and 2 for Agreement No. 12/1290/15/8 of 16 December 2005 for creation of a technical-scientific product. Kiev, 11 July 2006 and 30 November 2006: Ministry of Environmental Protection of Ukraine (in Ukrainian).
5. Agreement No. ir-350/77 for provision of telecommunication services. Kiev, 5 October 2006: Ministry of Environmental Protection of Ukraine (in Ukrainian).
6. Comments on the Draft Report of the Review of the Initial Report of Ukraine - Registry (submitted on 13 September 2007 and 16 November 2007).

### Energy sector

1. Fuel and energy balance report for 1990 year (form 1-TEB). B.2. –M: State Committee on Statistics of Ukraine. USSR, 1991. Archive No. 104 State Committee on Statistics of Ukraine (in Russian).
2. Goncharuk M.I. Analysis of gas losses reasons // Oil and Gas Industry. 2003. No. 1. pp. 51–53. (in Ukrainian).

3. Gurevich M.O. Revision of “The Methodological approaches for definition of GHG emissions related to fugitive emissions from production, transport, distribution and storage of natural gas”. Kiev, 24 April 2006: Institute of Gas of Ukraine (in Ukrainian).

#### Industrial processes sector

1. Research on national GHG emission factors, September 2006: ICF Consulting, Kiev. TACIS project.
2. Fuel and energy balance report for 1990 year (form 1-TEB). B.2. –M: State Committee on Statistics of Ukraine. USSR, 1991. Archival No. 104 State Committee on Statistics of Ukraine (In Russian).
3. Greenhouse gas emission inventory in Ukraine’s cement sector /Pacific Northwest National Laboratory, USA; Agency for Rational Energy Use and Ecology. Ukraine. Kyiv 2003. 30 p.
4. Staskevich N.A., Severinets G.N., Vygdorichik D.A. Reference book on natural gas industry and using. L.: Nedra, 1990. 762 p. (in Russian).

#### Agriculture sector

1. Statistical form No. 7. “Livestock and Poultry farming” (in Ukrainian).
2. Statistical form No. 24. Report on Condition of Agricultural Animals” (in Ukrainian).
3. Statistical form No. 01-SGN. “Inquirer of base interview” (in Ukrainian).
4. State Law on Administration Crime, Art 77-1.

#### LULUCF sector

1. Buksha I.F. and Pasternak V.P. (2005). The Inventory and Monitoring of Greenhouse Gases in Forestry. Kharkiv. KhAU (in Ukrainian).
2. Butrym O.V. (2006). The application of the IPCC Good Practice Guidance to the LULUCF sector of Ukraine: Lessons Learned. Technical meeting on specific forestry issues related to reporting and accounting under the Kyoto Protocol, Ispra, 27–29 November 2006.
3. Butrym O.V. (2006). The application of the IPCC Good Practice for Land Use, Land-use Change and Forestry in Ukraine: Experience gained. Current State and Future Development of GHG Inventory System and GHG Registry in Russia, Moscow, 2006 (in Russian).
4. Kiptenko E.N. and Kozlenko T.V. (2007). The assessment of emissions and removals of greenhouse gases in the Ukrainian land use, land-use change and forestry sector. The Proceedings of the Ukrainian Scientific and Research Hydrometeorological Institute, Kiev, 2007 (in Russian).
5. Pasternak V.P. and Buksha I.F. (2006). The problems of inventory and monitoring of greenhouse gases in forestry in Ukraine. Scientific Bulletin of NAU. Kiev. 96. pp.162–167 (in Ukrainian).
6. Pasternak V.P. and Buksha I.F. (2006). The inventory of greenhouse gases in forestry in Ukraine and the mechanisms for its improvement. Scientific Bulletin of KhAU. 6. pp. 203–207 (in Ukrainian).

7. Pasternak V.P. and Buksha I.F. (2007). Forest management in Ukraine under the UNFCCC and the Kyoto Protocol. The Conference of Teachers, Scientists and Post-Graduate Students of NAU Educational and Scientific Institute of Forestry and Gardening, Kiev, 2007 (in Ukrainian).
8. The Development of Regulatory Basis and Methodological Guidance on the Implementation of the Commitments of the Kyoto Protocol by Ukraine (2004). Research Report. Kharkiv (in Ukrainian).
9. The Investigation of Country-Specific Greenhouse Gas Emission Factors (2006). EC Project on the Technical Support of Implementation by Ukraine and Belarus of Global Climate Change Mitigation Commitments. Kiev. 2006 (in Russian).
10. The State Instruction for Statistical Land Accounting (Accounting forms 6-ZEM, 6a-ZEM, 6b-ZEM, 2-ZEM).

#### Waste sector

1. Mirniy A.N. Sanitary purification and cleaning of populated place. Reference book – Moskow. Stroyizdat. 1985 (in Russian).
2. Mirniy A.N. Sanitary purification and cleaning of populated place. Reference book – Moskow. Stroyizdat. 1990 (in Russian).
3. Aleksandrovskaya Z.V. Sanitary purification of cities from MSW/Environmental protection – Moskow. Stroyizdat. 1977 (in Russian).
4. Gulyaev N.F. Sanitary purification of cities / Collecting, moving off, sterilization and using of MSW. Moskow. 1966 (in Russian).
5. Recommended rates of collecting the MSW for settlements of Ukraine. Kharkiv. 1995. (in Russian).



Annex II**Acronyms and abbreviations**

CH <sub>4</sub>	methane	kg	kilogram (1 kg = 1 thousand grams)
CO <sub>2</sub>	carbon dioxide	LULUCF	land use, land-use change and forestry
CO <sub>2</sub> eq.	carbon dioxide equivalent	m <sup>3</sup>	cubic metre
CRF	common reporting format	MCF	methane correction factor
EC	European Community	NA	not applicable
EIT	economy in transition	NO	not occurring
EF	emission factor	NE	not estimated
ERT	expert review team	N <sub>2</sub> O	nitrous oxide
EU	European Union	NIR	national inventory report
GHG	greenhouse gas; unless indicated otherwise, GHG emissions are the sum of CO <sub>2</sub> , CH <sub>4</sub> , N <sub>2</sub> O, HFCs, PFCs and SF <sub>6</sub> without GHG emissions and removals from LULUCF	ODS	ozone depleting substances
GJ	gigajoule (1 GJ = 10 <sup>9</sup> joule)	PFCs	perfluorocarbons
GWP	global warming potential	PJ	petajoule (1 PJ = 10 <sup>15</sup> joule)
HFCs	hydrofluorocarbons	QA/QC	quality assurance/quality control
IEA	International Energy Agency	SF <sub>6</sub>	sulphur hexafluoride
IEF	implied emission factor	SO <sub>2</sub>	sulphur dioxide
IPCC	Intergovernmental Panel on Climate Change	Tg	teragram (1 Tg = 1 million tonnes)
		TJ	terajoule (1 TJ = 10 <sup>12</sup> joule)
		UNFCCC	United Nations Framework Convention on Climate Change

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