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Report on the individual review of the inventory submission of Ukraine submitted in 2015*

Note by the expert review team

* In the symbol for this document, 2015 refers to the year in which the inventory was submitted, and not to the year of publication.

GE.16-05592(E)

Contents

I. Introduction

1. This report covers the review of the 2015 inventory submission of Ukraine organized by the UNFCCC secretariat, in accordance with the "Guidelines for the technical review of information reported under the Convention related to greenhouse gas inventories, biennial reports and national communications by Parties included in Annex I to the Convention" (hereinafter referred to as the UNFCCC review guidelines) and particularly Part III, "UNFCCC guidelines for the technical review of greenhouse gas inventories from Parties included in Annex I to the Convention".[1] The review took place from 12 to 17 October 2015 in Bonn, Germany, and was coordinated by Ms. Lisa Hanle (UNFCCC secretariat). Table 1 provides information on the composition of the expert review team (ERT).

Table 1
Composition of the expert review team

Area of expertise	*Name*	*Party*
Generalist	Ms. Olia Glade	New Zealand
	Ms. Batima Punsalmaa	Mongolia
Energy	Mr. Ioannis Sempos	Greece
	Mr. Jongikhaya Witi	South Africa
	Mr. Shengmin Yu	China
IPPU	Mr. Roman Kazakov	Russian Federation
	Mr. Mauro Meirelles de Oliveira Santos	Brazil
	Mr. Jacek Skośkiewicz	Poland
Agriculture	Ms. Anna Romanovskaya	Russian Federation
	Mr. Asaye Ketema Sekie	Ethiopia
LULUCF	Mr. Sandro Federici	San Marino
	Mr. Javier Fernandez	Costa Rica
	Mr. Atsushi Sato	Japan
Waste	Mr. Gao Qingxian	China
	Ms. Violeta Hristova	Bulgaria
Lead reviewers	Ms. Glade	
	Mr. Gao	

Abbreviations: IPPU = industrial processes and product use, LULUCF = land use, land-use change and forestry.

2. An overview of the total greenhouse gas (GHG) emissions[2] reported under the Convention for Ukraine is provided in annex I; table 6 shows total GHG emissions for

[1] Annex to decision 13/CP.20.

[2] In this report, unless otherwise specified, "total GHG emissions" refers to the aggregated national GHG emissions expressed in carbon dioxide (CO_2) equivalent, excluding land use, land-use change and forestry, and including indirect CO_2 emissions if reported by the Party.

selected years, and tables 7 and 8 show GHG emissions reported under the Convention by gas and by sector, respectively.

3. This report contains findings based on the assessment by the ERT of the 2015 inventory submission against the UNFCCC review guidelines. The ERT has made recommendations to resolve those findings related to issues.[3] Other findings, and, if applicable, the ERT's encouragements to resolve them, are also included.

II. Summary and general assessment of the 2015 inventory submission

4. Table 2 provides the ERT's assessment of the inventory submission with respect to the tasks undertaken during the review. Further information on the issues identified below, as well as additional findings, may be found in tables 3 and 5 below.

Table 2
Summary of review results and general assessment of the inventory

Assessment			*Issue ID number(s) in tables 3 and/or 5*[a]
Dates of submission	Original submission: 14 August 2015 (NIR), 14 August 2015, version 1 (CRF tables)		
Review format	Format of review: centralized		
Adherence to the UNFCCC Annex I inventory reporting guidelines	Have any issues been identified in the following areas:		
	1. Identification of key categories	No	
	2. Selection and use of methodologies and assumptions	Yes	E.25, I.16, I.31, I.35, I.36, A.12, A.14, A.16, A.20, L.4, L.5, L.6, L.8, L.13, L.17, L.21, L.23, L.24, L.27, L.32, L.36, L.38, L.39, W.6
	3. Development and selection of emission factors	Yes	E.11, E.13, E.18, E.19, I.4, I.11, I.13, I.22, I.25, I.37, I.43, A.4, A.6, A.7, A.22
	4. Collection and selection of activity data	Yes	E.30, A.3, A.15, L.29, W.7, W.9, W.11
	5. Reporting of recalculations	Yes	A.8
	6. Reporting of a consistent time series	Yes	E.21, E.28, I.15, I.27, I.33, L.14, L.42, W.10
	7. Reporting of uncertainties, including methodologies	Yes	I.8, I.14, I.23, L.2
	8. Quality assurance/quality control	Yes	G.3, A.11, L.17, L.37, L.39, L.40, L.43, W.8

[3] "Issues" are defined in decision 13/CP.20, annex, paragraph 81.

Assessment			*Issue ID number(s) in tables 3 and/or 5*[a]
	9. Other departures from the UNFCCC Annex I inventory reporting guidelines related to transparency, comparability, accuracy and adherence to the UNFCCC Annex I inventory reporting guidelines	Energy: Yes	E.5, E.7, E.9, E.17, E.22, E.24, E.26, E.32
		IPPU: Yes	I.6, I.7, I.9, I.12, I.17, I.18, I.20, I.21, I.26, I.28, I.32, I.34, I.38, I.39, I.40, I.41
		Agriculture: Yes	A.5, A.13, A.17, A.21
		LULUCF: Yes	L.1, L.16, L.18, L.25, L.30
		Waste: Yes	W.13
Completeness	Is the inventory complete?	Energy: No	E.27, E.31, E.33
	Missing categories that affect completeness, if any, are included in annex II to this document	IPPU: No	I.19, I.42, I.43
		Agriculture: No	A.10, A.18
		LULUCF: No	L.26, L.33, L.34, L.41
		Waste: Yes	
	If one or more categories is not estimated because the Party determined that the estimated emissions would be insignificant, has the Party provided information showing that the likely level of emissions meets the criteria in paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines?	The Party did not report "NE" for any insignificant categories	
Corrections	Have emissions been reported without corrections (e.g. related to climate variations or electricity trade)?	Yes	
National inventory arrangements	Have there been any changes to the national inventory arrangements?	Yes	
	Taking into account any changes to the national inventory arrangements, are the institutional, procedural and legal arrangements effective and reliable for estimating GHG emissions?	Yes	
Implementation of previous recommendations	The ERT notes that the previous review report was published on 3 July 2015. On the basis of this publication date and taking into consideration the national circumstances, the ERT concludes that the Party has demonstrated sufficient progress in implementing improvements in its submission	General: Yes	
		Energy: No	E.5, E.7, E.9, E.13, E.18, E.19
		IPPU: Yes	
		Agriculture: Yes	
		LULUCF: No	L.14
		Waste: Yes	
Response from the Party during the	Has the Party provided the ERT with responses to the questions raised, including the data and information necessary for the assessment of	Yes	

Assessment			*Issue ID number(s) in tables 3 and/or 5*[a]
review	conformity with the UNFCCC Annex I inventory reporting guidelines and any further guidance adopted by the Conference of the Parties?		
Recommendation for an exceptional in-country review	On the basis of the issues identified, does the ERT recommend that the next review be conducted as an in-country review?	No	The ERT notes that in accordance with the UNFCCC review guidelines, Ukraine is due for an in-country review. The ERT would like to emphasize that an in-country review would be beneficial for the Party in the next inventory review cycle or in the following year

Abbreviations: CRF = common reporting format, ERT = expert review team, GHG = greenhouse gas, IPPU = industrial processes and product use, LULUCF = land use, land-use change and forestry, NE = not estimated, NIR = national inventory report, UNFCCC Annex I inventory reporting guidelines = "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual greenhouse gas inventories", UNFCCC review guidelines = "Guidelines for the technical review of information reported under the Convention related to greenhouse gas inventories, biennial reports and national communications by Parties included in Annex I to the Convention".

[a] Additional issues and findings may be included in tables 3 and/or 5.

III. Status of implementation of issues raised in the previous review report

5. Table 3 compiles all the recommendations made in the previous review report. For each issue, the ERT specified whether it believes the issue has been resolved by the conclusion of the review of the 2015 inventory submission and provided the rationale for its determination.

Table 3
Status of implementation of issues raised in the previous review report

ID#	*Issue classification*[a]	*Recommendation made in previous review report*	*ERT assessment and rationale*
General			
G.1	Key category analysis (table 4, 2014) (table 4, 2013) (15, 2012). Adherence to UNFCCC Annex I inventory reporting guidelines	Enhance the consistency between CRF table 7 and the NIR	Not relevant. This specific issue was related to the reporting of key categories in CRF table 7 that were key, based on qualitative criteria. The UNFCCC Annex I inventory reporting guidelines no longer include the qualitative assessment in CRF table 7
Energy			
E.1	General (energy sector) (20, 2014) (22,	Allocate the emissions from corresponding off-road vehicles to manufacturing industries	Resolved. Ukraine has implemented a new methodology for the quantification of emissions from off-road

ID#	*Issue classification*[a]	*Recommendation made in previous review report*	*ERT assessment and rationale*
	2013) (37, 2012) (48, 2011). Adherence to UNFCCC Annex I inventory reporting guidelines	and construction for the years 1990–2011	transportation for the entire time series using fuel consumption from energy statistics generated using data collection form 4-MTP and reallocated these emissions to manufacturing industries and construction
E.2	Reference approach (22, 2014)	Further investigate the difference between the reference and sectoral approaches and include in the NIR a comprehensive analysis that justifies the differences for all types of fuel	Not relevant. The ERT considers that this previous recommendation is not an issue, as defined in paragraphs 80 and 81 of the annex to decision 13/CP.20
E.3	Reference approach (20, 2014) (24, 2013) (42, 2012). Transparency	Disaggregate the data in the reference approach according to the different coal types for the years 1990–2011	Resolved. Data on different coal types were disaggregated for the entire time series 1990–2013, as recommended
E.4	Reference approach (23, 2014) (27, 2013). Consistency	Revise the apparent consumption for coking coal and natural gas for 2011 and 2012 using total production data and follow the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the 2006 IPCC Guidelines) for the apparent consumption calculations, as was done by the Party for the years 1990–2010	Resolved. The apparent consumption was revised, as recommended
E.5	Comparison with international data (24, 2014) (28, 2013) (43, 2012). Comparability	Investigate further the underlying reasons for the discrepancies between the CRF table and IEA data sets and include in the NIR a comprehensive analysis that justifies the deviation between the two data sets	Not resolved. The analysis was not provided in the NIR
E.6	International aviation (25, 2014). Transparency	Include the information on the detailed specification of flight types, destinations and characteristics, which are used to separate domestic and international aviation	Resolved. Relevant information was provided in the NIR (see section 3.2.2.1)
E.7	International aviation (25, 2014) (29, 2013) (45, 2012). Transparency	Provide an explanation in the NIR for the calculation of emissions from international aviation for the years 1990–1995, including justification for the rate of international aviation for the period	Not resolved. The NIR states that "the average proportion of domestic aviation in the total consumption of jet fuel for the needs of civil aviation in 1990–2006 is 22 per cent" but no further justification is provided
E.8	International navigation – CO_2, CH_4 and N_2O (26, 2014)	Estimate emissions from international marine bunkers for the years 1991–1997	Not relevant. The ERT considers that this previous recommendation is not an issue, as defined in paragraphs 80 and 81 of the UNFCCC Annex I inventory reporting guidelines
E.9	Feedstocks, reductants and other NEU of fuels (29, 2014) (31, 2013) (49, 2012). Transparency	Report the imported and exported refinery feedstocks and naphtha under the reference approach by including the amounts of these fuels in CRF table 1.A(b)	Not resolved. During the review, Ukraine explained that in the 2015 inventory submission the naphtha import/export data are reported together with oils and lubricants, as provided by the national energy statistics. The level of disaggregation in the national

ID#	*Issue classification*[a]	*Recommendation made in previous review report*	*ERT assessment and rationale*
			statistics does not allow for the separation of these data for the time series 1990–2010. Thus, in the CRF tables, "IE" was reported for naphtha. For refinery feedstocks, "NA" was reported for the period 1990–2010, while for the years 2011–2013 GHG emissions were reported. Ukraine indicated that in order to report import/export data for refinery feedstocks for the period 1990–2010 additional research would be required
E.10	1.A Stationary combustion: gaseous fuels – CO_2 (30, 2014). Accuracy	For the years 1990–1997, use the mean value of the country-specific carbon content for natural gas reported for the years 1998–2003	Resolved. Ukraine revised the carbon content for natural gas for the relevant years, as recommended
E.11	1.A Stationary combustion: liquid fuels – CO_2 (31, 2014). Accuracy	Develop and use country-specific CO_2 EFs for liquid fuels (i.e. residual fuel, diesel oil, LPG, petroleum coke and refinery gases) which have a significant share in the fuel mix of stationary combustion	Not resolved. During the review, Ukraine explained that this is a high priority for inventory improvements
E.12	1.A.1.c Manufacture of solid fuels and other energy industries: solid fuels – CO_2 (32, 2014). Transparency	Calculate and report the carbon mass balance for coke production, ensuring that all inputs and outputs of the process are included	Resolved. Ukraine provided the carbon balance in the NIR (annex 4.4)
E.13	1.A.3.b Road transportation: liquid fuels – CO_2 (20 and 35, 2014) (24 and 33, 2013) (53, 2012) (63, 2011). Accuracy	Develop country-specific CO_2 EFs for motor fuels (i.e. gasoline, diesel oil and LPG) based on their carbon content and provide an explanation of the methodology used in the NIR	Not resolved. During the review, Ukraine explained that this is a high priority for inventory improvements
E.14	1.A.3.b Road transportation: liquid fuels – CH_4 and N_2O (20 and 36, 2014) (24, 2013) (57, 2012)	Include in the NIR the methodology and assumptions used to split vehicles by category, as well as the AD and parameters used as input variables to the COPERT IV model, such as details of the vehicle fleet and its distribution into vehicle types, the mileage per vehicle class and road class, or the average speed per vehicle type and per road	Not relevant. Ukraine has changed the methodology used in the 2015 submission, reverting to the use of fuel consumption statistics to quantify CH_4 and N_2O emissions from road transportation. The ERT confirms that the methodology used to quantify CH_4 and N_2O emissions is consistent with the tier 1 methodology from the 2006 IPCC Guidelines
E.15	1.A.3.b Road transportation: liquid fuels – CO_2,	Make the appropriate arrangements concerning the delivery of the input parameters and AD for road transportation to	Not relevant. The ERT considers that this recommendation made in the previous review report is not an issue,

ID#	*Issue classification*[a]	*Recommendation made in previous review report*	*ERT assessment and rationale*
	CH_4 and N_2O (37, 2014)	the inventory team by the respective data provider	as defined in paragraph 81 of the UNFCCC Annex I inventory reporting guidelines
E.16	1.A.3.b Road transportation: liquid fuels – CO_2, CH_4 and N_2O (38, 2014). Comparability	Further investigate the differences between the results of the top-down and bottom-up approaches for estimating fuel consumption for road transportation	Not relevant. Ukraine no longer implements a bottom-up approach to estimate fuel consumption; therefore, no comparison is needed
E.17	1.A.3.b Road transportation: liquid fuels – CH_4 (39, 2014)	Provide a quantitative analysis in the NIR that justifies the decreasing trend in the CH_4 IEFs for gasoline and diesel oil, by interpreting the AD, parameters and emissions calculated by the COPERT IV model	Not resolved. Although the Party no longer uses the COPERT IV model to estimate emissions, the ERT notes that the CH_4 IEFs remain constant between 1990 and 2012 (18 kg/TJ for gasoline and 3.90 kg/TJ for diesel), but change in 2013 (18.03 kg/TJ and 3.86 kg/TJ, respectively) without an explanation in the NIR
E.18	1.A.4.b Residential liquid fuels (20, 2014) (24, 2013). Accuracy	Develop a country-specific CO_2 EF for fuel oil used under the residential category	Not resolved. During the review, Ukraine explained that this is a high priority for inventory improvements
E.19	1.B.2.b.6 Other (natural gas) (20, 2014) (24, 2013). Accuracy	Develop country-specific EFs for fugitive CH_4 emissions from natural gas leakage from end-users	Not resolved. During the review, Ukraine explained that this is a high priority area for improvement
IPPU			
I.1	General (IPPU) (43, 2014). Adherence to UNFCCC Annex I inventory reporting guidelines	Improve QC procedures in order to increase the transparency of the reporting; specifically, correct the reference to table P3.5.2 (which should read P3.1.5.2) and correct the units in table P3.1.1.9	Resolved. The ERT considers that the specific issues identified were resolved; however, the ERT identified additional issues (see I.7 in table 5 below)
I.2	2.A.1 Cement production – CO_2 (44, 2014). Transparency	Include in the NIR information on the three JI projects at cement plants	Resolved. The information about JI projects at the three cement plants of Ukraine has been added to the NIR (see page 107)
I.3	2.B.1 Ammonia production – CO_2 (46, 2014). Transparency	Improve QC procedures regarding the units reported in the NIR tables, especially in table P3.1.1.9 of the 2014 NIR	Resolved.The correct units were reported in the NIR
I.4	2.B.7 Soda ash production (50, 2014). Transparency	Report soda ash production AD and change the notation key for CO_2 emissions from "NA" to "NO"	Not resolved. Party has incorrectly reported in the 2015 inventory submission emissions from soda ash use under the category soda ash production. The recommendation regarding the use of the notation keys was not

ID#	*Issue classification*[a]	*Recommendation made in previous review report*	*ERT assessment and rationale*
			implemented
I.5	2.F.1 Product uses as substitutes for ozone-depleting substances – HFCs (51, 2014). Transparency	In cases where emissions from subcategories are estimated (e.g. "industrial refrigeration" and "semi-industrial and air conditioners"), split information over two lines in the CRF tables, or use a weighted EF	Resolved. The Party reported in the CRF tables combined data for emissions of HFCs with the use of a weighted coefficient
I.6	2.F.1 Product uses as substitutes for ozone-depleting substances – HFCs (51, 2014). Transparency	Include additional information in the NIR with regard to the end of the life cycle of the equipment	Not resolved. For further information, see I.43 in table 5 below
Agriculture			
A.1	3.B.1 Manure management – CH_4 (57, 2014) (51, 2013) (88, 2012). Accuracy	Further investigate the values of VS for dairy and non-dairy cattle used to calculate the country-specific CH_4 EF, and, if necessary, revise the values of VS excreted for each type of farm and per cattle animal species	Resolved. The values of VS excreted for dairy and non-dairy cattle were estimated both for agricultural enterprises and for private households based on the results of research work and the corresponding equation (NIR 2015, equation 5.5, page 198), and relevant information was provided in the NIR (annex 3.2, page 484)
A.2	3.F Field burning of agricultural residues – CH_4 and N_2O (59, 2014). Comparability	Reallocate the emissions associated with wildfires on cropland to the LULUCF sector	Resolved. CH_4 and N_2O emissions from wildfires on cropland were reported in CRF table 4(V)
LULUCF			
L.1	General (LULUCF) (63, 2014). Transparency	Report in the NIR, for each data type, the source of the information, and for each numerical value, the metric unit of that value	Not resolved. Although during the review Ukraine provided additional information, for which the ERT commends Ukraine, the recommended information was not provided in the NIR
L.2	General (LULUCF) (65, 2014). Transparency	Improve the transparency of the uncertainty analysis in terms of the data sources for each category	Not resolved. Although during the review Ukraine provided additional information, for which the ERT commends Ukraine, the recommended information was not provided in the NIR
L.3	General (LULUCF) (66, 2014) (56, 2013). Accuracy	Correctly apply the IPCC methodology on land transition by reporting in the generic year x under the relevant land conversion category for all land converted, in that year x, to that category, and continue reporting the area under that category for 20 years (i.e. until the year x+19), or another transition period as	Resolved. The IPCC methodology on land transition was correctly applied

ID#	*Issue classification*[a]	*Recommendation made in previous review report*	*ERT assessment and rationale*
		selected by the country to better reflect the SOM carbon stock dynamic of that category with a view to improving time-series consistency	
L.4	General (LULUCF) (67, 2014). Adherence to UNFCCC Annex I inventory reporting guidelines	For the model used to calculate the net changes in SOM in mineral soils, verify the model's outputs with measurements annually conducted in the country	Not resolved. Also in the 2015 inventory submission, dissimilar CSCs and trends have been reported in land categories: for instance, for cropland remaining cropland, where, across the time series 1990 to 2013, the SOM of mineral soils moves from being a net sink in 1990 of +0.2 t C/ha/year to a net source of identical magnitude but opposite sign (i.e. –0.2 t C/ha/year). The ERT notes that, according to the information provided by Ukraine during the review, and confirmed by data on crop yields reported in FAOSTAT (e.g. a 40 per cent increase in yield productivity of cereals from 1992 to 2013 (from 2.8 to 4.1 t d.m./ha)), the productivity of crops in Ukraine dramatically increased across the time series. Consequently, with an increase in productivity an increase in average long-term SOC is expected, which should have been reported across the time series 1990–2013, as an increasing sink instead of as an increasing source. In addition, the ERT notes that according to paragraph 41 of the UNFCCC Annex I inventory reporting guidelines, the verification of tier 3 estimates is a mandatory reporting requirement (see L.18 in table 5 below)
L.5	General (LULUCF) (67, 2014). Transparency	Ensure consistency among the different methods used, including the consistency of the soil depth for which the SOC and associated CSCs are calculated, for the different land-use categories, especially for the transfer of land between categories for which different methods are applied	Not resolved. Also in the 2015 inventory submission, dissimilar SOC changes and trends have been reported for land-use change categories. For instance, a net SOM carbon stock loss is reported across the time series for both forest land converted to grassland and for grassland converted to forest land. In the absence of further considerations of stratification of soil types as well as of management types of grassland (neither of which are reported in the NIR), such trends are inconsistent with each other
L.6	General (LULUCF) (68, 2014). Consistency	Ensure the consistency of the time series of CSCs in SOM for the entire transition period (i.e. default 20 years) in all land-conversion categories	Not resolved. Also, in the 2015 inventory submission, net SOM CSCs have been reported in all land-conversion categories only in the year when a conversion occurs. The ERT

ID#	*Issue classification*[a]	*Recommendation made in previous review report*	*ERT assessment and rationale*
			notes that it is good practice to report net SOM CSCs in the year in which the change occurred and in each of the 19 following years, as one twentieth of the total CSC
L.7	Forest land remaining forest land – CO_2 (61, 2014)	Provide information on the reasons for the recalculation of the CSC in DOM on forest land	Not relevant. There was no recalculation in the 2015 inventory submission
L.8	4.A.1 Forest land remaining forest land – CO_2 (69, 2014). Consistency	Revise the estimates of DOM. Establish sector-specific QC procedures to check the time-series consistency of the estimates and their coherence among carbon pools and categories	Not resolved. Although from 1990 to 2010 the net carbon gain per hectare in dead wood in the sub-category "managed forest land remaining forest land" is relatively constant (0.16 Mg C/ha), the ERT noted that in 2011 it becomes 66 per cent larger (0.26 Mg C/ha) and in 2012 and 2013 it becomes 82 per cent larger (0.29 Mg C/ha). The annual variability of disturbances that have been reported, as forest fires and harvesting, in the NIR for 2011, 2012 and 2013 does not seem to explain the high transfer rate from the biomass carbon pool to the dead wood carbon pool. Further, the ERT notes that since the methodology for dead wood CSCs is based on subsequent inventories (1st cycle 1999–2002, 2nd cycle 2003–2006; see NIR table P.3.3.7) annual high variability in disturbances, in the years 2011–2013, could not have affected the dead wood carbon stock estimates
L.9	4.A.1 Forest land remaining forest land – CO_2 (70, 2014). Accuracy	Report as biomass carbon stock loss any carbon stock lost as a consequence of harvesting, even if it is left to decay in the forest	Resolved. Ukraine correctly implemented the new methodology set out by the 2006 IPCC Guidelines
L.10	4.A.1 Forest land remaining forest land – CO_2 (71, 2014). Transparency	Justify the selection of any value different from the central value of the ranges provided as the IPCC default values for the biomass expansion factor for conversion of merchantable volume to above-ground tree biomass for conifers and broadleaves in temperate forests, or always apply the central value of those ranges	Resolved. Ukraine appropriately justified the selected values for the biomass expansion factor for conversion of merchantable volume to above-ground tree biomass for conifers and broadleaves in temperate forests
L.11	4.B.1 Cropland remaining cropland – CO_2 (73, 2014) (62, 2013). Comparability	Reallocate all land currently reported as "unmanaged cropland"	Resolved. Cropland is no longer subdivided into managed and unmanaged cropland; land previously referred to as unmanaged cropland was reallocated to the relevant subcategories

ID#	*Issue classification*[a]	*Recommendation made in previous review report*	*ERT assessment and rationale*
L.12	4.C.1 Grassland remaining grassland – CO_2 (74, 2014) (65, 2013). Accuracy	Check the calculation of the CSC in mineral soils	Resolved. Although issues contained in L.4 may also impact this category
L.13	4.D.2 Land converted to wetlands – CO_2 (75, 2014). Accuracy	Revise the methodology and CSC factors applied for forest land converted to wetlands	Not resolved. Ukraine assumes that such conversion occurs only on mineral soils although it does not provide documentation to support this assumption. Further, it does not provide information in the NIR on how the SOC at equilibrium is calculated
L.14	Biomass burning – CO_2, CH_4 and N_2O (78, 2014) (67, 2013) (108, 2012). Consistency	Estimate the emissions from biomass burning on grassland for the years 1990–2004 by applying one of the estimation techniques described in volume 1, chapter 5, of the 2006 IPCC Guidelines	Not resolved. Ukraine did not estimate emissions from biomass burning on grassland for the years 1990–2004; rather, it reported those emissions as "NO", although this activity occurred in that period
L.15	Biomass burning – CO_2, CH_4 and N_2O (79, 2014). Accuracy	Use country-specific data instead of the IPCC default values to calculate the emission estimates for the standing biomass and DOM in forest areas affected by disturbances	Resolved. Emissions from forest fires are calculated based on national data for damaged or burned wood (statistics form 3-lg)
L.16	Biomass burning – CO_2 (79, 2014). Transparency	Provide, in the NIR, a table with the average biomass carbon stocks used for estimating GHG emissions from biomass burning in forest land	Not resolved. The transparency of the estimates of biomass burning in forest land still appears to pose difficulties. For instance, in the year 2013, by dividing the total fuel consumption by the burned area for both forest and grassland fires, an average fuel of 2.26 kg d.m./ha and 4.18 kg d.m./ha, respectively, is calculated. Considering that, in ground fires, a default value of 10 to 100 t C d.m./ha for forest land is applied (see biomass in NIR equation P3.3.1), it is not clear why grassland has a higher fuel consumption than forest land and why forest land has such a low value. The ERT notes that the Party could ensure the necessary level of transparency by reporting an NIR table with the values of the biomass stocks applied for estimating the fuel stratified according to the Ukrainian stratification of forest land (various types of forest in various regions)
L.17	Biomass burning – CO_2 (80, 2014). Accuracy	Revise the calculation method used and implement sector-specific QC procedures for estimating GHG emissions from biomass burning in forest land	Not resolved. According to the 2006 IPCC Guidelines, the ERT notes that for estimating GHG emissions from forest fires: (a) The amount of carbon stock released to the atmosphere has to be

ID#	*Issue classification*[a]	*Recommendation made in previous review report*	*ERT assessment and rationale*
			estimated first; (b) For estimating the total (above- and below-ground) biomass carbon stock losses the amount of biomass killed but not oxidized also has to be estimated and reported as a carbon stock loss; (c) NIR equation P3.3.1 applied by Ukraine estimates the total carbon stock redox to atmosphere associated with forest fires. The ERT is of the view that the correct calculation can be performed by using the second part of NIR equation P.3.3.1 as modified, Wburned × BEF2 × D × (1+R) × CF, taking into consideration that, where CO_2 emissions are reported in CRF table 4(V), the amount of carbon released to the atmosphere has to be subtracted from the result obtained to avoid double counting such carbon stock loss
Waste			
W.1	General (waste) (84, 2014). Transparency	Improve the accuracy of the NIR and sector-specific QC procedures	Resolved. References in the waste chapter of the NIR and the annex were corrected
W.2	5.A Solid waste disposal on land – CH_4 (85, 2014) (72, 2013). Adherence to UNFCCC Annex I inventory reporting guidelines	Improve the QC activities in order to correct the DOC values for garden waste for the years 1990–1995 in the NIR	Resolved. The identified errors in the previous review report were resolved
W.3	5.A Solid waste disposal on land – CH_4 (86, 2014). Transparency	Report the data which are used for the calculation of emissions and further improve the transparency and accuracy of the NIR	Resolved. Ukraine included the data in the NIR that are used for the calculation

Abbreviations: 2006 IPCC Guidelines = *2006 IPCC Guidelines for National Greenhouse Gas Inventories*, AD = activity data, BEF = biomass expansion factor, CRF = common reporting format, CSC = carbon stock change, D = deforestation, d.m.= dry matter, DOC = degradable organic carbon, DOM = dead organic matter, EF = emission factor, ERT = expert review team, GHG = greenhouse gas, IEA = International Energy Agency, IE = included elsewhere, IEF = implied emission factor, IPCC = Intergovernmental Panel on Climate Change, IPPU = industrial processes and product use, JI = joint implementation, LPG = liquefied petroleum gas, LULUCF = land use, land-use change and forestry, NA = not applicable, NEU = non-energy use, NIR = national inventory report, NO = not occurring, QC = quality control, SOC = soil organic carbon, SOM = soil organic matter, UNFCCC Annex I inventory reporting guidelines = "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual greenhouse gas inventories", VS = volatile solids.

[a] References in parentheses are to the paragraph(s) and the year(s) of the previous review report(s) where the issue was raised. Issues are further classified as defined in decision 13/CP.20, annex, paragraph 81.

IV. Issues identified in three successive reviews and not addressed by the Party

6. In accordance with paragraph 83 of the UNFCCC review guidelines, the ERT noted that the issues included in table 4 have been identified in three or more successive reviews, including the review of the 2015 inventory submission of Ukraine, and have not been addressed by the Party.

Table 4
Issues identified in three or more successive reviews and not addressed by the Party

ID#[a]	*Issue identification*	*Number of successive reviews issue not addressed*
General: no such general issues were identified		
Energy		
E.5	Investigate further the underlying reasons for the discrepancies between the CRF table and IEA data sets and include in the NIR a comprehensive analysis that justifies the deviation between the two data sets	4 (2012–2015)
E.7	Provide an explanation in the NIR for the calculation of emissions from international aviation for the years 1990–1995, including justification for the rate of international aviation for the period	4 (2012–2015)
E.9	Report the imported and exported refinery feedstocks and naphtha under the reference approach by including the amounts of these fuels in CRF table 1.A(b)	4 (2012–2015)
E.13*	Develop country-specific CO_2 EFs for motor fuels based on their carbon content and provide an explanation of the methodology used in the NIR	5 (2011–2015)
E.18*	Develop a country-specific CO_2 EF for fuel oil used under the residential category	3 (2013–2015)
E.19*	Develop country-specific EFs for fugitive CH_4 emissions from natural gas leakage from end-users	3 (2013–2015)
IPPU: No such issues for the industrial processes and product use sector were identified		
Agriculture: No such issues for the agriculture sector were identified		
LULUCF		
L.14	Estimate the emissions from biomass burning on grassland for the years 1990–2004 by applying one of the estimation techniques described in volume 1, chapter 5, of the *2006 IPCC Guidelines for National Greenhouse Gas Inventories*	4 (2012–2015)
Waste: no such issues for the waste sector were identified		

Abbreviations: CRF = common reporting format, EF = emission factor, IEA = International Energy Agency, IPCC = Intergovernmental Panel on Climate Change, IPPU = industrial processes and product use, LULUCF = land use, land-use change and forestry, NIR = national inventory report.

[a] An asterisk is included after any issue identification number where the underlying issue is related to the accuracy or completeness of a key category, a missing category or a potential key category, as indicated in decision 13/CP.20, annex, paragraph 83.

V. Additional findings made during the 2015 technical review

7. Table 5 contains findings made by the ERT during the review of the 2015 inventory submission of Ukraine that are additional to those identified in table 3 above.

Table 5
Additional findings made during the 2015 technical review

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*[a]	*Is the finding an issue? If yes, classify by type*	
General				
G.2	Key category analysis	The ERT noted that N_2O emissions from road transportation was a key category in the 2014 inventory submission on a qualitative basis. In the 2015 inventory submission this category is not listed as a qualitative key category and no explanation is included in the NIR. It is not clear whether a qualitative key category assessment has been conducted by the Party for the 2015 inventory submission	No	
		During the review, Ukraine explained that road transportation was a key category based on a quantitative analysis and that it intends to apply qualitative criteria in the next inventory submission. The ERT notes that this category is not included in CRF table 7 as key, based on a tier 1 quantitative approach		
		The ERT encourages the Party to conduct a qualitative key category analysis, consistent with the 2006 IPCC Guidelines, and present the results in the NIR		
G.3	QA/QC and verification	The NIR comprehensively describes the QA/QC plan and procedures in chapter 1.2.3 (pages 31–44). However, the ERT noted a considerable number of errors, for example inconsistencies between the reporting in the NIR and the CRF tables, data gaps and calculation errors in all sectors	Yes	Adherence to UNFCCC Annex I inventory reporting guidelines
		The ERT recommends that the Party review its QA/QC plan and, as appropriate, update it to minimize errors, and report on its efforts in the NIR		
Energy				
E.20	Comparison with international data: gaseous fuels – CO_2, CH_4 and N_2O	The ERT noted that for 2012, CRF table 1.A.3 reported a total of 60,965.13 TJ for use of gaseous fuels for pipeline transport, while the IEA energy balances reported a figure of 95,409 TJ for the same activity	No	
		During the review, Ukraine explained that the 4-MTP data collection form used for collecting all end-use natural gas consumption recorded a total consumption of 1.78 billion m^3, as well as an additional 0.67 billion $m^3$of natural gas		

ID#	Finding classification	Description of the finding with recommendation or encouragement[a]	Is the finding an issue? If yes, classify by type	
		associated with losses during extraction, production, transformation and distribution of natural gas. Combined, this equals 2.45 billion m^3 of natural gas, which equates to more than 90,000 TJ. Ukraine further explained that according to the State Statistics Service of Ukraine, the data reported to IEA on natural gas consumption do not separate natural gas losses and hence the IEA data are much higher than what is reflected in the CRF tables for pipeline transport. The ERT notes that the State Statistics Service of Ukraine coordinates data collection efforts using the 4-MTP form and is also responsible for reporting to IEA		
		The ERT encourages Ukraine to harmonize the AD for pipeline transport reported in the CRF tables and the information reported to IEA		
E.21	International aviation: liquid fuels – CO_2, CH_4 and N_2O	Regarding the estimation of international aviation emissions for the period 1990–1995, the ERT notes that the approach followed by Ukraine is not in line with the data gap-filling methods described in volume 1, chapter 5, of the 2006 IPCC Guidelines because the emission estimates for the 1996–2013 data set are derived using a tier 2 methodology, while the 1990 data are based on fuel consumption (tier 1 methodology)	Yes	Consistency
		The ERT recommends that Ukraine apply the overlap methodology to fill the 1991–1995 data gap		
E.22	International navigation: liquid fuels – CO_2, CH_4 and N_2O	Ukraine uses cargo shipping tonnages to quantify emissions associated with navigation bunkers separated by domestic and international travel without an explanation of how this information is derived and translated into emissions. The NIR does not present a transparent explanation of the methodology applied in this category	Yes	Transparency
		During the review, Ukraine explained how emissions were estimated in this category. The ERT took note of the steps involved in the methodology presented and is of the view that the methodology presented is methodologically sound but lacks means of verification because the energy data form (4-MTP) does not break down national fuel consumption for navigation between domestic navigation and marine bunkers		
		The ERT recommends that Ukraine describe transparently in the NIR the methodology used to estimate emissions for international and domestic navigation. For example, the Party could include a schematic and an example of the calculation performed. The ERT encourages Ukraine to undertake a verification of this bottom-up fuel quantification methodology with fuel consumption data collected using the 4-MTP form from the State Statistics Service of Ukraine		

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*[a]	*Is the finding an issue? If yes, classify by type*	
E.23	International navigation – CO_2, CH_4 and N_2O	The NIR states that "national statistics does not include data on international bunker waterway" and does not describe plans to ensure that this information is included in future national statistics	No	
		During the review week, in response to a question raised by the ERT about how this relates to the reporting of AD for navigation bunkers to IEA, Ukraine explained that, currently, the State Statistics Service of Ukraine does not separate navigation-related fuel consumption by domestic and bunker fuels. All the fuel is accounted for as domestic. Ukraine further observed that the IEA data do not provide information regarding fuel consumption for marine bunkers, as the data only reflect domestic navigation. Ukraine stated that it will make efforts to investigate this possibility for statistics improvement		
		The ERT encourages Ukraine to review its fuel consumption AD collection processes to enable the separation of data into domestic navigation and marine bunkers. The ERT notes that this will enable Ukraine to verify its shipping tonnage based bottom-up methodology for separating data between domestic navigation and marine bunkers		
E.24	Feedstocks, reductants and other NEU of fuels	The ERT noted that Ukraine reported emissions from carbon black production for the first time under IPPU. The ERT commends the Party for this improvement	Yes	Adherence to UNFCCC Annex I inventory reporting guidelines
		The ERT further noted that Ukraine used a default CO_2 EF for the furnace black process, which implies that Ukraine could have used carbon black oil, which may be derived either as a by-product of petroleum refining or as a by-product of the metallurgical (coal) coke production process. The ERT concluded that it was not clear how these feedstocks have been reported in CRF table 1.A(d), if reported		
		During the review, Ukraine confirmed that it uses coal as a feedstock and that NEU of coal for this activity is not reported in CRF table 1.A(d) but rather in CRF table 1.A(b) under "carbon stored" for coke oven/gas coke. The ERT noted that this is not in line with the 2006 IPCC Guidelines, because all NEUs of fuels are to be reported in CRF table 1.A(d). The ERT also observed that there were no carbon stored data reported for 2013 in CRF table 1.A(b) associated with coke oven/gas coke		
		The ERT recommends that Ukraine report NEU of coal in carbon-black production in CRF table 1.A(d). The ERT further recommends that Ukraine report data or the appropriate notation key in CRF table 1.A(b) for coke oven/gas coke		

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*[a]	*Is the finding an issue? If yes, classify by type*	
E.25	1.A Stationary combustion: solid fuels – CO_2 and CH_4	The NIR (page 403) provides the country-specific methodology used by Ukraine to quantify the carbon content of fuels. The ERT noted that this methodology does not account for the volatile components of coal and that normally a correction factor is applied to account for volatiles over and above the correction for the water content of fuels	Yes	Accuracy
		During the review, Ukraine explained that according to a national study,[b] the conversional correcting factor during bituminous coal combustion may be considered as one. The ERT is of the view that the analysis reported by Ukraine is related to the oxidation factor that is accounted for during the combustion of bituminous coal and is not related to the correction factor aimed at accounting for volatile components in the coal itself		
		The ERT recommends that Ukraine revise its methodology for the quantification of the carbon content of solid fuels, such that it accounts for the fraction of volatile components in the coal itself		
E.26	1.A.2.d Pulp, paper and print – CH_4 and N_2O	The ERT noted that, for some years, Ukraine reported the AD for biomass use in pulp and paper as "NO" in CRF table 1.A(a), while other years show activity in this category. For the years when AD are reported, the NIR does not provide an explanation about further processing and use of biomass waste (e.g. wood chips and black liquor) that is generated from the pulp and paper process and associated emissions	Yes	Transparency
		During the review, Ukraine explained that the 4-MTP form used for collecting energy AD does not request the collection of information concerning biomass combustion in the pulp and paper industry. Ukraine further noted that the preliminary database of the State Statistics Service of Ukraine analysis regarding production of waste treatment, compiled from reporting enterprises, shows that paper carton waste produced by enterprises mainly goes to other enterprises for further treatment		
		The ERT noted that it is unclear from the NIR whether all biomass waste streams from the pulp and paper industry (e.g. wood chips and black liquor) are transferred to other enterprises		
		The ERT recommends that Ukraine investigate what happens to all the biomass waste streams from the pulp and paper industry and report the findings of this assessment in the NIR		
E.27	1.A.3.a Domestic aviation: liquid fuels – CO_2,	The ERT notes that in CRF table 1.A(a), Ukraine reported the AD and emissions from use of aviation gasoline in 2013 as "NO", implying that there are no activities associated with small propeller engine aircrafts in Ukraine; for	Yes	Completeness

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*[a]	*Is the finding an issue? If yes, classify by type*	
	CH_4 and N_2O	example, aircrafts that are used for spraying of pesticides in agricultural fields. The NIR (page 87) indicates that the estimation of emissions was conducted separately for aircraft equipped with jet and turboprop engines, which use jet fuel, and for those equipped with piston engines, which use aviation gasoline. Based on this, it appears that aviation gasoline might be consumed During the review, Ukraine explained that according to national statistics, aviation gasoline consumption occurred between 1990 and 2012, but was reported as 0 TJ in 2013. Upon further investigation, the ERT found information on aviation gasoline production in Ukraine.[c] Ukraine also acknowledged that the implication that there is no consumption of aviation gasoline is unexpected and that it will strive to analyse and specify AD for 2013 and compare the AD with alternative data sources in its next submission The ERT recommends that Ukraine report the outcome of this analysis and, as appropriate, revise the time series		
E.28	1.A.3.b Road transportation: liquid fuels – CO_2	During the review, the ERT noted that the CO_2 IEFs for all types of liquid fuels (gasoline, diesel oil, and LPG) were constant from 1990 to 2012 (69.30 t/TJ, 74.07 t/TJ, and 63.07 t/TJ, respectively), but in 2013 the IEF values declined (to 67.91 t/TJ, 73.33 t/TJ, and 62.44 t/TJ, respectively). The NIR did not provide a transparent explanation for the decline During the review, Ukraine explained that the changes to the CO_2 IEFs in this category in 2013 are caused by a change of the under-burning coefficient. Ukraine also explained that there was a calculation error that occurred in the emission calculation file for 2013 which resulted in an oxidation factor of unity not being applied to the 2013 CO_2 emission estimates. Ukraine also supplied a revised 2013 emissions file for this category with a revised CO_2 emission estimate, but not in an official submission. The revision of the oxidation factor resulted in a 375.32 kt (1.5 per cent) increase in CO_2 emissions from road transportation The ERT agrees with the response from the Party and recommends that Ukraine submit the revised estimates, recalculate the time series, and include the results of this analysis in the NIR	Yes	Consistency
E.29	1.A.3.b Road transportation: liquid fuels – CO_2	The inventory uses a tier 1 approach for estimating CO_2 emissions from road transportation, which is a key category. The NIR does not provide details of the verification procedures for the estimation During the review, Ukraine explained that the complete verification process for this category was difficult to perform during the preparation of the current	No	

ID#	Finding classification	Description of the finding with recommendation or encouragement[a]	Is the finding an issue? If yes, classify by type	
		inventory submission and, considering that this category is key, it will strive to conduct comprehensive verification procedures for emission estimation in this category in its next submission		
		The ERT notes the response by Ukraine and recommends that the Party apply a higher methodological tier for the category. The ERT further encourages Ukraine to report on its verification for this category in the NIR		
E.30	1.A.3.b Road transportation: liquid fuels – CO_2, CH_4 and N_2O	Ukraine reports lubricants as fuels under road transportation. The ERT noted that, according to the 2006 IPCC Guidelines, these emissions should be reported under the IPPU sector as NEU of fuels unless the lubricants are blended with other fuels in two-stroke engines	Yes	Comparability
		During the review, Ukraine explained that the 4-MTP form used for energy data collection separates lubricant use for energy use from NEU. The ERT notes that some of this lubricant use might actually be related to the category other sectors (1.A.4), as that is where most two-stroke engines are used		
		The ERT recommends that Ukraine investigate the allocation of emissions from the combustion of lubricants and report the outcome of this assessment		
E.31	1.A.3.e Other transportation: biomass – CH_4 and N_2O	For the years 1990–2012, CRF table 1.A(a) shows fuel consumption for biomass as "NO", but reports activity from this category in 2013. The NIR does not provide an explanation as to why the activity in this category had not been reported prior to 2013	Yes	Completeness
		During the review, Ukraine explained that, according to the 2013 national statistics (4-MTP form) biomass consumption for off-road transport between 1990 and 2012 did not occur. In 2013, biomass consumption was equal to 1.36 TJ. Ukraine also explained that data collection for biodiesel in the 4-MTP form was only introduced in 2013, which implies that, prior to 2013, AD on biodiesel had not been collected. Ukraine further indicated that to investigate AD for biodiesel before 2013 would require additional consultations with motor fuel suppliers		
		The ERT recommends that Ukraine strive to collect data for biodiesel consumption for the period 1990–2012 and report the outcome of its efforts in the NIR. The ERT further recommends that, if Ukraine is not able to collect these data, the notation key for the period 1990–2012 be changed from "NO" to "NE"		
E.32	1.B.1.a.i Underground mines (abandoned underground mines)	Ukraine reported AD from abandoned underground mines under "abandoned underground mines", a subcategory of the category 1.B.1.a.i; however; the remaining entries for the category (method, EF and emission estimates) are	Yes	Transparency

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*[a]	*Is the finding an issue? If yes, classify by type*	
	solid fuels – CH_4	reported as "NA" without an explanation. The information on EFs and the methodological approach used for abandoned underground mines is placed in a different category, namely, solid fuel transformation (1.B.1.a.ii post-mining activities). Furthermore, the NIR does not provide a transparent explanation regarding the methodology used to quantify emissions from abandoned underground mines. Specifically, it is not clear from the NIR: how the sampling strategy for abandoned mines is determined; the frequency of measurement; and how emission data from the measurement programme are extrapolated to the years when measurements are not undertaken During the review, Ukraine provided its detailed methodological approach to the quantification of emissions from abandoned underground mines. Ukraine further explained that a technical error was made in the completion of the CRF tables, resulting in the misallocation of emissions from abandoned mines to solid fuel transformation and that this will be corrected in its next submission The ERT agrees with the methodological approach presented by Ukraine during the review and recommends that the Party include the following information in the NIR: (a) Management practices in abandoned underground mines; (b) The sampling strategy; (c) The methodology used to extrapolate emissions to the years when measurements are not undertaken The ERT also recommends that the Party allocate emissions from abandoned underground mines to the category "abandoned underground mines" in place of the previously used notation key "NA"		
E.33	1.B.1.a.ii Surface mines: solid fuels – CH_4	The ERT noted that in CRF table 1.B.1, fugitive CH_4 emissions from surface mines were reported as "NO" for 2013. Upon further investigation, the ERT found that, according to the country profile report by GMI,[d] by the end of 2013 Ukraine had three active surface mines located in the Donbass and Lugansk regions. The ERT further observed that, according to the latest GMI report there are 31 coal mine methane recovery projects mostly linked with underground mines, 11 of which use the CH_4 for fuelling boilers, while it is used for combined heat and power in 8 projects, for flaring in 7 projects, and for industrial use, power generation, pipeline injection, heating/cooling and vehicle fuel and flaring in the remaining 5 projects. In addition, there are possible areas in Ukraine were spontaneous combustion is likely to take place The ERT also noted that the reporting of emissions associated with methane	Yes	Completeness

ID#	Finding classification	Description of the finding with recommendation or encouragement[a]	Is the finding an issue? If yes, classify by type	
		recovery for energy purposes through the coal mine methane projects under the category coal mining and handling is not in line with the 2006 IPCC Guidelines because the CH_4 recovered is used for energy recovery and, therefore, emissions from this activity should be reported under the energy sector		
		During the review, Ukraine explained that there are currently no alternative data sources with verified, accurate data which could be used for the inventory and that the areas where surface mining takes place do not allow for the official collection of information. Ukraine further explained that CH_4 emissions recovered through coal mine methane projects for energy purposes have been included under the category coal mining and handling		
		The ERT recommends that Ukraine identify a suitable means of collecting the AD associated with surface coal mining and report CH_4 emission estimates for this category or use an appropriate proxy. The ERT also recommends that the Party report the emissions associated with recovery for energy purposes through the coal mine methane projects under manufacture of solid fuels and other energy industries, or manufacturing industries and construction, depending on where the recovered CH_4 is used		
E.34	1.B.1.c Other (coal mining): solid fuels – CH_4	The NIR does not include statistics or a methodological basis for the quantification of emissions from spontaneous combustion of coal seams and the burning of coal dumps	No	
		The ERT encourages Ukraine to investigate the possibility of quantifying emissions from spontaneous combustion and the burning of coal dumps		
IPPU				
I.7	General (IPPU)	The NIR contains incorrect references and technical errors in the text, specifically: the numbering of the subsections in sections 4.19 and 4.22 are not successive; there are three different tables with the same number 4.6 (pages 111, 113 and 114); and the units of GHG emission data do not correspond to the data in table P.3.1.1.1	Yes	Transparency
		The ERT recommends that Ukraine improve the transparency of the IPPU section in the NIR by correcting the identified technical errors		
I.8	2.A.1 Cement production – CO_2	The reported uncertainties for CO_2 emissions from cement production (51.3 per cent) in the NIR are significantly higher than the expected levels of uncertainty for these categories (5–10 per cent). The ERT noted that the overestimation of uncertainties was caused by the incorrect application of tier 1 methods for estimating the uncertainty of the CKD correction factor	Yes	Accuracy

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*[a]	*Is the finding an issue? If yes, classify by type*	
		The ERT recommends that Ukraine correct the application of the tier 1 method for the uncertainty assessment with a focus on the uncertainty of the CKD correction factor calculation		
I.9	2.A.1 Cement production – CO_2	For the period 1990–2012, Ukraine used plant-specific data on clinker production to estimate emissions, and used national statistics data in order to conduct QC checks on the plant-level data. For 2013, the Party used national statistics instead, because it states that plant data were not available	Yes	Transparency
		The ERT recommends that the Party specify in the NIR the different sources of AD used, and how time-series consistency has been ensured		
I.10	2.A.1 Cement production – CO_2	The explanation for the trends in the EF provided in section 4.2.2 of the NIR (a decrease of the EF from 2012 to 2013) is inconsistent with the data in table P.3.1.1.2 of the NIR (an increase of the EF from 2012 (0.511 t CO_2/t clinker) to 2013 (0.52 t CO_2/t clinker). According to the CRF tables, the IEF increased from 2012 (0.5123 t CO_2/t clinker) to 2013 (0.5205 t CO_2/t clinker)	No	
		The ERT encourages the Party to provide a correct interpretation of the IEF trends for cement production and to ensure the consistency of the information on the category throughout the NIR		
I.11	2.A.1 Cement production – CO_2	The estimated country-specific CKD correction factor (1.00004) is lower than the default value provided in the 2006 IPCC Guidelines (1.02). The calculation used by Ukraine does not correspond to equation 2.5 of volume 3 of the 2006 IPCC Guidelines	Yes	Accuracy
		The ERT recommends that the Party either justify the use of the country-specific CKD value, or, if information is not available, revise the CKD correction factor following the methods in the 2006 IPCC Guidelines or use the IPCC default value (1.02)		
I.12	2.A.2 Lime production – CO_2	The NIR does not provide the information on the completeness of AD for marketed and non-marketed lime production	Yes	Transparency
		During the review, Ukraine indicated that there are approximately 80 enterprises producing lime and that the State Statistics Service of Ukraine receives data from all enterprises in Ukraine		
		The ERT recommends that Ukraine discuss in the NIR the completeness of the AD (marketed and non-marketed production of lime) used for the estimation of emissions from lime production		
I.13	2.A.2 Lime production	The country-specific CO_2 EFs for lime production (0.656 t CO_2/t high calcium	Yes	Accuracy

ID#	Finding classification	Description of the finding with recommendation or encouragement[a]	Is the finding an issue? If yes, classify by type	
	– CO_2	lime, 0.725 t CO_2/t high dolomitic lime) used in the inventory are lower than the default EFs from the 2006 IPCC Guidelines (0.750 t CO_2/t high calcium lime, 0.860 t CO_2/t high dolomitic lime) During the review, Ukraine explained that the country-specific EFs for lime production are calculated on the basis of quality parameters for a lime production standard (GOST B V.2.7-90-99). The standard contains the requirements for the lowest content of CaO and MgO in lime for different types of lime. However, the ERT notes that this explanation does not provide a justification for applying EFs that are lower than IPCC default values for estimating emissions from this category The ERT recommends that the Party justify in the NIR that the calculated .EFs are. appropriate for the national circumstances (i.e. neither under- nor overestimated) or use the default EFs for lime production from the 2006 IPCC Guidelines		
I.14	2.A.2 Lime production – CO_2	The estimated uncertainty level for CO_2 emissions from lime production (26.8 per cent) is higher than the expected level of uncertainty (5–10 per cent) corresponding to the chosen tiers for AD and EFs, owing to the incorrect application of the tier 1 method for the uncertainty estimation The ERT recommends that Ukraine correct its application of the tier 1 method for the uncertainty assessment, with a focus on avoiding an overestimation of the uncertainty of the correction factor for lime kiln dust	Yes	Accuracy
I.15	2.A.2 Lime production – CO_2	There are significant inter-annual changes in quicklime and hydrated lime production during the period 2011–2013 compared with the period 1990–2010. The reason for the change is not identified by the Party and is not presented in the NIR. Specifically, production of hydrated lime decreased in 2011 by 1.3 Mt (75 per cent) and that of quicklime increased by 1.5 Mt (38 per cent), while total lime production increased by 0.2 Mt (5 per cent) During the review, Ukraine indicated that the data obtained from the State Statistics Service of Ukraine showed a sharp decrease in hydrated lime production and an increase in quicklime production for those years, but do not provide a reason for either of those changes The ERT recommends that Ukraine investigate the reason for the observed changes in the lime production data and discuss the time-series consistency in the NIR, or revise the time series, as appropriate	Yes	Consistency
I.16	2.A.3 Glass production	Emissions from soda ash use for glass production are reported incorrectly under	Yes	Comparability

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*[a]	*Is the finding an issue? If yes, classify by type*	
	– CO_2	the category soda ash production		
		During the review, Ukraine indicated that the emissions from glass production are calculated based on a national study[e] and that all soda ash use is reported under the category soda ash production and use. The ERT notes that under the new UNFCCC Annex I inventory reporting guidelines, soda ash use is no longer reported with production, but instead in the category where the soda ash is used		
		The ERT recommends that Ukraine report emissions from soda ash use for glass production under glass production		
I.17	2.A.3 Glass production – CO_2	The CO_2 EF for glass production in Ukraine (0.11 t/t) is significantly lower than the default IPCC value (0.20 t/t). The ERT is of the view that this may in part be because soda ash consumption is not included in the calculation	Yes	Transparency
		During the review, Ukraine indicated that the country-specific EF was compared with seven other countries (Belarus, Germany, Italy, Latvia, Russian Federation, Slovakia and Spain) and found to be in the range of the EFs for those countries (0.098–0.430 t/t)		
		The ERT recommends that the Party include the discussion of the development of the EF for glass production in the NIR, including the comparison analysis undertaken		
I.18	2.A.4 Other process uses of carbonates – CO_2	The CRF tables report "NO" for all other process uses of carbonates, except ceramics. The NIR does not contain any information to justify the reporting of "NO" for these subcategories. Further, the ERT notes that the NIR contains incorrect information about the inclusion of carbonates used in the iron and steel industry in this category	Yes	Transparency
		During the review, Ukraine confirmed that only emissions from ceramics occur under this category, and that emissions from carbonate consumption in the iron and steel industry are correctly reported under the iron and steel category		
		The ERT recommends that Ukraine revise the description of this category in the NIR to correctly identify the activities that occur in Ukraine and the carbonates that are consumed		
I.19	2.A.4 Other process uses of carbonates – CO_2	CO_2 emissions from calcination of carbonates in the clay used in ceramic production are not included in the GHG inventory. During the review, Ukraine agreed that these emissions were missing and would be taken into account in the next inventory submission	Yes	Completeness
		The ERT recommends that Ukraine recalculate emissions from ceramic		

ID#	Finding classification	Description of the finding with recommendation or encouragement[a]	Is the finding an issue? If yes, classify by type	
		production for the entire inventory period taking into account clay calcination		
I.20	2.B.1 Ammonia production – CO_2	The NIR describes the recalculations associated with the CO_2 recovered for ammonia production. However, the ERT notes that the methodology used by the Party for the assessment of CO_2 recovery for urea production is not presented in section 4.6.2 of the NIR and that Ukraine reports "NO" for CO_2 recovery in CRF table 2(I).A-H	Yes	Transparency
		During the review, Ukraine acknowledged that the description of the methodology used for the estimation of CO_2 recovery is missing from the NIR and that CRF table 2(I).A-H was incorrectly completed with the notation key "NO" for CO_2 recovery due to technical errors		
		The ERT recommends that Ukraine include in the NIR the description of the methodology used for estimating CO_2 recovery and report in CRF table 2(I).A-H data on CO_2 recovery		
I.21	2.B.1 Ammonia production – CO_2	The CO_2 emissions from energy and non-energy natural gas consumption for ammonia production were reported under the IPPU sector in the NIR without any explanation as to whether the natural gas consumption data were excluded from the energy sector	Yes	Transparency
		The ERT recommends that the Party clarify in the NIR that the natural gas used for energy purposes in ammonia production was not double counted in the energy sector		
I.22	2.B.1 Ammonia production – CO_2	The carbon content of natural gas used for ammonia production (15.20 t C/TJ, table P.3.1.1.6) reported in the IPPU sector differs from the carbon content of natural gas determined for the energy sector (15.21 t C/TJ)	Yes	Accuracy
		During the review, Ukraine acknowledged that this was a technical error that will be corrected in the next inventory submission		
		The ERT recommends that Ukraine revise the carbon content for natural gas from ammonia production for 2013 using the EF corresponding to the energy sector		
I.23	2.B.1 Ammonia production – CO_2	The ERT identified possible errors and omissions in the uncertainties for the AD for ammonia production included in the NIR. The 2006 IPCC Guidelines note that the uncertainty of AD, including fuel use, ammonia production and CO_2 recovered, are generally highly accurate (up to ±2 per cent if plant data are used). Ukraine applies an uncertainty value of 7 per cent for the AD for natural gas consumption, although national statistics and plant-specific data were used in the estimation. Ukraine has not included the uncertainty of CO_2 emission	Yes	Adherence to UNFCCC Annex I inventory reporting guidelines

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		recovery in the uncertainty analysis. During the review, the Party indicated that an error had occurred regarding the uncertainty of the AD, and that the uncertainty of the AD from the national statistics should have been ±5 per cent, and from plants, ±2 per cent. The Party also confirmed that the uncertainty of the CO_2 recovery estimates was not taken into account		
		The ERT recommends that Ukraine revise the uncertainty assessment for natural gas consumption, taking into account the uncertainty values from the national statistics and plant-specific data. For CO_2 recovery, the ERT recommends that the Party use the default uncertainty values (5 per cent) provided in the 2006 IPCC Guidelines (section 3.2.3.2) if country-specific data are not available		
I.24	2.B.2 Nitric acid production – N_2O	The NIR does not contain information on whether the AD and N_2O EF used for the emission calculation correspond to 100 per cent concentration of nitric acid	No	
		During the review, Ukraine confirmed that research supports the use of the value of 100 per cent concentration of nitric acid		
		The ERT encourages the Party to include in the NIR the information on the concentration of nitric acid used for the emission calculations in nitric acid production		
I.25	2.B.2 Nitric acid production – N_2O	The NIR and the material referred to in the NIR (a national study[f]) do not provide sufficiently transparent information on the methods and data used for the country-specific N_2O EF (4.5 kg/t) for nitric acid production. The chosen EF corresponds to the average value of the default EFs for low-pressure technology recommended by the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (4–5 kg/t); the default EF recommended by the 2006 IPCC Guidelines being 5 kg/t. In previous reviews, and as confirmed during the current review, Ukraine indicated that it plans to continue conducting research in conjunction with the analysis of JI project data to help improve the accuracy of the country-specific EF	Yes	Transparency
		The ERT recommends that Ukraine provide more details in the NIR on how the applied country-specific EF for nitric acid production was developed or use an IPCC default EF from the 2006 IPCC Guidelines for the corresponding technology. In addition, the ERT encourages the Party to continue conducting research in conjunction with the analysis of the JI project data to help improve the accuracy of the country- specific EF		
I.26	2.B.2 Nitric acid production – N_2O	Ukraine hosted several JI projects aimed at reducing N_2O emissions from nitric acid production. However, the NIR does not provide information regarding the use of abatement systems	Yes	Transparency

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		The ERT recommends that Ukraine clarify in the NIR whether abatement systems are used in the Ukrainian plants, and if so, provide information on the number of plants using abatement technology, the type of abatement technology, the destruction efficiency and the utilization		
I.27	2.B.3 Adipic acid production – N_2O	The ERT noted that Ukraine reported "C" (confidential) for the amount of adipic acid produced for the period 1990–2010, then reported AD for 2011 (61.49 kt) and 2012 (13.00 kt) and "NO" for 2013	Yes	Consistency
		During the review, the ERT asked whether the earlier AD must still be held confidential, considering that more recent years are published. In response, Ukraine provided the underlying AD for the full time series. From the data provided, the ERT identified that the IEF for adipic acid production in 2009 is 7 per cent higher compared with the rest of the time series		
		The ERT recommends that the Party evaluate whether the AD for the entire time series can be reported and, if so, include this information in the CRF tables. In addition, the ERT recommends that Ukraine evaluate the time series for the IEF, and either recalculate the emissions from adipic acid production for 2009 or provide in the NIR a clear explanation for the observed trends in the IEF		
I.28	2.B.3 Adipic acid production – N_2O	The ERT considers that the NIR is not transparent regarding the methods used to estimate N_2O emissions from this category. Firstly, information regarding the tier applied is inconsistent. For instance, Ukraine uses a tier 2 approach, but then a tier 1 approach is referenced in table 4.14, and the Party applies the default EF but then refers to it as country-specific. In addition, the description of the methods used for the estimation of N_2O emissions from adipic acid production provided in the NIR does not contain information about abatement systems	Yes	Transparency
		The ERT recommends that the Party report consistently the information on the tier applied to estimate N_2O emissions from adipic acid production and include in the NIR the description of the number and type of abatement systems used in Ukraine and the corresponding destruction and utilization factors		
I.29	2.B.4 Caprolactam, glyoxal and glyoxylic acid production – N_2O	Ukraine applies the default N_2O EF for caprolactam production (9 kg N_2O/t). The uncertainty of the EF, as estimated by the Party, is 10 per cent, which is significantly lower than the default value of 40 per cent in the 2006 IPCC Guidelines	No	
		During the review, Ukraine indicated that this was a misprint that will be corrected in the next submission		
		The ERT encourages Ukraine to either justify the use of an uncertainty value of 10 per cent, or, in the absence of country-specific information, that the Party use		

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		the 40 per cent uncertainty value for the EF which is recommended by the 2006 IPCC Guidelines		
I.30	2.B.4 Caprolactam, glyoxal and glyoxylic acid production – N_2O	The QA/QC section of the NIR for category 2.B.4 refers incorrectly to the QA/QC procedures for the category 2.B.7 soda ash production During the review, the Party acknowledged that this is a misprint in the NIR and informed the ERT that general QA/QC procedures were applied to the category 2.B.4 The ERT encourages the Party to provide in the NIR transparent information about the QA/QC procedures applied for the category 2.B.4 and remove the references to category 2.B.7	No	
I.31	2.B.8 Petrochemical and carbon black production – CH_4	The Party included CH_4 emissions from coke production (from the conversion of coal to coke) in this category in the IPPU sector. However, according to the 2006 IPCC Guidelines (volume 3, section 4.2), all emissions from coke production should be included in the energy sector, under manufacture of solid fuels and other energy industries, category 1.A.1.c) The ERT recommends that Ukraine allocate all CH_4 emissions from coke production to the energy sector, under manufacture of solid fuels and other energy industries (category 1.A.1.c)	Yes	Comparability
I.32	2.C.1 Iron and steel production – CO_2	The NIR reports the use of a tier 3 method for the calculation of CO_2 emissions from this category; however, the ERT noted that the Party does not appear to have used a plant-specific approach for calculating the emissions and selecting the AD and EF for the emission estimates During the review, the Party indicated that the method applied was based on a national study from Energostal and took into account plant-level data The ERT recommends that Ukraine clearly document the method applied in the NIR and provide information consistent with the use of that method (i.e. for a tier 3 method, report the calculated emissions and sources of all data, recognizing the possible need to protect confidential data)	Yes	Transparency
I.33	2.C.1 Iron and steel production – CO_2	The data on limestone consumption in the iron and steel industry for 1990 (151 kg/t pig iron) seem inconsistent with consumption during the period 1991–2013 (ranging from 30 to 50 kg/t pig iron). The previous annual review reports for 2012 (para. 69) and 2013 (para. 42) contained recommendations for Ukraine to extrapolate specific limestone consumption data in the pig iron and steel industry back to 1990 to ensure time-series consistency; however, annex P3.1.2 of the current NIR suggests that such an exercise was not undertaken to correct	Yes	Consistency

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		the data		
		The ERT recommends that Ukraine review the accuracy of the limestone consumption data for 1990 and, if appropriate, extrapolate specific limestone consumption data based on the period 1991–2013 back to 1990, as recommended in the 2012 and 2013 annual review reports		
I.34	2.C.1 Iron and steel production – CO_2	NIR tables 4.23 and P.3.1.1.15 present inconsistent information regarding the CO_2 EF for pig iron production (0.620 t CO_2/t pig iron and 1.51 t CO_2/t pig iron, respectively). In addition, the ERT noted that table 4.23 contains two EFs for limestone (0.4335 and 0.4645 t/t)	Yes	Transparency
		During the review, Ukraine indicated that a misprint had occurred in table 4.23, and the correct EF for pig iron production (1.51 t/t) should have been referenced, and that this is the value used in the calculations. Further, the Party indicated that the EF of 0.4645 t/t reported in table 4.23 should be for dolomite, not limestone		
		The ERT recommends that the Party reconcile the inconsistent information between the CO_2 EF for pig iron production in NIR tables 4.23 and P.3.1.1.15. The ERT further recommends that the Party address the fact that table 4.23 contains two different CO_2 EFs for limestone use in the iron and steel industry		
I.35	2.C.2 Ferroalloys production – CO_2	The Party reported emissions from limestone use in ferroalloys production under iron and steel production. According to the 2006 IPCC Guidelines, it is good practice to report emissions from carbonate use where the carbonates are consumed	Yes	Comparability
		The ERT recommends that Ukraine report emissions from limestone use in ferroalloys production under the category ferroalloys production (2.C.2)		
I.36	2.C.2 Ferroalloys production – CO_2	The Party included CO_2 emissions from wood (biomass) use in ferroalloys production in the total amount of CO_2 emissions from this category. The ERT noted that this is not consistent with the 2006 IPCC Guidelines and leads to the double counting of CO_2 emissions from biomass	Yes	Adherence to UNFCCC Annex I inventory reporting guidelines
		During the review, Ukraine indicated that, according to manufacturers, wood acts as a reducing agent, and therefore these CO_2 emissions were included in the totals for this category. The ERT noted that the emissions from ferroalloys produced with wood or other biomass should not be counted under this category because wood-based carbon is of biogenic origin (volume 3, chapter 4.3, of the 2006 IPCC Guidelines)		
		The ERT recommends that Ukraine exclude CO_2 emissions from biomass use in		

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		ferroalloys production from the total emissions under category 2.C.2. The ERT further recommends that the Party provide an explanatory note in CRF table2(I).A-H and in the NIR indicating that biomass emissions from the use of biomass as a reductant are excluded from the emissions from ferroalloys production to avoid double counting and are included elsewhere (in the LULUCF sector)		
I.37	2.C.2 Ferroalloys production – CO_2	For the calculation of CO_2 emissions from ferroalloys production, Ukraine applies a carbon content of 8 per cent for wastes remaining after ferroalloys production. This value of carbon content in the wastes contradicts the information provided in section 4.15.2 of the NIR (1.69 per cent) and in a national study (1.8 per cent)[g]	Yes	Accuracy
		During the review, the Party indicated that the information on the carbon content was received from enterprises. The ERT could not assess the reliability of the value of the carbon content in the wastes (8 per cent) based on the clarifications provided by the Party. The ERT noted that overestimation of the carbon content in the wastes can potentially lead to an underestimation of CO_2 emissions from the category 2.C.2		
		The ERT recommends that Ukraine either justify in the NIR the use of a carbon content of 8 per cent in the wastes after ferroalloys production, with an explanation of all types of wastes under consideration, referencing relevant sources, or use the average value of carbon content for Ukraine (1.8 per cent) reported in the national study		
I.38	2.C.3 Aluminium production – PFCs and CO_2	The NIR does not contain any information about category 2.C.3, except that primary aluminium was not produced in the last year of the inventory period. However, Ukraine reports CO_2 and PFC emissions from aluminium production for the period 1990–2010 and as "NO" between 2011 and 2013 in CRF table 2(I).A-H because the single enterprise for primary aluminium production closed in 2011	Yes	Transparency
		The ERT notes that the UNFCCC Annex I inventory reporting guidelines (para. 48) require detailed and complete information to be provided in the NIR		
		The ERT recommends that Ukraine include the information for aluminium production in the NIR, covering the relevant time period, as required by the UNFCCC Annex I inventory reporting guidelines		
I.39	2.D Electronics industry – NF_3	The Party did not use notation keys in the CRF tables to present information on NF_3 emissions for the electronics industry	Yes	Transparency
		Ukraine explained during the review that the electronics industry, which,		

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		according to the 2006 IPCC Guidelines, includes the production of flat-panel displays, and thin-film transistor and photovoltaic cells, does not occur in the country		
		The ERT recommends that Ukraine describe in the NIR the absence of NF_3 emissions in a transparent manner and use the notation key "NO" in the CRF tables		
I.40	2.F.1 Product uses as substitutes for ozone-depleting substances – HFCs	The HFC emissions from industrial air conditioning (table 4.39 of the NIR) are reported in CRF table 2(II).B-H under industrial refrigeration.	Yes	Transparency
		The ERT noted that HFCs consumed for air conditioning in industrial facilities should be reported under stationary air conditioning		
		The ERT recommends that Ukraine improve the transparency of its reporting by reporting HFC emissions from industrial air conditioning under stationary air conditioning and not under industrial refrigeration		
I.41	2.F.1 Product uses as substitutes for ozone-depleting substances – HFCs	The ERT noted an inconsistency between the NIR and the CRF tables in the reporting of HFC-134a in operating systems in commercial refrigeration. According to CRF table 2(II).B-H, the amount of HFC-134a in operating systems (average annual stocks) for commercial refrigeration in 2013 was 14.25 t and the emissions were 23.55 t, resulting in a product life factor of 165.2 per cent. However, according to NIR table 4.38, the amount in operating systems should have been 156.99 t which, with the same emissions reported, resulted in a product life factor of 15 per cent	Yes	Comparability
		During the review, the Party acknowledged that there was an error in entering information into the CRF Reporter software, and that although the emissions were correct, the AD presented in the NIR (156.99 t) should have been used		
		The ERT recommends that Ukraine correct CRF table 2(II).B-H for HFC-134a stocks in commercial refrigeration, using the corresponding data on stocks and product life factor from the NIR		
I.42	2.F.1 Product uses as substitutes for ozone-depleting substances – HFCs	HFC emissions from transport refrigeration are not estimated by the Party. The ERT noted that CRF table 2(II).B-H has been left blank for the AD and HFC emissions from transport refrigeration	Yes	Completeness
		During the review, Ukraine stated that it is not possible to estimate emissions from transport refrigeration because of the lack of statistical data on HFC-containing refrigerators produced in Ukraine, and on the export and import of the same equipment. The emissions from transport refrigeration are not included under mobile air conditioning, which covers only emissions from mobile air		

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		conditioning for road and rail transport The ERT recommends that the Party investigate methods for collecting the AD for transport refrigeration and either complete the CRF tables with AD and emission values or report the relevant notation key ("NE")		
I.43	2.F.1 Product uses as substitutes for ozone-depleting substances – HFCs	The reported trend for HFC-134a emissions in operating systems from stationary air-conditioning equipment has grown since the first year of reporting, increasing from 0.0004 t in 2002 to 0.20 t in 2010. Starting in 2011, HFC-134a emissions from stocks are reported as "NO". Disposal emissions were reported as "NO" throughout the entire time period During the review, the Party confirmed the trend for HFC-134a emissions and did not provide further comment on the reporting of disposal emissions The ERT recommends that Ukraine investigate further the HFC-134a emissions from stationary air-conditioning equipment after 2010 and document the analysis, and any resulting changes, in the NIR The ERT also recommends that the Party investigate further disposal emissions, noting that the average lifetime for air-conditioning equipment according to the 2006 IPCC Guidelines is between 10 and 20 years, and documenting the analysis in the NIR	Yes	Completeness
Agriculture				
A.3	General (agriculture) – CH_4 and N_2O	Ukraine used the arithmetical mean between the populations of cattle at the beginning and at the end of each year to estimate the average annual population (page 463 of the 2015 NIR). For swine, the statistics on a certain date (1 January) were used. The ERT noted that fluctuations in the population during the year are not included, which might lead to the underestimation of the annual populations, particularly for non-dairy and young cattle and market swine The ERT recommends that the Party investigate data available to estimate fluctuations in populations within the year and develop average annual livestock populations in accordance with the 2006 IPCC Guidelines for the entire time series	Yes	Adherence to UNFCCC Annex I inventory reporting guidelines
A.4	3.A Enteric fermentation – CH_4	To estimate CH_4 emissions from enteric fermentation of cattle, Ukraine used the methane conversion factor (Ym) of 6 per cent. A reference to the country-specific methodology from 1995 is provided in the NIR.[h] The default value in the 2006 IPCC Guidelines presents a different, updated, value (6.5 per cent) for Ym. The ERT considers that the use of the value for Ym from 1995 might lead	Yes	Accuracy

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		to an underestimation of CH_4 emissions from the enteric fermentation of cattle		
		The ERT recommends that the Party investigate the appropriateness of the value used for Ym for cattle and provide a justification for the current value or recalculate CH_4 emissions from enteric fermentation of cattle for the entire time series using the Ym factor from the 2006 IPCC Guidelines		
A.5	3.A Enteric fermentation – CH_4	The live weight for mature non-dairy cattle reported shows an increase between 1990 (537.65 kg) and 2013 (588.01 kg) by 9.4 per cent; however, the GE intake values and the CH_4 IEF decreased by 7.4 per cent during the same period (from 207.99 to 192.53 MJ/head/day, and from 81.85 to 75.77 kg/head/year, respectively)	Yes	Transparency
		During the review, Ukraine indicated that the live weight of cattle is not used in the estimates and that feed consumption per head declined during the period 1990–2013. Additionally, Ukraine informed the ERT that the live weight of mature non-dairy cattle is the average standard values for beef cows (535.5 kg), cows on fattening and feeding (535.5 kg) and bulls (871 kg). The growth of this value occurred due to an increase in the rate of bulls from 0.006 in 1990 to 0.156 in 2013. The ERT noted that, in accordance with the 2006 IPCC Guidelines, the live weight of non-dairy cattle is the main indicator of the intensity of CH_4 emissions from enteric fermentation per head and trends of live weight, and the IEFs should not be contradictory		
		The ERT recommends that Ukraine provide an explanation of the standard live weights for various groups of non-dairy cattle and reasons for the trend between 1990 and 2013 in the NIR. Additionally, the ERT encourages Ukraine to obtain data on the actual live weight for these groups of cattle and use it for the verification of existing IEF trends		
A.6	3.B Manure management – CH_4	A constant value of feed digestibility (DE) for cattle for the period 1990–2013 is applied (75 per cent) without justification, while the IPCC default value is 60 per cent (table 10A.1 and 10A.2 of the 2006 IPCC Guidelines)	Yes	Transparency
		During the review, Ukraine explained that a national standard DE value for the period 1990–2013 was used		
		The ERT recommends that the Party improve the transparency of its justification for using a country-specific DE value for cattle in the NIR. In the absence of such justification, the ERT recommends that the Party apply the IPCC default DE value of 60 per cent		
		The ERT also encourages the Party to investigate possibilities to develop DE values on an annual basis separately for agricultural enterprises and private		

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		households		
A.7	3.B Manure management – CH_4	Ukraine applies a value of 0.32 for the maximum CH_4-producing potential (B_0) of poultry without a justification, while the IPCC default values are 0.36 and higher for developed countries (table 10A-9 of the 2006 IPCC Guidelines). The ERT noted that this might lead to the underestimation of CH_4 emissions from MMS	Yes	Accuracy
		During the review, the Party acknowledged that this would be changed in the next inventory submission		
		The ERT recommends that Ukraine recalculate CH_4 emissions from manure management of poultry for the entire time series with the appropriate default B_0 value from the 2006 IPCC Guidelines		
A.8	3.B Manure management – CH_4 and N_2O	The distribution of MMS has been recalculated between the 2014 and 2015 inventory submissions. The reason for the recalculation is not clearly described in the NIR	Yes	Transparency
		During the review, Ukraine explained that the transition to a new national methodology allowed it to allocate additional MMS (composting, deep bedding, etc.), thereby increasing the number of systems and changing the allocation		
		The ERT recommends that the Party include a transparent explanation for all recalculations made in the distribution of MMS		
A.9	3.B Manure management – N_2O	Ukraine used constant values for the N excretion rates for cattle for all years across the time series. The ERT noted that there are increasing trends in the GE intake of dairy cattle (+18.9 per cent) and young cattle (+24.8 per cent) for the period 1990–2013. The ERT also noted that constant Nex rates might lead to the underestimation of N_2O emissions from MMS in recent years because an increase in the GE of a population should lead to an increase in the Nex rate	No	
		The ERT encourages the Party to investigate the possibility of developing annual Nex rates for cattle on the basis of GE values with the use of equations 10.31 and 10.32 of the 2006 IPCC Guidelines		
A.10	3.B Manure management – N_2O	Ukraine has not reported direct and indirect N_2O emissions from the composting type of MMS under manure management	Yes	Completeness
		During the review, Ukraine explained that the related direct and indirect N_2O emissions are estimated and reported under direct and indirect N_2O emissions from agricultural soils. The ERT noted that, in accordance with the 2006 IPCC Guidelines, in CRF table 3.D only N_2O emissions after the application of		

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		manure onto soils are reported. N_2O emissions from the storage of manure are not included in CRF table 3.D; therefore, the approach used by the Party leads to the underestimation of N_2O emissions from MMS		
		The ERT recommends that Ukraine calculate direct and indirect N_2O emissions from the composting type of MMS and report emissions for the entire time series		
A.11	3.B Manure management – N_2O	For some livestock categories, the N excreted per MMS reported in CRF table 3.B(b) is lower than the estimates calculated by the ERT using other data reported by the Party (e.g. the reported value for dairy cattle in anaerobic lagoons is lower than the estimate calculated by the ERT by 24.0 per cent for 2013, while for swine, N excretion in anaerobic lagoons is lower than the estimate calculated by the ERT by 61.7 per cent). That might lead to the underestimation of N_2O emissions from MMS	Yes	Accuracy
		During the review, Ukraine indicated that it plans to correct its reporting in the next annual submission		
		The ERT recommends that the Party correct the error in the reporting of Nex per MMS in CRF table 3.B(b)		
A.12	3.B Manure management – N_2O	Ukraine used an average Nex rate for all species of fur animals (foxes, raccoons, mink and polecat) calculated as 8.34 kg N/head/year. However, the 2006 IPCC Guidelines provide data that allow for the disaggregation of the Nex rates for different animal groups	Yes	Accuracy
		During the review, Ukraine explained that disaggregated statistics are available for foxes, arctic foxes, mink and nutria since 2004		
		The ERT recommends that Ukraine use the available separate statistics on populations for fox plus raccoon and mink plus polecat animal groups and apply separate default Nex rates from 2004. The ERT also recommends that the Party apply the average population ratio for fur animals for the period 2004–2013 and apply separate default Nex rates for the period 1990–2003		
A.13	3.B Manure management – N_2O	The NIR does not provide a clear explanation of how indirect N_2O emissions from atmospheric volatilization in MMS were estimated. The information reported in the NIR (page 202) refers to volatilization and leaching at the same time. In CRF table 3.B(b), Ukraine reports indirect N_2O emissions from atmospheric volatilization (2.04 kt N_2O for 2013) and reports "NA" for leaching and run-off	Yes	Transparency
		During the review, Ukraine confirmed that it estimated emissions for		

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*[a]	*Is the finding an issue? If yes, classify by type*	
		atmospheric volatilization only		
		The ERT recommends that Ukraine provide a more transparent description of the methodology used for estimating indirect N_2O emissions from MMS, including exact information on the type of indirect N_2O emissions that are estimated and the applied equations		
A.14	3.D.a.2.a Agricultural soils – N_2O	The ERT noted that the N input into soils with manure from the composting type of MMS has been accounted twice: in the annual amount of animal manure applied to soils (F_{AM}) and the annual amount of compost N applied to soils (F_{COMP}). This resulted in an overestimation of N_2O emissions from soils because all N from MMS is included in the estimation of $F_{AM.}$	Yes	Accuracy
		The ERT recommends that Ukraine recalculate the N input into soils with manure from the composting type of MMS to eliminate double counting by removing the N of manure composted from the values of F_{COMP}		
A.15	3.D.a.2.4 Agricultural soils – N_2O	The NIR does not provide an explanation of how the N input with organic fertilizers (F_{ON}) into rice fields was estimated	Yes	Transparency
		The ERT recommends that the Party improve the transparency in the NIR by describing how the AD on the amount of N input from F_{ON} were calculated for the estimation of direct N_2O emissions from rice fields		
A.16	3.D.a.2.4 Agricultural soils – N_2O	Ukraine used the amount of N in plant feed of animals to estimate the fraction of removed residues ($Frac_{REMOVE}$). The ERT noted that for most plant species, only stubble and roots were included in the calculation of crop residues (F_{CR}). However, the FracREMOVE has been applied to the total sum of all crop residues (F_{CR}). The ERT considers that this might lead to the underestimation of N input to soils with crop residues and N_2O emissions from soils	Yes	Accuracy
		The ERT recommends that Ukraine check the correctness of the method currently used for calculating the residues removed and left in fields and provide a justification for the current approach or recalculate the entire time series of F_{CR} by applying the $Frac_{REMOVE}$ only to the respective part of crop residues		
A.17	3.D.a.2.4 Agricultural soils – N_2O	The NIR stated that some part of crop residues on cropland is burned due to wildfires. However, the ERT noted that the amount of burned crop residues has not been subtracted from the total amount of crop residues incorporated into soils. During the review, Ukraine explained that the data for the area damaged by wildfires before the harvest are removed by the State Statistics Service	Yes	Transparency
		The ERT recommends that the Party clarify in the NIR how the area of burning		

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		of crop residues on cropland is accounted		
A.18	3.D.a.2.5 Agricultural soils – N_2O	Ukraine reports "NA" for N_2O emissions from the annual amount of N mineralized in mineral soils as a result of losses of soil carbon (F_{SOM}). N_2O emissions from mineralization of soil carbon on converted lands to cropland and grassland are reported by Ukraine in the LULUCF sector (CRF table 4(III)). The ERT noted that the carbon stock changes in soils of cropland remaining cropland reported in CRF table 4.B show losses of soil carbon in managed soils. Not estimating the corresponding direct and indirect N_2O emissions leads to an underestimation of N_2O emissions	Yes	Completeness
		The ERT recommends that Ukraine estimate direct and indirect N_2O emissions from mineralization of soil carbon on cropland remaining cropland. Further, the ERT notes that N_2O emissions from mineralization of soil carbon on cropland and grassland should be reported in the agriculture sector and recommends that the Party reallocate these N_2O emissions from the LULUCF sector to the agriculture sector		
A.19	3.D.a.2.6 Agricultural soils – N_2O	Ukraine applies the default N_2O EF from the 2006 IPCC Guidelines to estimate N_2O emissions from managed organic soils (8.00 kg N_2O-N/kg N)	No	
		The ERT encourages the Party to use the Wetlands Supplement in preparing the annual inventory for N_2O emissions from managed organic soils		
A.20	3.D.b.1 Agricultural soils – N_2O	The calculations made by the ERT (using other data reported by the Party) for indirect N_2O emissions from atmospheric deposition resulted in lower values compared with those reported in CRF table 3.D for all years (e.g. for 2013 the ERT estimated emissions of 3.14 kt N_2O for atmospheric deposition from managed soils, while the Party reported emissions of 3.48 kt N_2O)	Yes	Accuracy
		During the review, the ERT determined that in Ukraine's calculations, the N input with synthetic fertilizers reported in CRF table 3.D is adjusted for the NH_3 and NO_X volatilization prior to estimating direct N_2O emissions. That is not in line with the methodology described in the 2006 IPCC Guidelines (see volume 4, chapter 11, page 11.12, footnote 11)		
		The ERT recommends that the Party recalculate the direct and indirect N_2O emissions from synthetic fertilizers for the entire time series using the methodology of the 2006 IPCC Guidelines: the total amount of N synthetic fertilizers applied to soils should be used to estimate direct N_2O emissions (without adjusting it for the NH_3/NO_X volatilization prior to that estimation). Indirect N_2O emissions should be estimated on the basis of equations 11.9 and 11.10 of volume 4, chapter 11, of the 2006 IPCC Guidelines		

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A.21	3.D.b.1 Agricultural soils – N_2O	The NIR does not provide the information on the $Frac_{GAS}$ coefficients used to estimate indirect N_2O emissions from atmospheric deposition	Yes	Transparency
		During the review, Ukraine informed the ERT that the value for $Frac_{GAS}$ used to estimate indirect N_2O emissions from atmospheric deposition is country-specific		
		The ERT recommends that the Party report the coefficients used for the estimation of indirect N_2O emissions from soils and the sources for these values		
A.22	3.G Liming – CO_2	The NIR stated that limestone and other liming materials are applied to soils. The ERT noted that the default CO_2 EF for only limestone (0.12 t C/t lime) is used in the calculations	Yes	Accuracy
		During the review, Ukraine explained that only limestone is used for liming of soils in Ukraine		
		The ERT recommends that the Party investigate the use of other liming materials, except limestone for liming of soils in Ukraine, and estimate the CO_2 emissions, if any, with the corresponding EF and report the results in the NIR		
LULUCF				
L.18	General (LULUCF)	The ERT noted that some of the methodological information needed to ensure the transparency of the NIR is missing (see L.5, L.10 and L.17 above and L.19, L.20, L.25, L.31 and L.35 below). During the review, Ukraine submitted relevant additional information to complement its NIR	Yes	Transparency
		The ERT commends Ukraine for the additional information provided and recommends that the Party enhance the information reported in the NIR to improve transparency. Specifically, the ERT recommends that Ukraine include, for each estimated category, the following information in the NIR to improve transparency:		
		(a) The methodology used, including the assumptions and evidence on which the assumptions are based, and inferences;		
		(b) The input data and parameters, including the sources of input data and parameters (see L.1 above) and any methodological elaboration to make them suitable for use in the GHG estimates, including for ensuring their time-series consistency;		
		(c) The verification of outputs (i.e. GHG estimates), if any, noting that the verification of outputs is mandatory for tier 3 estimates		
L.19	General (LULUCF)	The ERT noted that Ukraine uses several sources of information for compiling	No	

ID#	Finding classification	Description of the finding with recommendation or encouragement[a]	Is the finding an issue? If yes, classify by type
		its land representation, and that most of them do not identify potential land-use changes except for afforestation and deforestation The ERT notes that when using various data sets prepared under different approaches, the risk of inconsistency may be high and in such a case the transparency of the information is crucial to assess its quality. Further, the ERT notes that when compiling AD from different sources a hierarchical order, proportional to the quality of the data set, has to be set to avoid double counting or gaps The ERT considers that the transparency of the information on land representation could be further enhanced by reporting, in tabular format, the following information for each land category: (a) The data sources; (b) The time series of raw data; (c) The methodology applied for filling in gaps in the raw data (if any); (d) The methodology applied (including assumptions and inferences) to derive the land category areas from the raw data; (e) The methodology applied for filling in gaps in the time series of areas (if any); (f) The transition time of the land category for all land conversion categories; (g) Its hierarchical order, and other relevant information (if any) The ERT therefore reiterates the encouragement in the previous review report that Ukraine report in the NIR all the information listed above	
L.20	General (LULUCF)	Ukraine has reported in its NIR (table 6.4) a time series of annual matrices on land use and land-use change areas for the period 1990–2013. The ERT noted that the same information is currently reported in CRF table 4.1, as correctly compiled by Ukraine The ERT commends Ukraine for reporting the time series of annual land use and land-use change areas, but the ERT encourages the Party to use NIR table 6.4 to report the area of annual land use and land-use changes for the time period 1971–1989, because this time series would be complementary to, not a duplication of, that reported in CRF table 4.1 The ERT further notes that reporting in the NIR the time series of matrices of annual land use and land-use change areas for the period 1971–1989 would	No

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*[a]	*Is the finding an issue? If yes, classify by type*	
		enhance the transparency of the Party's NIR		
L.21	General (LULUCF) CO_2 and N_2O	The ERT noted that Ukraine's land representation is based on approach 1 (i.e. data do not allow the identification of land-use conversion) The ERT further notes that the 2006 IPCC Guidelines provide a specific formulation (volume 4, chapter 4, formulation A reported in box 2.1, page 234) which avoids the calculation of erroneous SOM carbon stock changes when net land area changes are used (e.g. a net increase of the wetlands area compared with a net decrease of the forest land area) instead of the gross area (i.e. which particular land use and soil type have been converted to wetlands and to which particular land use the soil type under forest land has been converted) The ERT recommends that Ukraine use formulation A for calculating the SOM carbon stock changes in mineral soils. Further, because the land representation is not spatially explicit, the ERT recommends that Ukraine use ancillary data or expert judgement when assigning the soil type to land-use changes For instance, the ERT encourages the Party to consider that it is more likely that an organic soil converts to wetlands than mineral soils; consequently, a net increase of wetlands is more likely to be caused by a conversion of organic soils previously under other uses than by the exclusive conversion of mineral soils as currently assumed by Ukraine. Indeed, a net increase of organic soils under forest land, as reported from 1990 to 2013, does not imply that no forest land with organic soils has been converted to wetlands. For example, a larger conversion of former agricultural land on organic soils to forest land may have determined an overall net increase of organic soils under forest land, although a portion of forest land on organic soils has been converted to wetlands	Yes	Transparency
L.22	General (LULUCF) – CO_2 and N_2O	The ERT noted that the model used by Ukraine for estimating GHG emissions and removals in agricultural lands (cropland and managed grassland) requires the stratification of crop and grass types, and their rotation across years, according to soil types. However, the land-cover/land-use data used for representing agricultural land by Ukraine are not spatially explicit (see L.21 above). The allocation of various crop and grass types to various soil types is therefore made by proportions. Consequently, uncertainties are judged to be large, and in any case larger than would result from using available free data sets. For instance, a free global cover data set for the year 2000 is available online[i] The ERT encourages Ukraine to use freely available, global land-cover/land-use data sets to identify agricultural lands and major types of crops across the	No	

ID#	Finding classification	Description of the finding with recommendation or encouragement[a]	Is the finding an issue? If yes, classify by type	
		country in order to stratify them together with soil types		
L.23	General (LULUCF) – CO_2 and N_2O	The ERT noted that, in some years (e.g. 2013) areas under other land uses are converted to unmanaged forest land. However, in the category land converted to forest land, those land areas are not reported as a subdivision	Yes	Accuracy
		During the review, Ukraine stated that any annual increase in the area of a land-use category is reported under the managed subdivision of that category. However, the ERT noted that, for example, in 2013 for forest land, the land representation of Ukraine reports an increase in the unmanaged subdivision		
		The ERT recommends that Ukraine provide information to clarify this apparent inconsistency. Further, considering that GHG emissions and removals in unmanaged land need not be reported, but GHG emissions and removals in formerly managed land that is subsequently abandoned do need to be estimated (until such a time as the carbon stocks in the land achieve the equilibrium level associated with the new land category), the ERT recommends that Ukraine ensure that GHG emissions and removals in formerly managed land subsequently abandoned are estimated until the carbon stocks in the land achieve the equilibrium level associated with the new land category (by default, for a 20-year period)		
L.24	4.A Forest land CO_2 and N_2O	In the NIR, for 2013 (page 242), it is reported that only 59,000 ha of forest land are unmanaged. However, in CRF table 4.1, 973.59 kha of forest land are reported as unmanaged for that year. During the review, Ukraine clarified that the subdivision "unmanaged forest land" includes primary forests but also includes "lands not covered by forests (according to national definitions), but which are provided for forestry and not include lands for agriculture production, other forest lands (according to national definition), which include forest roads, railroads, firebreaks and other, and forests on the territory of [the] restricted Chernobyl plant area"	Yes	Comparability
		While the ERT considers that it is appropriate to include under unmanaged forest land those forests in the Chernobyl area where use is forbidden and access restricted, it does not consider it to be consistent with good practice to include all forest areas without trees in the category unmanaged forest land just because the lands cannot be subject to harvesting		
		The ERT recommends that Ukraine report all areas that are included under forest land and that are unstocked because of management activities (e.g. firebreaks, forest roads, etc.) under the category managed forest land, possibly under a subdivision such as "unstocked managed forest land", or alternatively according to their dominant use (e.g. firebreaks as grassland and forest roads as		

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		settlements)		
L.25	4.A Forest land – CO_2	The NIR does not provide specific information on the factors used for estimating the carbon stock losses associated with harvesting During the review, the ERT asked if a table was available containing the BEF, basic wood density and/or BCEF applied for calculating biomass losses (including bark) from harvested industrial roundwood and harvested fuelwood. Ukraine provided a table containing the factors used for estimating the carbon stock losses associated with harvesting The ERT recommends that the Party report the factors used for estimating the carbon stock losses associated with harvesting (i.e. BEF, basic wood density and/or BCEF) together with a justification for each value selected for each factor	Yes	Transparency
L.26	4.A Forest land – CO_2	In the NIR, while the biomass carbon stock gains include the below-ground biomass carbon stock, the calculation of the biomass carbon stock losses is limited to the above-ground biomass carbon pool. Such asymmetrical treatment of carbon pools among carbon stock gains and losses results in an underestimation of the carbon stock losses and a consequent overestimation of the net carbon stock changes in the biomass carbon pool The ERT recommends that Ukraine include in its estimates the below-ground biomass carbon stock losses associated with harvesting and with other disturbances that cause the death of the entire tree	Yes	Completeness
L.27	4.A Forest land – CO_2 and N_2O	For the years 1991–1993 and 1995–1998, Ukraine reported a net carbon stock loss for both settlements and other land converted to forest land, and noted that such trends are incompatible with the SOC value equal to 0 (zero) for settlements and other land reported by the Party. The ERT considers that this as one example of a larger issue (see issues L.21, L.22, L.37, L.38, L.34, L.39, L.40 and L.41) that the calculation of all GHG emissions and removals from mineral soils in Ukraine is affected by errors in applying good practice During the review, Ukraine responded to a question raised by the ERT regarding how the SOC of settlements and of other land are estimated by explaining that the SOC in mineral soils is assumed to be zero for both settlements and other land The ERT recommends that Ukraine revise the calculations of GHG emissions and removals from forest land in mineral soils in forest land following the methods presented in the 2006 IPCC Guidelines and implement sector-specific QC procedures to ensure the accuracy of the estimates reported across the time	Yes	Accuracy

ID#	Finding classification	Description of the finding with recommendation or encouragement[a]	Is the finding an issue? If yes, classify by type	
		series		
L.28	4.B Land converted to cropland – CO_2 and N_2O	The ERT noted that most of the area reported as converted to cropland across the entire time series occurred in the year 1992 (35,897.90 kha). Knowing that in 1992 Ukraine experienced large changes in its administrative organization due to the dissolution of the Soviet Union, the ERT considers that it is likely that changes in the method and procedure of data collection on agriculture statistics may have caused an inconsistency with the data reported as cropland use in the previous two years of the time series (1990–1991)	No	
		The ERT encourages Ukraine to check whether differences in data quality between 1991 and 1992 have determined so large a variability between the size of the areas reported as converted to cropland in the year 1992 and those reported as converted in the other years of the time series. Further, the ERT encourages Ukraine to apply the methods provided in the 2006 IPCC Guidelines (volume 1, chapter 5) to remove from the time series any detected inconsistencies		
L.29	4.B Cropland – CO_2 and N_2O	The ERT noted that the area reported under cultivated organic soils decreased by almost 160,000 ha between 1990 (4,157.72 kha) and 2013 (4,002.34 kha)	Yes	Consistency
		During the review, Ukraine clarified that its land representation is not able to track across the time series the former agricultural lands (i.e. cropland and managed grassland) on drained organic soils. Consequently, GHG emissions and removals associated with those lands are reported only for the years in which they are subject to cultivation. Ukraine does not have information to establish whether drained organic soils in former agricultural lands are kept under drainage or are actually rewetting. The ERT notes that such inconsistency in the time series of drained organic soils may result in an erroneous decreasing trend in GHG emissions from drained organic soils if those soils are kept under drainage also in the category/subdivision to which they have been transferred once no longer subject to agricultural use		
		The ERT recommends that Ukraine enhance its data collection on the use under which organic soils are reported, and to supplement the current data gaps with available ancillary data and expert judgement, where needed, to ensure that no systematic errors affect the estimates of GHG emissions in the time series		
L.30	4.B Cropland 4.C Grassland – CO_2 and N_2O	The ERT noted that, according to figure 3A.5.1 in volume 4 of the 2006 IPCC Guidelines, most of the cropland and grassland areas in Ukraine are within the cool temperate climate zone. However, for estimating CO_2 emissions from drained organic soils under cropland and grassland, Ukraine applies the EFs of 10 t C/ha/year and 2.5 t C/ha/year, respectively, which are the IPCC default	Yes	Transparency

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		values for the warm temperate climate zone. During the review, Ukraine provided information justifying the use of the IPCC default values for the warm temperate climate zone The ERT recommends that Ukraine include this justification in its annual submission		
L.31	4.C.1 Grassland remaining grassland – CO_2	Grassland includes also former cropland and managed grassland that have been subsequently abandoned, for which the CSC should be estimated until the equilibrium level of carbon stocks in carbon pools associated with the new status of unmanaged land that is achieved. The ERT notes that the NIR does not report transparent information on how the CSCs in those abandoned lands have been estimated and under which subdivision of grassland the former cropland and managed grassland are reported from the year of their management change through to the end of the transition period across which the carbon stocks are expected to achieve the new equilibrium Considering that grassland includes different types of management systems, the ERT encourages the Party to report: estimates of the CSCs in this category stratified by the various management types; and transparent information on how the CSCs in those abandoned cropland and managed grassland have been estimated and under which subdivision of grassland these lands are reported from the year of their management change through to the end of the transition period	No	
L.32	4.D.1 Wetlands remaining wetlands – CO_2 and N_2O	Ukraine did not report GHG emissions from abandoned peat extraction sites During the review, the ERT asked whether the areas of peat that are no longer productive are rewetted or remain under drainage. In response, Ukraine clarified that peat extraction sites abandoned by production are assumed to remain under drainage. However, the ERT noted that once transferred to the land category other wetlands remaining other wetlands (4.D.1.3), Ukraine has not reported emissions from abandoned peat extraction sites .Consequently, Ukraine has reported GHG emissions associated with drainage of peat extraction sites only for the years in which they are subject to production. Ukraine has no information to establish whether drained organic soils in abandoned peat extraction sites are kept under drainage or are actually rewetting. The ERT noted that not reporting GHG emissions from abandoned peat extraction sites may result in an erroneous decreasing trend in GHG emissions from drained organic soils in case formerly productive sites are kept under drainage, as assumed by Ukraine The ERT recommends that Ukraine: enhance its data collection on the drainage	Yes	Consistency

ID#	Finding classification	Description of the finding with recommendation or encouragement[a]	Is the finding an issue? If yes, classify by type	
		status of peat production sites once abandoned; supplement the current data gaps with available ancillary data and expert judgement, where needed; and estimate GHG emissions in sites for peat production which, although abandoned, are still under drainage, to ensure that no errors affect the GHG emission trend		
L.33	4.D.2 Land converted to wetlands – CO_2 and N_2O	In addition to forest land converted to wetlands, Ukraine reports all land converted to wetlands as unmanaged wetlands, although most of these lands were managed before the conversion. Consequently, Ukraine has not reported the CSCs for those lands because no methods are available and lands are unmanaged. However, the ERT notes that, although abandoned, those lands should be considered as managed until the carbon stocks have achieved the long-term average carbon stock (i.e. until the impact of previous human activity has expired) and that for flooded land (a type of wetlands) the 2006 IPCC Guidelines provide a default methodology for estimating biomass carbon stock losses. Therefore, there appears to be a missing estimate for this category	Yes	Completeness
		The ERT recommends that Ukraine identify the areas of land converted to flooded land, especially forest land converted to flooded lands, and apply the default IPCC methodology (see volume 4, section 7.3.2.1 of the 2006 IPCC Guidelines) or any other method considered more appropriate for Ukrainian national circumstances		
		Further, considering the relevance of wetlands for the Ukrainian national circumstances, in particular for areas of organic soils left rewetting because of the reported reduction of the agricultural area across the time series, the ERT encourages Ukraine to use the Wetlands Supplement in preparing the annual inventories for those areas of managed wetlands not reported either as peat extraction sites or flooded lands, in future annual submissions		
L.34	4.E.2 Land converted to settlements 4.F.2 Land converted to other land – CO_2 and N_2O	The ERT noted that for land converted to settlements (4.E.2) and land converted to other land (4.F.2), Ukraine does not report the CSCs, with the exception of forest land converted to the above-listed categories. The 2006 IPCC Guidelines contain methods and factors that can be applied for estimating the CSCs associated with each of those conversions of land use. Further, the ERT noted that even if land converted to wetlands and/or other land are considered to no longer be subject to human activities, the CSCs associated with the land conversions have to be estimated and reported until the carbon stocks in pools achieve the long-term average level associated with the new land use (by default for a time period of 20 years)	Yes	Completeness
		The ERT recommends that Ukraine report the CSCs for land converted to		

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		settlements (4.E.2) and land converted to other land (4.F.2) by applying the default IPCC method and factors or any method and factors considered by Ukraine to be more appropriate to its national circumstances, while ensuring that they are in line with good practice		
L.35	4.G Harvested wood products – CO_2	The ERT noted that the transparency of the information reported in the NIR may be improved by providing the half-life values and other parameters applied to implement the production approach. Further, information on the treatment of exported wood and HWP, as well as of discarded HWP in SWDS, should be provided to allow a full understanding of the methodology applied. Finally, the description of how the time series of HWP has been reconstructed would be more transparent if the numerical values of the factors used to derive the Ukrainian HWP from Soviet Union data were reported	No	
		The ERT encourages Ukraine to report additional methodological information, as described above, including the methods applied to ensure consistency in the historical time series, to allow for the recalculation of the contribution from HWP		
		Further, considering the complexity of deriving data for Ukraine from former aggregated statistics of the Soviet Union, and since national data for the time series from 1961 to 1991 are not yet available (NIR page 256), the ERT noted that equation 2.8.6, contained in the *2013 Revised Supplementary Methods and Good Practice Guidance Arising from the Kyoto Protocol*, may reduce the need for a long historical time series by approximating the carbon stocks in HWP pools at the beginning of the consistent time series of available national AD		
L.36	4.H Other land – CO_2	As reported in the previous review report, category 66 (“dry open lands with special vegetation cover”) is classified by Ukraine under the IPCC category other land (4.H), although it contains significant carbon stocks in SOM and biomass. The ERT recommends that Ukraine revise this classification, noting that category 66 appears to more closely match the definition of the IPCC category grassland	Yes	Comparability
L.37	Forest land converted to any other land use – CO_2 and N_2O	The ERT noted that in 1990 the value of the SOM CSCF in mineral soils (–0.37 t C/ha) is the same for any forest land conversion to other land uses (cropland, grassland, settlements and other land). The ERT considers that such behaviour of the SOM CSCF is not justifiable, since the land-use SOC at equilibrium differs according to the use of land	Yes	Adherence to UNFCCC Annex I inventory reporting guidelines
		Considering that methodological issues related to GHG emissions and removals from mineral soils have already been addressed in item L.28 and that the issue reported here also highlights the lack of efficient QC procedures, the ERT		

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		recommends that Ukraine strengthen its QC procedures for the LULUCF sector and report on the improvements implemented		
L.38	Forest land converted to any other land use – CO_2 and N_2O	Considering that instantaneous oxidation is applied for both pools, the ERT noted that in 1990, the net CSCFs of biomass (–8.57 t C/ha) and DOM (–0.47 t C/ha) in the CRF tables are not consistent with those reported in the NIR for estimating carbon stock gains (see NIR tables P3.3.3, P3.3.6, P 3.3.7 and P 3.3.8), according to which a much larger amount of biomass and DOM carbon stock in deforested areas should have been accumulated before deforestation. Further, those CSCF values are also not consistent with those used for estimating GHG emissions from fires (e.g. from 10 to 100 t d.m./ha for DOM and under-storey vegetation)	Yes	Comparability
		During the review, Ukraine justified such values, clarifying that some of the forest land reported as converted to other land uses did not contain trees before conversion. The ERT considers that mixing the process of declassification of land with actual deforestation (i.e. removal of forest carbon stocks and conversion to other land uses) affects the transparency of estimates		
		The ERT recommends that Ukraine subdivide and report separately deforested areas between those that did contain trees and those that did not contain trees before deforestation. Further, the ERT recommends that Ukraine report in the NIR a table where, for each carbon pool, the standing carbon stocks before deforestation and after deforestation are reported for those lands that did contain trees before deforestation		
L.39	Direct N_2O emissions from nitrogen mineralization/ immobilization associated with SOM changes – N_2O	The ERT noted that the methodology applied by Ukraine in this category requires that for each land-conversion category reported in CRF table 4(III), a constant carbon:nitrogen ratio (C:N) and EF be applied. Consequently, the ERT noted that the IEF of each land conversion category reported has to be constant across the entire time series. However, except for the category grassland converted to cropland, in which the IEF value is constant across the entire time series (0.166 kg N_2O–N/ha), all other IEFs for all other reported land categories vary across the time series	Yes	Consistency
		The ERT recommends that Ukraine revise its calculations and implement sector-specific QC procedures to ensure the consistency of the emission estimates across the time series		
L.40	Direct N_2O emissions from nitrogen mineralization/ immobilization	According to the 2006 IPCC Guidelines, N_2O emissions may result from the N mineralization associated with loss of SOM resulting from change of land use or management of mineral soils. The ERT noted that, for some land-conversion categories, an increase in SOM would be expected with the application of the	Yes	Accuracy

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	associated with SOM changes – N_2O	tier 1 method (which was applied by Ukraine), but Ukraine reports N_2O emissions from mineralization of SOM in CRF table 4(III). In particular, N_2O emissions are reported for cropland converted to forest land, settlements converted to forest land, other land converted to forest land and other land converted to cropland, which are all land categories where a net carbon stock gain of SOM is to be reported		
		The ERT recommends that Ukraine revise its calculation of N_2O emissions from mineralization of SOM, ensuring that such emissions are only estimated and reported in land categories where a net carbon stock loss occurs		
L.41	Indirect N_2O emissions from managed soils – N_2O	The ERT noted that Ukraine reported "NO" for indirect N_2O emissions from managed soils in CRF table 4(IV). However, in CRF table 4(III), Ukraine reported some direct N_2O emissions from N mineralization associated with SOM carbon stock losses in all land-use categories. The ERT considers that according to the IPCC default methodology (see volume 4, equation 11.10), indirect N_2O emissions associated with N mineralization of SOM carbon stock losses have to be reported	Yes	Completeness
		The ERT recommends that Ukraine estimate and report indirect N_2O emissions from sources of N mineralization associated with SOM losses		
L.42	Biomass burning – CO_2, CH_4 and N_2O	Ukraine reports "NO" for CO_2, CH_4 and N_2O emissions from biomass burning in land converted to forest land for the period 1990–2007, and thereafter reports emissions	Yes	Consistency
		During the review, Ukraine explained that biomass burning may have occurred in land converted to forest land in the period 1990–2007 and that, if it occurred, it would be reported together with biomass burning emissions from forest land remaining forest land. Ukraine proposed to replace the notation key "NO" with "IE". The ERT noted that the revision proposed by Ukraine may make the estimates more accurate if such emissions are actually reported under forest land remaining forest land, but it would make the time series inconsistent unless "IE" were used for the entire time series, not only for the period 1990–2007		
		The ERT considers that the techniques provided in the 2006 IPCC Guidelines (volume 1, chapter 5) may be applied for preparing a consistent time series and therefore the ERT recommends that Ukraine apply the techniques provided in the 2006 IPCC Guidelines for preparing GHG estimates for biomass burning in land converted to forest land		
L.43	Biomass burning – CO_2, CH_4 and N_2O	The ERT noted that the ratio between the three GHGs is not constant across the time series, even though constant EFs have been applied. From 1990 to 2010,	Yes	Consistency

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		the ratio of N_2O:CO_2:CH_4 emitted was 1:12,152.4:57.1. The ratio changed in 2011 (1:30,406.8:145.2) and again for the period 2012–2013 (1:30,933.3:145.5)		
		The ERT recommends that Ukraine implement category-specific QC procedures to ensure the consistency of the emission estimates from biomass burning across the time series and the ratio of different gases		
Waste				
W.4	5.A Solid waste disposal on land – CH_4	The NIR reports that the first managed SWDS were constructed after 1986; however, the emission estimates from this category were reported for 1990 onwards. The NIR does not present an explanation for these missing data	Yes	Transparency
		During the review, the Party indicated that although the upgrade of MSW landfills began in 1986, the Party considered that the first managed MSW landfills consistent with the definitions in the 2006 IPCC Guidelines only started operating in 1990		
		The ERT recommends that the Party include a more transparent explanation of when the managed SWDS were constructed and became operational		
W.5	5.A Solid waste disposal on land – CH_4	The ERT noted that the explanation in the NIR does not describe transparently how the amounts of waste disposal on various types of SWDS are determined	Yes	Transparency
		During the review, the Party presented a detailed explanation of how waste is distributed between the different types of SWDS		
		The ERT recommends that Ukraine include in the NIR detailed information on how the amounts of waste disposal on various types of SWDS were determined		
W.6	5.A Solid waste disposal on land – CH_4	The ERT noted that the NIR does not present a transparent description of how the amount of CH_4 flared and the amount of CH_4 used for energy recovery were determined. The 2006 IPCC Guidelines provide a default value for CH_4 recovery (zero). CH_4 recovery should be reported only when references documenting the amount of CH_4 recovery are available. Reporting based on metering of all gas recovered for energy and flaring, or reporting of gas recovery based on the monitoring of produced amount of electricity from the gas is consistent with good practice	Yes	Transparency
		The ERT recommends that Ukraine include in the NIR the information on how the operators of MSW landfills determine the amount of CH_4 flared and the amount of CH_4 used for energy recovery		
W.7	5.A Solid waste	The NIR stated that CH_4 flaring started in 2008. However, the CRF tables indicate that CH_4 flaring started in 2003. The amounts of CH_4 flared are	Yes	Transparency

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*[a]	*Is the finding an issue? If yes, classify by type*	
	disposal on land – CH_4	reported for 2003 (0.29kt), 2004 (0.29 kt) and 2006 (0.01 kt) During the review, Ukraine indicated that degassing systems were put into operation at the largest MSW landfills as of 2008. The minor amount of CH_4 flared in 2003, 2004 and 2006 was due to testing systems, as well as commissioning/pre-operational works that are a necessary preliminary stage for the commercial implementation of new technologies The ERT recommends that Ukraine include in the NIR the information on the source of the CH_4 flaring AD for the full time series as reported in CRF table 5.A		
W.8	5.A Solid waste disposal on land – CH_4	The NIR reports the annual amount of waste at SWDS for the entire time series. However, for the period 2005–2013, the data in the NIR for the total amount of waste (11,408.25 kt in 2005 and 12,762.58 kt in 2013) do not match the sum of the components of the waste shown in table P3.4.1 of the NIR (i.e. unmanaged shallow (4,120.77 kt in 2005 and 4,455.57 kt in 2013), unmanaged deep (4,970.73 kt in 2005 and 5,401.49 kt in 2013) and managed SWDS (2,835.02 kt in 2005 and 3,247.37 kt in 2013). Furthermore, the amount of waste from unmanaged shallow, unmanaged deep and managed SWDS for the period 2005–2013 does not match the corresponding data in CRF table 5.A. The total annual amounts of waste for 2007 and 2008 are also different between the NIR (10,377.12 kt and 11,249.32 kt, respectively) and the CRF table (10,367.49 kt and 11,259.78 kt, respectively) During the review, the Party confirmed that a technical error had occurred in finalizing the NIR and that the data in the CRF tables are correct The ERT recommends that the Party ensure that the QA/QC plan includes the procedure for cross-checking that data for the amount of waste at SWDS in the NIR and the CRF tables are the same, in order to minimize or avoid inconsistencies between the NIR and the CRF tables	Yes	Transparency
W.9	5.A Solid waste disposal on land – CH_4	The ERT found inconsistencies between the population data reported in the NIR, the population data used in the waste calculation model (provided to the ERT during the review) and the population data reported by the State Statistics Service of Ukraine. During the review, Ukraine responded to the discrepancies, acknowledging that the population data are derived from different sources and differences may be seen because of the timing of the availability of population data and errors due to approximations. Ukraine also indicated that it is planning to perform a comparison analysis of the population data and present this in the next submission	Yes	Accuracy

ID#	Finding classification	Description of the finding with recommendation or encouragement[a]	Is the finding an issue? If yes, classify by type	
		The ERT recommends that Ukraine examine the accuracy of the population data used for reporting emissions from solid waste disposal on land to ensure that the population data best reflect the population of Ukraine in the respective inventory years and present the results of this analysis in the NIR		
W.10	5.B Biological treatment of solid waste – CO_2, CH_4 and N_2O	The inventory reports significant inter-annual changes in CO_2 equivalent (CO_2 eq) emissions from composting between 2011 (4.60 kt CO_2 eq) and 2012 (0.78 kt CO_2 eq) (–83.0 per cent) and 2012 and 2013 (6.36 kt CO_2 eq) (+713.6 per cent). Overall, between 1990 (15.24 kt CO_2 eq) and 2013 (6.36 kt CO_2 eq) emissions from composting declined by 58.2 per cent. According to the NIR (section 7.3.2.2), data from the statistics are not reliable during this period	Yes	Consistency
		During the review, the Party indicated that new plant-level reporting began for this category in 2010; however, the data do not allow the Party to explain the underlying trends. The Party further explained that in future years the statistical data will be broadened, which will allow the Party to analyse in more detail the above-mentioned fluctuations		
		The ERT recommends that the Party further investigate the AD for this category and, if the data quality is not sufficient, apply interpolation for 2012, using data for 2011 and 2013		
W.11	5.C Incineration and open burning of waste – CO_2, CH_4 and N_2O	The ERT identified significant inter-annual changes in CO_2 eq emissions from waste incineration between 2010 (13.75 kt CO_2 eq) and 2011 (21.05 kt CO_2 eq) (+53.2 per cent), 2011 and 2012 (10.15 kt CO_2 eq) (–51.8 per cent) and 2012 and 2013 (3.97 kt CO_2 eq) (–60.9 per cent). According to the NIR (section 7.4.2.2), data from the statistics are not reliable during this period	Yes	Consistency
		During the review, the Party indicated that new plant-level reporting began for this category in 2010; however, the data do not allow the Party to explain the underlying trends. The Party further explained that in future years the statistical data will be broadened, which will allow the Party to analyse in more detail the above-mentioned fluctuations		
		The ERT recommends that the Party further investigate the AD for this category and use the results of this analysis to support the observed trends, or, if appropriate, revise the AD		
W.12	5.D Wastewater treatment and discharge – CH_4	The ERT noted that the NIR refers to use of the IPCC good practice guidance for estimating CH_4 emissions from wastewater treatment and discharge	No	
		During the review, Ukraine confirmed that for both domestic and industrial wastewater, the methodology from the 2006 IPCC Guidelines was actually		

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*[a]	*Is the finding an issue? If yes, classify by type*	
		applied		
		The ERT encourages Ukraine to update the references in the NIR to the 2006 IPCC Guidelines, consistent with the method implemented in the calculations		
W.13	5.E Other (waste) – CH_4 and N_2O	Ukraine reported emissions from waste composting in two different categories for the period 2006–2011: biological treatment of solid waste and other (waste)	Yes	Accuracy
		During the review, Ukraine explained that these emissions are reported in the category biological treatment of solid waste and, owing to a technical error, emissions have also been reported in the category other (waste). The ERT considers that this presents an issue of double counting		
		The ERT recommends that Ukraine report emissions from waste composting under the category biological treatment of solid waste, which is in line with the UNFCCC Annex I inventory reporting guidelines to avoid double counting of these emissions		

Abbreviations: 2006 IPCC Guidelines = *2006 IPCC Guidelines for National Greenhouse Gas Inventories*, AD = activity data, B_0 = maximum methane-producing potential, BCEF = biomass conversion and expansion factor, BEF = biomass expansion factor, C = confidential, CKD = cement kiln dust, CRF = common reporting format, CSCF = carbon stock change factor, DE = digestible energy, DOM = dead organic matter, EF = emission factor, ERT = expert review team, F_{AM} = annual amount of animal manure applied to soils, F_{COMP} = annual amount of compost N applied to soils, F_{CR} = fraction of crop residues, F_{ON} = N input with organic fertilizers, $Frac_{GAS}$ = fraction of N loss from volatilization of NH_3 and NO_X, $Frac_{REMOVE}$ = fraction of removed residues, F_{SOM} = N mineralized in mineral soils as a result of losses of soil carbon, GE = gross energy, GHG = greenhouse gas, GMI = Global Methane Initiative, HWP = harvested wood products, IE = included elsewhere, IEA = International Energy Agency , IEF = implied emission factor, IPCC = Intergovernmental Panel on Climate Change, IPCC good practice guidance = *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*, IPPU = industrial processes and product use, JI = joint implementation, LPG = liquefied petroleum gas, LULUCF = land use, land-use change and forestry, MMS = manure management systems, MSW = municipal solid waste, N = nitrogen, NA = not applicable, NE = not estimated, Nex = nitrogen excretion, NEU = non-energy use, NIR = national inventory report, NO = not occurring, QA/QC = quality assurance/quality control, SOC = soil organic carbon, SOM = soil organic matter, SWDS = solid waste disposal sites, UNFCCC Annex I inventory reporting guidelines = "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual greenhouse gas inventories", Wetlands Supplement = *2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands*, Ym = methane conversion factor.

[a] Recommendations are related to issues as defined in decision 13/CP.20, annex, paragraph 81, identified by the ERT during the review. Encouragements are made to the Party to address all findings not related to issues.

[b] "Calculations of Power Plants Performance for Reports on Heat Efficiency of Equipment Methodological Guidelines". GKD 34.09.103-96. Kyiv: 1996. For more details, please see <http://www.ipcc-nggip.iges.or.jp/tsu/intern_report/TSU_InternshipReportOlga.pdf>, page 22.

[c] The information found by the ERT is available at <https://www.quandl.com/data/JODI/OIL_GSIMKD_UKR-Oil-Flows-Motor-And-Aviation-Gasoline-Imports-Ukraine>.

[d] Global Methane Initiative. 2014. International Coal Mine Methane Projects Database, "Ukraine, Summary of Coal Industry – Coal Mine Methane (CMM)" chapter 34. Available at <http://www3.epa.gov/cmop/docs/cmm_country_profiles/Toolsres_coal_overview_ch34.pdf>.

[e] "Development of methodology for calculating and determining carbon emissions when using limestone and dolomite" developed by the Ukrainian State Scientific–Technical Centre (UkrSSTC), "Energostal".

[f] Ukrainian Scientific Research Institute of Transport Medicine. 2013. *Report on the Scientific Research Study "Development of the Methods for Calculation and Estimation of Greenhouse Gases in Certain Categories of Chemical Industry with Definition of the Time Series"*.

[g] Energostal. 2012. *Assessment of the Current Status of the Methodologies with Definition of the Emission Factors for the Ferroalloys Production*. UkrNTC.

[h] Martinez A, Johnson DE, Bogdanov GA and Rust J. 1995. *Reducing Methane Emissions from Ruminant Livestock: Ukraine Pre-Feasibility Study*. Final report to the United States Environmental Protection Agency. Winrock International: Morrilton, Arkansas.

[i] See <http://www.eea.europa.eu/data-and-maps/data#c17=&c11=&c5=all&c0=5&b_start=0&c12=global+land+cover>, where areas of major crops of Ukraine are continuously monitored and mapped. See also information hosted at the Food and Agriculture Organization of the United Nations: <http://www.geoglam-crop-monitor.org/pages/about.php?target=maps-charts>.

Annex I

Overview of greenhouse gas emissions and removals for Ukraine for submission year 2015

Table 6 shows total greenhouse gas (GHG) emissions, including and excluding land use, land-use change and forestry and, for Parties that have decided to report indirect carbon dioxide (CO_2) emissions, with and without indirect CO_2. Tables 7 and 8 show GHG emissions reported under the Convention by Ukraine by gas and by sector, respectively.

Table 6
Total greenhouse gas emissions for Ukraine, base year[a] to 2013
(kt CO_2 eq)

	Without indirect CO_2		*With indirect CO_2[b]*	
	Total with LULUCF	*Total without LULUCF*	*Total with LULUCF*	*Total without LULUCF*
Base year (1990)	850 834.11	912 660.10	850 834.11	912 660.10
1990	850 834.11	912 660.10	850 834.11	912 660.10
1995	480 156.57	532 919.22	480 156.57	532 919.22
2000	348 824.46	403 636.27	348 824.46	403 636.27
2010	342 450.49	385 764.30	342 450.49	385 764.30
2011	395 563.48	406 923.37	395 563.48	406 923.37
2012	365 994.90	398 309.58	365 994.90	398 309.58
2013	347 289.58	385 933.20	347 289.58	385 933.20

Note: If emissions from the sector "other" are reported, they are excluded from total greenhouse gas emissions.
Abbreviation: LULUCF = land use, land-use change and forestry.
[a] "Base year" refers to the base year for the Party under the Convention specified in decision 24/CP.19, annex, paragraph 8.
[b] Ukraine chose not to report indirect CO_2 emissions.

Table 7
Greenhouse gas emissions by gas, base year[a] to 2013
(kt CO_2 eq)

	CO_2	*CH_4*	*N_2O*	*HFCs*	*PFCs*	*SF_6*	*NF_3*
Base year (1990)	691 343.87	179 404.65	41 675.75	NA, NO	235.82	0.01	NA
1990	691 343.87	179 404.65	41 675.75	NA, NO	235.82	0.01	NA
1995	375 425.86	130 724.73	26 590.50	NA, NO	178.06	0.07	NA
2000	275 008.04	109 633.91	18 858.16	20.01	115.74	0.42	NA
2010	286 294.41	77 548.32	21 146.21	738.98	26.67	9.71	NA
2011	300 616.28	81 818.86	23 669.76	810.07	NA, NO	8.41	NA
2012	297 861.77	76 545.64	23 063.61	827.57	NA, NO	10.99	NA
2013	288 391.67	71 719.07	24 942.80	867.12	NA, NO	12.54	NA
Per cent change base year–2013	–58.3%	–60.0%	–40.2%	NA	NA	164 253.4%	NA

Note: CO_2, CH_4 and N_2O emissions do not include emissions and removals from the land use, land-use change and forestry sector. Ukraine did not report indirect CO_2 emissions in CRF table 6.
Abbreviations: NA = not applicable, NO = not occurring.

[a] "Base year" refers to the base year for the Party under the Convention specified in decision 24/CP.19, annex, paragraph 8.

Table 8
Greenhouse gas emissions by sector, base year[a] to 2013
(kt CO_2 eq)

	Energy	*IPPU*	*Agriculture*	*LULUCF*	*Waste*	*Other*
Base year (1990)	698 301.24	118 011.00	84 759.74	–61 825.99	11 588.12	NA
1990	698 301.24	118 011.00	84 759.74	–61 825.99	11 588.12	NA
1995	409 324.36	57 153.18	55 310.97	–52 762.65	11 130.71	NA
2000	293 727.58	66 320.96	32 585.48	–54 811.81	11 002.25	NA
2010	271 601.24	73 865.84	28 421.65	–43 313.81	11 875.58	NA
2011	286 770.74	78 502.93	29 669.25	–11 359.90	11 980.46	NA
2012	281 681.95	75 214.43	29 410.90	–32 314.68	12 002.30	NA
2013	270 194.80	71 695.37	31 869.75	–38 643.62	12 173.29	NA
Per cent change base year–2013	–61.3%	–39.2%	–62.4%	–37.5%	5.0%	NA

Note: Ukraine does not report indirect CO_2 emissions in CRF table 6.

Abbreviations: IPPU= industrial processes and product use, LULUCF = land use, land-use change and forestry, NA = not applicable.

[a] "Base year" refers to the base year for the Party under the Convention specified in decision 24/CP.19, annex, paragraph 8.

Annex II

Additional information to support findings in table 2

A. Missing categories that affect completeness

The following categories were reported as "NE" (not estimated) or the expert review team (ERT) otherwise determined that there is an issue with the completeness of reporting in the Party's inventory:

- Carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O) emissions from aviation gasoline in domestic aviation (E.27);
- CH_4 and N_2O emissions from biomass used for other transportation (E.31);
- CH_4 emissions from surface mines (E.33);
- CO_2 emissions from other process use of carbonates – ceramics production (I.19);
- Hydrofluorocarbons (HFCs) from transport refrigeration (I.42);
- HFC-134a emissions from disposal of stationary air-conditioning equipment (I.43);
- Direct and indirect N_2O emissions from manure management – composting manure management systems (A.10);
- N_2O emissions from agricultural soils – nitrogen mineralized in mineral soils as a result of losses of soil carbon (A.18);
- Below-ground biomass carbon stock losses associated with harvesting on forest land (L.26);
- CO_2 and N_2O emissions from soil organic matter (SOM) of drained organic soils in land converted to wetlands (L.33);
- CO_2 and N_2O emissions from SOM of mineral soils in land converted to settlements and other land (L.34);
- Indirect N_2O emissions from managed soils (L.41).

B. Recommendation for an in-country review: list of issues

The ERT does not recommend that an exceptional in-country review be carried out.

Annex III

Documents and information used during the review

A. Reference documents

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

Hiraishi T, Krug T, Tanabe K, Srivastava N, Baasansuren J, Fukuda M and Troxler TG (eds.). 2014. *2013 Revised Supplementary Methods and Good Practice Guidance Arising from the Kyoto Protocol*. Switzerland: Intergovernmental Panel on Climate Change.

"Guidelines for the preparation of national communications by Parties included in Annex I to the Convention Part I: UNFCCC reporting guidelines on annual greenhouse gas inventories". Annex to decision 24/CP.19. Available at <http://unfccc.int/resource/docs/2013/cop19/eng/10a03.pdf#page=4>.

"Guidelines for the technical review of information reported under the Convention related to greenhouse gas inventories, biennial reports and national communications by Parties included in Annex I to the Convention". Annex to decision 13/CP.20. Available at <http://unfccc.int/resource/docs/2014/cop20/eng/10a03.pdf#page=6>.

Annual status report for Ukraine for 2015. Available at <http://unfccc.int/resource/docs/2015/asr/ukr.pdf>.

FCCC/ARR/2014/UKR. Report on the individual review of the annual submission of Ukraine submitted in 2014. Available at <http://unfccc.int/resource/docs/2015/arr/ukr.pdf>.

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

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

FCCC/ARR/2012/UKR. Report of the individual review of the annual submission of Ukraine submitted in 2011. <http://unfccc.int/resource/docs/2012/arr/ukr.pdf>.

B. Additional information provided by the Party

Responses to questions during the review were received from Mr. Igor Onopchuk (National Centre of GHG Emission Inventory), including additional material on the methodology and assumptions used. The following documents[1] were also provided by Ukraine:

Energostal. 2012. Оцінка поточного стану методичного забезпечення з визначення коефіцієнтів викидів парникових газів при виробництві феросплавів (*Assessment of the current status of the methodologies with definition of the emission factors for the ferroalloys production*). UkrNTC

[1] Reproduced as received from the Party.

Examples of the landfill operators' answers to the Ministry of Ecology and Natural Resources of Ukraine requests on landfill methane utilization (flaring and/or recovery) in the country.

Methodological Guidelines. Calculations of Power Plants Performance for Reports on Heat Efficiency of Equipment, GKD 34.09.103-96. - Kyiv.: 1996" (for more details, please see http://www.ipcc-nggip.iges.or.jp/tsu/intern_report/TSU_InternshipReportOlga.pdf, see page 22)

National Academy of Sciences of Ukraine. 2012. ДОСЛІДЖЕННЯ ГАЗОУТВОРЕННЯ НА НАЙБІЛЬШ ВЕЛИКИХ ПОЛІГОНАХ ТПВ ТА ПЕРЕХІД НА ТРЬОХКОМПОНЕНТНУ НАЦІОНАЛЬНУ МОДЕЛЬ РОЗРАХУНКУ ВИКИДІВ ПГ ВІД ЗВАЛИЩ ТПВ В УКРАЇНІ (*Research on the formation of gas from the largest solid waste disposal sites and transition to ternary national model for determining the greenhouse gas emissions from landfills in Ukraine*)

Shmarin, S. A. Ivan, R. Filozof, R. Natalia and D. Gintaras. 2014. СОДЕРЖАНИЕ БИОРАЗЛАГАЕМЫХ КОМПОНЕНТОВ В СОСТАВЕ ТВЕРДЫХ БЫТОВЫХ ОТХОДОВ В УКРАИНЕ (*The content of biodegradable components in municipal solid waste in Ukraine*). Ecology and Industry. N1 (p. 73 – 77).

Statistical Yearbook, 2014. 2013. *Balance and consumption of major food products from population of Ukraine*

Ukranian Scientific – Research Institute of Transpor Medicine, 2013 . Розробка методики розрахунку та визначення викидів парникових в окремих категоріях хімічної промислвості із побудовою визначеного часового ряду (*Report on the scientific - research study "Development of the methods for calculation and estimation of greenhouse gases in certain categories of chemical industry with definition of the time series*).

Ukraine's aviation profile (Oil Flows- Motor nad Aviation Gasoline Imports-Ukraine)- <https://www.quandl.com/data/JODI/OIL_GSIMKD_UKR-Oil-Flows-Motor-And-Aviation-Gasoline-Imports-Ukraine>.

Annex IV

Acronyms and abbreviations

AD	activity data
B_0	maximum methane-producing potential
BCEF	biomass conversion and expansion factor
BEF	biomass expansion factor
C	carbon
C	confidential
CaO	calcium oxide
CH_4	methane
CKD	cement kiln dust
CO_2	carbon dioxide
CO_2 eq	carbon dioxide equivalent
CRF	common reporting format
CSC	carbon stock change
CSCF	carbon stock change factor
DE	digestible energy
d.m.	dry matter
DOM	dead organic matter
EF	emission factor
ERT	expert review team
F_{AM}	annual amount of animal manure applied to soils
F_{COMP}	annual amount of compost N applied to soils
F_{CR}	fraction of crop residues
F_{ON}	N input with organic fertilizers
F_{SOM}	N mineralized in mineral soils as a result of losses of soil carbon
$Frac_{GAS}$	fraction of N loss from volatilization of NH_3 and NO_X
$Frac_{REMOVE}$	fraction of removed residues
GE	gross energy
GHG	greenhouse gas; unless indicated otherwise, total GHG emissions are the sum of CO_2 (including indirect CO_2 emissions if reported by the Party), CH_4, N_2O, HFCs, PFCs and SF_6 without GHG emissions and removals from LULUCF
ha	hectare
HFCs	hydrofluorocarbons
HWP	harvested wood products
IE	included elsewhere
IEA	International Energy Agency
IEF	implied emission factor
IPCC	Intergovernmental Panel on Climate Change
IPPU	industrial processes and product use
JI	joint implementation
k	decay rate
kg	kilogram (1 kg = 1,000 grams)
kt	kilotonne (1 kt = 1 gigagram (Gg))
LPG	liquefied petroleum gas
LULUCF	land use, land-use change and forestry
m^3	cubic metre
MCF	methane conversion factor
Mg	megagrams
MgO	magnesium oxide

MJ	megajoule
MMS	manure management system
MSW	municipal solid waste
Mt	million tonnes
N	nitrogen
N_2O	nitrous oxide
NA	not applicable
NE	not estimated
NEU	non-energy use
Nex	nitrogen excretion
NF_3	nitrogen trifluoride
NH_3	ammonia
NIR	national inventory report
NO	not occurring
NO_x	nitrogen oxide
PFCs	perfluorocarbons
PJ	petajoule (1 PJ = 10^{15} joule)
QA/QC	quality assurance/quality control
SOC	soil organic carbon
SOM	soil organic matter
SF_6	sulphur hexafluoride
SWDS	solid waste disposal sites
t	tonne
TJ	terajoule (1 TJ = 10^{12} joule)
UNFCCC	United Nations Framework Convention on Climate Change
VS	volatile solids
Ym	methane conversion factor