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**Report for the Stage 3 in-depth review of emission
inventories submitted under the UNECE LRTAP
Convention and EU National Emissions Ceilings
Directive for:**

Ukraine

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INTRODUCTION

1. The mandate and the overall objectives for the emission inventory review process under the LRTAP Convention are given by the UNECE document '*Methods and Procedures for the Technical Review of Air Pollutant Emission Inventories reported under the Convention and its Protocols*'⁽¹⁾ – hereafter referred to as the 'Methods and Procedures' document.
2. This annual review has concentrated on SO₂, NO_x, NMVOC, NH₃, plus PM₁₀ & PM_{2.5} for the time series years 1990 – 2009, reflecting current priorities from the EMEP Steering Body and the Task Force on Emission Inventories and Projections (TFEIP). HMs and POPs have been reviewed to the extent possible.
3. This report covers the stage 3 centralised reviews of the UNECE LRTAP Convention and EU NEC Directive inventories of the Ukraine coordinated by the EMEP emission centre CEIP acting as review secretariat. The review took place from 27th June to 1st July 2011 in Copenhagen, Denmark, and was hosted by the European Environment Agency (EEA). The following team of nominated experts from the roster of experts performed the review: Generalist – Anne Wagner (UK), Energy – Sophie Hoehn (CH) and Giorgos Mellios (GR), Industry – Sebastian Plickert (DE), Solvents – Ioannis Sempos (GR), Agriculture + Nature – Romain Joya (FR), Waste – Intars Cakarlas (LIT).
4. Kevin Hausmann (DE) was the lead reviewer. The review was coordinated by Katarina Marečková, (EMEP Centre on Emission Inventories and Projections - CEIP).

¹ Methods and Procedures for the Technical Review of Air Pollutant Emission Inventories reported under the Convention and its Protocols. Note by the Task Force on Emission Inventories and Projections. ECE/EB.AIR/GE.1/2007/16 <http://www.unece.org/env/documents/2007/eb/ge1/ece.eb.air.ge.1.2007.16.e.pdf>

PART A: KEY REVIEW FINDINGS

5. The Ukraine did not provide any answers to the ERT during the 2011 centralised stage 3 review. The Party did, however, submit additional information to the ERT. These documents could only be used to a very limited extent since they are in Ukrainian.

6. Based on the additional information provided by the Party, the ERT was partly able to review the Ukrainian inventory within the time period.

INVENTORY SUBMISSION

7. The inventory is partly in line with the EMEP/EEA Inventory Guidebook and UNECE Reporting Guidelines. In their 2011 submission, the Ukraine provides a national inventory for the year 2009 in NFR08 categories for all main pollutants. No emissions of POPs are reported. No IIR is provided in 2011 either.

8. The Ukraine does not report projected emissions and associated socio-economic data, neither for the 'With Measures' nor the 'With Additional Measures' scenarios.

9. Further recommendations for improvements identified during this review are presented in part B of this report.

KEY CATEGORIES

10. No IIR has been provided, and therefore it is not possible to comment on Key Category Analysis (KCA). The ERT strongly encourages the Ukraine to include a key category analysis in their IIR as part of their 2012 submission and to use the findings of this report to prioritise areas of improvement.

11. The ERT encourages the Ukraine to present key sources as trends as well as percentage contributions to total emissions in their 2012 IIR. To clarify this issue, the ERT recommends that Ukraine includes trends for key sources over the whole time period and includes all sources contributing an accumulated 80% of the total emissions, in line with UNECE Guidelines.

QUALITY

Transparency

12. The ERT cannot comment on the transparency of the methodology as no IIR has been provided for the stage 3 review.

13. No further explanation is provided on the notation keys used. The ERT encourages the Ukraine to provide information in the 'Additional Info' tab in the official reporting template and to provide NFR codes for sectors where 'NE' and 'IE' are used.

Completeness

14. The Ukraine does not report emissions for 1980 to 2008 and does not report activity data for any of these years. The ERT encourages the Party to provide this information in their 2012 submission.
15. The Ukraine does not report emissions of POPs. The ERT encourages the Party to provide emissions of POPs in their 2012 submission.
16. The ERT notes that the Ukraine does not report emission estimates for projections for the 'With measures' and the 'With additional measures' scenarios. The ERT encourages Ukraine to report projected emissions for both scenarios together with the associated social economic data for 2010 and 2020 until 2050 if possible.
17. The Ukraine reports emissions of TSP but does not report emissions of PM10 or PM2.5. Scaling or conversion factors for PM10 and PM2.5 can be found on the US EPA website. The ERT encourages Ukraine to report emissions for PM10 and PM2.5 in the future.
18. The Ukraine reports emissions of NO_x, SO_x from 1 A 3 a I (I) International Aviation (LTO) but reports 'NO' (Not Occurring) for TSP emissions. PM10, which is part of TSP, is emitted from this source. The ERT encourages the Ukraine to report emissions for this source and pollutant using the emission factors available in the EMEP/EEA Guidebook.
19. The Ukraine does not report emissions for '1 A 4 b ii Residential: Household and gardening (mobile)' for NO_x, NMVOC, SO_x and TSP. The ERT encourages Ukraine to report emissions for these sources using the emission factors available in the EMEP/EEA Guidebook.
20. The Ukraine does not report QA/QC or improvement procedures. To improve the completeness of the submitted inventory, the ERT encourages Ukraine to provide detailed information in the 2012 IIR.
21. The ERT further encourages the Ukraine to add more information as to why some sources are currently not reported (e.g. lack of activity data, source does not exist in Ukraine) and whether there are plans to report them in the future.

Consistency, including recalculations and time series

22. Ukraine does not submit an IIR. Thus, there is no information regarding recalculations for the latest CLRTAP submission. The ERT encourages the Ukraine to provide detailed and complete information on recalculations in the next IIR submission for each source, pollutant and year for which recalculations have been performed.

Comparability

23. The Ukraine uses an older NFR reporting format. The ERT encourages the Ukraine to use the NFR09 reporting format for future submissions.

CLRTAP/NECD comparability

24. The Ukraine does not report emissions under the National Emission Ceilings (NEC) Directive.

Accuracy and uncertainties

25. In the absence of an IIR, it is not known whether the Ukraine performs an uncertainty analysis. The ERT encourages the Ukraine to provide quantitative uncertainty estimates of the emission values, especially for key sources, in their next submission.

26. The ERT further encourages the Ukraine to provide information on activity data, emission factors and the methodologies which were used to enable the ERT to verify the emissions provided.

Verification and quality assurance/quality control approaches

27. Ukraine did not present any information on their QA/QC procedures. The ERT is therefore not able to make any comments, other than strongly recommending that QA/QC procedures are undertaken in accordance with the EMEP/EEA Guidebook in the future, and that such information is included in an IIR.

FOLLOW-UP TO PREVIOUS REVIEWS

28. So far, the Ukraine has not provided any responses to the questions identified in the Stage 2 Review. The ERT encourages the Ukraine to respond to the Stage 2 Review findings and consider improving/explaining these findings in the next submission.

AREAS FOR IMPROVEMENT IDENTIFIED BY UKRAINE

29. The Ukraine does not list any improvements as part of the 2011 submission. No IIR was provided with the 2011 submission, so the ERT does not have any information on planned improvements. The ERT strongly recommends that planned improvements are included in the IIR as part of the 2012 submission.

PART B: RECOMMENDATIONS FOR IMPROVEMENTS TO THE PARTY

CROSS-CUTTING IMPROVEMENTS IDENTIFIED BY THE ERT

30. The ERT identifies the following cross-cutting issues for improvement:
31. The ERT strongly recommends that the Ukraine improves the transparency of its inventory and provides an IIR which complies with the information provided in the EMEP/EEA Guidebook and the UNECE Reporting Guidelines. Without proper documentation it is not possible to undertake the Stage 3 review according to a satisfactory standard.
32. The ERT recommends that the Ukraine provides the complete time series in line with the CLRTAP deadline.
33. The ERT recommends that the Ukraine provides a complete IIR with detailed information on assumptions, activity data time series, data sources, emission drivers and tiers of methods used, as well as on QA/QC procedures and quantitative uncertainty estimates for each sector.
34. The ERT recommends that the Ukraine reports all pollutants under CLRTAP for all emission sources occurring in the country.
35. The ERT recommends that the Party submits projected emissions for the 'With measures' and the 'With additional measures' scenarios together with the associated social economic data for 2010 to 2050 where possible
36. The ERT encourages the Ukraine to provide complete and detailed information on recalculations in the 2012 IIR.
37. The ERT encourages the Ukraine to list all sources that contribute an accumulated 80% of the total emissions for each pollutant as key sources, to apply a Tier 2 or 3 methodology and to present the key sources as trends as well as the percentage contributions to total emissions.
38. The ERT encourages the Ukraine to provide information on the notation keys used, especially IE and NE, within the reporting template.
39. The ERT encourages the Ukraine to include an improvement plan in the IIR, and to highlight how identified improvements are prioritized. The improvement plan should also cover information on missing sources and whether there are any plans to include these in the inventory.

SECTOR SPECIFIC RECOMMENDATIONS FOR IMPROVEMENTS IDENTIFIED BY ERT

ENERGY

Review Scope

Pollutants Reviewed		NO _x , NMVOC, SO _x NH ₃ , PM ₁₀ & PM _{2.5} , TSP, CO, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn, PCDD/PCDF, PAHs, HCB, PCB		
Years		1990 – 2009		
NFR Code	CRF_NFR Name	Reviewed	Not Reviewed	Recommendation Provided
1.A.1.a	public electricity and heat production	x		x
1.A.1.b	petroleum refining	x		x
1.A.1.c	Manufacture of solid fuels and other energy industries	x		x
1.A.2.a	iron and steel	x		x
1.A.2.b	non-ferrous metals	x		x
1.A.2.c	chemicals	x		x
1.A.2.d	pulp, paper and print	x		x
1.A.2.e	food processing, beverages and tobacco	x		x
1.A.2.f.i	Stationary Combustion in Manufacturing Industries and Construction: Other (Please specify in your IIR)	x		x
1.A.2.f.ii	Mobile Combustion in Manufacturing Industries and Construction: (Please specify in your IIR)			
1 A 3 e	Pipeline compressors?			
1.A.4.a.i	commercial / institutional: stationary	x		x
1.A.4.a.ii	commercial / institutional: mobile ?			
1.A.4.b.i	residential plants	x		x
1.A.4.b.ii	household and gardening (mobile)			
1.A.4.c.i	Agriculture/forestry/fishing. stationary	x		x
1.A.4.c.ii	off-road vehicles and other machinery?			
1.A.4.c.iii	national fishing?			
1.A.5.a	other, stationary (including military)	x		x
1.A.5.b	other, mobile (including military, land based and recreational boats)?			
1.B.1.a	coal mining and handling	x		x
1.B.1.b	solid fuel transformation	x		x
1.B.1.c	other fugitive emissions from solid fuels)	x		x
1 B 2 a i	Exploration, production, transport	x		x
1 B 2 a iv	Refining / storage	x		x
1 B 2 a v	Distribution of oil products	x		x
1 B 2 b	Natural gas	x		x
1 B 2 c	Venting and flaring	x		x
1 B 3	Other fugitive emissions from geothermal energy production, peat and other energy extraction not included in 1 B 2	x		x

Note: Where a sector has been partially reviewed (e.g. some of the NFR codes) please indicate which codes have been reviewed and which have not in the respective columns.

General recommendations on cross-cutting issues.

Transparency:

40. The NFR tables from the Ukraine provide emissions for the energy sector. But due to missing information in the IIR, it is not possible for the ERT to know which methodology was used to calculate the emissions of each sub-sector. In addition, no trend discussion and thus no information on the evolution of emissions within Ukraine are accessible to the ERT. The ERT asks the Party to provide such information in a future IIR.

41. Moreover, the ERT notes some missing or not adapted notation keys (see issue 1). The ERT recommends that the Ukraine checks the notation keys for the next submission.

Completeness:

42. The Ukraine reported most of the pollutants for the energy sector, for 2009, which is very good. The ERT therefore encourages the Party to also report the pollutants before 2002. Because of the need for environmental assessment, it is a great benefit when the coverage of reported data is as complete as possible for all pollutants.

43. The ERT notes that the Ukraine has not reported POPs and dioxin emissions. The ERT encourages the Party to add these emissions to the next submissions.

Consistency including recalculation and time series:

44. The ERT notes some inconsistency in the time series with some jumps and outliers but also missing values (see issue 2). Therefore, the ERT recommends that the Party checks the time series and improves the missing values.

45. Due to missing information in the IIR, the ERT has not been able to understand the changes in emissions between the 2010 and 2011 submissions and whether these recalculations have been justified and resulted in real improvements of the inventory. The ERT encourages the Party to include detailed information on recalculations which have been carried out (absolute and relative changes) as well as the reasons for any recalculations in future IIRs.

Comparability:

46. The Ukraine uses an older NFR reporting format. The ERT encourages the Ukraine to use the NFR09 reporting format for future submissions.

47. The Ukraine does not report under the National Emission Ceilings (NEC) Directive.

Accuracy and uncertainties:

48. Due to missing information in the IIR, there is no explanation on whether the Ukraine carries out an uncertainty analysis or QA/QC procedures. The ERT encourages Ukraine to undertake uncertainty analysis for the energy sector in order to improve the report and to provide an indication of the reliability of the inventory data.

Improvement:

49. Due to missing information in the IIR, no information is available to the ERT about improvements already carried out or planned by the Ukraine for the energy sector. The ERT encourages the Ukraine to add a section "improvements" to the IIR to provide a continuous overview of the evolution of the IIR and of the data.

Sub-sector Specific Recommendations.

50. The ERT recommends that the Ukraine improves the IIR by adding information on data collection, data models, and by adding activity data and emission factors which are used in the IIR. The recommended way is using tables. Moreover, the ERT encourages the Party to also report activity data in the NFR tables.

51. The ERT encourages the Ukraine to report the entire time series (from 1980 until now) to improve reporting on important environmental data.

52. Finally, the ERT notes some inconsistency in the time series. The ERT recommends that the Ukraine checks the reported time series and improves them if necessary. The Party can find some useful information in Chapter 4, Part A, Time series consistency, in the EMEP/EEA Guidebook 2009.

Category issue 1: Notation keys

53. The ERT notes inconsistencies in the use of notation keys, particularly for PM_{2.5} and PM₁₀. NO should be replaced by NE because TSP are calculated and reported.

54. In general, NO should be used when a process (sub-sector activity) does not occur. If some emissions are reported for the process, the notation key for not-estimated pollutants should be NE or NA.

55. The ERT recommends that the Ukraine improves the notation keys for the next submission. Useful information can be found in the EMEP/EEA Guidebook.

Category issue 2: 1 A 1 a, 1 A 1 b, 1 A 1 c, 1 A 2 f i - TSP

56. The ERT has noticed that emissions of TSP for 2006 in the sub-categories which are mentioned are 1000 times higher than for the other years. Therefore, the ERT recommends that the Party verifies the unit used for the emissions. Moreover, quite a few substances are only reported for 2008 and 2009. The ERT recommends that the Party checks and completes the time series.

TRANSPORT

Review Scope

Pollutants Reviewed		SO ₂ , NO _x , NMVOC, NH ₃ , TSP, CO, HMs		
Years		1990 – 2009		
NFR Code	CRF_NFR Name	Reviewed	Not Reviewed	Recommendation Provided
1.A.3.a.i.(i)	international aviation (LTO)	x		
1.A.3.a.i.(ii)	international aviation (cruise)	x		
1.A.3.a.ii.(i)	civil aviation (domestic, LTO)	x		
1.A.3.a.ii.(ii)	civil aviation (domestic, cruise)	x		
1.A.3.b.i	road transport, passenger cars	x		x
1.A.3.b.ii	road transport, light duty vehicles	x		
1.A.3.b.iii	road transport, heavy duty vehicles	x		x
1.A.3.b.iv	road transport, mopeds & motorcycles	x		
1.A.3.b.v	road transport, gasoline evaporation	x		
1.A.3.b.vi	road transport, automobile tyre and brake wear		NE	x
1.A.3.b.vii	road transport, automobile road abrasion		NE	x
1.A.3.c	railways	x		
1.A.3.d.i (ii)	international inland navigation	x		
1.A.3.d.ii	national navigation	x		
1.A.4.b.ii	household and gardening (mobile)		NO	
1.A.4.c	agriculture / forestry / fishing	x		
1.A.4.c.ii	off-road vehicles and other machinery	x		
1.A.4.c.iii	national fishing	x		
1.A.5.b	other, mobile (including military, land based and recreational boats)	x		
1 A 3 d i (i)	International maritime navigation	x		
1 A 3	Transport (fuel used)		NE	

Note: Where a sector has been partially reviewed (e.g. some of the NFR codes) please indicate which codes have been reviewed and which have not in the respective columns.

General recommendations on cross-cutting issues.

Transparency:

57. The Ukraine has provided a detailed emissions inventory. Estimates are provided at the most detailed level for all sub-sectors. However, only limited information on the methodology and/or emission factors used for the estimation of the emissions has been provided in the IIR. It is understood that the Ukraine uses its own methods and emission factors for a number of sub-sectors and pollutants. The ERT thus recommends that the Ukraine includes more information on the methodology and the country-specific emission factors used for compiling the inventory.

58. The Ukraine uses the notation key “NO” in a number of areas in the reporting tables, e.g. for PM_{2.5}, PM₁₀ and some HM emissions. It is understood that these emissions have not been estimated and that, hence, the “NE” notation key should be used instead. The ERT encourages the Ukraine to use the appropriate notation keys (e.g. NO where emissions are “Not Occurring”, NE where emissions are “Not

Estimated” and IE where emissions are “Included Elsewhere”) for reporting where estimates are not available.

59. Since the Ukraine uses its own methods and/or emission factors, the ERT recommends that the Ukraine provides clear references to these and, if possible, comments on how these compare to the recommended methods, e.g. those from the EMEP/EEA Guidebook 2009.

Completeness:

60. The ERT considers the Transport sector to be complete for all pollutants except POPs. The ERT encourages the Ukraine to provide a description of plans for estimating POPs and activity data in the IIR.

61. The ERT has found the automobile tyre and brake wear category to be missing in the transport sector. The ERT believes that this source has little influence on the national total but encourages the Ukraine to provide the rationale for excluding this category and/or descriptions of plans for estimating these sources in the IIR.

Consistency including recalculation and time series:

62. No comparison to previous years is provided in the IIR. The ERT encourages the Ukraine to include complete time series and to provide a description of trends in the IIR.

63. The Ukraine has not recalculated emissions for any of the pollutants reported in the inventory.

Comparability:

64. The Ukraine has not provided any information on the methodology, activity data and/or emission factors used for the estimation of their emissions. Based on general information on the vehicle fleet population provided by UNECE, emissions from passenger cars seem to have been overestimated for all the main pollutants, PM and CO, whereas emissions from heavy duty vehicles seem to have been underestimated, particularly for NO_x. The ERT recommends that the Party checks the estimated emissions for all transport sub-sectors and in particular for passenger cars and heavy duty vehicles, and to provide supplementary information on its own methods and/or emission factors.

Accuracy and uncertainties:

65. The Ukraine has not provided any uncertainty estimates. The ERT encourages the Ukraine to undertake uncertainty analysis in order to help inform the improvement process and to provide an indication of the reliability of the inventory data.

66. The Ukraine has performed some QA/QC activities. However, these are not sufficiently described in the IIR. The ERT encourages the Ukraine to provide sector specific information on QA/QC procedures in future submissions.

Improvement:

67. No improvements for the transport sector are mentioned in the IIR.

Sub-Sector Specific Recommendations.

Category issue 1: 1.A.3.a Air Transport: CO

68. There are large differences (three orders of magnitude) in the CO emissions reported for the years 2008-2009 and 2002-2005. The ERT recommends checking the units and correcting where necessary or justifying these differences in the IIR.

Category issue 2: 1.A.3.b.i and 1.A.3.c Passenger cars and Railways: TSP

69. There are large differences (three orders of magnitude) in the TSP emissions reported for the year 2006 compared to the previous (2002-2005) and subsequent (2007-2009) years. The ERT recommends checking the units and correcting where necessary or justifying these differences in the IIR.

INDUSTRIAL PROCESSES

Review Scope

Pollutants Reviewed		All main pollutants, TSP and heavy metals		
Years		1990 – 2009		
NFR Code	CRF_NFR Name	Reviewed	Not Reviewed	Recommendation Provided
2.A.1	cement production	x		
2.A.2	lime production	x		
2.A.3	limestone and dolomite use	x		
2.A.4	soda ash production and use	x		
2.A.5	asphalt roofing	x		
2.A.6	road paving with asphalt	x		
2.A.7.a	Quarrying and mining of minerals other than coal	x		
2.A.7.b	Construction and demolition	x		
2.A.7.c	Storage, handling and transport of mineral products	x		
2.A.7.d	Other Mineral products (Please specify the sources included/excluded in the notes column to the right)	x		x
2.Bb.1	ammonia production	x		
2.B.2	nitric acid production	x		
2.B.3	adipic acid production			x
2.B.4	carbide production	x		
2.B.5.a	Other chemical industry (Please specify the sources included/excluded in the notes column to the right)	x		x
2.B.5.b	Storage, handling and transport of chemical products (Please specify the sources included/excluded in the notes column to the right)	x		x
2.C.1	iron and steel production	x		x
2.C.2	ferroalloys production	x		
2.C.3	aluminium production	x		
2.C.5.a	Copper Production	x		
2.C.5.b	Lead Production		x	
2.C.5.c	Nickel Production		x	
2.C.5.d	Zinc Production	x		
2.C.5.e	Other metal production (Please specify the sources included/excluded in the notes column to the right)	x		x
2.C.5.f	Storage, handling and transport of metal products (Please specify the sources included/excluded in the notes column to the right)		x	
2.D.1	pulp and paper	x		
2.D.2	food and drink	x		
2.D.3	Wood processing	x		x
2.E	production of POPs		x	
2.F	consumption of HM and POPs (e.g. electrical and scientific equipment)		x	x

2.G	Other production, consumption, storage, transportation or handling of bulk products (Please specify the sources included/excluded in the notes column to the right)	x		x
Note: Where a sector has been partially reviewed (e.g. some of the NFR codes) please indicate which codes have been reviewed and which have not in the respective columns.				

General recommendations on cross-cutting issues

Transparency:

70. The ERT assumes that the reason why the Ukraine reports neither activity data in the NFR tables nor detailed methodologies in the IIR is the practice of direct reporting by operators who are not obliged to report activity data or the methods they apply. Nevertheless, without activity data or detailed methodology descriptions, it is not possible to assess the reported emissions, e.g. by calculating implied emission factors which could then be compared with those from other parties or with the defaults. Furthermore, the consistency and the accuracy of the reported emissions cannot be evaluated.

71. The ERT encourages the Ukraine to establish a legal basis for the collection of activity data as well as methodical information from the operators. This activity data could be collected either together with the emission data or separately by the national statistics office. As the activity data from the individual companies would be aggregated on the national level, confidentiality should not be an issue for most sectors.

72. Neither in the NFR tables nor in the IIR is it specified which kind of sources - in the following source categories - are covered in the Ukraine's report:

- (a) 2 A 7 d Other Mineral products
- (b) 2 B 5 a Other chemical industry
- (c) 2 B 5 b Storage, handling and transport of chemical products
- (d) 2 C 5 e Other metal production
- (e) 2 D 3 Wood processing
- (f) 2 F Consumption of POPs and Heavy Metals
- (g) 2 G Other production, consumption, storage, transportation or handling of bulk products

73. This information is needed to improve transparency and to facilitate comparison with other inventories or with default emission factors. The ERT encourages the Ukraine to collect additional information on the kind of sources actually covered in its reports, so that this information can be included in future reports.

Completeness:

74. For some industrial source categories activity data is available in the CRF tables (UNFCCC reporting, submission 2011), but was not reported under CLRTAP, or vice versa. Additionally, although activity data for the source categories 2.B.3 was reported under UNFCCC, no emissions have been reported for this sector under CLRTAP. On the other hand, for source categories 2.A.5, 2.A.7.a-c, 2.B.4, 2.B.5.b, 2.C.2, 2.C.3, 2.C.5.a, 2.C.5.d, 2.C.5.e, 2.D.1, 2.D.2, 2.D.3, 2.F and 2.G emissions were reported under CLRTAP but no activity data was reported under UNFCCC (submission 2011).

75. The ERT encourages the Ukraine to check and improve the consistency of CLRTAP and UNFCCC reporting. Utilization of synergies between CLRTAP and UNFCCC reporting would also help to improve the completeness of the inventories with little additional workload. In particular, the ERT recommends checking regularly if emissions are reported - under both CLRTAP and UNFCCC - for every source category where activity data is available.

76. Generally, the Ukraine has not reported PM₁₀, PM_{2.5} and POP emissions. The ERT encourages the Ukraine to complete its inventory with regard to PM₁₀, PM_{2.5} and POP, in particular as some industrial sectors, e.g. 2.C.1 Iron and Steel production, are well known as major emitters of dioxin and particulate matter.

77. Additionally, the ERT noticed some gaps in the following time series:

- (a) PM₁₀ and PM_{2.5} emissions from 2.C.5.e and 2.G (emissions were only reported for 2004 and 2005, PM₁₀ also for 2002)
- (b) Pb, Cd and Hg emissions from 2.C.5.e and 2.G (individual data gaps in 2003, 2004 and 2008/2009)

78. The ERT encourages the Ukraine to complete the named time series. If no original data is available to fill the gaps, it is recommended that the missing values are interpolated according to the guidelines. If it was intended to report zero emissions in particular cases, e.g. because of the cessation of activities in the sector in question, or because the emissions were reported elsewhere, the ERT recommends that the appropriate notation keys are used (e.g. 'NO', 'IE') and a short explanation is provided in the IIR.

Consistency including recalculation and time series:

79. Emission trends are not described in the IIR. The ERT encourages the Ukraine to describe emission trends transparently in the IIR, in particular the reasons for dips and jumps.

80. The ERT has noticed outliers in the following time series:

- (a) NO_x and NMVOC emissions from 2.G
- (b) NH₃ emissions from 2.A.7.d
- (c) PM₁₀ and PM_{2.5} emissions from 2.C.5.e and 2.G

(d) TSP emissions from 2.A.7.d, 2.C.5.e and 2.G

(e) Pb, Cd and Hg emissions from 2.C.5.e and 2.G

81. The ERT encourages the Ukraine to correct the outliers or to provide an explanation, if appropriate. If the data provided by the operators is apparently inconsistent, the ERT encourages the Ukraine to intensify QA/QC of the incoming data. If the outliers cannot be traced back to a particular source, the ERT encourages the Ukraine to determine figures on its own, in order to make the time series consistent (these estimates should then be documented in the IIR).

Comparability:

82. Since little information is provided on the methods used for emission estimation, the ERT has not been able to assess and assure the comparability of the reported emissions. In order to improve comparability, the ERT recommends that the Ukraine either applies the methods from the Guidebook or describes its country-specific methods in detail in the IIR.

83. A special issue of comparability is how the emissions from industry are allocated to the source categories 2.x (Industrial Processes) and the corresponding source categories 1.A.x (Stationary Combustion in Manufacturing Industries), e.g. between NFR 2.C.1 and 1.A.2.a. The ERT assumes that this allocation is carried out by the operators when they report emissions from individual sources within their plant. The ERT notes that the Guidebook recommends different ways of allocating emissions from sector to sector. E.g. for emissions from the iron and steel industry the Guidebook only provides default emission factors for NO_x, SO₂ and CO in source category 1.A.2.a, whereas guidance on estimating other pollutants is provided in chapter 2.C.1 - hence emissions of those pollutants are also expected to be reported under 2.C.1. But in the Ukrainian NFR tables the reported emissions of As, Ni and Se from 1.A.2.a are higher than the emissions reported for 2.C.1, so apparently a major part of the emissions from the iron and steel are reported under 1.A.2.a. This is not in line with the Guidebook and thus hampers comparability. Additionally, as the allocation is presumably carried out individually by the operators, this may also be an issue of consistency and accuracy, as emissions may be allocated differently by the individual operators, and even some double counting of emissions (both in 2.x and 1.A.x) may occur.

84. The ERT encourages the Ukraine to allocate the emissions to source categories 1.A.x and 2.x according to the Guidebook. If the methods from the Guideline are not clear or not applicable for the Ukraine in particular cases, the ERT recommends that the Ukraine describes its country-specific method in detail in the IIR. No matter which methods are applied, it is crucial that these methods are used consistently by all operators as well as across the time series.

Accuracy and uncertainties:

85. Due to the lack of information (see transparency issues above), the ERT could not assess the accuracy of the reported emissions. The ERT encourages the Ukraine to collect more information (e.g. activity data) in order to facilitate quality checks and to undertake uncertainty analysis for the industrial emissions. This would

deliver important information for the improvement process and provide an indication of the reliability of the reported data.

Improvement:

86. No improvements are announced in the IIR.

Sub-sector Specific Recommendations.

Category issue 1: 2 B 3 Adipic Acid Production

87. The ERT notes the use of different notation keys ('NO' or 'NA') in source category 2 B 3 for the individual pollutants.

88. The ERT encourages the Ukraine to report emissions for this sector. According to the EMEP/EEA Emission Inventory Guidebook 2009, at least NO_x and CO emissions could be reported using the provided default factors. Alternatively, it would be recommended that the used notation keys are checked and corrected, if necessary.

SOLVENTS

Review Scope

Pollutants Reviewed		SO ₂ , NO _x , NMVOC, NH ₃ , PM ₁₀ & PM _{2.5} , Heavy Metals, CO, PAHs		
Years		1990 – 2009		
NFR Code	CRF_NFR Name	Reviewed	Not Reviewed	Recommendation Provided
3.A.1	Decorative coating application	x		x
3.A.2	Industrial coating application	x		x
3.A.3	Other coating application (Please specify the sources included/excluded in the notes column to the right)	x		x
3.B.1	Degreasing	x		x
3.B.2	Dry cleaning	x		x
3.C	Chemical products,	x		x
3.D.1	Printing	x		x
3.D.2	Domestic solvent use including fungicides	x		x
3.D.3	Other product use	x		x
Note: Where a sector has been partially reviewed (e.g. some of the NFR codes) please indicate which codes have been reviewed and which have not in the respective columns.				

General recommendations on cross-cutting issues

Transparency:

89. The ERT notes that the Ukraine reported no information in the IIR about the activity data and the methods / emission factors / assumptions used for the estimation of emissions from the solvents sector. The ERT strongly encourages the Ukraine to improve the transparency of its inventory by providing, in a comprehensive way and with a good level of detail, the above mentioned information in next year's IIR.

Completeness:

90. The ERT notes that although in most countries the solvents sector is a key source concerning NMVOC emissions, this is not the case for the Ukraine; according to the key source analysis for CLRTAP, no key source of NMVOC emissions belongs to the solvents sector. Moreover, the ratio of per capita NMVOC emissions in each of the 3A, 3B, 3C and 3D categories of the Ukraine is the lowest compared to its neighbouring countries. Especially for the 3A and 3D source categories, the reported NMVOC emissions are very low compared to the respective emissions of neighbouring countries, e.g. 15 and 32 times lower than Moldova's emissions. The above mentioned observations are indications of a possible underestimation of emissions in the solvents sector. The ERT also notes that very limited information is provided in the IIR about the estimation of emissions in the solvents sector. The ERT recommends that the Ukraine, in the next IIR submission, describes which categories (sub-sectors) are included in each solvents sector's source category and provides comprehensive (with good levels of detail) activity data and methodology

descriptions, in order to justify these low per capita emissions and to enable the ERT to assess the completeness of the inventory.

91. The ERT notes that NMVOC emissions are not reported for the years 1990-2001. The ERT encourages the Ukraine to estimate and report, in the next submission, the respective emissions. If the required data are not available, the Ukraine could apply simple drivers as population figures or the GDP to provide an estimation of the emissions for these years.

Consistency:

92. The ERT notes that the time series of the reported NMVOC emissions shows a sharp decrease during the more recent years of reporting compared to the previous ones. NMVOC emissions of the 3A and 3B source categories in 2008 and 2009 decreased by about 70% and 60%, respectively, compared to 2007. NMVOC emissions of the 3C source category in 2009 decreased by about 100% compared to 2008, reaching the same level of emissions as in the period 2002 - 2007. The ERT encourages Ukraine to justify these decreasing trends in the next IIR. The ERT also encourages Ukraine to investigate the activity data, EFs and assumptions used for the emissions estimations in order to improve time series consistency.

Comparability:

93. The ERT notes that neither the activity data nor the methods / emission factors / assumptions used for the estimations of emissions are described in the IIR. The ERT encourages the Ukraine to include comprehensive (with good levels of detail) activity data and methodology descriptions in next year's IIR.

Accuracy and uncertainties:

94. The ERT notes that no uncertainty analysis is performed by Ukraine for the solvents sector concerning CLRTAP emissions. The ERT encourages the Ukraine to undertake uncertainty such analysis for the solvent sector in order to prioritize improvement actions and provide an indication of the reliability of the inventory data.

95. The ERT notes that the Ukraine mentioned in the IIR that it performs some general QA/QC procedures. The ERT commends Ukraine for that. However, given the possible underestimation of emissions in the solvents sector (please refer to the completeness section above), the ERT encourages the Ukraine to design and implement sector specific OA/QC and verification procedures for NMVOC emissions in the solvents sector and to report accordingly in the next submission.

Improvement:

96. The ERT notes that no improvement plan for the solvents sector is mentioned in the IIR. The ERT encourages Ukraine to prepare an improvement plan for the solvents sector, focusing on the transparency, time series consistency and underestimation issues described above and include this plan in the next IIR.

Sub-sector Specific Recommendations.

Category issue 1: 3.C and 3.D.3 – PAHs

97. The ERT notes that the Ukraine does not report PAH emissions from the 3C and 3D3 source categories. However, these pollutants are emitted from asphalt blowing and the preservation of wood with creosote preservatives. In the EMEP/EEA Air Pollutant Emission Inventory Guidebook, there is a simple-to-apply Tier 2 method for estimating these emissions. The Ukraine is encouraged to estimate these emissions and report them in the next submission.

AGRICULTURE

Review Scope:

Pollutants Reviewed		NO _x , NMVOC, NH ₃ , TSP		
Years		All the years submitted by the country		
NFR Code	CRF_NFR Name	Reviewed	Not Reviewed	Recommendation Provided
4 B 1 a	Cattle dairy	x		x
4 B 1 b	Cattle non-dairy	x		x
4 B 2	Buffalo	x		x
4 B 3	Sheep	x		x
4 B 4	Goats	x		x
4 B 6	Horses	x		x
4 B 7	Mules and asses	x		x
4 B 8	Swine	x		x
4 B 9 a	Laying hens	x		x
4 B 9 b	Broilers	x		x
4 B 9 c	Turkeys	x		x
4 B 9 d	Other poultry	x		x
4 B 13	4 B 13 Other	x		x
4 D 1 a	Synthetic N-fertilizers	x		x
4 D 2 a	Farm-level agricultural operations including storage, handling and transport of agricultural products	x		x
4 D 2 a	Off-farm storage, handling and transport of bulk agricultural products	x		x
4 D 2 c	N excretion on pasture range and paddock unspecified (Please specify the sources included/excluded in the notes column to the right)	x		x
4 F	Field burning of agricultural wastes		x	
4 G	Agriculture other(c)		x	
11 A	(11 08 Volcanoes)		x	
11 B	Forest fires		x	

Note: Where a sector has been partially reviewed (e.g. some of the NFR codes) please indicate which codes have been reviewed and which have not in the respective columns.

General recommendations on cross-cutting issues

Transparency:

98. There is no description of the methodologies provided in the IIR. Moreover, there are no references and information on the data used is not given. Therefore, the IIR does not allow for a complete understanding of how the estimations are performed. There are also no references to the sources and activity data and to the emission factors provided in the report. The ERT recommends that the Ukraine provides a transparent description of the methodologies applied with their related levels (Tier 1, 2 or 3).

99. The activity data which have been used as a basis for the emission calculations are not provided in the NFR tables. The ERT has been unable to analyse the emission results with regard to activity data. The ERT recommends that

the Ukraine provides activity data, especially because it has already been reported in the UNFCCC report (NIR).

Completeness:

100. The agriculture inventory of Ukraine covers the most important sources of emissions with the exception of estimates for emissions of PM 2.5 and PM10 for all the NFR codes from the agriculture sector. The ERT reminds the Ukraine that EMEP/EAA Guidebooks offer simple methodologies for PM emissions from livestock husbandry and from agricultural soils cultivation. The ERT also encourages the Party to use appropriate notation keys (e.g. NO where the source does not exist and is consequently “Not Occurring”, NA where the source exists but where there are no emissions, NE where emissions are “Not Estimates” and IE where emissions are “Included Elsewhere”) for reporting where estimates are not available or necessary. In the case of the Ukraine's last report, the notation key “NO / Not Occurring” has been reported for many CRF codes (in particular for PM emissions), even if an activity has been reported. In that case, “NE / Not Estimated” or “NA / Not Applicable” should be used.

Consistency including recalculation and time series:

101. The time series for 4D1a changes a lot over the years, so that consistency between the years is low. The ERT encourages the Ukraine to identify the source of these dips and jumps in the time series and to harmonize the whole time series.

102. The ERT encourages the Party to provide a detailed description of the recalculations which have been done.

Comparability:

103. The IEFs (Implied Emission Factors) for NH₃ (estimated by the ERT by using the animal numbers from UNFCCC CRF reporting) seem very low for dairy cattle (three times lower than the EF provided in EMEP 2009) and rather high for beef cattle.

104. The IEFs for TSP emissions should also be justified. The ERT recommends that the Party compares its inventory parameters with EMEP 2009 and other countries in order to identify outliers and to check if the EFs used reflect the Ukrainian production systems.

Accuracy and uncertainties:

105. The ERT encourages the Ukraine to undertake an uncertainty analysis (quantitative where possible) for the agriculture sector, in order to steer the improvement process and to provide an indication on the reliability of the inventory data.

Improvement:

106. Even if no methodological improvements are described in the IIR, the ERT strongly encourages Ukraine to improve the transparency of reporting by providing a complete agriculture chapter in the IIR (including especially the activity data and the EFs for all the pollutants reported).

Sub-sector Specific Recommendations.

Category issue 1: 4.B Manure management: NH₃

107. The ERT encourages the Party to explain the sources and the origins of the EFs used for emissions from manure management, especially because several IEFs calculated by the ERT differ strongly from standards provided in the EMEP Guidebook or the EFs used by other UNECE parties.

Category issue 2: 4.D.1 Agricultural Soils: NH₃

108. The ERT encourages the Ukraine to provide detailed information on the breakdown of national fertilizer consumption (especially for urea application) into the relevant compounds in use, which are accounted for in emission estimates under 4D1 Direct Soil Emissions.

WASTE

Review Scope:

Pollutants Reviewed		All pollutants		
Years		1990-2009		
NFR Code	CRF_NFR Name	Reviewed	Not Reviewed	Recommendation Provided
6.A	solid waste disposal on land	x		x
6.B	waste-water handling	x		x
6 C a	6 C a Clinical waste incineration (d)	x		x
6 C b	Industrial waste incineration (d)	x		x
6 C c	Municipal waste incineration (d)	x		x
6 C d	Cremation	x		x
6 C e	Small-scale waste burning			
6.D	other waste (e)	x		x
Note: Where a sector has been partially reviewed (e.g. some of the NFR codes) please indicate which codes have been reviewed and which have not in the respective columns.				

General recommendations on cross-cutting issues

Transparency:

109. The Ukraine has not provided an IIR chapter on waste. In the Ukraine's NIR (from UNFCCC reporting) 2011 some information is provided. Emission calculations from the waste sector are not transparent because information on methodology is missing. Emissions from waste incineration should be reviewed.

Completeness:

110. The Ukraine reports emissions from seven waste sub-sectors out of eight. Not all pollutants are covered; in particular POP emissions are not estimated. Activity data are not provided. Since calculation methodologies are not explained, the accuracy of the calculations could not be reviewed. In general, however, many emission sources are covered by the Ukrainian NFR.

111. The use of notation keys is not correct in all cases. The ERT encourages a review and correction of the notations keys in NFR sector 6. In cases where a national methodology used to calculate emissions does not provide emission factors, the EMEP/EEA Inventory Guidebook 2009 could be used.

Consistency, including recalculation and time series:

112. Not reviewed due to a lack of detailed information.

113. No recalculations done by the Ukraine in the last submission (2011).

Comparability:

114. Not reviewed due to a lack of detailed information.

Accuracy and uncertainties:

115. Some QA/QC procedures are described in the IIR. The Ukraine uses direct data from enterprises and operators. To develop QA/QC procedures in this case, institutional instruments should be involved, like environmental inspectorates etc.

Improvement:

116. No improvements mentioned in the Ukrainian IIR 2011.

Sub-sector Specific Recommendations.

Category issue 1: 6.A - Solid waste disposal on land

117. NH₃, NMVOC and TSP emissions are estimated. In the Ukrainian NIR 2011 only waste disposal activities in landfills are mentioned. In 2009, methane collection from landfills and flaring did not occur in the Ukraine.

Category issue 2: 6.C.a, 6.C.b, 6.C.c – Waste incineration (clinical, industrial, municipal)

118. According to the Ukrainian NIR 2011, there is no waste incineration without energy recovery in waste incineration facilities. Emissions from these sectors should be accounted for in the energy sector. The ERT encourages a review of these sectors and the collection of all the necessary information from enterprises about energy uses.

Category issue 3: 6.C.d - Cremation

119. The Ukraine has calculated emissions from cremation. All pollutants which have emission factors in the EMEP/EEA Inventory Guidebook 2009 (chapter 6.C.d. Cremation), could be calculated. The ERT recommends calculating these emissions.

Category issue 4: 6.D - Other waste

120. The Ukraine reports emissions in this sector. It is not clear what kinds of activities are included. The ERT encourages the Ukraine to provide an explanation in the next IIR submission.

LIST OF ADDITIONAL MATERIALS PROVIDED BY THE COUNTRY DURING THE REVIEW

1. Party Stage 1 report 2011
2. Party IIR 2010 (in Ukrainian), plus a Google translation of this file
3. Party Report from 2009 on emissions from power plants (in Ukrainian), plus a partial Google translation of this file
4. Party Report on Methods to calculate pollutant and GHG emissions from vehicles (in Ukrainian), plus a partial English Google translation of this file
5. Ukraine GHG inventory 2011 in Russian (submitted 08.06.2011.)