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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:**

**STAGE 3 REVIEW REPORT
UKRAINE**

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INTRODUCTION

1. The mandate and overall objectives for the emission inventory review process under the LRTAP Convention is 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 – 2013 reflecting current priorities from 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 Ukraine coordinated by the EMEP emission centre CEIP acting as review secretariat. The review took place from 22nd June 2015 to 27th June 2015 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 – Charlotte Vanpoucke (Belgium), Energy - Thomas Gustafsson (Sweden), Transport - Melanie Hobson (EU), Industry - David Kuntze (Germany), Solvents - Kees Peek (Netherlands), Agriculture + Nature - Hakam Al-Hanbali (Sweden), Waste - Dirk Wever (Netherlands).
4. Anne Misra (United Kingdom) was the lead reviewer. The review was coordinated by Katarina Marečková, (EMEP Centre on Emission Inventories and Projections - CEIP).
5. Ukraine submitted an inventory in the NFR09 codes. Recommendations and references mentioned in the following chapters refer to the NFR09 nomenclature with the NFR14 code in brackets. The summary tables at the beginning of each chapter use the NFR14 nomenclature though to be in line with the latest Stage 3 report template.

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

6. Unfortunately, Ukraine's participation in the 2015 centralised Stage 3 review was very limited. The answers provided to the ERT reflect the limited resources available in Ukraine to prepare a detailed report or any further information. Given the scarce documentation available it was very difficult for the ERT to undertake an in-depth review of the Ukrainian inventory.

7. The inventory is partly in line with the 2013 EMEP/EEA Inventory Guidebook and the UNECE Reporting Guidelines. However, emissions and activity data are only reported for 2013 in the old NFR09 template. Furthermore emissions of PCDD/F and PCBs are not reported. The ERT also noted some missing sources being reported as 'NA'.

8. No recalculations are performed and the time series seem to be inconsistent.

9. The 2015 submission shows little improvement. The ERT identified a great need for further improvements in the transparency, completeness, consistency and accuracy of the Ukrainian inventory.

INVENTORY SUBMISSION

10. In 2015 Ukraine submitted emissions and activity data for 2013 for all pollutants except PCDD/F and PCB in the former NFR09 format. Ukraine did not provide an Informative Inventory Report (IIR) in 2015. The last IIR reported dates from the previous Stage 3 review in 2011.

11. Ukraine does not report projected emissions and associated socio-economic data, for the 'With Measures' or the 'With Additional Measures' scenarios. In response to the Stage 3 review, Ukraine indicated that it will not use LRTAP projections as part of the Gothenburg Protocol.

12. Recommendations for improvements identified during this review are presented in part B of this report.

KEY CATEGORIES

13. Due to limited resources, a Key Category Analysis (KCA) could not be undertaken by Ukraine. Also no Tier 2 or Tier 3 methodologies are used for key categories. The ERT recommends that Ukraine includes a key category analysis in their IIR as part of their inventory submission and to use the findings of this report to prioritise areas of improvement.

QUALITY

Transparency

14. As no IIR has been provided, there is a lack of transparency with regard to methodologies, assumptions made and choice of data used to estimate the emissions. The ERT strongly recommends that Ukraine submits an IIR (in English) describing assumptions, methodologies, activity data and emission factors used to estimate emissions per sector.

15. When no emissions were estimated, Ukraine used the notation key 'NA'. The ERT strongly recommends that Ukraine uses the appropriate notation keys ('NO', 'NE', 'IE' or 'NA'). For definitions see the revised Guidelines on Emission Inventory Reporting, III-12. Furthermore, the ERT recommends that the IIR includes a full description of the activities included in each sector and an explanation of any aggregations or missing sources.

16. No information on recalculations or planned improvements are provided. QA/QC is very limited and not well described in the IIR.

Completeness

17. The 2015 submission contains emission estimates and activity data for 2013. Ukraine does not report emissions or activity data for 1980 to 2012. Through submissions in previous years, a time series from 2002 to 2013 is available for most pollutants. The ERT recommends that Ukraine reports the full time series for every submission in the latest NFR14 format.

18. Ukraine does not report emissions of PCDD/F and PCBs. The ERT encourages the Party to provide these emissions in their next submission.

19. The ERT noted some missing sources in the Ukrainian inventory. Ukraine does not report emissions for 1A2c, 1A2e, 1A3ai(i) and 1A3ai(ii), 1A3biv-vii, 1A4aii, 1A4ciii, 1A5a, 1B3, 2A7b-c, 2C5a-d,f, 2D3, 2E, 3A3, 4B2, 4B4, 4B7, 4B9a, 4B9c, 4D2b, 4D2c, 6Ce. The ERT encourages Ukraine to report emissions for these sources in accordance with methodologies from the EMEP/EEA Guidebook.

20. The ERT further encourages 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.

21. Ukraine does not report improvement procedures and only very limited information has been made available on QA/QC. To improve the completeness of the submitted inventory, the ERT encourages Ukraine to provide detailed information in the next IIR.

22. The ERT notes that 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 2015 and 2020 until 2050, if possible.

Consistency, including recalculations and time-series

23. Ukraine did not submit an updated IIR. Thus, there is no information regarding recalculations for the latest CLRTAP submission. The ERT encourages 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.

24. The Ukrainian time series, i.e. data submitted over the last few years, show great variability. Ukraine responded during the review and informed the ERT that sometimes it uses different methods for different years depending on the presence and absence of data. The ERT concludes that there is an inconsistency in the time series and encourages Ukraine to try to retrieve data and improve the consistency and completeness of its inventory.

Comparability

25. The ERT notes that the inventory of Ukraine is only to a small extent comparable with those of other reporting parties. Ukraine uses an older NFR format and some sources are missing in the inventory. The ERT encourages Ukraine to use the NFR14 template for future submissions.

CLRTAP/NECD comparability

26. Ukraine is not an EU country and as such does not report emissions under the EU National Emission Ceilings (NEC) Directive.

Accuracy and uncertainties

27. It is not known whether Ukraine performs an uncertainty analysis. The ERT encourages Ukraine to provide quantitative uncertainty estimates of the emission values, especially for key sources, in future submissions.

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

Verification and quality assurance/quality control approaches

29. Only very limited information on QA/QC procedures was given in the IIR. The ERT encourages Ukraine to further elaborate their QA/QC procedures in accordance with the EMEP/EEA Guidebook in the future and include this information in the IIR.

FOLLOW-UP TO PREVIOUS REVIEWS

30. The current Stage 3 review has used outputs from the Stage 1 and Stage 2 review processes. The ERT invites Ukraine to also refer to these previous reviews when examining this review report and when making its improvement plans.

AREAS FOR IMPROVEMENTS IDENTIFIED BY UKRAINE

31. Ukraine does not list any improvements as part of their 2015 submission. No IIR was provided with the 2015 submission. The ERT does not have any information on planned improvements. The ERT strongly recommends including planned improvements in the IIR as part of the 2016 submission.

PART B: RECOMMENDATIONS FOR IMPROVEMENTS TO THE PARTY

CROSS CUTTING IMPROVEMENTS IDENTIFIED BY THE ERT

32. The ERT identifies the following cross-cutting issues for improvement:
- (a) ERT strongly recommends that 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 to a satisfactory standard.
 - (b) The ERT recommends that Ukraine provides the complete time series in the new NFR14 format for all pollutants under CLRTAP for all emission sources occurring in the country.
 - (c) The ERT recommends that 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.
 - (d) The ERT recommends that Ukraine lists all sources that contribute an accumulated 80% of the total emissions for each pollutant as key sources, and to apply a Tier 2 or 3 methodology for these key sources.
 - (e) The ERT encourages Ukraine to provide complete and detailed information on recalculations in the next IIR.
 - (f) The ERT recommends that Ukraine uses the appropriate notation keys as outlined in the Guidelines on Emission Inventory Reporting. The ERT also recommends that information on the notation keys used is provided, especially IE and NE.
 - (g) The ERT recommends including in the IIR a full description of the activities included in each sector and explanation for any aggregations. Furthermore, the ERT recommends including 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.
 - (h) The ERT recommends that Ukraine analyses trends in time series and gives explanations for fluctuations, dips and jumps throughout the time series.
 - (i) The ERT encourages Ukraine to include an improvement plan in the IIR, and to highlight how identified improvements are prioritised. The improvement plan should also cover information on missing sources and whether there are any plans to include these in the inventory.
 - (j) The ERT encourages Ukraine to submit projected emissions for the 'With measures' and the 'With additional measures' scenarios together with the associated social economic data for 2015 to 2050 where possible.

SECTOR SPECIFIC RECOMMENDATIONS FOR IMPROVEMENTS IDENTIFIED BY ERT

ENERGY

Review Scope

Pollutants Reviewed		SO ₂ , NO _x , NMVOC, NH ₃ , TSP, PM ₁₀ & PM _{2.5} , Cd, Hg, Pb, Dioxin, PAH		
Years		1990 – 2013		
NFR Code	CRF_NFR Name	Reviewed	Not Reviewed	Recommendation Provided
1A1a	Public electricity and heat production	X		X
1A1b	Petroleum refining	X		X
1A1c	Manufacture of solid fuels and other energy industries	X		X
1A2a	Iron and steel	X		
1A2b	Non-ferrous metals	X		
1A2c	Chemicals		X	
1A2d	Pulp, Paper and Print	X		
1A2e	Food processing, beverages and tobacco		X	
1A2f	Stationary combustion in manufacturing industries and construction: Non-metallic minerals	X		X
1A2gviii	Stationary combustion in manufacturing industries and construction: Other (please specify in the IIR)	X		
1A3ei	Pipeline transport	X		
1A3eii	Other (please specify in the IIR)	X		
1A4ai	Commercial/institutional: Stationary	X		
1A4bi	Residential: Stationary	X		
1A4ci	Agriculture/Forestry/Fishing: Stationary	X		
1A5a	Other stationary (including military)	X		
1B1a	Fugitive emission from solid fuels: Coal mining and handling	X		
1B1b	Fugitive emission from solid fuels: Solid fuel transformation	X		X
1B1c	Other fugitive emissions from solid fuels	X		
1B2ai	Fugitive emissions oil: Exploration, production, transport	X		X
1B2aiv	Fugitive emissions oil: Refining / storage	X		
1B2av	Distribution of oil products	X		
1B2b	Fugitive emissions from natural gas (exploration, production, processing, transmission, storage, distribution and other)	X		X
1B2c	Venting and flaring (oil, gas, combined oil and gas)	X		
1B2d	Other fugitive emissions from energy production	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:

33. The Ukraine has improved its use of notation keys in the reporting tables since the latest review in 2009. The ERT commends the Party for its efforts to improve the transparency of its reporting. However, the ERT noted that the notation key “NA” is still used for all pollutants in several sources (e.g. 1 A 2 c Stationary combustion in manufacturing industries and construction: Chemicals) despite the reporting of activity data. The ERT encourages Ukraine to estimate emissions for the relevant pollutants in future submissions and to use the notation key “NE” in the meantime.

34. In addition, Ukraine uses the notation key ‘NA’ where there may be no activity occurring, in this case for “Other fugitive emissions from geothermal energy production, peat and other energy extraction not included in 1B2” (1B3 in NFR09 reporting format). This issue was also raised in the previous review report. The ERT reiterates the previous recommendation that Ukraine should use the correct notation key “NO” for sources not occurring in the country or “NE” for pollutants not estimated due to a lack of available emission data.

35. In the IIR, Ukraine describes that both direct measurements of emissions (Tier 3) and activity data and emission factors (Tier 1 or Tier 2 methods) are used to estimate emissions. However, due to missing information in the IIR, it is not possible for the ERT to know which methodology or emission factors were used to calculate the emissions of each sub-sector. In addition, no trend development and thus no information on the evolution of emissions in Ukraine are accessible to the ERT. These issues were raised by the previous ERT in 2009 and the ERT strongly reiterates its encouragement that Ukraine should provide such information in a future IIR.

Completeness:

36. Since the latest review in 2009, Ukraine has improved the completeness of its reporting of PM₁₀, PM_{2.5} and POPs (in particular total PAHs and benzo(a)pyrene) for several sources as well as including activity data in the reporting tables for the energy sector. The ERT commends Ukraine for its efforts and encourages the Party to continue improving the completeness of its reporting (e.g. of black carbon emissions) using information in the 2013 EEA/EMEP Guidebook if national measurements or emission factors are missing.

37. The Ukraine does not report any emissions before 2002, and for some pollutants (e.g. total PAH) only since 2010. The ERT therefore reiterates the previous encouragement that the Party should also report the pollutants for missing years (from 1990). When making an environmental assessment, it is a great benefit when the coverage of reported data is as complete as possible for all pollutants.

Consistency including recalculation and time series:

38. Ukraine only reported emissions for 2013 in its 2015 submission. Hence, no recalculations have been performed. For issues related to inconsistent time-series due to the lack of reported emissions, please see paragraph 46 above.

Comparability:

39. The Ukraine uses an older (NFR09) NFR reporting format. The ERT reiterates the previous encouragement that the Ukraine should use the latest (NFR14 for the 2015 submission) reporting format for future submissions.

Accuracy and uncertainties:

40. In the previous review report in 2009, it was noted that 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 noted that no further information has been added to the IIR in this regard and thus reiterates the previous encouragement that Ukraine should undertake an 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:

41. In the previous review report in 2009, it was noted that no information on improvements already carried out or planned by the Ukraine for the energy sector was made available in the IIR. The ERT noted that no further information has been added to the IIR in this regard and thus reiterates the previous encouragement that the Ukraine should 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

Category issue 1: 1A1a, 1A1b, 1A1c, 1A2fi (1A2gviii I NFR14 format) - TSP

53. In the previous review report the ERT noted that emissions of TSP for 2006 in the sub-categories which are mentioned are 1000 times higher than for the other years. The ERT noted that this issue has not been rectified by Ukraine and thus reiterates the previous recommendation that the Party verifies the unit used for the emissions and that the Party performs checks of emissions before submission.

Category issue 2: 1A1b, 1B1b – PM_{2.5}

42. Ukraine uses the notation key "NA" for PM_{2.5} emissions from 1A1b and 1B1b despite reporting emissions of PM₁₀ and TSP for both sources. The ERT recommends that Ukraine estimates emissions of PM_{2.5} and reports them in future submissions, and in the meantime uses the notation key "NE".

Category issue 3: 1B2ai, 1B2b – PM₁₀

43. The ERT noted that Ukraine reported lower PM₁₀ emissions than PM_{2.5} emissions in 1B2ai and 1B2b. The ERT recommends that Ukraine reports the correct PM₁₀ values in its next submission and that Ukraine implements QC checks of the relation between reported TSP, PM₁₀ and PM_{2.5} before submission to avoid such errors in the future.

TRANSPORT

Review Scope

Pollutants Reviewed		NO _x , NMVOC, NH ₃ , CO,		
Years		2013		
NFRCode	CRF_NFRName	Reviewed	Not Reviewed	Recommendation Provided
1A2gvii	Mobile Combustion in manufacturing industries and construction: (please specify in the IIR)		x	
1A3ai(i)	International aviation LTO (civil)	x		x
1A3ai(ii)	International aviation cruise (civil)	x		x
1A3aii(i)	Domestic aviation LTO (civil)	x		x
1A3aii(ii)	Domestic aviation cruise (civil)	x		x
1A3bi	Road transport: Passenger cars	x		x
1A3bii	Road transport: Light duty vehicles	x		
1A3biii	Road transport: Heavy duty vehicles and buses	x		x
1A3biv	Road transport: Mopeds & motorcycles	x		
1A3bv	Road transport: Gasoline evaporation	x		
1A3bvi	Road transport: Automobile tyre and brake wear		NE	x
1A3bvii	Road transport: Automobile road abrasion		NE	x
1A3c	Railways	x		
1A3di(ii)	International inland waterways		x	
1A3dii	National navigation (shipping)	x		
1A4aii	Commercial/institutional: Mobile	x		x
1A4bii	Residential: Household and gardening (mobile)	x	x	
1A4cii	Agriculture/Forestry/Fishing: Off-road vehicles and other machinery		x	
1A4ciii	Agriculture/Forestry/Fishing: National fishing		x	
1A5b	Other, Mobile (including military, land based and recreational boats)		x	
1A3di(i)	International maritime navigation		x	
1A3	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:

44. Ukraine has provided an emissions inventory for the year 2013. 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 Ukraine uses its own methods and emission factors

for a number of sub-sectors and pollutants. The ERT therefore recommends that Ukraine includes more information on the methodology and the country-specific emission factors used for compiling the inventory.

45. Ukraine uses the notation key “NA” for a large number of cells in the reporting tables. “NA” should be used where a source exists but relevant emissions are considered never to occur. It is thought that in the majority of cases the emissions do occur but have not been estimated and hence the notation key “NE” should have been used instead. The ERT encourages Ukraine to use the appropriate notation keys (for example, NO where emissions are “Not Occurring”, NE where emissions are “Not Estimated”, IE where emissions are “Included Elsewhere” and “NA” where emissions of that specific pollutant do not occur for that source) for reporting where estimates are not available.

46. Since Ukraine uses its own methods and/or emission factors, the ERT recommends that Ukraine provides clear references to these and, if possible, comments on how these compare to the methods recommended in the 2013 EMEP/EEA Guidebook.

Completeness:

47. The ERT considers the Transport sector to be incomplete as estimates are missing for a large number of sources and pollutants. Examples include no emission estimates for International Aviation (LTO), Road transport: motorcycles and mopeds, Road transport: gasoline evaporation and Road transport: automobile tyre and brake wear. In addition, estimates of particulate matter are not provided for any transport source. It is understood that resourcing is an issue, but the ERT encourages Ukraine to provide a description of plans for estimating emissions from these sources in the IIR.

Consistency including recalculation and time series:

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

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

Comparability:

50. Ukraine has not provided any information on the methodology, activity data and/or emission factors used to estimate their emissions. The ERT recommends that the Party checks the estimated emissions for all transport sub-sectors.

Accuracy and uncertainties:

51. Ukraine has not provided the methodology used for estimating emissions from the transport sector. It is recommended that the emission estimates are checked as some of the data appears to be wrong. For example, NMVOC emissions are higher than NO_x emissions from Road Transport: Passenger Cars (1A3bi). A second example is that NO_x emissions from Residential Household and Gardening (1A4bii) are more than double the emissions from all road transport. The ERT recommends checking the data and units and that corresponding changes are made in the next inventory if appropriate.

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

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

Improvement:

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

Sub-Sector Specific Recommendations.

Category issue 1: 1.A.3.a Air Transport: All pollutants

55. Ukraine has provided estimates of NO_x, NMOVCs and CO from Domestic aviation (LTO and cruise) in 2013. For other pollutants, the notation key "NA" is provided. The ERT encourages Ukraine to provide estimates of the other pollutants and, if this is not possible, to use the correct notation key.

56. No emission estimates are provided for International Aviation (LTO and cruise). The ERT recommends estimating emissions for this sector.

Category issue 2: 1.A.3.b All road transport: All pollutants

57. Ukraine has provided estimates of NO_x, NMVOCs, NH₃ and CO from the road transport sector. No estimates are provided for other pollutants and in particular particulate matter. The ERT strongly encourages Ukraine to provide emission estimates for particulate matter and other missing pollutants.

58. The NMVOC emission estimates are higher than the NO_x emission estimates for Road Transport passenger cars (1A3bi). The ERT encourages Ukraine to check these figures and amend them accordingly if appropriate.

Category issue 3: 1.A.4.b.ii Residential Household and Garden mobile: All pollutants

59. Ukraine has provided estimates of NO_x, NMVOCs, NH₃ and CO from the Residential Household and Garden Mobile sector. These estimates appear to be very high for all pollutants compared to the road transport emission estimates. No activity data has been provided for this sector and therefore further checks cannot be made. The ERT strongly encourages Ukraine to review the estimates for this sector and update the inventory accordingly.

INDUSTRIAL PROCESSES

Review Scope

Pollutants Reviewed		SO ₂ , NO _x , NMVOC, NH ₃ , PM ₁₀ & PM _{2.5}		
Years		1990 – 2013 + (Protocol Years)		
NFR Code	CRF_NFR Name	Reviewed	Not Reviewed	Recommendation Provided
2A1	Cement production	X		
2A2	Lime production	X		
2A3	Glass production	X		
2A5a	Quarrying and mining of minerals other than coal	X		
2A5b	Construction and demolition	X		
2A5c	Storage, handling and transport of mineral products	X		
2A6	Other mineral products (please specify in the IIR)	X		
2B1	Ammonia production	X		
2B2	Nitric acid production	X		
2B3	Adipic acid production	X		
2B5	Carbide production	X		
2B6	Titanium dioxide production	X		
2B7	Soda ash production	X		
2B10a	Chemical industry: Other (please specify in the IIR)	X		
2B10b	Storage, handling and transport of chemical products (please specify in the IIR)	X		
2C1	Iron and steel production	X		
2C2	Ferroalloys production	X		
2C3	Aluminium production	X		
2C4	Magnesium production	X		
2C5	Lead production	X		
2C6	Zinc production	X		
2C7a	Copper production	X		
2C7b	Nickel production	X		
2C7c	Other metal production (please specify in the IIR)	X		
2C7d	Storage, handling and transport of metal products (please specify in the IIR)	X		
2H1	Pulp and paper industry	X		
2H2	Food and beverages industry	X		
2H3	Other industrial processes (please specify in the IIR)	X		
2I	Wood processing	X		
2J	Production of POPs	X		
2K	Consumption of POPs and heavy metals (e.g. electrical and scientific equipment)	X		
2L	Other production, consumption, storage, transportation or handling of bulk products (please specify in the IIR)	X		

General recommendations on cross cutting issues

Transparency:

60. The Party's ' IIR has only two pages containing only general information. Therefore, the IIR is not transparent at all. Because of this a review of the methods, sources of the activity data, the emission factors and emissions is simply not possible. ERT strongly recommends including this information in the next IIR.

Completeness:

61. Ukraine reports many different pollutants for many industrial process sectors. ERT commends Ukraine for reporting so many pollutants for so many sources. This is very impressive. However, the Party still uses the old NFR Format, and as the IIR does not give any information about the methods and data sources, the reviewers were not able to carry out a quality control of the data.

Consistency including recalculation and time series:

62. Ukraine delivered only emissions data for the year 2013.

Comparability:

63. No recommendation about the comparability is possible, as the necessary information is missing in the IIR.

Accuracy and uncertainties:

64. It is not possible to make any recommendations about Accuracy and Uncertainty as the necessary information has not been provided in the IIR.

Improvement:

65. There are no sector specific planned improvements reported in the IIR.

Sub-sector Specific Recommendations

66. As there is no chapter for the industrial processes in the IIR, it was not possible to make subsector specific recommendations. .

SOLVENTS

Review Scope

Pollutants Reviewed		NMVOC		
Years		1990 – 2013		
NFR Code (NFR009)	CRF_NFR Name	Reviewed	Not Reviewed	Recommendation Provided
2D3a (3.D.2)	Domestic solvent use including fungicides	x		x
2D3b	Road paving with asphalt	x		x
2D3c	Asphalt roofing	x		x
2D3d (3.A.2/3.A.1)	Coating applications	x		x
2D3e (3.B.1)	Degreasing	x		x
2D3f (3.B.2)	Dry cleaning	x		x
2D3g (3.C)	Chemical products	x		x
2D3h (3.D.1)	Printing	x		x
2D3i	Other solvent use (please specify in the IIR)	x		x
2G (3.D.3)	Other product use (please specify in the IIR)	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

67. So far, Ukraine only provided an IIR in 2011 (5 pages in Ukrainian). In addition, Ukraine only submitted NFR tables with detailed information for the period 2008 – 2013 in the NFR09 format. Furthermore, Ukraine did not provide any answers to the ERT to questions regarding the Solvent and Other Product Uses sector during the 2013 centralised Stage 3 review.

68. Due to these facts the Solvent and Other Product Uses sector of Ukraine could not be reviewed properly. Only a few recommendations could be given after reviewing the submitted **NFR09** tables.

Transparency:

69. The ERT notes that according to the NFR table 3A2 (2D3d) is a key source of NMVOC and strongly recommends that Ukraine stipulates which Tier methods are used to estimate the NMVOC emissions from key sources in future IIRs.

70. The ERT also notes that there was an enormous increase in NMVOC emissions from the NFR09 (NFR14) codes 3A1 (2D3d), 3A2 (2D3d), 3B1 (2D3e), 3B2 (2D3f) and 3C (2D3d) after 2011 and strongly recommends that Ukraine includes explanations of dips and jumps in future IIRs.

Completeness:

71. As already mentioned in the general part of this report, the ERT strongly recommends that Ukraine prepares an IIR, with all the necessary information (including a chapter on the Solvent and Other Product Uses sector) and a complete set of NFR Tables in the NFR14 format in the next submission.

72. Furthermore the ERT notes that Ukraine only reported activity data for 2012 and 2013 and strongly recommends that Ukraine includes activity data for the whole period from 1990 onwards in the next submission.

Consistency including recalculation and time series:

73. The ERT notes that Ukraine has not performed recalculations for any of the source categories within the Solvents and Other Product Use sector. The ERT found no discrepancies between the 2012 and 2013 emissions time series for the various emission sources.

74. As already mentioned the ERT notes that Ukraine has not provided full time series of emissions. Therefore, it is not possible to analyze the time series.

Comparability:

75. Ukraine provided its emissions in the NFR09 format. The ERT strongly recommends provides emissions in the NFR14 format in the next submission.

Accuracy and uncertainties:

76. So far, Ukraine has only provided an IIR in 2011 (5 pages in Ukrainian) and therefore it was not possible to analyze these issues. The ERT strongly recommends that Ukraine includes information about these issues in the next submission.

Improvement:

77. The ERT encourages Ukraine to include an inventory improvement plan in its next submission.

AGRICULTURE

Review Scope:

Pollutants Reviewed		SO ₂ , NO _x , NMVOC, NH ₃ , CO, PM ₁₀ & PM _{2.5} , TSP and POPs.		
Years		2013 + (Protocol Years)		
NFR Code	CRF_NFR Name	Reviewed	Not Reviewed	Recommendation Provided
3B1a	Dairy cattle	x		x
3B1b	Non-dairy cattle	x		x
3B2	Sheep	x		x
3B3	Swine	x		x
3B4a	Buffalo	x		x
3B4d	Goats	x		x
3B4e	Horses	x		x
3B4f	Mules and asses	x		x
3B4gi	Laying hens	x		x
3B4gii	Broilers	x		x
3B4giii	Turkeys	x		x
3B4giv	Other poultry	x		x
3B4h	Other animals (please specify in IIR)	x		
3Da1	Inorganic N-fertilizers (includes also urea application)	x		x
3Da2a	Animal manure applied to soils	x		
3Da2b	Sewage sludge applied to soils	x		
3Da2c	Other organic fertilisers applied to soils (including compost)	x		
3Da3	Urine and dung deposited by grazing animals	x		x
3Da4	Crop residues applied to soils	x		
3Db	Indirect emissions from managed soils	x		
3Dc	Farm-level agricultural operations including storage, handling and transport of agricultural products	x		
3Dd	Off-farm storage, handling and transport of bulk agricultural products	x		
3De	Cultivated crops	x		
3Df	Use of pesticides	x		
3F	Field burning of agricultural residues	x		x
3I	Agriculture other (please specify in the IIR)			
11A	Volcanoes			
11B	Forest fires			

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:

78. Ukraine provided emission data covering only 2013 (submission 2015) and used the old version of the NFR Templates. Ukraine also provided a very short IIR only, with no reference to the Agriculture sector. The NFR table includes emission data from the main

categories and activity data. The ERT was unable to check the methodologies, emission factors, references and information on the data used for estimating emissions for the Agriculture sector. The ERT recommends that Ukraine provides a transparent chapter on agriculture in the IIR with a description of the methodologies applied for estimating emissions and a trend analysis, using the updated NFR Templates for reporting emission data in next submission.

Completeness:

79. The emission inventory of the Agriculture sector covers the most important sources of emissions, although estimates for the main pollutants from some sub-categories (e.g., goats, buffalo, laying hens and turkeys) were missing. The emissions from these animal categories were reported as not applicable ("NA"), however, the activity data of these animals were given in the NFR table. The 2013 EMEP/EAA Guidebook provides methodologies for estimating emissions of NO_x, NMVOC NH₃ and PM from various sources of the Agriculture sector. The ERT recommends that Ukraine estimates the emissions from these sub-categories in order to enhance the completeness of the Agriculture sector in future submissions.

80. Ukraine did not provide a full time series (1990-2013) of emissions from the Agriculture sector. The ERT recommends that Ukraine provides a full time series (1990-2013) of pollutants emissions using the updated NFR Templates in future submissions.

Consistency including recalculation and time series:

81. The ERT was unable to check the consistency of the emission inventory of the Agriculture sector as the NFR table only includes emission data for 2013. The ERT recommends that Ukraine provides a detailed description of the recalculation of the emission inventory of the Agriculture sector in future submissions.

Comparability:

82. The ERT was unable to assess the comparability of the inventory as methodologies, emission factors, references and information on the data used for estimating emissions have not been provided. The ERT recommends that Ukraine provides a separate chapter on the Agriculture sector with a detailed description of the methodologies applied for estimating emissions in next submission.

Accuracy and uncertainties:

83. The ERT encourages Ukraine to undertake an uncertainty analysis for the Agriculture sector in order to steer the improvement process and to provide an indication of the reliability of the inventory data.

Improvement:

84. The ERT was unable to assess whether Ukraine has made any improvement to its inventory or not. The ERT encourages Ukraine to list any improvements in its next submission in order to enhance the quality of its emission inventory.

Sub-sector Specific Recommendations

Category issue 1: 4B (3B) Manure management - All relevant pollutants

85. The ERT noted that there were no descriptions of methodologies or references and relevant information on the data used. The ERT recommends that Ukraine provides a separate chapter on agriculture with a detailed description of the methodologies applied for estimating emissions in the next submission.

Category issue 2: 4Da1 (3Da1) Synthetic N-fertilizers - NH₃

86. The ERT noted that the reported activity data for 4Da1 (3Da1) synthetic N-fertilizers is 928390000 kg N/y, while the emission of NH₃ was 8.08 E-06 Gg or 8 kg N/y, which is extremely low, considering the large quantity of fertilizers used. The ERT recommends that Ukraine enhances its QA/QC procedures for the Agriculture sector in general, and estimates the correct NH₃ emission from this category in next submission in order to enhance the accuracy and reliability of the inventory data.

Category issue 3: 4D2ac (3Da3) N-excretion on pasture range and paddock - NH₃

87. The ERT noted that the Party used the notation key "NA" (Not Applicable) to report emissions of NH₃ from 4D2ac (3Da3) N-excretion on pasture range and paddock, while providing activity data (163874367.3 Kg N/y) in the NFR. The ERT recommends that Ukraine enhances the QA/QC procedures for the Agriculture sector in general. The ERT reminds the Party that the EMEP/EAA Guidebook 2013 provides methodologies for estimating emissions from various sub-categories. The ERT also recommends that Ukraine estimates NH₃ emission from this category in the next submission in order to improve the completeness, accuracy and reliability of the inventory data.

Category issue 4: 4B manure management 4B2 (3B4a) Buffalo, 4B4 (3B4d) Goats, 4B9a (3B4gi) Laying hens and 4B9c (3B4giii) Turkeys) - NH₃ and PM

88. The ERT noted that the Party reported emissions of NH₃ and PM from Buffalo, Goats, Laying hens and Turkeys, using the notation key "NA" (Not Applicable), while providing activity data for these animal categories in the NFR table.

89. The ERT recommends that Ukraine enhances the QA/QC procedures for the Agriculture sector in general. The ERT reminds the Party that the EMEP/EAA Guidebook 2013 provides methodologies for estimating emissions from various sub-categories. The ERT also recommends that Ukraine estimates NH₃ emission from these animal categories in next submission in order to enhance the accuracy, completeness and reliability of the inventory data.

Category issue 5: 4F (3F) Field burning of agricultural residues - NO_x and CO

90. The ERT noted that the Party reported emissions of NO_x (0.00034366 Gg or 0.343 ton NO_x) and CO (8,561E-05 Gg or 85.6 kg CO) from field burning of agricultural residues in 2013.

91. The ERT recommends that Ukraine enhances the QA/QC procedures for the agriculture sector, and estimates the correct NO_x and CO emissions from this category in the next submission in order to improve the accuracy and reliability of the inventory data.

Category issue 6: 4F Field burning of agricultural residues - NO_x and CO

92. The ERT noted that emissions of NO_x (1.72 Gg) and CO (46.16 Gg) from field burning of agricultural residues reported to UNFCCC (submission 2014) differ significantly from emissions reported to CLRTAP. The ERT recommends that Ukraine harmonizes reporting emissions to the UNFCCC and CLRTAP in future submissions.

Category issue 7: 4B (3B) Manure management and 4D (3D) Agricultural soil – SO₂ and CO

93. The ERT noted that emissions of SO₂ and CO were reported in the NFR table from a number of sub-categories of 4B (3B) manure management and 4D (3D) Agricultural soil (e.g., emissions of SO₂ and CO from dairy cows and swine). The ERT recommends that Ukraine enhances the QA/QC procedures for the agriculture sector in general. The ERT also strongly recommends that Ukraine validates the reported emissions of SO₂ and CO from dairy cows and swine in its next submission.

Category issue 8: 4B (3B) Manure management, 3B3 Swine - POPs/PAH

94. The ERT noted that emissions of polychlorinated hydrocarbons (PAH) were reported from swine. The ERT strongly recommends that Ukraine validates the reported PAH emissions from swine in the next submission.

Category issue 9: 4D1 (3D) Agricultural Soils - NH₃

95. The ERT encourages Ukraine to provide detailed information on the breakdown of national fertilizer consumption into the relevant compounds in use, which are accounted for in emission estimates under 4D1 (3D) agricultural soil.

WASTE

Review Scope:

Pollutants Reviewed		SO ₂ , NO _x , NMVOC, NH ₃ , PM, heavy metals and POP's		
Years		1990 – 2013 + (Protocol Years)		
NFR Code	CRF_NFR Name	Reviewed	Not Reviewed	Recommendation Provided
5A	Biological treatment of waste - Solid waste disposal on land	X		X
5B1	Biological treatment of waste - Composting	X		X
5B2	Biological treatment of waste - Anaerobic digestion at biogas facilities	X		X
5C1a	Municipal waste incineration	X		X
5C1bi	Industrial waste incineration	X		X
5C1bii	Hazardous waste incineration	X		X
5C1biii	Clinical waste incineration	X		X
5C1biv	Sewage sludge incineration	X		X
5C1bv	Cremation	X		X
5C1bvi	Other waste incineration (please specify in the IIR)		X	
5C2	Open burning of waste		X	
5D1	Domestic wastewater handling	X		X
5D2	Industrial wastewater handling	X		X
5D3	Other wastewater handling	X		X
5E	Other waste (please specify in IIR)	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

96. Ukraine only provided an IIR in 2011 (5 pages in Ukrainian). Until now, Ukraine has submitted in total a time series of NFR-tables from 2002 – 2013 in the NFR09 format.

97. Similar to the 2011 centralized review, Ukraine did not provide any answers to questions on the Waste sector during the 2015 centralized review. This is why Ukraine's submission could not be reviewed properly. The ERT strongly recommends that Ukraine prepares a complete time series in NFR14 format and a complete IIR with all the necessary information.

Transparency:

98. The ERT asked Ukraine to provide information on the methodology, activity data and the emission factors used for the calculations. The ERT didn't receive an answer and recommends that Ukraine reports this information in the next IIR submission.

Comparability:

99. The ERT notes that the Ukraine provided an NFR-table in the NRF09 format. The ERT recommends the use of the NFR2013 format and a recalculation for all NFRs in the next submission.

Transparency, completeness, comparability, consistency and accuracy:

100. No up-to-date IIR has been submitted in 2015. Furthermore, the submitted NFR table is still in the NRF09 format and several requests from the ERT to Ukraine to provide information on specific subjects remained unanswered. The ERT notes that this has caused a lack of information on methodology, AD and EFs used, uncertainty information and a key source analysis. As a result, the ERT was not able to perform a review of the Ukrainian inventory as desired. The ERT strongly recommends that Ukraine takes up the recommendations made in this and former reviews for its next submission, and that the Party submits an NFR table in the NFR13 format and a full description of the inventory as described in the reporting guidelines.

Improvement:

101. The ERT asked Ukraine to provide an overview of the progress made as a result of the recommendations from the 2011 review. The ERT didn't receive an answer and recommends that Ukraine reports the improvements made in the next IIR submission.

Sub-sector Specific Recommendations

Category issue 1: 5A Solid waste disposal on land – All pollutants

102. The ERT notes that Ukraine reports several pollutants from this source. However, the 2013 EMEP/EEA Guidebook just provides an EF for NMVOC and particulate matter. The ERT notes that it is not clear what methodology is used and what the origin of the EFs used for the other pollutants is. The ERT recommends providing this information in the next submission.

Category issue 2: 5B1 and 5B2 Biological treatment of waste - all pollutants

103. The ERT notes that there are no emissions reported from these sources in the NFR tables. The ERT recommends implementing emission calculations from these sources in the NFR tables and providing a description of methodology, AD and EFs used in the next submission.

Category issue 3: 5C1All waste incineration – all pollutants

104. 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 reiterates its encouragement from the 2011 review to perform a review of these sectors and to collect all necessary information about energy uses from enterprises.

Category issue 4: 5C1bv Cremation – all pollutants

105. The Ukraine has calculated emissions from cremation. All pollutants for which there are emission factors in the EMEP/EEA Inventory Guidebook 2013 (chapter 5C1bv

Cremation) could be calculated, but are not. The ERT reiterates the recommendation from the 2011 review to calculate these emissions.

106. Ukraine has calculated emissions for several pollutants from cremations. The ERT notes that in the NFR-table the amount of human corpses and animal carcasses is reported as NA. The ERT notes that the Ukraine was asked to explain this, but they did not provide an answer to this question. The ERT recommends the proper use of notation keys and to report the activity data (the amounts of human corpses and animal carcasses) as used in the calculations.

Category issue 5: 5D All waste water handlings – all pollutants

107. The ERT notes that the Ukraine reports several emissions and activity data from waste water handling. However, the ERT notes that the guidebook just provides EFs for NMVOC and NH₃. The ERT notes that it is not clear which sources are included in the reported emissions, what methodology is used and what the origin of the EFs used for the other pollutants is. The ERT recommends providing this information in the next submission.

Category issue 6: 5E Other waste – all pollutants

108. In this review the ERT repeated its question from the 2011 review to the Ukraine to explain which activities (sources/processes) are included in this sub-category. The Ukraine did not provide an answer to the ERT. The ERT reiterates the encouragement of the 2011 review to provide an explanation in the next IIR submission.

**LIST OF ADDITIONAL MATERIALS PROVIDED BY THE COUNTRY DURING THE
REVIEW**

No additional material has been submitted by Ukraine.