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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
NORWAY

CONTENT

INTRODUCTION

1. The mandate and 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 SO_x, NO_x, NMVOC, NH_3, plus PM_{10} & $PM_{2.5}$ for the time series years 1990 – 2011 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 Norway coordinated by the EMEP emission centre CEIP acting as review secretariat. The review took place from 17th to 21st June 2013 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 – Valentina Idrissova (Kazakhstan), Energy - Stephan Poupa (Austria) and Laetita Nicco (France), Transport - Michael Kotzula (Germany), Industry - Neil Passant (European Union), Agriculture +Nature - Hakam Al-Hanbali (Sweden), Waste - Intars Cakaras (Latvia). There was no expert available to review emissions from the Solvents sector.

4. Chris Dore (United Kingdom) 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 CLRTAP inventory submitted by Norway is in line with the EMEP/EEA Air Pollutant Emissions Inventory Guidebook and the UN/ECE Reporting Guidelines and appears to be of good quality and well documented in the informative inventory report (IIR). However, the ERT considers that the IIR could be improved further (particularly as regards transparency) and therefore has provided some source-specific observations, recommendations and encouragements to enable an improvement of the emissions inventory for future submissions.

6. The ERT has noted that Norway has improved its IIR since the last review in 2009, and commends them for following all of the recommendations from the previous ERT.

7. The ERT would also like to thank Norway for their timely replies to the questions raised by the ERT before and during the review week.

INVENTORY SUBMISSION

8. Norway has reported emissions for its Protocol base years and a full time-series from 1989 to 2011 (the latest year) for its protocol pollutants (NOx, SOx, NMVOC, PAH and dioxins, and HMs) in the most recent NFR format. In addition, Norway has also provided a full 1989 - 2011 time series for CO, PM_{10} and $PM_{2.5}$ as well as estimates for 1980 and 1987 for all substances.

9. The ERT noted that Norway reported emissions of PCBs and HCBs as NE due to a lack of AD and/or EFs. However, the ERT has also noted that estimating emissions of these pollutants is listed in the inventory improvement plan. The ERT recommends that Norway report emissions of these pollutants in its next submission to improve completeness and to comply with the POPs Protocol.

10. The ERT has noted that Norway mostly applies Tier II and Tier III methods to estimate emissions from key categories, and the ERT commends Norway for its comprehensive efforts to report accurate emissions.

KEY CATEGORIES

11. Norway has presented in its IIR a Tier I level Key Source Category Analysis by reported pollutants for all sectors for the years 1990 and 2011. The ERT noted that Norway has used its KCA to prioritise inventory improvements. The ERT encourages Norway to perform a trend key category analysis in future submissions.

QUALITY

Transparency

12. The ERT recognises the level of effort undertaken by Norway in providing an inventory that is comprehensive and shows a high level of detail.

13. The ERT has also noted that Norway reported AD in the NFR tables and emission factors in the IIR. However, the ERT considered that more transparent presentation of AD could be provided in the IIR (e.g. AD with more disaggregation, and AD trends in IIR Annexes). For example, the IIR gives general descriptions for the energy sector (1A, 1A1, 1A2, 1A4, 1A5, 1B) but does not provide detailed explanations for all of the sub-categories.

14. The ERT has also noted some misuse or inconsistent use of notation keys in the NFR tables (e.g. in the energy sector for fuels not used in the country (NE is used instead of NO) and for POPs in the industrial processes sector (NA is used instead of NE)). The ERT recommends that Norway use correct notation keys in its future submissions to improve the transparency and consistency of the inventory.

Completeness

15. The ERT considers Norway's emissions inventory to be complete. The Party has reported emissions of some pollutants from some categories as NE (e.g. fugitive emissions of HM from solid fuel transformation, emissions of NMVOC from asphalt roofing and road paving, etc.) due to a lack of activity data, emission factors in the EMEP/EEA Guidebook or methodology or insignificance of the source (e.g. in the waste sector) and documented these in detail in its IIR.

16. During the review, Norway provided information that demonstrated that the emissions reported as NE are considered to make only a very small contribution to the emission total. The ERT encourages Norway to undertake this assessment for all sources currently reported as NE to justify the use of this notation key, and report the results in the IIR.

Consistency, including recalculations and time-series

17. The ERT commends Norway for their particularly detailed explanation of recalculations in the IIR.

18. The ERT has noted Norway's explanation that some categories in the energy sector for the latest reported year were usually preliminary and would therefore be subject to recalculation in the future submissions. During the review, Norway provided the ERT with an assessment of the difference between preliminary and final totals (0.1 per cent in 2008, 0.2 per cent in 2009, and -0.2 per cent in 2010) and explained that most data sources are included in the energy balance used for reporting. As a result, use of the preliminary data gives fairly reliable emission estimates. The ERT encourages Norway to include a comment on the accuracy of the preliminary data in future IIRs.

Comparability

Accuracy and uncertainties

19. The ERT has noted some differences/errors in the AD reported to the CLRTAP and the UNFCCC (e.g. animal population in agriculture). During the review Norway confirmed that there was an error in reporting these AD. The ERT encourages Norway to review their QA procedures to ensure that inconsistencies do not arise between the CLRTAP and UNFCCC submissions.

20. The ERT has noted that Norway compiled uncertainty estimates for protocol pollutants emissions, EFs, AD and point sources. The ERT commends Norway for their efforts in compiling a complete and detailed uncertainty analysis.

Verification and quality assurance/quality control approaches

21. In the IIR, Norway has provided information on their particularly detailed general and sector-specific QA/QC procedures and verification checks. The ERT commends Norway for using comprehensive QA/QC procedures, and encourages the Party to continue to undertake such procedures for future submissions.

FOLLOW-UP TO PREVIOUS REVIEWS

22. Norway responded to the Stage 2 S&A report findings on outliers of implied emissions factors only for the years the review took place. The ERT encourages Norway to reply to the Stage 2 S&A report findings annually.

AREAS FOR IMPROVEMENTS IDENTIFIED BY NORWAY

23. Norway has indicated a number of general and source-specific areas for improvement in their IIR including:

- Revision and better documentation of EFs
- Estimation of PCB and HCB emissions.
- Updating energy statistics
- Better documentation of the national Norwegian NH_3 model
- Updating activity data on manure storage and management.

24. The ERT considers this to be an appropriate priority list of improvements, and encourages Norway to undertake these improvements in time for its next annual submission.

PART B: RECOMMENDATIONS FOR IMPROVEMENTS TO THE PARTY

CROSS CUTTING IMPROVEMENTS IDENTIFIED BY THE ERT

25. The ERT recommends that Norway report emissions of PCBs and HCB in its next submission, and notes that they have expressed their intention to do so.

26. The ERT recommends that Norway review their current use of notation keys in time for future submissions (see sector-specific comments).

SECTOR SPECIFIC RECOMMENDATIONS FOR IMPROVEMENTS IDENTIFIED BY ERT

ENERGY

Review Scope

Pollutants Reviewed		NOx, NMVOC, SOx, NH_3, PM, CO, Priority HMs, dioxins, PAHs		
Years		1990-2011		
NFR Code	**CRF_NFR Name**	**Reviewed**	**Not Reviewed**	**Recommendation Provided**
1.A.1.a	public electricity and heat production	x		
1.A.1.b	petroleum refining	x		
1.A.1.c	Manufacture of solid fuels and other energy industries	x		
1.A.2.a	iron and steel	x		x
1.A.2.b	non-ferrous metals	x		
1.A.2.c	chemicals	x		
1.A.2.d	pulp, paper and print	x		x
1.A.2.e	food processing, beverages and tobacco	x		
1.A.2.f.i	Stationary Combustion in Manufacturing Industries and Construction: Other (Please specify in your IIR)	x		
1.A.2.f.ii	Mobile Combustion in Manufacturing Industries and Construction: (Please specify in your IIR)	x		x
1 A 3 e	Pipeline compressors ?		x	
1.A.4.a.i	commercial / institutional: stationary	x		
1.A.4.a.ii	commercial / institutional: mobile ?	x		
1.A.4.b.i	residential plants	x		
1.A.4.b.ii	household and gardening (mobile)	x		
1.A.4.c.i	Agriculture/forestry/fishing. stationary	x		
1.A.4.c.ii	off-road vehicles and other machinery?	x		
1.A.4.c.iii	national fishing?	x		
1.A.5.a	other, stationary (including military)	x		
1.A.5.b	other, mobile (including military, land based and recreational boats)?	x		
1.B.1.a	coal mining and handling	x		x
1.B.1.b	solid fuel transformation	x		
1.B.1.c	other fugitive emissions from solid fuels)			NO
1 B 2 a i	Exploration, production, transport	x		
1 B 2 a iv	Refining / storage	x		
1 B 2 a v	Distribution of oil products	x		x
1 B 2 b	Natural gas	x		
1 B 2 c	Venting and flaring	x		
1 B 3	Other fugitive emissions from geothermal			NO

	energy production , peat and other energy extraction not included in 1 B 2			
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:

27. The ERT has noted that Norway sometimes uses NE to report some fuels in the activity data in the NFR tables for combustion activities (1A).

28. Since Norway has assessed the use of all of the different types of fuels in the source sectors in 1A, the fuel data should be reported as “NO” instead of “NE”. During the review week, Norway agreed with the ERT’s observations. The ERT recommends that Norway correct the use of the notation key in the NFR tables from "NE" to "NO" where fuel use does not occur.

29. The ERT noted that the IIR gives general descriptions for the energy sector (1A, 1A1, 1A2, 1A4, 1A5, 1B) but does not provide detailed explanations for all of the sub-categories, and especially for the key categories (method tier used, activity data and an assessment of the emission times series) even if estimates are provided at the most detailed level in the NFR tables.

30. The ERT thanks Norway for providing comprehensive and quick responses during the review process, but the ERT encourages Norway to include more detail in the IIR to facilitate review assessment and improve transparency.

Completeness:

31. The ERT considered Norway’s emissions estimates for the Energy combustion sector (1A) to be complete, and commends Norway for their comprehensive work on this inventory sector.

32. Concerning Energy fugitive sector (1B), the ERT encourages Norway to complete its estimates as explained in the sub-sector specific recommendations below.

Consistency including recalculation and time series:

33. The ERT considered Norway’s emissions estimates for the energy sector to be consistent, and commend Norway for this.

34. The ERT also thanks Norway for its comprehensive explanations in the IIR about the recalculations carried out.

Comparability:

35. The ERT considers Norway’s submission to be good with regard to comparability.

Accuracy and uncertainties:

36. The ERT considered Norway's emissions estimates for the energy sector to be accurate, and commends Norway for their work on this inventory sector.

Improvement:

37. The ERT commends Norway for its planned improvement actions, which are described in the IIR.

38. The ERT encourages Norway to include all of the ERT's recommendations in its improvement plan.

Sub-sector Specific Recommendations.

Category issue 1: 1A2f ii & 1A3e

39. The ERT has noted that the IIR (chapter 3.2.3.2) does not provide enough information to allow the ERT to understand where emissions from off-road machinery in industry were taken into account (1A3e or 1A2f ii), whereas the NFR tables show emissions in 1A2f ii and no emissions in 1A3e (IE).

40. During the review week, Norway explained in detail how emissions from off-road machinery in industry were allocated to the different NFR categories and indicated that the IIR would be corrected in the next submission. The ERT thanks Norway for their willingness to make this improvement, and recommends that the text is added to the IIR to clearly explain the allocation of off-road mobile machinery emissions to NFR categories.

41. The ERT has made the observation that it would be sensible if the reporting under the CLRTAP was consistent with the reporting under the UNFCCC.

Category issue 2: 1B1a - NMVOC, PM

42. The ERT noted that Norway reports activity data in NFR 1B1a (coal mining) for all of the time series, but corresponding emissions are reported as 'NA'. In its IIR, Norway indicates that PM emissions from coal mining are not estimated because of a lack of an appropriate EF.

43. The EMEP/EEA Emissions Inventory Guidebook does include EFs for NMVOC and PM10 for this source.
During the review week, Norway agreed to include emission estimates for 1B1a Coal Mining in its next submission.

44. The ERT thanks Norway for their willingness to make this improvement, and recommends that they include emission estimates for 1B1a Coal Mining in their next submission, and to include comprehensive information in their IIR.

Category issue 3: 1A2a Iron and steel – CO

45. The ERT noted that the IEF for CO emissions from 1A2a in 2011 (about 80 g CO/GJ) appears low compared to the EMEP/EEA Emissions Inventory Guidebook (e.g. 931 g CO/GJ when using hard coal or brown coal for the iron and steel industry) and the data reported by other countries.

46. During the review week, Norway explained that it uses a zero emission factor for solid fuels (coke and blast furnace gas).

47. The ERT recommends that Norway re-evaluate the data used for estimating CO emissions, and also encourages Norway to collaborate with the different plant operators in this industry in order to improve the accuracy of the current emissions estimates.

Category issue 4: 1B2av – activity data

48. The ERT noted that activity data in NFR 1B2av has been decreasing since 2005, and that there is no explanation of this trend in the IIR.

49. Norway provided a comprehensive and quick explanation of this trend during the review week. The ERT recommends that Norway include this explanation in their next IIR to improve transparency.

Category issue 5: 1A2d – IEF trends

50. The ERT has noted variations and discrepancies concerning the IEFs for Pb, Hg and dioxins in NFR 1A2d over the time series. The IIR did not include an explanation for these trends.

51. During the review week, Norway provided a comprehensive and quick explanation for the reasons behind the IEF trends. The ERT recommends that Norway include this explanation in their next IIR to improve transparency.

TRANSPORT

Review Scope

Pollutants Reviewed		NO_x, NMVOC, NH_3, SO_x, $PM_{2.5.}$, PM_{10}, TSP,, CO, Main HM, PAH		
Years		1990, 2010, 2011		
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		
1.A.3.b.ii	road transport, light duty vehicles	x		
1.A.3.b.iii	road transport, heavy duty vehicles	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	x		x
1.A.3.b.vii	road transport, automobile road abrasion	x		x
1.A.3.c	railways	x		x
1.A.3.d.i (ii)	international inland navigation		NO	
1.A.3.d.ii	national navigation	x		
1.A.4.b.ii	household and gardening (mobile)	x		
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		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)	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:

52. The ERT considers the Norwegian inventory as generally transparent regarding the reporting of emissions from mobile sources.

53. The notation key "NE" is used throughout the inventory for emissions of the heavy metals nickel, selenium and zinc as well as of all four single PAH compounds. The ERT encourages Norway to further investigate whether it is possible to estimate emissions from these sources reported as NE for future submissions - focussing on those sources from which significant pollutant emissions can be expected (e.g. zinc from tyre wear).

54. Within the IIR, good descriptions are provided for each of the mobile sources. Nonetheless, in order to improve the inventory's transparency, the ERT encourages Norway to include some information on the tier approaches applied to the reported emission sources in the next IIR. This could be done as an overview table or as information at the beginning of each sectoral chapter, with a clarification on whether the sector is a key source.

Completeness:

55. During the review the ERT noted several problems regarding the following pollutants with "NE" having been used for the entire time series where emissions are likely to occur, and the sector is likely to be a major source of this specific pollutant:

56. Ammonia - NH_3

- 1.A.3.c - Railways,
- 1.A.3.d ii - National navigation
- 1.A.3.e - Pipeline compressors
- 1.A4.c iii - Agriculture/Forestry/Fishing: National Fishing
- 1.A.3.d i (i) - International maritime navigation

57. Zinc - Zn

- 1.A.3.b vi - RT: Automobile tyre and brake wear.

58. Norway has indicated that they would review the sectors for NH3. The ERT welcomes Norway's willingness to look into the NH_3 issues and recommends that they include the result of the evaluation in next year’s reporting. The ERT also recommends that Norway also provide explanatory information on the missing estimates in the NFR tables and the IIR.

Consistency including recalculation and time series:

59. The ERT considers the time series provided with the current submission as consistent. A few issues were noted by the ERT, with one not yet finally solved by the inventory compilers (see Category Issue 2 below).

60. Norway has recalculated its inventory for several mobile sources, presenting all necessary information within the IIR (rationales, years affected, absolute and relative changes in estimates, and effect on trends). The ERT commends Norway’s efforts to transparently display the process of revising their inventory.

Comparability:

61. During the review the ERT noted that within the IIR information is provided on the different sources of activity data used, but unfortunately, no tables with entire time series for consumption data are given to explain and underline developments and trends. In order to improve the inventory's comparability and transparency, the ERT asked Norway to provide time series of sector- and fuel-specific consumption data for the review week and to include such data in the next IIR.

62. Norway forwarded a table to the ERT that included consumption data for all mobile sources that was already reported to the ECE in February 2013. The ERT thanks Norway for the data provided, and encourages them to include these data in its next IIR, recommending that more years should be included in the resulting tables (e.g. for 1990, 1995, 2000, and all years from 2005 onwards) in order to better display recent trends and developments.

63. In addition to the issue discussed above, the ERT has noted that within the IIR it is stated that biofuels (biodiesel, bio-ethanol) are not handled as separate fuels, with the consumption data being included in the corresponding data for gasoline and autodiesel, respectively. Therefore, within the NFR tables, for this and other sectors where the use of biofuels is likely to occur, "NE" has been used.

64. The ERT asked Norway to provide more information on why no separate data has been provided for biofuels and to include it in future NFR tables and, as mentioned above, in future IIRs. Norway stated that such data is available and was submitted during the review, also explaining that biofuels are treated differently in the CLRTAP inventory than in the GHG inventory. As Norway intends to use the GHG approach for air pollutants, the ERT encourages Norway to do so before the next submission, which will improve the inventory's transparency and comparability.

Accuracy and uncertainties:

65. A quantitative uncertainty analysis has been provided at least for activity data, mainly based on studies and expert judgement. For emission factors, depending on the pollutant, quantitative or qualitative uncertainty analysis has been provided depending on the sector. The ERT commends the efforts made to estimate the uncertainty of statistical data and emission factors. The ERT also commends the detailed description of the analysis and its results.

66. As stated in the IIR, the quality and quantity of QA/QC procedures implemented varies between the different mobile sources. Here, the ERT understands that sector specific procedures have been applied to major sources such as road transport or navigation, whereas for minor mobile sources basic procedures have been used. The ERT commends Norway for providing good information on the individual procedures used within the sectoral chapters.

Improvement:

67. The ERT commends the Party for the ongoing improvements planned for the transport sector itself, and also the underlying energy statistics.

Sub-sector Specific Recommendations.

Category issue 1: 1.A.3.b vii - Road Transport: Automobile road abrasion - PM emissions from road abrasion

68. The ERT wondered why PM emissions from road abrasion show an overall declining trend, whereas mileage driven emissions from tyre and brake wear have

steadily increased. The ERT considered the information provided in the IIR on the methodology used for estimating emissions from road abrasion, but asked Norway to further clarify this issue. Norway stated that particulate matter emissions from road abrasion are declining due to the implementation of measures focussing on studded tyres. As a result, the number of cars with studded tyres was reduced both in the cities and all over the country. In addition, the weight of the studs was reduced. Norway underlined that due to these measures, and despite an increasing mileage, the emissions continue to decrease. - The ERT thanks Norway for the answer provided and understands the national circumstances regarding studded tyres. Given these circumstances, the equation used for estimating emissions differs from the tier 2 approach proposed within the 2009 EMEP guidebook (chapter 1.A.3.b.vi Road tyre and brake wear). With the clear correlation between studded tyres and emissions of particles with a rather big diameter, the ERT encourages Norway to further develop the explanations provided for the reducing effect of the restricted use of studded tyres on emissions of PM10 and especially PM2.5.

Category issue 2: 1.A.3.c - Railways - trend of liquid fuels AD

69. During the review, the ERT noted that liquid fuels used in railways show a declining trend over the entire time series 1990-2011, with a sharp drop in consumption after 1995. With no specific information to be found in the 1.A.3.c chapter of the IIR, the ERT asked Norway to provide some information on the overall trend as well as the additional sharp decline. Providing detailed statistical background data, Norway stated that from 1998 consumption figures from the railway company had been used in the energy statistics and emission calculations, whereas for former years figures from the statistics on the sales of petroleum products had been used. Norway has also admitted that currently they are not able to decide whether this sharp drop is due to an actual consumption decrease or an inconsistency in the sales statistics time series. The ERT welcomes this explanation of national circumstances, and requests Norway to further investigate this issue, and provide the background information and explanations in future IIRs.

Category issue 3: 1.A.3.c - Railways - IEF NOx

70. The ERT has noted that emissions follow activity data and that the IEF remains constant for all years. The ERT understands that most railways are powered by electricity. So, assuming that emissions from power generation for railways are located within NFR 1.A.1, the ERT wondered whether there had been no technical changes within the diesel driven railways operated in Norway. Norway confirmed that most Norwegian railway lines have been electrified, with more than 95% of the electricity coming from hydro power. Furthermore, as assumed by the ERT, emissions from electricity production from fossil fuels (mainly gas) are reported in 1.A.1.a. Norway also explained that NOx emissions from the remaining diesel powered engines are calculated using a constant tier1 EF. The ERT thanks Norway for the answer provided, and welcomes the plan proposed by Norway to revise the inventory for off-road motor vehicles.

Category issue 4: 1.A.3.d i(i) - International maritime Navigation - all pollutants: 2011 emissions

71. During the review the ERT asked Norway to provide explanatory information on the extreme peaks for all 2011 emission estimates. Norway admitted that there was an error in the calculation of 2011 emissions for all compounds, and provided corrected figures. The ERT thanks Norway for the explanation and data provided, and recommends that Norway include the corrected estimates in the next NFR submission, as well as explaining the necessary recalculations in the next IIR.

72. INDUSTRIAL PROCESSES

Review Scope

Pollutants Reviewed		SOx, NOx, NMVOC, NH_3, PM_{10} & $PM_{2.5}$, Pb, Cd, Hg, POPs		
Years		1990 – 2011		
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		NA, NE	
2.A.5	asphalt roofing		NA, NE	
2.A.6	road paving with asphalt		NA, NE	
2.A.7.a	Quarrying and mining of minerals other than coa	x		
2.A.7.b	Construction and demolition		x	
2.A.7.c	Storage, handling and transport of mineral products		NA, IE	
2.A.7.d	Other Mineral products (Please specify the sources included/excluded in the notes column t the right)	x		
2.Bb.1	ammonia production		NA, NE	x
2.B.2	nitric acid production	x		
2.B.3	adipic acid production		NO	
2.B.4	carbide production	x		
2.B.5.a	Other chemical industry (Please specify the sources included/excluded in the notes column t the right)	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)		NE	
2.C.1	iron and steel production	x		
2.C.2	ferroalloys production	x		
2.C.3	aluminium production	x		
2.C.5.a	Copper Production		NA, IE, NE	
2.C.5.b	Lead Production		NA, IE, NE	
2.C.5.c	Nickel Production		NA, IE, NE	
2.C.5.d	Zinc Production		NA, IE, NE	
2.C.5.e	Other metal production (Please specify the sources included/excluded in the notes column t the right)		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)		NA, IE	
2.D.1	pulp and paper	x		
2.D.2	food and drink	x		x

2.D.3	Wood processing		NA, NE	
2.E	production of POPs		NA, NE	
2.F	consumption of HM and POPs (e,g. Electrical ar dscientific equipment)		NA, NE	
2.G	Other production, consumption, storage, transportation or handling of bulk products (Please specify the sources included/excluded i the notes column to the right)		NA, 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:

73. The Norwegian IIR is clear and informative, and gives a good overview of each source sector and the methodology used to estimate emissions. The ERT commends Norway for their good work on the IIR.

Completeness:

74. The ERT notes that emissions of individual PAH species are not estimated for any source categories, and recommends that Norway includes emission estimates in all future submissions. The ERT also noted that Ni, Se and Zn are not reported. The ERT recognise that reporting emissions of these pollutants is voluntary, and therefore encourages Norway to include emission estimates for these pollutants in all future submissions.

75. For other pollutants, NE is not used for many sources, which suggests a high level of completeness. However, there are instances where NA is used for sources where emissions might be expected (e.g. particulate matter emissions from 2.A.4). The ERT considers that NO or NE would be more appropriate in some cases. The ERT encourages Norway to review the use of notation keys, especially the use of NA where this is not already given as a default in the reporting template, and to implement improvements in time for the next submission, to improve both the completeness and transparency.

Consistency including recalculation and time series:

76. The ERT has not identified any issues related to the consistency of the Norwegian submission. The IIR does not contain any discussion of trends, and only limited comments on factors driving changes (such as closures, economic factors and abatement), and the ERT encourages Norway to increase the level of detail that is included in the IIR.

77. Norway makes use of both default emission factors from the EMEP/EEA Guidebook and operator-reported site-specific emissions data. These methods are consistent with the guidance provided in the EMEP/EEA Guidebook.

Comparability:

78. Norway reports its emissions from industrial processes using the most up to date version of the NFR reporting templates. Also, the IIR chapter on industrial process emissions generally follows the guidance provided in the Reporting Guidelines in terms of structure and content. As a result the submission from Norway is considered readily comparable with other national inventory submissions.

Accuracy and uncertainties:

79. Norway has provided a quantitative uncertainty analysis for NOx, SOx NMVOC and NH_3 at the national level and also gives information on assumptions made at the sectoral level. Uncertainty in the heavy metal and POPs inventories is discussed in broad, qualitative terms at national level. No information is given on particulate matter or CO, and the ERT recommends that Norway include some assessment for these additional pollutants in their next submission.

80. The ERT commends Norway for including uncertainty assessments for point source data. The ERT recognises that it can be difficult to assess the quality of a Party's point source data as a constituent part of the review process, and so this information is considered to be particularly valuable.

Improvement

81. Norway has included planned improvements in the IIR (Section 10.2), although no improvements are given for the industrial processes sector.

82. Due to the extensive use of facility-level data, and the high level of completeness, it is possible that no improvements for the industrial process sector are considered important enough to give them priority at this point in time. The ERT encourages Norway to include some text on industrial processes in Section 10.2, even if this is only to confirm that "no improvements are considered necessary at this time". This would improve the transparency of the IIR.

Sub-Sector Specific Recommendations.

Category issue 1: 2.B.1 Ammonia Production

83. The notation key reported in NFR table 1 for 2.B.1 for NH_3 (“NE”) is not consistent with the one reported in Table 4.6 of the IIR (“NA”). Norway has confirmed that the NK should be NA in both cases, and have undertaken to correct this for the next submission. The ERT welcomes this correction, and recommends that it is undertaken before the next submission. Category issue 2: 2.B.5 Other Chemical Industry

Category issue 2: 2.D.2 Food and Drink

84. The ERT noted that the NMVOC emissions reported for NFR category 2.D.2 Food and Drink did not include emissions from spirits manufacture. In response to a question from the ERT during the review week, Norway explained that emissions from spirit manufacture are considered insignificant (for example, emissions in 2011 were estimated to be 20 tonnes). The ERT recommends that Norway include this

information in the IIR in time for the next submission to improve the level of transparency.

SOLVENTS

Review Scope

Pollutants Reviewed		SO_x, NOx, NMVOC, NH_3, PM_{10} & $PM_{2.5}$		
Years		1990 – 2006 + (Protocol Years)		
NFR Code	**CRF_NFR Name**	**Reviewed**	**Not Reviewed**	**Recommendation Provided**
3.A.1	Decorative coating application		x	
3.A.2	Industrial coating application		x	
3.A.3	Other coating application (Please specify the sources included/excluded in the notes column to the right)		x	
3.B.1	Degreasing		x	
3.B.2	Dry cleaning		x	
3.C	Chemical products,		x	
3.D.1	Printing		x	
3.D.2	Domestic solvent use including fungicides		x	
3.D.3	Other product use		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.				

No Solvents experts were available for the review.

AGRICULTURE

Review Scope:

Pollutants Reviewed		SOx, NOx, NMVOC, NH_3, PM10 & $PM_{2.5}$,		
Years		1980 – 2011		
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		
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		
4 D 2 a	Off-farm storage, handling and transport of bulk agricultural products	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		
4 F	Field burning of agricultural wastes	X		X
4 G	Agriculture other(c)	X		X
11 A	(11 08 Volcanoes)			
11 B	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

85. The agriculture inventory submission 2013 of Norway includes emissions for the 1980 – 2011 time series. Norway estimated agricultural emissions for manure management (4B), agricultural soils (4D1). Emissions related to field burning of agricultural wastes (4F) and agriculture other (4G) have also been reported. Only emissions of NH_3 were reported from 4B and 4D1. The ERT encourages Norway to estimate PM_{10} and $PM_{2.5}$ and other relevant pollution emissions from these sub-categories. The ERT also encourages Norway to estimate pollutant emissions from (4F) and (4G), which are currently reported as not estimated “NE”, in time for the next submission.

86. The ERT recommends that Norway provide improved detailed information and analysis of the emission trends in the IIR, by including more diagrams of different sub-categories in order to improve the quality of reporting and enhance the transparency of the agriculture sector in time for the next submission.

Transparency:

87. Norway's IIR contains good descriptions of the activity indicators, data sources and methodologies. The ERT encourages Norway to provide more detailed information in the IIR to enhance the transparency of its emission inventory.

Completeness:

88. The ERT is of the view that Norway's agricultural inventory (submission 2013) is generally complete with respect to the most important sources of pollutants released from the agriculture sector. Only NH_3 emissions were estimated from 4B and 4D. The ERT encourages Norway to consider including more relevant pollutants such as NOx, PM_{10} and PM2.5 from these sub-sectors in future submissions to further enhance the completeness of the inventory.

89. The ERT considers that the use of notation keys in the NFR tables, especially for 4B and 4D, can be further improved. The ERT has noted that Norway has used the notation key not applicable "NA" for reporting NOx, and PM emissions from 4B manure management and 4D1 synthetic fertilizer application, although Tier 1 emission factors are available in the EMEP/EEA emission inventory Guidebook 2009. The ERT recommends that Norway report these emissions as not estimated "NE" or even better, estimate these emissions in order to enhance the completeness of the inventory.

Consistency including recalculation and time series:

90. Emission data from the agricultural sector is generally consistent over the time series. The ERT commends Norway for the consistency of its agricultural inventory and encourages the Party to keep its inventory consistent for the main pollutants emissions and other relevant pollutants in the future.

Comparability:

91. The ERT acknowledges the efforts undertaken by Norway to develop a country specific model of NH3 emissions from agricultural sources, and commends them for their work. The ERT encourages Norway to continue with this approach and use methodologies that refer as far as possible to the international guidance provided in the EMEP/EEA Emissions Inventory Guidebook.

Accuracy and uncertainties:

92. The ERT has noted that Norway has sector specific systems in place within the national system, which govern sector specific QA/QC roles. The ERT commends Norway for their thorough QA/QC systems, and encourages them to continue to use these procedures in future submissions.

Improvement:

93. The ERT has noted that Norway has undertaken a number of improvements in the agricultural sector such as, 4B Liquid systems, 4B Solid storage and dry lot and 4D2 Pasture range and paddock. Norway has also listed a number of planned improvements such as a better documentation of the national Norwegian NH3 model and updating activity data on manure storage and management. The ERT commends Norway for these improvements and encourages them to continue working on this in order to enhance the quality of the emission inventory.

94. The ERT has noted that Norway has carried out a large body of development work with respect to the national emissions model for NH3. The ERT acknowledges Norway's efforts in delivering improvements to the calculation model for NH3 emissions, in particular those for sector 4B Manure Management and 4D1 Direct Soil Emissions. The ERT encourages Norway to continue improving the emissions calculations of this sector.

Recalculations:

95. The ERT has recognised that Norway has undertaken recalculations for the agricultural sector. For example, emission factors for nitrogen excretion from domestic animals have been updated which gave a net increase of estimated nitrogen in manure. Moreover, the data sources for young cattle and animals for slaughter have been updated. The ERT encourages Norway to provide similar information in relation to any future recalculations in its IIR submissions.

Sub-sector Specific Recommendations.

Category issue 1: 4.B Manure management: Activity data

96. The ERT noted that the activity data (animal numbers) reported in the IIR/NFR is not consistent with the National Inventory Report/Common Reporting Format (NIR/CRF) for the GHG inventory. The ERT requested that Norway provides an explanation for this discrepancy. During the review week Norway acknowledged this discrepancy and indicated that the correct time series of animal numbers would be provided in the next submission. The ERT recommends that Norway harmonise the activity data in order to ensure consistency between the two inventories.

Category issue 2: 4.B1a (dairy cattle) and 4B1b (non-dairy cattle): AD and NH3 emission

97. The ERT has noted that the population of 4B1b (non-dairy cattle) has decreased by about 13% while the emission of NH_3 has increased by 33% between 1990 and 2011. During that period, emission of NH_3 from 4B1a (dairy cattle), and population number have decreased by 11% and 13%, respectively. The ERT requested Norway during the review week to explain these opposing trends. Norway provided the ERT with a revised table of animal population data and urine-nitrogen factors. Based on this, the non-dairy cattle population has decreased by about 3% (from 363,033 in 1990 to 350,941 in 2011). Norway explained that the reason for the increase in emissions of NH_3 from 4B1b (non-dairy cattle) - despite the decrease in the population number - was due to an increase in the urine-nitrogen factor per animal. The ERT recommends that Norway enhance the QA/QC procedure for the

agricultural sector with respect to the AD used in emission calculations. The ERT also recommends that Norway include a detailed description of methodologies used in its IIR and includes supporting documentation to enhance the transparency of the agricultural inventory in their next submission.

Category Issue 3: 4.B 4 (Goats) and 4B 8 (Swine): Notation keys, AD and NH3 emission

98. The ERT noted that Norway has used the notation key not applicable "NA" to describe the activity data of 4B 4 (Goats) and 4B 8 (Swine), while reporting NH3 emission estimates for these animals. During the review week, Norway explained that the reported populations for goats and swine are incorrect and would be corrected with the next submission, and also provided the ERT with the correct time series for the animal population data used for the NH_3 estimates. The ERT recommends that Norway enhance the QA/QC procedure for the agricultural sector, in order ensure correct reporting of the activity data in its next submission.

WASTE

Review Scope:

Pollutants Reviewed		All pollutants		
Years		1990 – 2011		
NFR Code	CRF_NFR Name	Reviewed	Not Reviewed	Recommendation Provided
6.A	solid waste disposal on land			x
6.B	waste-water handling			x
6 C a	6 C a Clinical waste incineration (d)	x		
6 C b	Industrial waste incineration (d)	x		
6 C c	Municipal waste incineration (d)	x		
6 C d	Cremation	x		x
6 C e	Small scale waste burning	x		x
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.

99. The ERT commends Norway for the transparency of the Informative Inventory Report but noted that the waste sector could be improved in terms of completeness. Details are provided in the sections below.

Transparency:

100. The ERT considers the IIR to be very transparent and commends Norway for the detailed descriptions provided in the IIR.

Completeness:

101. The ERT has noted that there are a number of sources where Norway reports a notation key, rather than emissions e.g. with 6B Wastewater Handling, 6A Solid Waste Disposal, and 6Ce Small Scale Waste Burning. Norway explained that emissions from 6A Solid Waste Disposal on Land and 6B Wastewater handling are insignificant on the national scale. However, the ERT notes that e.g. in the UK emissions inventory, NMVOC emissions from Solid Waste Disposal on Land have accounted for approximately 4% of the national total in recent years, Wastewater Handling for ~2% of the NH_3 national total, and Small Scale Waste Burning for ~15% of the dioxin/furan national emissions total.

102. The ERT encourages Norway to review the completeness of their emissions inventory, and makes some sector specific recommendations in the sections below.

Consistency, including recalculation and time series:

103. The ERT considers the emissions inventory data reported to be consistent, and also considers the NFR tables to be consistent with the IIR.

Comparability:

104. Norway has prepared the waste inventory in accordance with the recommendations given in the EMEP/EEA Emissions Inventory Guidebooks, and also uses the most up to date versions of the reporting templates for their inventory.

Accuracy and uncertainties:

105. The ERT considers the inventory to show an acceptable level of accuracy. However, the ERT has also noted some issues relating to completeness which have an impact on accuracy (see below).

Improvement:

106. Further improvements are not mentioned in Norway's IIR. The ERT encourages Norway to implement improvements that would address the sector specific issues identified below that relate to completeness.

Sub-Sector Specific Recommendations.

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

107. Norway does not calculate NMVOC or NH_3 emissions from solid waste disposal. The ERT recommends that Norway calculate NMVOC emissions from Solid Waste Disposal on Land, include them in the inventory and report them in the IIR of the next submission.

Category Issue 2: 6.B Waste-water handling

108. Norway does not estimate emissions from wastewater handling. The ERT recommends that Norway use the EMEP/EEA Guidebook to estimate emissions of NH3 from wastewater handling (for example by estimating the fraction of the population using latrines to determine the wastewater handling systems).

Category Issue 3: 6.C.d - Cremation

109. The ERT considers the methodology for estimating emissions from cremation to follow good practice. However, the ERT recommends that Norway investigate the average body weight (60 kg) that is assumed and present information in the IIR on the source of this weight.

Category Issue 4: 6.C.e – Small scale waste burning

110. Norway does not calculate emissions from small scale waste burning, using the notation key "NE". Whilst recognising the challenges in obtaining reliable data for emission estimates from this source, the ERT recommends that Norway estimate emissions from this source and include them in the next submission.

Category Issue 5: 6.D - Other waste

111. Norway does not calculate in this sector NMVOC emission from compost production and NOx from sludge spreading. The ERT encourages Norway to calculate emissions from these activities, and include them in the next submission.

LIST OF ADDITIONAL MATERIALS PROVIDED BY THE COUNTRY DURING THE REVIEW