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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
DENMARK

CONTENT

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 SO_2, NOx, NMVOC, NH_3, plus PM_{10} & $PM_{2.5}$ for the time series years 1990 – 2012, 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 Denmark coordinated by the EMEP emission centre CEIP acting as review secretariat. The review took place from 23rd June 2014 to 27th June 2014 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 – Kristina Saarinen (Finland), Energy – Garmt Jans Venhuis (the Netherlands), Transport - Michael Kotzulla (Germany), Industry – Guillaume Jacquier (France), Solvents – Ils Moorkens (the Netherlands), Agriculture + Nature – Michael Anderl (Austria), Waste – Intars Cakars (Latvia).

4. Kristina Saarinen 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 inventory is generally in line with the EMEP/EEA Air Pollutant Emission Inventory Guidebook and the UNECE Reporting Guidelines. Transport sector emissions are calculated on the basis of fuels sold. The ERT considers the Danish inventory to be sufficiently detailed and notes that national methodologies have been used where possible.

6. The ERT recognises the level of effort undertaken by Denmark in providing an inventory with a significant level of detail, enabling an in-depth review.

7. Recalculations have, for the most part, been carried out consistently throughout the time series and justifications have been provided in the IIR.

8. According to the results of the Stage 2 review, the Danish submissions under the CLRTAP, the NECD and the UNFCCC are not fully consistent.

9. The 2014 submission shows improvements in a number of issues, including updates due to improved statistics and emission factors in the emission estimates, for instance in the Energy sector. Areas for further improvements related to the transparency, completeness and consistency of the inventory are explained below.

INVENTORY SUBMISSION

10. Denmark submitted the inventory under the NECD on 20th December 2013, within the deadline of 31st December. The inventory was submitted in NFR09 (Version 2009-1) for the years 1980 - 2012 (the latest year) for NOx, SOx, NMVOC and NH3 and included projections for 2015, 2020 and 2030. The submission did not include an Informative Inventory Report (IIR).

11. Denmark submitted the inventory under the UNECE CLRTAP on 13th February 2014, within the deadline of 15th February. The inventory was submitted in NFR09 (Version 2009-1) and included a full NFR 1980 - 2012 time series for SOx, a full 1985 - 2012 time series for NOx, NMVOC, NH_3 and CO, a full 1990-2012 time series for all air pollutants other than particles and a full 2000-2012 time series for particles (PM_{10}, $PM_{2.5}$, and TSP). The submission included projections for NOx, SOx, NMVOC, NH_3, $PM_{2.5}$ and PM_{10} in 2015, 2020 and 2030. A detailed Informative Inventory Report (IIR) was submitted on 15th March 2014, within the deadline of 15th March, and resubmitted on 26th March 2014. The submission also included an application for adjustments for NH_3. Gridded data and LPS data for 2005 and 2010 were included in the 2012 submission.

12. The ERT found the inventory submitted by Denmark to be of high quality and in general well documented in the Informative Inventory Report (IIR). Due to the good quality of the IIR and the Party's responsiveness, the ERT was able to review the inventory in detail and provide a number of detailed recommendations.

KEY CATEGORIES

13. Denmark states in the IIR that no Key Category Analysis has been carried out for this submission due to a lack of resources. In the review, the ERT used the results of the level Key Category Analysis performed by the CEIP.

14. According to the Reporting Guidelines, Parties should identify in their IIR national key categories as described in the Guidebook for the base year and the most recent inventory year. For sources that are determined to be key categories in accordance with the Guidebook, Parties should make every effort to use a higher-tier (detailed) methodology, including country-specific information and focus the available resources for improvements in data and methods on categories identified as key categories. The ERT recommends that Denmark performs a Key Category Analysis and uses the results of the analysis to prioritise improvements in the inventory. In addition, for the purpose of the review, the ERT finds it useful if pollutants for which the source is a key category are indicated in the IIR at the beginning of each sub-sector chapter.

QUALITY

Transparency

15. The ERT recognises the level of effort undertaken by Denmark in providing an inventory of with a significant level of detail to undertake a detailed review.

16. The IIR of Denmark is comprehensive and transparent. The assumptions made in the calculations are mainly documented, external information sources clearly referenced and fluctuations in data generally well explained. Some areas for further improvements are presented in the sector chapters below. The ERT commends Denmark on the thorough work.

17. Together with the presentation of the methodologies for the Energy and Transport sectors, Denmark has provided estimates at the most detailed level. However, the ERT found it difficult to fully assess the information related to the applied methodologies and considers that the transparency of the current presentation, structured by subject (methodology, activity data, emissions, etc.), could be substantially improved by reorganising the information by NFR category. The ERT also notes a lack of some source-specific information on issues affecting the emission trends and assumptions made in the calculations, as explained in the Transport sector. The ERT recommends that Denmark further improves the usefulness of the IIR for reviews by including the pieces of information provided to the ERT during the review in the IIR, and by further organising the information in the IIR by NFR categories.

18. The use of notation keys is explained in the IIR Annex 3 and partly in the “Additional Info” sheet of the NFR table for the latest year. The ERT noted some inaccuracies in the use of notation keys as explained in the sector chapters below

(Energy, Transport, Industrial Processes and Waste sectors, as well as for some AD in the NFR table). The ERT recommends that Denmark checks the use of these notation keys.

19. Denmark provides clear documentation on sources reported as not estimated (NE) in the IIR. The ERT commends Denmark on this.

20. Denmark reports emissions from some sources in the Transport and Industrial Processes sectors as included elsewhere (IE). The ERT encourages Denmark to investigate possibilities for reporting combustion and process emissions separately.

21. The IIR provides general explanations for the emissions trends. However, the ERT found that for the purposes of the review, more detailed information on drivers influencing the emission levels is needed to enable understanding the development of the emissions over time. The ERT recommends that Denmark further improves the transparency of the emission trends by including this information in the IIR.

Completeness

22. The ERT acknowledges the effort to which Denmark has gone to provide estimates of emissions for all sub-sectors and all pollutants reviewed. The ERT commends Denmark for the comprehensive information on the completeness of the inventory in Annex 3 of the IIR. The ERT found the inventory to be generally complete in terms of years, sectors, pollutants and geographical coverage.

23. Denmark reports some pollutants as not estimated (NE) in the Industrial Processes, Agriculture and Waste sectors, such as for quarrying and mining of minerals other than coal, construction and demolition, storage, handling and transportation (mineral, chemical and metal products), pulp and paper production, and wood processing. To the question raised by the ERT Denmark replied that they had not made an assessment of the magnitude of possible emissions from these sources. The ERT recommends that Denmark assesses the importance of these sources for Danish emissions and estimates emissions where emission levels are not considered to be negligible, and that it includes further information in the IIR on the reasons why they are reported as NE.

Consistency, including recalculations and time series

24. The ERT found the inventory to be generally consistent over the time series.

25. Denmark has recalculated emissions in the Energy, Transport, and Industrial Processes sectors since the last submission and provided justifications for most of the recalculations and information of their impact on emissions in the IIR. Explanations for some outliers identified by the ERT are generally well explained in the IIR: However, the ERT recommends that Denmark further improves documentation on inconsistencies in the Industrial Processes and Solvent sectors and corrects the errors identified in the time series in the Industrial Processes sector.

Comparability

26. The ERT notes that the inventory of Denmark is comparable with those of other reporting parties. The methodologies used in the inventory are consistent with the EMEP/EEA Guidebook and the allocation of source categories follows that of the EMEP/UNECE Reporting Guidelines. The ERT encourages Denmark to continue providing comparable inventory data.

CLRTAP/NECD comparability

27. According to the results of the Synthesis and Assessment (Stage 2 review) of annual inventory submissions carried out by the CEIP, the Danish submissions under the CLRTAP, the NECD and the UNFCCC are not fully consistent, especially for NMVOC and NH_3 emissions, where the differences vary between 1.5-2.5% and 6.3-13%, respectively. To the question raised by the ERT during the review Denmark replied that the differences originated from the different timings of submissions that allow for errors to be corrected in GHG reporting due to the later reporting deadline, and that some larger differences originated from the fact that emissions from growing crops (NMVOC and NH_3) are not reported under the NECD. The ERT recommends that Denmark documents the reasons behind the inconsistencies identified in the IIR and improves the consistency of emissions reported under the different international conventions, where possible, and also encourages Denmark to resubmit the revised inventories to improve the consistency of internationally reported data.

Accuracy and uncertainties

28. The Danish inventory is detailed and mainly calculated at Tier 2 level. The ERT noted the extensive use of country-specific methods in the calculation of emissions from several source categories. In the Industrial Processes and Energy sectors Denmark also uses plant-specific data to develop emission factors and Denmark also includes emission data reported by plants in the inventory for some sectors. The ERT commends Denmark for the detailed level of the methodologies used in the inventory and encourages it to continue with this approach. The ERT did not identify any systematic under- nor over-estimations.

29. Denmark has performed a Tier 1 uncertainty analysis using the methodology presented in the EMEP/EEA Guidebook and reported it in the IIR. To the question raised by the ERT on whether Denmark considers undertaking a Tier 2 uncertainty analysis, Denmark replied that there are no plans to implement a Tier 2 uncertainty analysis for air pollutants given the resources that would be required for this work. However, Denmark provides detailed uncertainty values for the Agriculture sector for all air pollutants and source categories that are reported. The ERT encourages Denmark to implement a Tier 2 uncertainty analysis and to use the results to prioritise improvements in the inventory. The uncertainty analysis is also used in inventory reviews to assess the accuracy of the estimates at source category level.

30. The ERT noted some minor errors in the Transport and Industrial Processes sectors of the inventory as explained in the sector chapters below, and recommends that Denmark corrects these in the next inventory.

31. Denmark includes information about source category-specific planned improvements in most of the NFR sector-specific chapters of the IIR. The ERT recommends that Denmark includes paragraphs on planned improvements also in the Transport and Solvent Use sectors of the IIR.

Verification and quality assurance/quality control approaches

32. The Danish IIR provides information on the QA/QC and verification procedures performed during the preparation of the inventory. Denmark also indicates in the IIR that the QA/QC system for the Danish greenhouse gas inventory operated in accordance with the UNFCCC and IPCC guidelines and ISO standards partly covers air pollutants (i.e. SOx, NOx, NMVOC and CO) reported under the UNECE CLRTAP. In addition, the same activity data which is covered by the GHG QA/QC system is widely used in both inventories. However, there is no formal QA/QC plan for the air pollution inventory. To the question raised by the ERT on the kind of checks carried out on air pollutants or sources not included under GHG reporting, Denmark replied that sector experts carry out checks at the different phases of inventory preparation but that these are not described in detail and not documented in the IIR, except for the brief descriptions of sector QC activities. The ERT welcomes the explanation provided by Denmark. The ERT also recommends that Denmark check whether there may be any AD not covered by UNFCCC/EU reporting and establish a quality system for these, as well as selecting and updating methodologies used for the other air pollutants not covered by GHG reporting. The ERT also encourages Denmark to provide further information on the source-specific QA/QC procedures in the IIR to fully reflect the good quality of the inventory.

33. Denmark uses data reported by the plants for comparison in the inventory and also includes emission data reported by the plants to an increased extent in the inventory. The ERT welcomes this effort. To the question raised by the ERT on QA/QC activities for bottom-up data not only used for comparison but actually included in the inventory, Denmark replied that the time series of the reported emissions is checked taking into account changes in activity data, that outliers are identified and further investigated in environmental reports and, if necessary, solved in cooperation with the relevant companies. The ERT commends Denmark for its QA/QC work on bottom-up data and recommends that Denmark includes this information in the IIR.

34. The ERT notes that the Danish IIR describes verification procedures carried out for some source sectors (stationary combustion, cement production, some industrial processes, agriculture) and that the IIR refers to the verification carried out for data used in the Danish greenhouse gas inventory (Fauser et al 2007 and 2013). The ERT commends Denmark for this work and encourages Denmark to include more air pollutant sources in the verification processes.

FOLLOW-UP TO PREVIOUS REVIEWS

35. The ERT commends Denmark for implementing many of the recommended improvements since the last Stage 3 review in 2009, including the implementation of NFR09 source categories, the structuring of the IIR according to the outline provided in the Reporting Guidelines, giving explanations for time-series consistency and using bottom-up data. Denmark has also made some improvements to the information provided on the QA/QC activities in the IIR.

36. The ERT found that the following recommendations from the previous review are still pending: missing explanations for the differences between the CLRTAP and NECD submissions, implementation of a key category analysis still pending, missing information on the use of uncertainty analysis results (to focus on key category improvements). Denmark does not include these cross-cutting issues in its list of planned improvements. The ERT recommends that Denmark carries out these improvements to further improve the accuracy and transparency of the inventory.

AREAS FOR IMPROVEMENTS IDENTIFIED BY DENMARK

37. The IIR identifies several areas for improvement. These include:

(a) Energy: documentation of emission factors; uncertainty estimates at NFR category level using country-specific UC values for some of the main emission sources; estimation of emissions from the storage of fuels in tank facilities when data becomes available.

(b) Industrial processes: inclusion of emissions from NFR 2.A.7.a-c sectors where resources are available; time series for the production of yellow bricks; extension of the time series for clay products to include 1980-1989 emissions; completing the time series for chemical, metal and other production processes; new emission factors for the latest years for secondary aluminium and zinc production; study on the relevance of emissions from wood, wine and yeast production, smokehouses and from the Other Industrial Processes sector.

(c) Agriculture: inclusion of NMVOC emissions from livestock production in the next submission; implementing the effect of reduction technologies of NH_3 emissions in housings where data are available; inclusion of dust emissions from arable farming; comparison of inventory calculations with data from other institutions and organisations; and implementing a QA procedure for the inventory when resources become available.

PART B: RECOMMENDATIONS FOR IMPROVEMENTS TO THE PARTY

CROSS-CUTTING IMPROVEMENTS IDENTIFIED BY THE ERT

38. The ERT identifies the following cross-cutting issues for improvement:

(a) Perform a Key Category Analysis and use the results of the analysis to prioritise improvements in the inventory;

(b) Implement a Tier 2 uncertainty analysis and use the results to prioritise improvements in the inventory.

(c) Assess the importance of sources reported as NE for Danish emissions and estimate emissions where emission levels are not considered to be negligible, document reasons why they are reported as NE.

(d) Correct the use of some notation keys and errors in the calculations, estimate missing emissions or review the methodology in the Energy (paras 46, 48), Transport (para 57), Industrial Processes (paras 62, 68, 69, 70, 71, 72, 73, 74, 75), Agriculture (para 85, 89, 96, 97) and Waste (paras 105, 106, 107) sectors.

(e) Further improve the transparency of the IIR by:
- improving documentation in the Energy (para 47), Transport (paras 49, 55, 56), Industrial Processes (para 66), Solvent Use (para 76), Agriculture (paras 90, 91, 95) and Waste (para 107) sectors;
- further organising the information in the IIR by NFR categories;
- providing explanations for inconsistencies and fluctuations in emissions, specifically in the Energy (para 54), Transport (para 52), Solvent Use (para 77), Agriculture (paras 83, 93) and Waste (para 100) sectors;
- including information on planned improvements to all NFR categories

(f) Establish QA/QC procedures for AD not included in the GHG inventory and for procedures to select and update methodologies used for the other air pollutants not covered by GHG reporting, and include information on the current QA/QC practices in the IIR.

(g) Provide explanations in the IIR for any differences between data reported under the UNECE CLRTAP, EU NECD and UNFCCC.

SECTOR SPECIFIC RECOMMENDATIONS FOR IMPROVEMENTS IDENTIFIED BY ERT

ENERGY

Review Scope

Pollutants Reviewed		SO_2, NOx, NMVOC, NH_3, PM_{10} & $PM_{2.5}$		
Years		1990 – 2006 + (Protocol Years)		
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		X
1.A.2.c	chemicals	X		X
1.A.2.d	pulp, paper and print	X		X
1.A.2.e	food processing, beverages and tobacco	X		
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:		X	
1 A 3 e	Pipeline compressors	X		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		
1.B.1.b	solid fuel transformation	X		
1.B.1.c	other fugitive emissions from solid fuels)	X		X
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		
1 B 2 b	Natural gas	X		
1 B 2 c	Venting and flaring	X		
1 B 3	Other fugitive emissions from geothermal energy production , peat and other energy extraction not included in 1 B 2	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:

39. Denmark has provided estimates at the most detailed level for all Energy sector categories. The methodology and emission factors presented in the IIR are considered by the ERT to be transparent and well described. However, the ERT notes that the transparency of the current presentation, structured by subject (methodology, activity data, emissions, etc.), could be substantially improved by organising the information by NFR category. The ERT also encourages Denmark to include the information provided in response to questions raised by the ERT during the review in the Energy sector chapters in future IIRs (see Sub-sector Specific Recommendations).

Consistency including recalculation and time series

The ERT considers the inventory and the time series provided to be consistent.

Completeness:

40. The ERT considers the Energy sector inventory to be complete in terms of sources, pollutants and years.

Comparability:

41. The ERT notes that the inventory of Denmark is comparable with those of other reporting parties. The allocation of source categories follows that of the EMEP/UNECE Reporting Guidelines. The ERT commends Denmark for following the methodology provided in the EMEP/EEA Guidebook for the Energy sector and for providing completed NFR tables with a minimal use of notation keys. The ERT encourages Denmark to continue providing comparable inventory data.

Accuracy and uncertainties:

42. The ERT commends Denmark for its thorough quality work in the Energy sector and for providing information on general QA/QC procedures in its IIR. The ERT recommends that Denmark provides information on the QA/QC procedures specific to the Energy sector and implements the planned upgrade of the uncertainty estimates based on the main SNAP categories in the estimates based on NFR categories.

Improvement:

43. The ERT notes that Denmark has improved the Energy sector inventory due to improved statistics and new emission factors and has also planned a number of improvements for the stationary combustion inventories. Denmark plans to further improve reporting of, and referencing, applied emission factors. Denmark also plans to improve its uncertainty estimates. The current uncertainty estimates are based on the main SNAP categories and default uncertainties. The source categories will be changed to NFR categories and country-specific uncertainty estimates included for some of the main emission sources. The ERT commends Denmark on having implemented most of the recommendations of the previous review - or on including them in the list of future improvements - and encourages Denmark to continue describing planned improvements in the IIR.

Sub-sector Specific Recommendations.

Category issue 1: 1.A.2.a, 1.A.2.b, 1.A.2.c, 1.A.2.d: Industry – Activity Data

44. In the NFR table for 2012 Denmark reports, for some sub-sectors, activity data (fuels) as IE. To the question raised by the ERT about this issue Denmark responded that the notation key should be “NO”, as there is no fuel consumption for these specific combinations of fuel/sector. The ERT recommends that Denmark corrects the NRF table in the next submission.

Category issue 1: 1.B.2.a.i: Exploration, production, transport - All pollutants

45. From the IIR it is not entirely clear which methodologies have been used for key category 1.B.2.a.i. To the question raised about this issue Denmark responded that emissions reported in the category cover several different activities: extraction of oil and gas, loading onshore and offshore and transport and storage of crude oil. For some of the sources the EFs are country-specific or plant-specific, while for some other sources they are regional (i.e. Norwegian EFs that correspond to Tier 3 EFs of the EMEP/EEA Guidebook). According to the reply from Denmark, emissions from extraction and loading are based on the Tier 3 methodology from the EMEP/EEA Guidebook (Chapter 3.4.2). The calculation of emissions from oil transport/storage is based on a Tier 3 methodology: for later years, on specific information from the operator, i.e. “plant-specific” EFs and for the earlier years on the Tier 3 methodology from the Guidebook Chapter 3.4.2. The ERT recommends that Denmark includes information on these methodologies in the IIR.

Category issue 3: NFR 1.A.3.e reported as 'NO' (not occurring)

46. During the previous review, Denmark stated that emissions from this sector were included under NFR 1.A.1.c due to a lack of information in the energy statistics and that this information would be included in the IIR submission 2010, indicating that pipeline compressors do exist in Denmark, but that specific AD are not available. To the question raised by the ERT about using 'NO' (not occurring) for NFR 1.A.3.e in the latest NFR tables and in the IIR (Table 3.1.1), Denmark replied that, with respect to information provided by the DGC (Danish Gas Technology Centre), all compressors installed onshore in Denmark are electric and that this knowledge was not available during the previous inventory submissions. Given the Party's response, the ERT considers the use of the notation key 'NO' as inappropriate and recommends that Denmark uses the notation key 'NA' for this source and provides relevant information in both the IIR and the 'Additional info' sheet of the NFR table.

TRANSPORT

Review Scope

Pollutants Reviewed		SO_2, NO_x, NMVOC, NH_3, PM_{10} & $PM_{2.5}$		
Years		1990 – 2006 + (Protocol Years)		
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		x
1.A.3.a.ii.(i)	civil aviation (domestic, LTO)	x		
1.A.3.a.ii.(ii)	civil aviation (domestic, cruise)	x		x
1.A.3.b.i	road transport, passenger cars	x		x
1.A.3.b.ii	road transport, light duty vehicles	x		
1.A.3.b.iii	road transport, heavy duty vehicles	x		
1.A.3.b.iv	road transport, mopeds & motorcycles	x		
1.A.3.b.v	road transport, gasoline evaporation	x		x
1.A.3.b.vi	road transport, automobile tyre and brake wear	x		
1.A.3.b.vii	road transport, automobile road abrasion	x		
1.A.3.c	railways	x		
1.A.3.d.i (ii)	international inland navigation	x		
1.A.3.d.ii	national navigation	x		
1.A.4.b.ii	household and gardening (mobile)	x		
1.A.4.c.ii	off-road vehicles and other machinery	x		
1.A.4.c.iii	national fishing	x		
1.A.5.b	other, mobile (including military, land based and recreational boats)	x		
1.A.3.d i (i)	international maritime navigation	x		
1.A.3	Transport (fuel used)		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:

47. The ERT commends Denmark on the level of transparency and detail provided in the NFR tables and in the IIR, especially regarding documentation on road transport. The methodology and emission factors presented in the IIR are transparent and well described. However, the ERT feels that the transparency of the current presentation, structured by subject (methodology, activity data, emissions, etc.) could be substantially improved by organising the information by NFR category. For those cases where the information is not provided on NFR09 level but on a more aggregated level (i.e. for NFRs 1.A.3. 4 and 5) the ERT found it difficult to fully assess the information related to the tier levels and trend descriptions of the methodologies applied. The ERT recommends that Denmark provides information on a fully disaggregated NFR level in future IIRs.

Completeness:

48. The ERT considers the Transport sector and the other sub-sectors (NFRs 1.A.2, 1.A.4 and 1.A.5), which include mobile sources, to be complete in terms of the pollutants, sources and the years covered.

Consistency including recalculation and time series

49. The ERT considers the inventory and the time series provided to be consistent. The few outliers identified by the ERT for the Transport sector are generally well explained in the IIR. The ERT recommends that Denmark completes the information in the IIR with details presented during the review in response to the questions raised by the ERT.

Comparability:

58. The ERT notes that the inventory of Denmark is comparable with those of other reporting parties. The allocation of source categories follows that of the EMEP/UNECE Reporting Guidelines. The ERT commends Denmark for following the methodology of the EMEP/EEA Guidebook for the Transport sector and for providing completed NFR tables with a minimal use of notation keys. The ERT encourages Denmark to continue providing comparable inventory data.

Accuracy and uncertainties:

50. Denmark includes emissions from the Transport sector in the general uncertainty analysis. However, as the uncertainty estimates for the other mobile sources are only provided on an aggregate level, the ERT encourages Denmark to implement a more sector-specific uncertainty analysis in future submissions.

Improvement:

The ERT commends the Party for the various improvements carried out since the last Stage 3 review. Nonetheless, several issues have not yet been fully resolved (i.e. a key category analysis for mobile sources, sector-specific uncertainty estimates). The ERT encourages Denmark to implement these improvements.

51. The ERT encourages Denmark to add information on planned improvements for all sub-sector chapters in the Transport sector.

Sub-sector Specific Recommendations.

Category issue 1: 1.A.3.b i & 1.A.3.b v – 1990 NOx, NMVOC, CO emissions

52. The ERT notes that for the pollutants reviewed, emissions in 1990 are slightly lower than in 1991 and do not fit in with the downward trend after 1991. To the question raised by the ERT during the review, Denmark replied that, compared to 1989, there was a big increase in 1990 in the number of registrations of used gasoline cars, belonging to the ECE 15/04 (cars from 1981-1985) and ECE 15/05 (cars from 1986-1990) legislation segment, causing an increase in passenger car emissions between 1989 and 1990, and that in 1991, compared to 1990, there was a big increase in the number of registrations of fairly new – but nevertheless still used –

gasoline cars belonging to the ECE 15/05 legislation segment. Compared to the same segment's figures for 1990, these used vehicles also had quite elevated annual mileages, causing the emissions from passenger cars to increase between 1990 and 1991. From 1991 onwards, the gradual phasing-out of gasoline cars without three-way catalytic converters has been playing a larger and larger role in the decreasing trend of emissions. Fleet and mileage data is provided by the Danish Research Institute DTU, Transport sector fleet statistics from Statistics Denmark and mileage statistics from the Danish Road Directorate. The ERT thanks Denmark for the explanation provided, and recommends that Denmark includes the information provided in its reply in the IIR.

Category issue 2: Comparability and transparency – Particulate matter emissions from NFRs 1.A.3.d ii, 1.A.4.c iii (and 1.A.3.d i (i))

53. During the review, the ERT noted that for several NFRs (1.A.2.f ii, sub-sectors of 1.A.3.a and 1.A.3.b, 1.A.3.c, mobile sources in 1.A.4 and 5) similar emission estimates were provided for $PM_{2.5}$, PM_{10} and TSP. The ERT further noted that, in contrast, for NFRs 1.A.3.d ii and 1.A.4.c iii (and 1.A.3.d i (i)), a different ratio of $PM_{2.5}$: PM_{10} : TSP seems to have been applied. To the question raised by the ERT, Denmark confirmed that, due to the emission factor used for maritime engines in the Danish inventory, $PM_{2.5}$ and PM_{10} emissions were slightly lower than TSP emissions. The Party furthermore explained that the EF used was based on experimental findings from the world's largest engine manufacturer MAN Diesel & Turbo. The ERT thanks Denmark for the explanation provided, and considers the issue to be resolved.

Category issue 3 - Comparability and transparency – heavy metal and POPs from 1.A.3.a i (ii) and ii (ii)

54. The ERT noted that for NFRs 1.A.3.a i (ii) and ii (ii) heavy metal and POP emissions were reported as 'NE' but that, in contrast, such emissions were listed in the corresponding LTO sectors (NFRs 1.A.3.a i (i) and ii (i)). To the question raised by the ERT about the reason for this different approach (assuming that emissions reported for the LTO range are included solely for small piston-engine aircraft operating below 3,000 feet of altitude only), Denmark responded that, due to a lack of emission data on jet kerosene in the EMEP/EEA Guidebook and in the international literature in general, HM and POP emissions were not estimated for aircraft using this type of fuel. The Party furthermore stated that in the absence of emission factor data specific to aviation gasoline, fuel-related emission factors for road transport gasoline are used. The ERT thanks Denmark for the explanation provided, and considers this issue to be resolved. Nevertheless, the ERT is asking the Party to include such helpful and interesting sector-specific information in future IIRs.

Category issue 5 - 1.A.3.d i (i) – 1996 Hg emissions

55. The ERT notes that according to Stage 1 data, the 1996 emission value of mercury (0.014 Mg) is significantly lower than the values reported for 1995 (0.05) and 1997 (0.045 Mg), also noting that AD and other pollutant emission trends do not show such a dip. To the question raised by the ERT on whether this was a mistake, Denmark confirmed that the low Hg emissions were due to an error in the Danish

reporting software and that the error will be corrected prior to the next submissions. The ERT considers this issue to be resolved for the time being.

INDUSTRIAL PROCESSES

Review Scope

Pollutants Reviewed		All		
Years		1990 – 2012 + (Protocol Years)		
NFR Code	**CRF_NFR Name**	**Reviewed**	**Not Reviewed**	**Recommendation Provided**
2.A.1	cement production	x		x
2.A.2	lime production	x		x
2.A.3	limestone and dolomite use	x		x
2.A.4	soda ash production and use	x		
2.A.5	asphalt roofing	x		
2.A.6	road paving with asphalt	x		
2.A.7.a	Quarrying and mining of minerals other than coal	x		
2.A.7.b	Construction and demolition	x		
2.A.7.c	Storage, handling and transport of mineral products	x		
2.A.7.d	Other Mineral products (Please specify the sources included/excluded in the notes column to the right)	x		x
2.Bb.1	ammonia production	x		
2.B.2	nitric acid production	x		
2.B.3	adipic acid production	x		
2.B.4	carbide production	x		
2.B.5.a	Other chemical industry (Please specify the sources included/excluded in the notes column to the right)	x		
2.B.5.b	Storage, handling and transport of chemical products (Please specify the sources included/excluded in the notes column to the right)	x		
2.C.1	iron and steel production	x		x
2.C.2	ferroalloys production	x		
2.C.3	aluminium production	x		x
2.C.5.a	Copper Production	x		
2.C.5.b	Lead Production	x		
2.C.5.c	Nickel Production	x		
2.C.5.d	Zinc Production	x		x
2.C.5.e	Other metal production (Please specify the sources included/excluded in the notes column to the right)	x		
2.C.5.f	Storage, handling and transport of meta products (Please specify the sources included/excluded in the notes column t the right)	x		
2.D.1	pulp and paper	x		
2.D.2	food and drink	x		
2.D.3	Wood processing	x		
2.E	production of POPs	x		
2.F	consumption of HM and POPs (e.g. electrical and scientific equipment)	x		
2.G	Other production, consumption, storage	x		

	transportation or handling of bulk products (Please specify the sources included/excluded in the notes column t the right)			
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:

56. The ERT found the information in the IIR to be generally transparent and well organised. The ERT commends Denmark for the detailed documentation of the methodology used to estimate emissions.

57. The ERT noted that no key sources for the Industrial Processes sector had been identified in this submission. The ERT recommends that Denmark performs a key source analysis and reports it in the next submission.

Consistency including recalculation and time series:

58. The ERT identified several inconsistencies in the time series. During the review, Denmark provided the ERT with explanations for some of the inconsistencies and confirmed that the remaining ones were errors. The ERT recommends that Denmark includes detailed information, in the next report, on the time series fluctuations and to further develop the existing QA/QC procedures in order to avoid errors.

Completeness:

59. The ERT considers the inventory of the Industrial Processes sector to be complete with respect to pollutants and years for the sources that are included and commends Denmark for its efforts.

60. In the IIR Denmark provides a list of categories that have not been estimated. Denmark indicates in the IIR that the relevance for emissions of some of these categories will be investigated. The ERT commends Denmark for providing this information, and recommends that Denmark estimates the emissions, where possible, or provides an assessment of their importance and information on the reasons why they have been reported as NE.

- Emissions from quarrying and mining of minerals other than coal
- Emissions from construction and demolition
- Emissions from storage, handling and transport of mineral products
- Emissions from storage, handling and transport of chemical products
- Emissions from storage, handling and transport of metal products
- Emissions from pulp and paper production
- Emissions from wood processing
- Emissions from the production of POPs
- Emissions from the consumption of POPs and heavy metals

61. The ERT noted that Denmark included sub-sector specific paragraphs on recalculations in each chapter of this sector and documented the justifications for and impacts of the recalculations. The ERT commends Denmark for its efforts.

Comparability:

62. The ERT found the methods used to estimate emissions consistent with those in the Guidebook, and the results comparable with those of other Parties, and commends Denmark for its efforts.

Accuracy and uncertainties:

63. The ERT notes the extensive use of country-specific emission factors. The ERT commends Denmark for its efforts and encourages it to continue with this approach.

64. The Industrial Processes sector is included in the general Tier 1 uncertainty assessment as a whole. However, no uncertainty analysis at the sub-sector level is provided. The ERT encourages Denmark to carry out an uncertainty analysis to help support improvements in the estimation of emissions and to provide an indication of the reliability of the inventory data.

Improvement:

65. Denmark has included sub-sector specific paragraphs on improvements in each paragraph of the sub-sector. Improvements are planned for the sub-sectors Mineral products, Chemical industry, Metal production and Other production industries. The ERT commends Denmark on the improvement plan, and encourages it to continue with the plan in the future.

Sub-sector Specific Recommendations.

2A1 Cement production, 2.A.2 Lime production, 2.C.3 Secondary aluminium production, and 2.C.5 Other metal production

66. Denmark reports emissions of NOx and SOx from this source category as aggregated emissions in the Energy sector (NFR 1.A.2.fi). To the question raised by the ERT Denmark responded that for some processes it was not possible to separate process and fuel related emissions and that this was especially the case for "processes with contact" such as cement and lime production. The ERT encourages Denmark to investigate possibilities for reporting combustion and process emissions separately if possible, or to provide a justification for reporting aggregated emissions to increase the transparency of the IIR.

2A2 Lime production

67. The ERT identified significant variations in the time series for PCDD/F. To the question raised by the ERT Denmark responded that there had been an error in the emission factor unit for some years for this point source. The ERT recommends that Denmark corrects this error in the next submission.

2A3 Limestone and dolomite use and 2.A.4 Soda ash production and use

68. The ERT identified some inaccuracies in the use of the notation keys for NFR 2.A.3 and 2.A.4, where the emissions are reported as included elsewhere (IE). To the question raised by the ERT Denmark replied that for NFR 2.A.3 all pollutants should have been reported as NA, since the only relevant pollutant emitted is CO_2[2], and that for NFR 2.A.4 the correct notation key would be NO/NA, as soda ash production is not occurring in Denmark and soda ash use only leads to emissions of CO_2. The ERT recommends that Denmark corrects these notation keys in the next submission.

2A7d - Other Mineral products

69. The ERT identified significant variations in the time series for NMVOC. To the question raised by the ERT about this issue Denmark responded that the increase in emissions was due to emissions from glass wool production, which, by mistake, had not not reported prior to 2010. The ERT recommends that Denmark includes the missing emissions in the next submission.

2C1 – Iron and steel

70. The ERT noted that the time series for Hg the emissions appeared to be inconsistent. To the question raised by the ERT Denmark responded that the sector comprised three activities: an electric arc furnace (EAF) (until 2001/2002 and in 2005), rolling mills (from 2003) and grey iron foundries (whole time series). Emissions of mercury are not assumed to arise from grey iron foundries, but indeed from the EAF. Therefore no emissions occurred in 2002 (there were emissions before 2002 due to the EAF, and from 2003 onwards due to rolling mills) and the proper notation key for that year would have been NA. According to the reply from Denmark, there will be an investigation before the next submission to find out whether mercury emissions really are applicable in the case of steel rolling mills. Currently, emissions are reported from the activity. The ERT recommends that Denmark investigates the generation of Hg emissions for the next submission.

71. Process emissions from grey iron foundries are currently reported in NFR 2.C.1. According to the EMEP/EEA Guidebook, they should be reported under NFR 2.C.2. The ERT encourages Denmark to report process emissions from grey iron foundries in NFR 2.C.2 for the next submission.

2C3 – Secondary aluminium production

72. For secondary aluminium production default activity data is currently used in the calculation for the period 1990-1999. However, this activity data is not consistent with the period 2000-2012. The ERT notes, moreover, that some pollutants are reported for 1990-2012, but that other pollutants are only reported from 2000 onwards. To the question raised by the ERT, Denmark responded that there was no evidence that the activity had occurred prior to the year 2000 and that, by mistake, PCDD/F emissions had been reported for the earlier years from 1990. The ERT recommends that Denmark corrects the data and provides an explanation for this

[2] ERT note: this is reflected in NFR2014 tables, where this category has been deleted.

issue in the IIR for the next submission, to ensure consistency between activity data and the emissions reported.

2C5d – Secondary zinc production

73. The ERT identified significant variations in the time series for secondary zinc production activity data and noted that there was no information regarding this activity in the IIR. To the question raised by the ERT Denmark indicated that it was planning to review the activity data and provide information in the IIR for the next submission. The ERT encourages Denmark to carry out the planned improvement.

SOLVENTS

Review Scope

Pollutants Reviewed		NMVOC$_5$		
Years		1990 – 2012 + (Protocol Years)		
NFR Code	**CRF_NFR Name**	**Reviewed**	**Not Reviewed**	**Recommendation Provided**
3.A.1	Decorative coating application	x		x
3.A.2	Industrial coating application	x		
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		x
3.B.2	Dry cleaning	x		
3.C	Chemical products,	x		
3.D.1	Printing	x		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.				

General recommendations on cross-cutting issues

Transparency:

74. The ERT considers the information provided in the IIR for the Solvent sector to be transparent. The previous ERT encouraged Denmark to improve the transparency of the sector by adding a table with emission factors and information on which of them are country-specific. In the current submission this table is not included. In response to a question about this issue, Denmark provided averaged EFs for all pollutants and activities for each category under NFR 3 D Other industry, for non-industrial solvent use and for domestic and other diffuse use. Denmark also provided a reference, i.e. a report entitled 'Danish Emission Inventory for Solvent Use in Industries and Households', NERI Technical Report no. 768/2010, which contains a detailed table of country-specific emission factors for households. The ERT recommends that Denmark includes all the above information in the IIR in its next submission in order to increase transparency.

Consistency including recalculation and time series:

75. The ERT found the inventory to be consistent. The description of the recalculations in the IIR is comprehensive and transparent: However, the IIR does not provide an explanation of the impacts of the recalculations on the emission levels. The ERT recommends that Denmark includes these in the next submission.

Completeness:

76. The ERT considers the Solvent sector to be complete in terms of sources, pollutants and the years reported.

Comparability:

77. The ERT found the methods used for the solvent sector inventory to be consistent with the Guidebook, the allocation to NFR categories to be in line with the Reporting Guidelines and the inventory thus to be comparable with those of other countries.

Accuracy and uncertainties:

78. The ERT noted that Denmark provides Tier 1 uncertainty estimates in the IIR. The ERT encourages Denmark to undertake a Tier 2 uncertainty analysis to prioritise improvements in the Solvent sector and to provide an indication of the reliability of the data.

Improvement:

79. Denmark does not mention any planned improvements in the Solvent sector. The ERT recommends that Denmark adds this information in the IIR.

Sub-sector Specific Recommendations.

THE ERT DOES NOT HAVE ANY SUB-CATEGORY SPECIFIC RECOMMENDATIONS OTHER THAN THOSE INCLUDED ABOVE IN THE GENERAL ASSESSMENT OF THE SECTOR.

AGRICULTURE

Review Scope:

Pollutants Reviewed		SO_2, NOx, NMVOC, NH_3, PM_{10}, $PM_{2.5,}$ TSP		
Years		1990 – 2012		
NFR Code	CRF_NFR Name	Reviewed	Not Reviewed	Recommendation Provided
4 B 1 a	Cattle dairy	X		
4 B 1 b	Cattle non-dairy	X		
4 B 2	Buffalo	X		
4 B 3	Sheep	X		
4 B 4	Goats	X		
4 B 6	Horses	X		
4 B 7	Mules and asses	X		
4 B 8	Swine	X		
4 B 9 a	Laying hens	X		
4 B 9 b	Broilers	X		
4 B 9 c	Turkeys	X		
4 B 9 d	Other poultry	X		
4 B 13	4 B 13 Other	X		
4 D 1 a	Synthetic N fertilisers	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		
4 G	Agriculture other(c)	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

Transparency:

80. Denmark provided a detailed and generally transparent emissions inventory for the Agriculture sector. The ERT considers the methodologies and emission factors included in the IIR to be transparent and well described. The ERT encourages Denmark to improve the description of emission trends and IEFs for relevant livestock categories and, for EFs and methodologies, to provide references to Tables and Formulas from the EMEP/EEA Guidebook which are more precise, to further increase transparency and facilitate the review.

Consistency including recalculation and time series:

81. Denmark has recalculated NH3 emissions from the application of synthetic fertilisers by using the new Tier 2 EFs obtained from the EMEP/EEA Guidebook 2013. This revision led to a considerable increase in NH3 emissions from agricultural soils (between 5-10%). Updates of geese and swine numbers and for hens in housing resulted in a slight increase of NH3 emissions, too. For the calculation of PM and TSP emissions the shift to the new Tier 2 EFs of the EMEP/EEA Guidebook 2013 led to an overall decrease in emissions, mainly due to lower EFs for fattening pigs and weaners.

Completeness:

82. The ERT considers the Agriculture sector to be complete in terms of sources and years. For NH_3 all relevant sources are included in the inventory. Denmark reports buffalos (4.B.2), mules and asses (4.B.7) as not occurring in Denmark. For the sector field burning (4.F) Denmark reports an almost complete set of emissions. Denmark does not estimate PM emissions from crop production or NOx and NMVOC emissions from manure management and synthetic fertiliser application. The ERT encourages Denmark to further improve completeness as indicated in its IIR. In the EMEP/EEA Emission Inventory Guidebook 2013, Tier 1 emission factors are provided for the planned improvements.

Comparability:

83. Denmark estimates emissions using methodologies in accordance with the EMEP/EEA Guidebook and allocates emissions to the NFR categories according to the Reporting Guidelines. The ERT considers the inventory to be comparable with those of other reporting parties.

Accuracy and uncertainties:

84. Denmark provides uncertainty estimates for all air pollutants and source categories in the Agriculture sector in the IIR.

85. The QA/QC and verification plan for the Agricultural sector is continually being developed. A procedure for internal quality checks has been established, the need for external comparisons of calculations with other institutions has been identified. The ERT supports this initiative, and recommends additional validation activities to further improve the accuracy of and confidence in the emission estimates.

Improvement:

86. For the next submission, Denmark plans to include dust emissions from arable farming – i.e. harvesting and field preparation by machines as well as NMVOC emissions from livestock production (NFR 4.B). The ERT commends Denmark on the improvement plan and encourages Denmark to continue its efforts.

Sub-sector Specific Recommendations.

Category issue 1: 4.B Manure management: - NH_3

87. Denmark processes emission data on a very detailed level using a comprehensive agriculture model. The use of high quality input data increases the accuracy and significantly reduces the uncertainty of the estimates. The agriculture model allows to include impacts from abatement measures conducted in the context of environmental action plans, resulting in decreasing IEFs for most of the animal categories.

88. The ERT questioned the strong decrease in IEFs for dairy cattle and the rather constant trend of the IEF for non-dairy cattle. In its answer Denmark provided a detailed explanation. Contrary to dairy husbandry in Denmark's beef production, only small changes have taken place in the housing types. Additional changes in the application of animal manure do not affect the IEF for non-dairy cattle as much as the IEF for dairy cattle, because of the high share of solid manure.

89. The ERT appreciates the high quality of the work done by the Danish inventory team and encourages Denmark to provide additional descriptions and explanations for the trends on the level of the most relevant livestock categories as provided during the review, in order to facilitate the assessment of the impressive emission reductions reported in the IIR.

90. Average N excretion and TAN values are annually provided by the Danish Centre for Food and Agriculture (DCA), Aarhus University. Although background information is provided in the IIR, it is difficult to find out how the "Danish standards" are derived, validated and representativeness is ensured. The ERT thanks Denmark for providing clarification on all the questions raised by the ERT during the review. The ERT encourages Denmark to further improve the transparency of the sector in the IIR by providing more stringent documentation.

91. In response to the question regarding the monitoring of abatement technologies, Denmark explained that most of the impacts resulted from the introduction of action plans. These actions plans include general requirements for an improved handling of animal manure. Farmers are forced to implement these measures as part of their agriculture practices. During the review Denmark provided a report on the Danish monitoring and action programmes in accordance with the Nitrates Directive (1991/676/EEC).

92. There is one specific abatement technology included in the inventory which is expected to be used more widely: sulphuric acid treatment of slurry during spreading on fields. During the review Denmark provided a VERA[3] verification statement for this technology documenting (as the main test result) an ammonia emission reduction efficiency of 49% when applied on cattle slurry. Activity data on the effectiveness of applied acidified slurry for the reduction target is derived from information from the

[3] VERA = Verification statement: verification of environmental technologies for agricultural production

companies that deliver the acidification techniques or perform the application of acidified slurry.

93. The IEFs for ammonia for laying hens show a peak in 2006 and for broilers a peak in 2004. With regard to the issue, Denmark explained that for both laying hens and broilers the main cause for the peak in the IEF was a change in the distribution on housing types. New and more detailed data on animals in different housing systems had been available for laying hens from 2007 onwards, and for broilers from 2005 onwards. The ERT encourages Denmark to investigate options for establishing a consistent time series. Specific methodologies are provided in the Guidebook 2013, chapter 4 “Time series consistency”.

Category issue 2: 4.G Agriculture other: NH_3

94. The ERT noted that the country-specific NH_3-N EF for sewage sludge (0.019kg NH3-N/kg N) was lower than the average NH3-N EF for synthetic fertilisers (0.03kg NH3-N/kg N). Following the IIR, p. 278, the EF is based on information from the Danish Environmental Protection Agency. In response to the question raised by the ERT about the data source, Denmark explained that the IEF was based on an expert judgment. The N content in sewage sludge varies from year to year and is usually 4–5 % of the total amount of sludge. An emission factor of 3 % of the N content in the sludge is used, based on information from the Danish Environmental Protection Agency. For sludge incorporated into soil within six hours of application the emission factor is expected to be half, i.e. 1.5 %. Concerning field application, it is assumed that 25 % of the sludge is not incorporated, while the remaining 75 % is incorporated within six hours. This gives a weighted emission factor of approximately 1.9 % (the same for all years). Denmark observed that the expert judgment from 2002 was only based on one reference and that it might be appropriate to check the scientific basis for this emission factor. The ERT welcomes Denmark’s plan to check and – if necessary - update the IEF for sewage sludge for the next submission.

WASTE

Review Scope:

Pollutants Reviewed		SO_2, NOx, NMVOC, NH_3, PM_{10} & $PM_{2.5}$		
Years		1990 – 2006 + (Protocol Years)		
NFR Code	**CRF_NFR Name**	**Reviewed**	**Not Reviewed**	**Recommendation Provided**
6.A	solid waste disposal on land	x		x
6.B	waste-water handling	x		x
6 C a	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		
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

95. The Waste sector inventory covers the years 1990 - 2012. Denmark reports emissions from cremation, composting and accidental fires. The ERT considers the inventory of Denmark not to be complete in terms of sources and pollutants and recommends that Denmark improves completeness by including other sources and other pollutants where relevant, using the methodologies presented in the EMEP/EEA Guidebook or national methodologies, and that it documents in the IIR the methodologies used. Where sources have not been included in the inventory, the ERT recommends that Denmark provides justifications for not estimating the emissions.

Transparency:

96. The ERT found the documentation of the methodologies used to calculate emissions to be transparent. Denmark reports emissions from waste incineration under NFR 1 and has documented and justified the allocation of these emissions (waste incineration is utilised for heat and power production) in the IIR.

Consistency, including recalculation and time series:

97. The ERT found the emission time series to be consistent. However, explanations for the fluctuations of emissions levels are not provided. The ERT recommends that Denmark provides information on the reasons behind the fluctuations.

Completeness:

98. The ERT considers the sector to be almost complete. For solid waste disposal on land and wastewater treatment, emissions are not estimated. In the IIR Denmark explains that emissions have not been estimated due to limited resources.

The ERT recommends that Denmark includes emissions from these sectors in the inventory.

Comparability:

99. Denmark uses both national methods and default methods from the EMEP/EEA Guidebook and allocates emissions to the NFR categories in line with the Reporting Guidelines. The ERT found the inventory to be comparable with those of other countries.

Accuracy and uncertainties:

100. According to information in the IIR, QA/QC procedures are carried out for the the waste inventory. Denmark provides uncertainty estimates for the activity data used in the calculations but does not estimate uncertainty for the emissions at source sector level. However the general uncertainty analysis at Tier 1 level includes the Waste sector.

Improvement:

101. Denmark does not report planned improvements for the Waste sector in the IIR. The ERT recommends that Denmark completes the inventory of the Waste sector by estimating emissions from the sources currently not included in the inventory (solid waste disposal on land, wastewater handling, small-scale waste burning) as explained below.

Sub-sector Specific Recommendations.

6A - Solid waste disposal on land

102. Denmark does not report emissions from this source. In response to the question raised by the ERT, Denmark explained that NMVOC emissions from solid waste disposal on land were not calculated due to a lack of resources. However, as Denmark already reports CH_4 emissions from the source under the UNFCCC, and NMVOC emissions can be estimated as a share of CH_4 emissions, the ERT recommends that Denmark uses the data from the CH_4 inventory and default factors from the Guidebook to estimate NMVOC emissions, and reports them in the next submission.

6B- Waste-water handling

103. Denmark does not report NMVOC and NH3 emissions from wastewater handling. In response to the question raised by the ERT, Denmark explained that emissions were not calculated due to a lack of resources. The ERT recommends that Denmark estimates and reports emissions from wastewater handing using the methods from the Guidebook, as all activity data needed for the calculation are available in the national statistics.

6.C.a, 6.C.b, 6.C.c – Waste incineration (clinical, industrial, municipal)

104. Denmark reports emissions from waste incineration as included elsewhere (IE) and aggregates them under NFR 1A1a. In the IIR Denmark explains that this is because all wastes are incinerated with energy recovery.

6Cd Cremation

105. Denmark reports emissions from cremation, including emissions not only from human cremation but also from incineration of animal carcasses. The ERT commends Denmark for the good quality of the inventory in this sector.

6Ce Small-scale waste burning

106. Denmark reports emissions from small-scale waste burning as not occurring (NO). The ERT recommends that Denmark provides a justification for the use of this notation key, or investigates the possible generation of emissions from small-scale waste burning in the country, such as from the burning of straw, and that it estimates these emissions and reports them in the next submission.

6D Other wastes

107. Denmark reports CO and NH_3 emissions from compost production and accidental fires in this sub-sector. The ERT commends Denmark for the completeness of reporting in this sector, and for the detailed description of the methodology used to calculate emissions from this sector.

LIST OF ADDITIONAL MATERIALS PROVIDED BY THE COUNTRY DURING THE REVIEW

1. Responses to preliminary questions raised prior to the review
2. Responses to questions raised during the review
3. Denmark Stage 2 S&A Report 2014
4. Denmark Stage 1 Report 2014
5. Denmark IIR 2014
6. BioCover a/s /2010) VERA Verification Statement. Verification of environmental technologies for agricultural production.
7. Bruger (2014) Marked estimate for acidified slurry in Denmark 2012. Reply to the ERT 27.6.2014.
8. DCE/MST (2009). Status and trends of aquatic environment and agricultural practice. Danish monitoring and action programmes in accordance with the Nitrates Directive (1991/676/EEC). Summary Report to the European Commission, 25.5.2009
9. Fauser, P., Thomsen, M., Nielsen, O-K., Winther, M., Gyldenkærne, S.,Hoffmann, L., Lyck, E. & Illerup, J.B. 2007: Verification of the Danish emission inventory data by national and international data comparisons. National Environmental Research Institute, University of Aarhus, Denmark. 53 pp – NERI Technical Report no. 627. Available at: http://www2.dmu.dk/Pub/FR627_Final.pdf (2013-01-24).
10. Fauser, P., Nielsen, M., Winther, M., Plejdrup, M., Gyldenkærne, S., Mikkelsen, M.H., Albrektsen, R., Hoffmann, L., Thomsen, M., Hjelgaard, K. & Nielsen, O.-K. 2013. Verification of the Danish 1990, 2000 and 2010 emission inventory data. Aarhus University, DCE – Danish Centre for Environment and Energy, 85 pp. Scientific Report from DCE – Danish Centre for Environment and Energy No. 79. http://dce2.au.dk/pub/SR79.pdf (2014-01-27).
11. Nielsen, Ole Kenneth (2014). IER trend cattle. Reply to the ERT 27.6.2014.