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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:**

SWEDEN

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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 SO₂, NO_x, NMVOC, NH₃, plus PM₁₀ & 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 Sweden coordinated by the EMEP emission centre CEIP acting as review secretariat. The review took place from 17th June 2013 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 – Kristina Saarinen (Finland), Energy – Ole-Kenneth Nielson (Denmark), Transport – Nina Holmengen (Norway), Industry – Kees Peek (Netherlands), Solvents – Ardi Link (Estonia), Agriculture & Nature – Michael Anderl (Austria), Waste – Katja Hjelgaard (Denmark).
4. Kevin Hausmann 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. Sweden's inventory is generally in line with the EMEP EEA Inventory Guidebook and the UNECE Reporting Guidelines. Emissions reported under the CLRTAP and the NECD are consistent. The 2013 submission included improvements for almost all recommendations from the previous review. The ERT acknowledges the effort Sweden has made to provide the inventory and commends the Party for the work carried out so far.

6. The Swedish inventory is documented with a great level of detail and the ERT commends Sweden for this work. The transparency of the inventory can be further improved by providing further information on the allocation of emissions currently reported as included elsewhere (IE) as well as with information on the justifications for recalculations and their impacts on emission levels.

7. The ERT notes that Sweden reports a number of sources as not estimated (NE). As the completeness of the inventory is essential for checking compliance with obligations under the conventions, emission values or at least an assessment of the quantitative importance of the sources currently not estimated is needed.

8. Sweden has carried out recalculations in the energy, industrial processes, as well as the product use sectors and clearly documented these in its IIR.

INVENTORY SUBMISSION

9. Sweden submitted its inventory under the NECD on 20.12.2012 and under the CLRTAP on 14.02.2013, both within the deadlines of 31.12.2012 and of 15.2.2013, respectively. The submissions included NFR tables from 1990 to 2011 (the latest year) for the NECD pollutants NO_x, SO₂, NH₃, NMVOC, and under the CLRTAP also for the following heavy metals As, Cd, Cr, Cu, Hg, Ni, Pb, Se, and Zn and POPs: HCB, PCDD/F, PAH-4 and PCB, as well as for CO, TSP, PM₁₀, and PM_{2.5} in NFR format. Sweden does not include the earlier years 1980-1989 in the NFR tables.

10. Sweden provided a detailed IIR on 14.2.2013 and projected emissions on 29.1.2013. In 2012, Sweden also provided gridded data and LPS data.

11. The inventories are of good quality and well documented in the informative inventory report (IIR). Due to the high quality of the IIR and the Party's responsiveness, the ERT was able to review the inventory in detail and provide a number of specific recommendations.

KEY CATEGORIES

12. Sweden compiled and presented in its IIR a key category analysis (KCA) for the latest inventory year 2011 and for the following pollutant trends: NO_x, CO, NMVOC, SO₂, NH₃, TSP, PM₁₀ and PM_{2.5}, As, Cd, Cr, Cu, Hg, Ni, Pb, Se, Zn, PCDD/F and PAH-4 including all sectors. The analysis was performed at Tier 1 and Tier 2 levels for both emission levels and emission trends according to the 2009 EEA/EMEP Guidebook. The KCA carried out by the Party and the CEIP produced similar results.

13. According to the UNECE Reporting Guidelines Parties should identify in their IIR national key categories as described in the Guidebook for the base year and the latest inventory year. Sweden has, however, not presented a KCA for the base years of the pollutants in the IIR. The ERT recommends that Sweden adds the KCA for the base years to the IIR of the next submission.

14. Sweden states in the IIR that the key category analysis is used to prioritise improvements in the inventory. The ERT commends Sweden for analysing the key sources and using the results for inventory improvement.

QUALITY

Transparency

15. The ERT recognises the level of effort undertaken by Sweden in providing an inventory with a significant level of detail to enable an in-depth review. The ERT found the inventory and the IIR to be of good quality and generally transparent.

16. To further improve the transparency of the inventory the ERT recommends that Sweden adds the currently missing Chapter 10 “Recalculations and Improvements” and updates it annually, and that it provides information on recalculations and their impacts on emission trends and fully follows the recommended IIR² structure in its next submission.

17. Sweden currently reports several NFR categories as included elsewhere (IE), and there is no explanation as to where the emissions are included, neither in the IIR nor in the NFR tables sheet “Additional info”. The ERT recommends that Sweden provides information on where the sources reported as “included elsewhere” are aggregated in its next submission.

Completeness

18. The ERT acknowledges the effort Sweden has made to provide estimates of emissions for all sectors and all pollutants reviewed. Sweden’s inventory is generally complete for the years submitted and in terms of geographical coverage. The ERT notes that Sweden reports several emissions using the notation key NE (not estimated), while no explanation is provided in the IIR why emissions are not estimated:

- a) PCBs and HCB for all other categories but 1A3dii, 1A4ciii, 1A5b are reported as NE. However, as it may occur that there are other larger sources of these pollutants, currently reported as NE (e.g. road transport, residential combustion, petroleum products and coke oven (also a source of PAHs), iron and steel industries, and industrial waste incineration for PCBs, and residential combustion, chemical and metal industries, and industrial waste incineration for HCB), the ERT recommends that Sweden investigates the relevance of sources currently reported as NE and provides emission estimates if emissions occur. In case no emissions occur from these sources, the ERT recommends that Sweden changes the notation keys to NA.

² see Annex VI of UNECE Reporting Guidelines

- b) Heavy metal emissions from some activities in the transport, industrial processes and waste sectors are reported as NE. To improve the completeness of the inventory as well as the consistency of the time series, the ERT recommends that Sweden estimates the missing emissions. In case data is not available for all years to estimate emissions, the ERT recommends that alternative methods or appropriate techniques are used for these years³, and any significant fluctuations between the years explained in the IIR. In case no emissions occur, the ERT recommends that Sweden changes the notation keys to NA.

19. As the completeness of the inventory is essential for checking compliance with obligations under the UNECE CLRTAP Protocols and the NECD (for those cases where the notation key NE is reported), the ERT recommends that Sweden provides an explanation why it was not possible to estimate emissions and assesses the quantitative importance of these sources in relation to the total emissions, and that it provides a plan which specifies when such estimates could be prepared. The ERT also recommends that Sweden adds a list of sources which have not been estimated in chapter 1.5 (General assessment of Completeness) to provide a more comprehensive overview of the completeness of the inventory.

20. During the review, the ERT was informed that Sweden was planning to start various projects to investigate the completeness of POP inventories. The ERT commends Sweden for this excellent initiative.

21. In 2012, Sweden reported gridded emissions for 2010 for all the requested substances, except for HCB and PCB (which were reported as NE) and for Cd (which was reported as NA) as well as for Pb, Hg and HCH (which were reported as NO). However, in the NFR table for 2010, there are emission estimates for Pb, Hg, PCB and HCB. The ERT recommends that Sweden checks the completeness of gridded data reporting for the next submission.

Consistency, including recalculations and time-series

22. Sweden has carried out recalculations in the sectors energy, industrial processes, and product use. The IIR provides justifications for the recalculations but there is no analysis of their impact on the relevant emission levels. It was not clear for the ERT how the consistency of the time series (including the base year and all other years) was affected. The ERT recommends that Sweden checks the consistency of the time series and provides information on the impacts of recalculations on the time series. This information should preferably be provided in an IIR Chapter 10 (as in the recommended outline for the IIR⁴), which is not included in the current IIR, and needs to be updated each year.

23. The ERT notes that the time series in the agriculture sector are not fully consistent and recommends that Sweden checks their status. All details on this issue are given in the chapter on agriculture below.

24. Sweden reported emissions for 1980-1989 in the past (national totals only) and these data can be found in the CEIP database. However, Sweden does not

³ Paragraph 27 in document ECE/EB.AIR/97

⁴ Annex VI of the UNECE Reporting Guidelines

include emissions from these years in its current NFR tables, nor in the IIR. The base year for Sweden for SO₂ was 1980, for NO_x 1987 and for NMVOC 1988. According to the UNECE Review Guidelines paragraph 21, the review should focus on ensuring a consistent approach in estimating emissions for the base year and the latest reported year. Due to a lack of information in the IIR, it was not possible for the ERT to conclude if the emissions for the base year and later years are comparable for the sources covered and if consistent methods have been used in the production of emissions data. The ERT therefore recommends that Sweden provides information on the consistency of calculation methods for the ERT to assess the consistency of time series related to the protocol base years and the following years. The ERT also recommends that Sweden includes the years 1980-1989 in the time series analysis.

Comparability

25. The ERT notes that the inventory of Sweden is comparable with those of other reporting parties. The allocation of source categories follows that of the EMEP/UNECE Reporting Guidelines. The ERT encourages Sweden to continue with this approach to national inventory calculation.

CLRTAP/NECD comparability

26. The ERT notes that the inventories by Sweden submitted under the NECD and the CLRTAP include no differences between the estimates. The ERT commends Sweden for the consistency achieved between its inventories.

Accuracy and uncertainties

27. Sweden has compiled uncertainty estimates for the following pollutants: As, Cd, CO, Cr, Cu, Hg, NH₃, Ni, NMVOC, NO_x, PAH-4, PCDD/F, Pb, PM_{2.5}, PM₁₀, Se, SO₂, TSP, and Zn. According to the IIR, the uncertainty estimates have been prepared using Tier 1 methodology. The ERT commends Sweden for providing an uncertainty analysis.

28. In the IIR, Sweden mentions that also bottom-up data (environmental reports by the plants) is used for the preparation of the inventory, especially in the energy and industrial processes sectors. To the question raised by the ERT on how bottom-up data are taken into account in the uncertainty assessment, Sweden replied that only confidence intervals presented in the Guidebook or national expert judgements were used. The ERT recommends that Sweden includes further details in the general description of the UC methodology on the uncertainty estimates used in the calculations for activity data, emission factors and/or emission data, and that it provides uncertainty estimates for the base years for the relevant pollutants.

29. The ERT also notes that there are additional uncertainties in the inventory through emissions currently reported as not estimated (NE), as discussed under the "Completeness" section of this report. The ERT recommends that Sweden assesses the impact of the not estimated (NE) emissions on the uncertainties and includes the identified emissions in its inventory.

Verification and quality assurance/quality control approaches

30. Sweden has elaborated and implemented comprehensive quality assurance and quality control (QA/QC) methods. The quality work includes general QC

procedures (Tier 1) as well as source category-specific procedures (Tier 2) for key categories and for those individual categories in which significant methodological and/or data revisions have occurred. These have been documented in the respective sub-chapters in the IIR. Quality assurance activities are in place, using extensive expert reviews. The ERT commends Sweden on the comprehensive QA/QC activities carried out.

31. According to the IIR, Sweden's inventory is peer reviewed and published nationally before submission. There is no clear description in the IIR of the final approval of the inventory, and the ERT encourages Sweden to add this explanation to the detailed information already provided on the inventory preparation process.

FOLLOW-UP TO PREVIOUS REVIEWS

32. Sweden provided detailed responses to the questions identified during the Stage 2 review for their submissions in 2013.

33. The ERT notes that Sweden has not carried out all improvements recommended by the previous ERT in 2009, for instance:

- a. information on allocation of emissions between the energy and industrial processes sectors,
- b. recommendations for the transport and industrial processes sector, and
- c. inclusion of NMVOCs from natural gas distribution in the inventory.

The ERT recommends that Sweden continues with the implementation of improvements identified by the previous review team. Detailed information on which of the former recommendations have as yet not been implemented can be found in the specific sector chapters of this report.

AREAS FOR IMPROVEMENT IDENTIFIED BY SWEDEN

34. The Swedish IIR 2013 does not identify any specific planned improvements. In the IIR it is stated that the QA/QC programme collects information on improvement needs from all stages of the annual inventories.

PART B: RECOMMENDATIONS FOR IMPROVEMENTS TO THE PARTY

CROSS-CUTTING IMPROVEMENTS IDENTIFIED BY THE ERT

35. The ERT identified the following cross-cutting issues for improvement:
- a. Consider adding KCA for the base years for the relevant pollutants in the IIR
 - b. Provide information on where the sources reported as “included elsewhere” are aggregated
 - c. Investigate the relevance of the sources currently reported as NE and provide emission estimates if emissions occur or estimates of the quantitative importance of emission from these sources, and add a list of sources not estimated to the IIR
 - d. Check reporting of gridded data for completeness
 - e. Check the consistency of the time series and provide information on the impacts of recalculations on the time series in the IIR
 - f. Consider moving on to Tier 2 uncertainty analysis, and estimating UC for the base years
 - g. Add details of UC analysis in the IIR and assess the impact of the not estimated (NE) emissions on UC

SECTOR SPECIFIC RECOMMENDATIONS FOR IMPROVEMENTS IDENTIFIED BY ERT

ENERGY

Review Scope

Pollutants Reviewed		All		
Years		1990 – 2011		
NFR Code	CRF_NFR Name	Reviewed	Not Reviewed	Recommendation Provided
1.A.1.a	public electricity and heat production	x		x
1.A.1.b	petroleum refining	x		
1.A.1.c	Manufacture of solid fuels and other energy industries	x		
1.A.2.a	iron and steel	x		
1.A.2.b	non-ferrous metals	x		
1.A.2.c	chemicals	x		
1.A.2.d	pulp, paper and print	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		x
1.A.2.f.ii	Mobile Combustion in Manufacturing Industries and Construction: (Please specify in your IIR)			
1 A 3 e	Pipeline compressors ?			
1.A.4.a.i	commercial / institutional: stationary	x		x
1.A.4.a.ii	commercial / institutional: mobile ?			
1.A.4.b.i	residential plants	x		
1.A.4.b.ii	household and gardening (mobile)			
1.A.4.c.i	Agriculture/forestry/fishing. stationary	x		
1.A.4.c.ii	off-road vehicles and other machinery?			
1.A.4.c.iii	national fishing?			
1.A.5.a	other, stationary (including military)	x		
1.A.5.b	other, mobile (including military, land based and recreational boats)?			
1.B.1.a	coal mining and handling	x		
1.B.1.b	solid fuel transformation	x		x
1.B.1.c	other fugitive emissions from solid fuels)	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		x
1 B 2 c	Venting and flaring	x		x
1 B 3	Other fugitive emissions from geothermal energy production , peat and other energy extraction not included in 1 B 2	x		

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:

36. The ERT notes the comprehensive information on the methodologies used which is contained in Sweden's IIR. The ERT in particular commends Sweden for its transparent report on EFs in the Annex to the IIR.

Completeness:

37. The ERT notes that Sweden reports benzo(b)fluoranthene, benzo(k)fluoranthene, Indeno(1,2,3-cd)pyrene, HCB and PCBs as "not estimated (NE)". The EMEP/EEA Guidebook contains default EFs for these pollutants for several fuels/categories. In response to a question raised by the ERT, Sweden informed the ERT that there were no current plans to address the completeness of reporting on these pollutants. The ERT recommends that Sweden estimates emissions of these pollutants in all cases where there are default emission factors in the EMEP/EEA Guidebook.

Consistency including recalculation and time series:

38. Sweden transparently describes the recalculations made in chapter 3.6 of the IIR. However, the ERT notes that not all the recalculations have been explained in a manner so that the magnitude of the recalculation can be immediately assessed. The ERT recommends that Sweden includes an indication (qualitative or quantitative) on the impact of the mentioned recalculations.

Comparability:

39. The ERT considers Sweden's inventory of emissions from the energy sector comparable.

Accuracy and uncertainties:

40. Sweden reports transparently and in detail on the methodology and results of the uncertainty estimate. The ERT commends Sweden for the comprehensive report on uncertainties and on its key category analysis. However, the ERT notes that Sweden does not provide information in the IIR on how the results of the uncertainty analysis and the key category analysis are used to prioritise improvements. The ERT encourages Sweden to document how the two analyses are used to prioritise improvements.

Improvement:

41. The ERT notes that chapter 3.7 of the IIR only contains a general statement related to planned improvements and that no specific planned improvements are listed. The ERT recommends that Sweden elaborates, if relevant, specific plans for improvement or simply states in the IIR that there are no planned improvements. In elaborating an improvement plan, Sweden could use the recommendations provided in this review report.

Sub-sector Specific Recommendations.

Category issue 1: 1A: Stationary combustion – NMVOC

42. The ERT notes that the NMVOC emission factors are only separated by source category and not by technology. Especially for gaseous and liquid fuels, the combustion technology will have a large impact on the emission level. The same emission factors have been used for all years since 2003. In response to a question raised by the ERT, Sweden explained that any changes in combustion technology have not been assessed. The ERT encourages Sweden to continuously evaluate if there are changes in the mix of combustion technologies that would warrant an update of the emission factors.

Category issue 2: 1A1a: Public electricity and heat production – SO₂

43. During the review, the ERT noticed that the emission factors for coke and petroleum coke used in public electricity and heat production are high and have been kept constant through the whole time series. In response to a question raised by the ERT, Sweden explained that these fuels are in fact not used in public electricity and heat production. The ERT recommends that Sweden corrects the table in the next submission.

Category issue 3: 1A2: Manufacturing industries and construction – All pollutants

44. In the previous review in 2008, the ERT recommended that Sweden should report the share of emissions from cement production in the total emissions reported in category 1A2f i. Furthermore, the previous ERT recommended that Sweden should include in the IIR an overview table showing the allocation of emissions to energy and industrial processes for the different pollutants. The ERT notes that neither of these recommendations has been implemented. In response to a question raised by the ERT, Sweden informed the ERT that the recommendations had not been implemented due to time constraints. The ERT reiterates its recommendation - made in the previous review report - that Sweden in the IIR provides information on the share of emissions from cement production in the total emissions reported under 1A2f i and that Sweden provides an overview table describing the allocation to energy and industrial processes for each pollutant.

Category issue 4: 1A2: Stationary combustion in manufacturing industries and construction – All pollutants

45. During the review, the ERT noted that for multiple sub-categories in "manufacturing industries and construction" it is stated in the IIR that: "Emissions from companies with less than 10 employees are allocated to NFR 1A2f". From the description in the IIR, it is not clear why this allocation has been made. In response to a question raised by the ERT, Sweden explained that fuel consumption in small enterprises is not included in any survey and that a model estimate is published in the annual energy balances. The model estimate is made on an aggregate level for enterprises in all sub-categories of the manufacturing industries and hence it is not possible to split consumption into the different sub-sectors. The ERT recommends that Sweden includes this explanation in its IIR.

Category issue 5: 1A4a i: Commercial / institutional: Stationary – All pollutants

46. During the review, the ERT noted that the IIR states that biomass use in the sector has been increasing and that “However, a data check performed in 2009 showed that the data on biomass use in the commercial/institutional sector in the energy balances might not be complete. Further investigations were planned for submission in 2011, but this issue was not prioritised”. In response to questions raised by the ERT, Sweden explained that the text in the IIR was no longer correct and that a study carried out in 2013 had shown that the fuel consumption estimate used in the national energy balance and the emission inventory is more complete than the data reported to Eurostat. The ERT recommends that Sweden updates the description in the IIR in its next submission.

Category issue 6: 1B1b: Solid fuel transformation – All pollutants (excl. SO₂ and PAH)

47. During the review, the ERT noted that only SO₂ and PAH emissions were estimated and reported as fugitive emissions from coke production. In both the EMEP/EEA Guidebook and the US EPA AP-42 it is assumed that there are more pollutants emitted as fugitive emissions from e.g. charging, pushing, quenching, equipment leaks and door leaks. In response to a question, Sweden informed the ERT that estimating other pollutants had not been prioritised. The ERT recommends that Sweden estimates and reports on all relevant fugitive emissions for which there are default emission factors in the EMEP/EEA Guidebook.

Category issue 7: 1B2: Oil and natural gas – NMVOC

48. During the review, the ERT noted that Sweden states: “Losses of gas from gas works are reported by the gas producers of gas works to Statistics Sweden and published in the Statistics on the delivery of gas products. Emissions are calculated with emission factors for stationary combustion”. Using EFs from stationary combustion to estimate fugitive emissions from losses of gas is only applicable in the case of flaring. In response to a question raised by the ERT, Sweden explained that the assumption had been that the losses were flared. However, a study from 2013 had shown that this was not the case. The ERT recommends that Sweden revises the methodology, calculations and descriptions for category 1B2 in its next submission.

Category issue 8: 1B2b Natural gas – NMVOC

49. During the review, the ERT noted that fugitive emissions from natural gas are reported as "not occurring (NO)" in the NFR tables. The ERT also notes that Sweden estimates and reports fugitive emissions of CH₄ from natural gas transmission and distribution to the UNFCCC and that this issue was also raised in the previous review report. In response to a question raised by the ERT, Sweden informed the ERT that a national study concerning fugitive emissions from gas had been carried out in 2013 and that the results would be implemented in the 2014 submission. The ERT welcomes the national study being carried out and recommends that Sweden includes the results in its 2014 submission.

Category issue 9: 1B2c: Venting and flaring – All pollutants

50. During the review, the ERT noted that the calculation of emissions from flaring was not transparently described in the IIR and requested more information regarding the emission factors used and the references. In response, Sweden

provided the ERT with the references and further explained that the emission factors used were the same as for the combustion of refinery gas. The ERT notes that for some pollutants it might not be appropriate to use the same emission factors for flaring and for the regular combustion of refinery gas. Especially emissions of CO, NMVOC and PAH could be significantly higher from a flare than from regular combustion. The ERT, noting that flaring is not a key category, encourages Sweden to review and update the emission factors used for flaring.

TRANSPORT

Review Scope

Pollutants Reviewed		Main pollutants, particulate matter, HM and CO		
Years		1990 – 2011		
NFR Code	CRF_NFR Name	Reviewed	Not Reviewed	Recommendation Provided
1.A.3.a.i.(i)	international aviation (LTO)	x		x
1.A.3.a.i.(ii)	international aviation (cruise)		x	
1.A.3.a.ii.(i)	civil aviation (domestic, LTO)	x		x
1.A.3.a.ii.(ii)	civil aviation (domestic, cruise)		x	
1.A.3.b.i	road transport, passenger cars	x		x
1.A.3.b.ii	road transport, light duty vehicles	x		x
1.A.3.b.iii	road transport, heavy duty vehicles	x		x
1.A.3.b.iv	road transport, mopeds & motorcycles	x		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		x
1.A.3.b.vii	road transport, automobile road abrasion	x		
1.A.3.c	railways	x		x
1.A.3.d.i (ii)	international inland navigation		x	
1.A.3.d.ii	national navigation	x		x
1.A.4.b.ii	household and gardening (mobile)	x		x
1.A.4.c	agriculture / forestry / fishing	x		x
1.A.4.c.ii	off-road vehicles and other machinery	x		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.

51. The Swedish inventory of transport emissions is generally complete and transparent. However, the ERT has made some recommendations to further improve the completeness of the emission inventory for mobile sources. The ERT commends Sweden for its good and timely responses to transport questions during the review.

Transparency:

52. The emission estimates from mobile sources are transparently described in the Swedish IIR and its Annexes. The ERT finds that methodologies for road transport emissions are particularly well documented in the Annex. During the review, the ERT received additional information concerning methodologies and the principles used for road transport and off-road machinery. The IIR also contains some inaccuracies concerning the division of sources, with a description of the source 1A3e ii which is not included in the NFR tables. Sweden confirmed during the review that this was a mistake, and that the text in the IIR would be changed. The ERT finds that the description of allocations and the methodologies used within off-road

machinery could be more transparent, and encourages Sweden to include a more detailed description in the next IIR. In addition, the ERT has made some recommendations to further increase the transparency of the Swedish IIR; see category issue 1 and 2.

53. The NFR tables are transparently presented with a limited number of emissions included elsewhere. Only NMVOC emissions from gasoline evaporation are reported as IE; see category issue 3. The ERT has made one recommendation concerning the use of the notation key NO; see category issue 4.

Completeness:

54. For the main pollutants and particulates, the Swedish inventory is complete. However, in the case of mobile sources, reporting is incomplete for heavy metals and POPs. The ERT has made some source-specific recommendations; see category issue 5-7.

Consistency including recalculation and time series:

55. The emissions time series are consistent within the mobile sources. No dips and jumps in the time series have been identified. The ERT notes that Sweden has not updated the NFR tables for emissions from road transport in the 1980s.

56. Recalculations are thoroughly described and justified at a detailed level in the IIR.

Comparability:

57. The Swedish inventory is in accordance with the 2009 Guidebook, and country-specific methodologies are described in the IIR. Emission estimates are comparable to those of other countries.

Accuracy and uncertainties:

58. Sweden has performed a quantitative uncertainty analysis for its CLRTAP emission inventory. The ERT commends Sweden for this work, and encourages Sweden to use the uncertainty analysis to prioritise possible areas of improvement for the future.

Improvement:

59. Chapter 3.7 in the IIR contains information on planned improvements within the energy sector. There are no planned improvements listed for mobile sources. The ERT recommends that Sweden uses the uncertainty analysis and feedbacks from this review to prioritise areas of further improvement within the mobile sources sector in the Swedish emission inventory.

Sub-sector Specific Recommendations.

Category issue 1: 1A3b i-iv – All pollutants

60. The IIR contains a detailed description of methodologies for road transport emission calculations. The ERT, however, finds that data sources and update frequency are insufficiently described so that for example an assessment of time

series consistency is not possible. During the review Sweden informed the ERT about what data are updated annually, and expressed their willingness to investigate the possibility of including such documentation in the IIR in the future. The ERT encourages Sweden to expand its documentation on road transport by including a table that qualitatively describes the various data sources and the update frequency for input data to HBEFA.

Category issue 2: 1A3a - All pollutants

61. The IIR contains little information about what annual data are used to calculate emissions from aviation. This reduces the transparency of the Swedish inventory. During the review Sweden informed the ERT that year-specific flight data regarding the number of LTO cycles, place of take-off and destination, type of aircraft and engine are used in a model to estimate emissions from aviation every year. The ERT encourages Sweden to include this qualitative information in the methodology description in the IIR, in order to increase transparency.

Category issue 3: 1A3b v - NMVOC

62. In the previous review report (from 2009) the ERT stated that NMVOC emissions from gasoline evaporation were reported as included elsewhere, and that no information on allocation was to be found in the IIR. The ERT of 2013 found that the NMVOC emissions from gasoline evaporation were still reported as IE with no information provided in the IIR as to where the emissions are included. During the review, Sweden provided the information that these emissions are included under 1A3b i-iv. The ERT reiterates the recommendation that the emissions should be allocated to NFR sector 1A3b v Gasoline evaporation in the future, in order to increase transparency.

Category issue 4: 1A4a ii – All pollutants

63. Emissions from 1A4a ii are reported as not occurring in the NFR, while, according to the IIR, these emissions are included in 1A4b ii. Sweden informed the ERT that the IIR was correct, and that the notation key would be changed to IE. The ERT welcomes this correction, and encourages Sweden to collect information, if possible, that will render disaggregation of energy consumption and emissions to 1A4a ii and 1A4b ii possible.

Category issue 5: 1A2f ii, 1A3a, 1A3b i-iv, 1A3c, 1A4b ii and 1A4c ii - Heavy metals

64. Heavy metal emissions from combustion within mobile sources are not calculated, with some exceptions. This is not in accordance with the 2009 Guidebook, which provides emission factors for many of the components of these sources. The reported emissions are known to be significant in many comparable countries. During the review Sweden informed the ERT that making estimates of Hg and Zn from road traffic and Pb from aviation was planned for the 2014 submission. The ERT welcomes this improvement of completeness and comparability, and recommends that Sweden increases the completeness of the Swedish inventory further by also reporting emissions of other heavy metals from mobile sources.

Category issue 6: 1A2f ii, 1A3c, 1A4b ii and 1A4c ii – PAH

65. Emissions of several PAHs are not estimated for 1A2f ii, 1A3c, 1A4b ii and 1A4c ii. The 2009 Guidebook provides Tier 1 emission factors for most of these pollutants from these sources. The ERT encourages Sweden to report PAH emissions from off-road machinery and railways in order to increase the completeness of the emission inventory.

Category issue 7: 1A3b vi - As and Se

66. As and Se emissions from automobile tyre and brake wear are reported as NE. The 2009 Guidebook provides information on these substances similar to the other heavy metals. Sweden informed the ERT during the review that the emission factors had been taken from two Swedish studies where As and Se were not included. The ERT encourages Sweden to examine possibilities for calculating As and Se emissions from automobile tyre and brake wear.

INDUSTRIAL PROCESSES

Review Scope

Pollutants Reviewed		NO _x , NMVOC, SO _x , NH ₃ , PM _{2.5} , PM ₁₀ , TSP, CO, Cd, Hg, Pb, POPs		
Years		1990 – 2011		
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		x
2.A.6	road paving with asphalt	x		x
2.A.7.a	Quarrying and mining of minerals other than coal	x		x
2.A.7.b	Construction and demolition	x		x
2.A.7.c	Storage, handling and transport of mineral products	x		x
2.A.7.d	Other Mineral products (Please specify the sources included/excluded in the notes column to the right)	x		x
2.B.1	ammonia production		x	
2.B.2	nitric acid production		x	
2.B.3	adipic acid production		x	
2.B.4	carbide production	x		x
2.B.5.a	Other chemical industry (Please specify the sources included/excluded in the notes column to the right)	x		x
2.B.5.b	Storage, handling and transport of chemical products (Please specify the sources included/excluded in the notes column to the right)	x		x
2.C.1	iron and steel production	x		x
2.C.2	ferroalloys production	x		x
2.C.3	aluminium production	x		x
2.C.5.a	Copper Production	x		x
2.C.5.b	Lead Production	x		x
2.C.5.c	Nickel Production	x		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		x
2.C.5.f	Storage, handling and transport of metal products (Please specify the sources included/excluded in the notes column to the right)		x	
2.D.1	pulp and paper	x		x
2.D.2	food and drink	x		x
2.D.3	Wood processing	x		x
2.E	production of POPs		x	
2.F	consumption of HM and POPs (e.g. Electrical and scientific equipment)		x	
2.G	Other production, consumption, storage, transportation or handling of bulk products (Please		x	

	specify the sources included/excluded in the notes column to 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:

67. Sweden's industrial processes inventory is generally transparent and well organised. However, the ERT notes that short descriptions of all source categories (e.g. is it a key-source, NO, NA, etc.) and information on which tier methods have been used are missing. The ERT encourages Sweden to add this information in its next submission of the IIR. The ERT also notes that tables with activity data and emission factors are missing and encourages Sweden to include these tables at least for the key categories in its next submission.

68. The ERT notes that the explanations for the use of the notation keys NE and IE are not provided in the NFR tables. In the IIR, the use of some NE and IE notation keys is explained. To the question raised by the ERT, Sweden replied that there was no complete overview available of explanations for the use of the notation keys NE and IE and that NEs had been used where no national data on EFs or emission measurements were available. The ERT recommends that Sweden includes an overview with explanations for the use of the notation keys NE and IE in its IIR.

69. The ERT notes that the use of generic emission factors for NFR sector 2 is limited and that most of the reported emissions are obtained from environmental reports at facility level. The ERT encourages Sweden to continue in this way. The ERT notes that Sweden uses appropriate notation keys in the NFR tables for the source categories of the industrial processes sector and commends Sweden for this.

Completeness:

70. The ERT considers the industrial processes sector to be almost complete for the main sources and comprehensive with good levels of detail in the methodology descriptions. To avoid under-estimates, the ERT recommends that Sweden includes plans to address missing emissions (NE) in its IIR, either by obtaining data allowing an emission estimate to be made, or by reporting the emissions as not applicable.

Consistency including recalculation and time series:

71. The ERT notes that Sweden has performed recalculations for all the source categories within the industrial processes sector and has described them very well. The time series for all revised data have been studied carefully in search for outliers and to make sure that the levels are reasonable. The ERT commends Sweden for this.

Both the time series for the activity data and EFs used to calculate emissions are consistent.

Comparability:

72. Sweden reported its emissions inventory in accordance with the reporting requirements and submitted it in the requested NFR format. Furthermore, the ERT notes that there are no differences between the CLRTAP and NEC emissions reported by Sweden.

Accuracy and uncertainties:

73. The ERT notes that Sweden provided an uncertainty analysis for all pollutants and presented the results in Annex 1 to its 2013 submission. The ERT commends Sweden for this.

74. Besides general QA/QC procedures, source-specific Tier 2 QC procedures are carried out for 2C1 (iron and steel production). Furthermore, the Swedish QA/QC system includes national peer reviews by sectoral authorities for all sectors.

Improvement:

75. The ERT notes that Sweden has not planned any major improvements for the source categories within the industrial processes sector. The ERT encourages Sweden to list planned improvements in its IIR in order to support improvement prioritisation.

Sub-sector Specific Recommendations.**Category issue 1: 2A1, 2A2, 2B4, 2C1, 2C5 - All Pollutants**

76. In the sections about 2A1, 2A2, 2B4, 2C1, 2C5 the following text about the size distribution of particles is included in Sweden's IIR: "The size distribution of particles between 10 µm and 2.5 µm (PM10 and PM2.5) has been done by expert judgement." When consulted, Sweden responded that there is currently no overview available of the size distribution of particles between 10 µm and 2.5 µm (PM10 and PM2.5) per category/sub-category. To increase the transparency of its submission, the ERT recommends that Sweden provides an overview of the size distribution of particles between 10 µm and 2.5 µm (PM10 and PM2.5) per category/sub-category in its next submission.

Category issue 2: 2C1 - All Pollutants

77. The ERT notes that the NFR tables contain only figures relating to emissions, but no activity data for key source 2C1 (iron and steel production). When consulted, Sweden responded that there are about 20-25 plants included in 2C1 in Sweden and that they do not have an overview table of their individual AD and EFs. In most cases the figures are based on reported emissions as stated in the plants' annual environmental reports. To increase the transparency of its submission, the ERT encourages Sweden to include a list of its iron and steel plants, with their reported emissions, in future IIRs.

SOLVENTS

Review Scope

Pollutants Reviewed		NMVOC, NOx, PM ₁₀ , PM _{2.5} , TSP, CO, HMs, PCDD/PCDF, PAHs		
Years		1990 – 2011		
NFRCode	CRF_NFRName	Reviewed	Not Reviewed	Recommendation Provided
3.A.1	Decorative coating application	x		x
3.A.2	Industrial coating application	x		x
3.A.3	Other coating application (Please specify the sources included/excluded in the notes column to the right)		x	x
3.B.1	Degreasing		x	x
3.B.2	Dry cleaning	x		x
3.C	Chemical products,	x		x
3.D.1	Printing	x		x
3.D.2	Domestic solvent use including fungicides		x	x
3.D.3	Other product use	x		x
Note: Where a sector has been partially reviewed (e.g. some of the NFR codes) please indicate which codes have been reviewed and which have not in the respective columns.				

General recommendations on cross-cutting issues

Transparency:

78. The ERT notes that the methodology used for calculating the emissions from Sweden's solvent sector has been described in a way that enables reviewers to assess the inventory parameters. Still, the ERT recommends that Sweden provides more information on the dynamics of emission trends in sub-sector overviews and encourages Sweden to present the emissions, activity data and emission factors used for each category at the highest possible level of detail.

79. The ERT encourages Sweden to include a list of the most important chemical and/or product groups in the IIR.

Completeness:

80. The ERT notes that all important sources for the solvent sector have been included in the inventory. Still, there are some NEs for PMs in NFR 3.D.1 and for Ni, Se, Zn, PAHs (separately), HCB and PCBs in NFR 3D3. According to the EMEP/CORINAIR Guidebook 2009, Sweden should carry out, for those cases where NEs have been used, a qualitative assessment of their importance, for the present and the future. The ERT encourages Sweden to include a description of its intentions to calculate these emissions in the future or an explanation as to why there are no such plans in its IIR.

Consistency including recalculation and time series:

81. Sweden updates its reported activity data and emissions for the last three years in every new submission. The reason for that is explained in the IIR. The

reason for minor corrections of emissions in the inventory is not explained. The ERT recommends that Sweden provides the reasons for emission changes in the IIR even if they are minor.

82. In general, the ERT considers the time series for emissions and activity data to be consistent.

Comparability:

83. Sweden uses a country-specific methodology to calculate its solvent emissions, which is sufficiently described in the IIR. No over- or under-estimates can be identified in the Sweden's emission estimates. The ERT notes that the results are comparable with those provided by other Parties.

Accuracy and uncertainties:

84. Sweden uses the Tier 1 uncertainty methodology described in the EMEP/CORINAIR Guidebook 2009 and a description of the uncertainty analysis is presented in the IIR.

85. Sweden uses the "Manual for SMED's Quality System in the Air Emission Inventories" as its QA/QC plan. All Tier 1 general inventory level QC procedures and some sector specific Tier 2 QC procedures have been performed and are documented in checklists.

Improvement:

86. The ERT notes that Sweden is not planning any major improvements of its solvent sector emission estimates for the next submission.

Sub-sector Specific Recommendations.

87. The ERT has no specific sub-sector recommendations for Sweden's solvent sector emission estimates.

AGRICULTURE

Review Scope:

Pollutants Reviewed		NH ₃ , PM _{2.5} , PM ₁₀		
Years		1990 – 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		
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		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)		x	
11 B	Forest fires		x	

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

General recommendations on cross-cutting issues

88. The ERT commends Sweden for its advanced agriculture inventory based on scientific research and national data.

Transparency:

89. Sweden's IIR includes most of the relevant information for the agriculture sector. Still, the ERT encourages Sweden to further improve transparency by including all activity data in the IIR and providing more detailed background information on the national emission factors applied.

Completeness:

90. The ERT finds that for NH₃ all important sources are included in the inventory. Buffalos (4B2), mules and asses (4B7), field burning (4F) and agriculture other (4.G)

are not occurring in Sweden. For NO_x emissions from 4B9a, b, and c (poultry) Sweden reports "NE", and for all other relevant agriculture source categories Sweden reports NO_x emissions as not applicable ("NA"). In the EMEP/EEA emission Inventory Guidebook 2009, Tier 1 emission factors for the calculation of NO_x emissions from manure management and synthetic fertiliser application are available. The ERT recommends that Sweden uses the correct notation keys ("NE") and continuously improves the completeness of its inventory.

91. Sweden reports emissions of PM_{2.5} and PM₁₀ for all relevant sources for which emission factors are available in the EMEP/EEA Guidebook 2009. TSP emissions are reported as "NE". The ERT encourages Sweden to make further efforts to improve the completeness of its inventory.

Consistency including recalculation and time series:

92. Sweden reports emissions of NH₃ and PM from 1990 to 2011. However, there are some inconsistencies for the years before 1995 due to changed statistical input data. The ERT recommends that Sweden establishes a consistent time series. In the EMEP/EEA Guidebook, chapter 4, basic methods and principles are provided.

Comparability:

93. Sweden applies higher tier methods for all key sources (4B1b, 4B1a, 4B8, 4B6, 4B9d, 4D1a) in line with the Guidebook. For the estimates of NH₃ emissions from sector 4B, a country-specific method was applied, NH₃ emissions from mineral fertiliser application were estimated using the Tier 2 methodology. Although the ERT finds that Sweden's IEFs are in the range of those applied in other countries, Sweden's specific trends should be explained in more detail.

Accuracy and uncertainties:

94. The ERT notes that Sweden undertakes sector-specific QA/QC procedures and encourages Sweden to provide specific information on the implementation of ERT recommendations in the IIR of its next inventory submission.

Improvement:

95. Following the Swedish IIR 2013, no major improvements are planned for the next submission.

Sub-sector Specific Recommendations

Category issue 1: 4.B Manure management - NH₃

96. Sweden uses a national method for the calculation of NH₃ emissions from manure management, grazing and synthetic fertiliser use. Sweden's IIR does not provide sufficient information on the validation of the model. Sweden responded that the method had originally been developed in cooperation between the Swedish Institute of Agricultural and Environmental Engineering (JTI), the Swedish University of Agricultural Sciences (SLU), the Swedish Board of Agriculture (SJV), the Swedish EPA (NV) and Statistics Sweden (SCB). Since first developed in the late 1980s, it has been overhauled on several occasions, mainly by the Swedish Institute of Agricultural and Environmental Engineering. The method is believed to be well suited for Swedish conditions with country-specific parameters and emission factors

developed by scientific methods. As referenced in the IIR, there are mainly two reports that describe the method (Swedish EPA 1997 and JTI 2002). The ERT encourages Sweden to provide more information on the validation of the model and its results in the next IIR.

97. The ERT notes that Sweden has provided activity data tables as recommended in the previous review report. For the calculation of emissions from sows the ERT encourages Sweden to establish a consistent time series for the years before 1996. In the EMEP/EEA Guidebook, chapter 4, basic methods and principles are provided.

Category issue 2: 4.B.1. Cattle NH₃

98. For the years 1990 to 1995 Sweden does not report ammonia emissions from dairy cattle (4B1a) separately (i.e. as "IE"). Emissions are included in the non-dairy cattle category (4B1b). A description is given in the IIR as encouraged in the previous review report. As activity data on dairy cattle is available, the ERT encourages Sweden to make efforts to report emissions from dairy cattle under 4B1a. In the EMEP/EEA Guidebook, chapter 4, basic methods and principles are provided.

99. The Swedish inventory shows a decreasing trend for 1996 to 2011 in NH₃ IEF for dairy cattle (from 36.42 kg NH₃/a to 32.70 kg NH₃/a). The NH₃ IEF of non-dairy cattle is rather constant from 1996 onwards. The ERT encourages Sweden to provide an explanation for these trends in the IIR of its next annual submission.

Category issue 3: 4.D.1 Agricultural Soils - NH₃

100. The amount of fertiliser application in horticulture and forestry is assumed to be 5% of the amount of synthetic fertilisers applied in agriculture. Following the IIR, this assumption was made by the inventory team in the early 1990s, but no further explanation is given. No activity data on synthetic fertiliser use is provided in the IIR. In its answer to a question raised by the ERT, Sweden explained that there are two surveys that estimate fertiliser use in Sweden. One survey is a bottom-up estimate of the amount used. That is, Statistics Sweden ask Swedish farmers twice a year about their use of fertiliser and manure. The other survey is a top-down estimate. Here, Statistics Sweden ask producers, importers and/or wholesalers about the total sales of fertilisers in Sweden. Because the sales statistics also include use for horticulture purposes, the difference between the two estimates should be the approximate amount used in horticulture (at least in the long run). The amount used in forestry is, as stated in the IIR (paragraph 6.3.2.4), estimated by the Swedish National Board of Forestry. The ERT recommends that Sweden includes activity data as encouraged in the previous review report and that it also includes additional information (as provided to the ERT during the review) in the IIR with its next annual submission.

101. In addition, Sweden has not provided clear references for the methods and emission factors used. In the IIR 2013, p. 114, it is explained that emission factors for commercial fertilisers were obtained from the EMEP/EEA Emission Inventory Guidebook 2009. On page 125, Table 6.11, CORINAIR is given as a reference. The ERT recommends that Sweden provides an improved description of the methodology it applies, including clear references.

WASTE

Review Scope:

Pollutants Reviewed		All		
Years		1990 – 2011		
NFR Code	CRF_NFR Name	Reviewed	Not Reviewed	Recommendation Provided
6.A	solid waste disposal on land	x		x
6.B	waste-water handling	x		x
6 C a	6 C a Clinical waste incineration (d)	x		
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		
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.

102. The ERT commends Sweden for the transparency of its Informative Inventory Report. At the same time, the ERT recommends that Sweden improves the completeness and comparability of waste sector reporting. Specific problems which have been found and proposed solutions are given below.

Transparency:

103. The ERT considers the report to be very transparent and commends Sweden for the detailed descriptions provided in the Informative Inventory Report.

Completeness:

104. The ERT does not consider the reported data to be complete and recommends that Sweden includes missing sources/pollutants in its inventory for which there are methodologies and default emission factors available in the EMEP/EEA Guidebook. These include: solid waste disposal on land, waste water handling, and cremation. Please find further information in the sector-specific recommendations below.

105. The ERT commends Sweden for estimating and reporting emissions from categories that are not included in the EMEP/EEA Guidebook and recognises Sweden's intention to use country-specific emission factors.

Consistency, including recalculation and time series:

106. The ERT considers the report to be consistent.

Comparability:

107. The ERT considers the report to be comparable for some categories (e.g. cremation) and incomparable for other categories (e.g. NH₃ from wastewater handling). Please refer to the sector-specific recommendations below.

Accuracy and uncertainties:

108. The ERT considers the accuracy of the report to be acceptable.

Improvement:

109. The ERT encourages Sweden to carry out the recommended improvements, as specified under the Sector-specific Recommendations.

Sub-sector Specific Recommendations.**Category issue 1: 6A Solid Waste Disposal on Land - NMVOC**

110. During the review, the ERT noted that emissions of NMVOC are not estimated for solid waste disposal on land even though there is a default emission factor in the 2009 EMEP/EEA Guidebook. This issue was mentioned in the previous review report where Sweden was encouraged to calculate emissions for future submissions. During the review Sweden replied: "The estimated emissions for other substances (GHG) are based on national information. We may in future submissions include emission estimates based on the emission factors from the Guidebook". The ERT recommends that Sweden calculates and reports emissions of NMVOC from solid waste disposal on land. Alternatively, the ERT recommends that Sweden explains the reason for not calculating emissions from solid waste disposal in its IIR and corrects the notation key for NMVOC accordingly.

Category issue 2: 6B Wastewater handling - NMVOC

111. During the review, the ERT noted that Sweden had not estimated or reported NMVOC emissions from wastewater handling. During the review, Sweden replied: "These emission estimates have not been updated in many years. We may in future submissions include emission estimates based on the EFs from the Guidebook". The ERT recommends that Sweden calculates and includes NMVOC emissions from wastewater handling. If no national emission factor is available, a default emission factor is available in the 2009 EMEP/EEA Guidebook. This issue was also raised under the previous review.

Category issue 3: 6B Wastewater handling - NH₃

112. The estimated emissions of ammonia from the part of the population that is not connected to municipal wastewater treatment are based on a model developed in the beginning of the 1990s and the same value (0.4 Gg NH₃) has been reported for every year since 1990. This issue was mentioned in the previous review report where Sweden was encouraged to update these emissions for future submissions. During the review Sweden replied: "These emission estimates have not been updated in many years. Thus no comparison has been made with the emission factor in the EMEP/EEA Emission Inventory Guidebook 2009". The ERT encourages Sweden to update NH₃ emissions from latrines by including an activity data time series, by taking into account the evolution of the population that is not connected to municipal

wastewater treatment and, if possible, by taking into consideration the evolution of per capita protein intake. If a national emission factor is available, then the ERT encourages Sweden to make a comparison with the emission factor available in the 2009 EMEP/EEA Guidebook to ensure that no under- or over-estimates are occurring.

Category issue 4: 6Cd Cremation - multiple pollutants

113. During the review, the ERT noted that Sweden had not estimated or reported emissions of multiple pollutants for which there are default emission factors in the EMEP/EEA Guidebook. During the review Sweden replied: "The EFs are national EFs and only available for the mentioned substances. We may in future submissions include emission estimates based on the EFs from the Guidebook". The ERT recommends that Sweden improves the completeness of its submission by including the entire list of pollutants provided in the 2009 EMEP/EEA Guidebook for cremation.

Category issue 5: 6D Other Waste - NH₃

114. During the review the ERT noted that Sweden had not estimated or reported NH₃ emissions from composting. This was also noted under the previous review. During current review Sweden replied: "These emission estimates have not been updated in many years. We may in future submissions include emission estimates based on the EFs from the Guidebook". The ERT recommends that Sweden calculates NH₃ emission from composting based on the default emission factor provided by the 2009 EMEP/EEA Guidebook.

LIST OF ADDITIONAL MATERIALS PROVIDED BY THE COUNTRY DURING THE REVIEW

1. Fridell, E., Jernström, M., Lindgren, M. (2008): Arbetsmaskiner, Uppdatering av metod för emissionsberäkningar, SMED