**UNITED
NATIONS**

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
Greece

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, NO_x, NMVOC, NH_3, plus PM_{10} & $PM_{2.5}$ for the time series years 1990 – 2012, reflecting current priorities of 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 Greece coordinated by the EMEP emission centre CEIP acting as review secretariat. The review took place from 23 June 2014 to 27 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 – J Webb (UK), Energy - Jeroen Kuenen (Netherlands), Transport - Jean-Marc Andre (France), Industry - Ils Moorkens (Belgium), Solvents - Kees Peek (Netherlands), Agriculture + Nature - Mette Mikelsen (Denmark), Waste – Dirk Wever (Netherlands).

4.   Anne Misra was the lead reviewer. The review was coordinated by Katarina Marečková (EMEP Centre on Emission Inventories and Projections - CEIP).

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[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 not in line with the EMEP/EEA Inventory Guidebook and the UNECE Reporting Guidelines. Only emissions of NO_x, SO_2 NMVOC, CO and NH_3 (agriculture sector only) are reported.

6.   Few results are presented in the IIR. The only time series covered in the IIR are for NO_x and SO_2. Emissions are reported in detail only for the Transport sector.

7.   The ERT encourages Greece to submit an IIR fully in line with the EMEP/EEA Inventory Guidebook and the UNECE Reporting Guidelines. In addition to NO_x and SO_2, the inclusion of all pollutants and sectors reported in the LRTAP NFR tables (i.e. NMVOC, CO and NH_3) would be welcome. The ERT also encourages Greece to report full time series in the IIR.

8.   The Party participated actively in the Stage 3 review process providing further information and data when requested, with fast turnaround times. Based on the additional information provided by Greece, the ERT was able to review the inventory within the given time period.

INVENTORY SUBMISSION

9.   Greece has not submitted a detailed IIR. Since Greece has ratified the Sulphur and NO_x Protocols, the IIR only reports emissions of SO_2 and NO_x. Emissions of NMVOC, CO and NH_3 are available in the NFR tables submitted to LRTAP on 26/2/2014 and resubmitted on 12/3/2014.

10.   Emissions are reported in NFR09 categories. The notation 'NE' (Not Estimated) is used only sparingly in the Annex IV spreadsheet but no explanation is given in the IIR for the application of NE. No indication is given in the IIR if transport emissions are based on fuel used or fuel sold.

KEY CATEGORIES

11.   Greece has not reported any key source category analysis in the IIR.

12.   The preparation of the CLRTAP pollutants inventory is based on the Greenhouse Gas Inventory System of Greece. Key category analysis is performed and reported for GHGs. The outcomes of GHG key category analysis are relevant to the estimation of the CLRTAP pollutants, with respect to the collection of and QA/QC processes applied to activity data, since the same activity data are used for the estimation of emissions of both GHG and CLRTAP pollutants.

13.   Moreover, Greece tries to estimate emissions from the categories with the greatest contributions to the national total by applying country-specific EFs or advanced models, where possible.

14.   The ERT encourages Greece to present results of the key category analysis that are relevant to emissions reported to the LRTAP Convention in future IIR reports.

QUALITY

Transparency

15.   Insofar as the emissions Greece has reported are concerned, the calculations are reasonably transparent. However, only NO_x emissions from transport have been reported in detail.

16.   The ERT encourages Greece to carry out and report detailed descriptions of recalculations for all sectors in future IIRs.

17.   Greece has reported that it has attempted to estimate emissions from the categories with the greatest contributions to the national total by applying country-specific EFs or advanced models, where possible. But no references are made to country-specific methods, other than plant-specific data, in the IIR.

18.   The ERT encourages Greece to include country-specific EFs, and cite their sources, in future IIRs.

19.   Greece makes use of the notation keys NE (Not Estimated) and IE (Included Elsewhere) in the spreadsheets submitted. But no explanation of the reasons for using these keys is presented in the IRR. The ERT encourages Greece to explain the reasons for using these keys in future IIRs.

Completeness

20.   Greece has provided an IIR for the review process. However, this IIR does not provide all the information needed for a proper review. Following a request from the ERT, Greece did provide some additional material used for estimating emissions. Only four pollutants (SO_2, NO_x, NMVOC and CO) are reported and in some sectors also NH_3. The ERT strongly encourages Greece to include also emissions of particulate matter, heavy metals and POPs in the next submission.

21.   Greece has submitted a complete series of inventories for the years 1990 to 2012 for NO_x, NMVOC, CO and NH_3 and SO_2. There are significant gaps with regard to the emissions reported and sectors included and in the descriptions and sections covered in the IIR.

22.   Greece has not listed the sources not estimated in the inventory and has not given a qualitative assessment of their importance. Nor is there any account of the measures taken to determine if these sources can be calculated in future.

23.   The ERT acknowledges the effort to which Greece has gone to provide estimates of NO_x emissions for the Transport sector and encourages Greece to provide an equivalent level of detail for other pollutants and sectors.

Consistency, including recalculations and time series

24.   Greece has undertaken recalculations of their 2012 submission for the Transport sector for 1987 to 2009 but there is no indication of any recalculations in the Energy, Agriculture and Waste sectors. Recalculations in those sectors have been reported in the sectoral chapters of the NIR submitted to the UNFCCC. A

summary of the annual recalculations is reported in chapter 9 of the NIR (http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/8108.php).

25.   The ERT encourages Greece to carry out recalculations for other pollutants and sectors over the complete time series in its future IIR submissions.

Comparability

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

CLRTAP/NECD comparability

27.   As regards the pollutants reported (NO_x, NMVOC, SO_2 and NH_3) there are no differences in the total emissions between the CLRTAP and NECD inventories.

Accuracy and uncertainties

28.   Greece has not compiled uncertainty estimates for its UNECE submission. During the review Greece indicated that while they had not performed an uncertainty analysis for the LRTAP inventory, the uncertainty associated with the activity data used in the emission calculation was included in the Greek NIR submitted to the UNFCCC. Since the same activity data are used for estimating emissions of both GHG and LRTAP pollutants, the findings of the GHG uncertainty analysis are therefore relevant to the LRTAP emissions.

29.   The ERT encourages Greece to compile at least Tier 1 estimates for future submissions and report the findings in the IIR.

Verification and quality assurance/quality control approaches

30.   Greece has not carried out a QA/QC assessment. During the review Greece indicated that QA/QC procedures and verification activities were implemented in the Greek National Inventory System. They comprise:

- QC checks using source-specific Tier 2 QC procedures.

- Annual internal audits that are undertaken by MEECC/NTUA between January and March each year and audits by independent local experts.

- Bilateral QA exercises with the inventory teams of other countries (e.g. in 2013 a bilateral QA exercise was performed between the Spanish and the Greek Inventory teams).

- QC checks and / or technical reviews from DG CLIMA.

- Review of the annual submissions of Greece by the nominated experts from the UNFCCC.

- Review of the CLRTAP inventory by UNECE/CEIP.

31.   The ERT encourages Greece to include this information on QA/QC procedures in future submissions of the IIR.

FOLLOW-UP TO PREVIOUS REVIEWS

32.   The Report on the Stage 3 in-depth review of emission inventories submitted for Greece in 2011 identified the following cross-cutting issues for improvement:

(a)   The ERT invited Greece to complete the inventory with estimates for all pollutants from all source categories and for all years as specified in the EMEP/EEA Reporting Guidelines and its Annexes. The IIR only reports emissions of SO_2 and NO_x while LRTAP reporting only includes NMVOC, NH_3 and CO.

(b)   The ERT strongly recommends that Greece prepares an IIR for next year's emission inventory in accordance with the Recommended Structure for Informative Inventory Reports (Annex VI to ECE/EB.AIR/97, Version: 30 Sept 2009). *This has been partially implemented*.

(c)   The ERT encourages Greece to undertake an uncertainty analysis in order to inform the improvement process and to provide an indication of the reliability of the inventory data. *Outstanding, no specific uncertainty analysis reported in the IIR.*

(d)   The ERT encourages Greece to clarify the QA/QC procedures in the next submission and to provide information on a QA/QC plan and information on QA/QC activities in the next IIR. *Outstanding, no specific QA/QC reported in the IIR.*

(e)   The ERT recommends that Greece ensures consistency of the methodologies with the latest version of the EMEP/EEA Guidebook and to explain discrepancies in the IIR. *This has been implemented.*

(f)   The ERT recommends that Greece provides information on recalculations in the IIR. *Greece has undertaken recalculations (for their 2012 submission) for the Transport sector for 1987 to 2009 but not for other sectors.*

(g)   The ERT encourages Greece to provide a key source analysis in the IIR. *Outstanding, Greece has not reported any key source category analysis in the IIR.*

(h)   The ERT encourages Greece to provide an inventory improvement plan with a schedule for the improvements identified and needed as part of the next submission. *Outstanding, there is no improvement plan in the IIR.*

(i)   The ERT recommends that Greece completes the estimation of not estimated (NE) sources. *Outstanding, no reference is made in the IIR to the NE category.*

AREAS FOR IMPROVEMENT IDENTIFIED BY GREECE

33.   There are no suggestions or recommendations for improvement in the IIR.

PART B: RECOMMENDATIONS FOR IMPROVEMENTS TO THE PARTY

CROSS-CUTTING IMPROVEMENTS IDENTIFIED BY THE ERT

34.   e.g. The ERT identifies the following cross-cutting issues for improvement:

(a)   In addition to NO_x and SO_2, the inclusion in the IIR of those pollutants (NMVOC, CO and NH_3) submitted in the LRTAP NRF table Annex IV would be welcome. The ERT also encourages Greece to report full time series in the IIR.

(b)   The ERT recommends that Greece carries out and reports detailed descriptions of the recalculations in all sectors in future IIRs.

(c)   The ERT encourages Greece to submit an IIR fully in line with the EMEP/EEA Inventory Guidebook and the UNECE Reporting Guidelines.

(d)   The ERT recommends that Greece presents results of a key category analysis that are relevant to the emissions addressed by the CLRTAP in future IIR reports.

(e)   The ERT encourages Greece to include country-specific EFs, and cite their sources, in future IIRs.

(f)   The ERT encourages Greece to include information on QA/QC procedures in future submissions of the IIR.

(g)   The ERT encourages Greece to evaluate the procedures used to prepare the inventory and develop a plan for improvement.

SECTOR SPECIFIC RECOMMENDATIONS FOR IMPROVEMENTS IDENTIFIED BY ERT

ENERGY

Review Scope

Pollutants Reviewed		SO$_2$, NO$_x$, NMVOC, CO (other pollutants not provided)		
Years		1990 – 2012		
NFR Code	**CRF_NFR Name**	**Reviewed**	**Not Reviewed**	**Recommendation Provided**
1.A.1.a	public electricity and heat production	X		X
1.A.1.b	petroleum refining	X		X
1.A.1.c	Manufacture of solid fuels and other energy industries	X		X
1.A.2.a	iron and steel	X		X
1.A.2.b	non-ferrous metals	X		X
1.A.2.c	chemicals	X		X
1.A.2.d	pulp, paper and print	X		X
1.A.2.e	food processing, beverages and tobacco	X		X
1.A.2.f.i	Stationary Combustion in Manufacturing Industries and Construction: Other (Please specify in your IIR)	X		X
1 A 3 e	Pipeline compressors		NO	
1.A.4.a.i	commercial / institutional: stationary	X		X
1.A.4.b.i	residential plants	X		X
1.A.4.c.i	Agriculture/forestry/fishing. stationary	X		X
1.A.5.a	other, stationary (including military)		IE	X
1.B.1.a	coal mining and handling		NA	
1.B.1.b	solid fuel transformation		NO	
1.B.1.c	other fugitive emissions from solid fuels)		NO	
1 B 2 a i	Exploration, production, transport		IE	X
1 B 2 a iv	Refining / storage	X		X
1 B 2 a v	Distribution of oil products		IE	X
1 B 2 b	Natural gas		NA	
1 B 2 c	Venting and flaring		NE	X
1 B 3	Other fugitive emissions from geothermal energy production, peat and other energy extraction not included in 1 B 2		NA	
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:

35.	Greece has submitted an IIR; however, this IIR only provides some information about NO$_x$ and SO$_2$ emissions, not about the other pollutants. From the limited information provided in the IIR it was not possible to review the Energy sector, since the methodologies applied are not clear. The ERT strongly encourages Greece to provide a more detailed IIR with a full explanation of how emissions are estimated for each NFR source category. This includes an overview of the activity data and the emission factors used within each chapter of the IIR.

36.   Given the information provided by Greece during the review process, it was clear that the emission factors are based on earlier versions of the EMEP/EEA Guidebook and expert judgements. The ERT recommends that Greece updates the methodologies to the latest version of the 2013 EMEP/EEA Guidebook, to be used for reporting in 2015 and thereafter.

37.   Greece reports IE (Included Elsewhere) for some of the NFR codes in the Energy sector. However, it is not clear where these codes are included. The ERT encourages Greece to provide this information in their IIR.

Completeness:

38.   The ERT notes that the Greek inventory of the Energy sector only includes emissions of the four main pollutants (NO_x, SO_2, NMVOC and CO). The ERT encourages Greece to also consider emissions for the other pollutants (particulate matter, heavy metals and POPs) in the reporting template.

39.   Due to the limited information available, it is difficult to review the completeness of the inventory. For the combustion sector, the inventory seems to be relatively complete for the 4 pollutants provided. For the non-combustion part of the Energy sector, emissions are reported in only one sector (1.B.2.a.iv) whereas all the others have notation keys. For sector 1.B.2.c emissions are not estimated, although emissions are likely to occur here. The ERT would like to reiterate the recommendation made by the 2011 ERT, i.e. that Greece improves the completeness of its inventory for the next submission.

40.   For the Energy sector and the 4 pollutants covered, the inventory seems to be relatively complete. However, for source category 1.B.2.c NE (Not Estimated) is used although emissions are likely to occur.

Consistency including recalculation and time series:

41.   Due to a lack of information, it was not possible for the ERT to assess whether recalculations have been performed for the Energy sector. The ERT encourages Greece to provide information on recalculations in their next submission.

42.   The ERT has analysed the trend in reporting for the Energy sector for the 4 pollutants covered by the inventory. Generally, the trends are understandable, but there are some cases where large jumps and dips are found which are difficult to understand, e.g. in 1.A.4.a.i the value for 2007 is much higher compared to earlier and later years, for CO and NMVOC in particular. The ERT encourages Greece to investigate the jumps and dips and explain them in the next submission of the IIR.

Comparability:

43.   The ERT has found that the IIR provides very little guidance on the methodologies used for estimating emissions in the Energy sector. After consultations with the country, it was found that Greece used emission factors from previous versions of the EMEP/EEA Guidebook along with expert judgements. Although these values are within the Guidebook emission factor ranges, they may be quite different. The ERT strongly encourages Greece to update their methodologies to the methods provided in the latest version of the Guidebook for the next

submission. Where expert judgements are used, these need to be properly discussed in the IIR to enable the ERT to understand the background of these emission factors.

Accuracy and uncertainties:

44.   The ERT encourages Greece to undertake an uncertainty analysis for the Energy sector to help inform the improvement process and to provide an indication of the reliability of the inventory data.

45.   Greece provides in the IIR some information about the QA/QC plan which is used in the inventory, which seems to be consistent with Good Practice Guidance. However, the IIR provides no information on the results of the checks on the evaluation of activity data and emission factors. Therefore, the ERT cannot review this part of the IIR.

Improvement:

46.   Greece does not report any planned improvements in the IIR. The ERT encourages Greece to make an improvement plan following the recommendations provided in this review report, see Sector-specific Recommendations.

Sector-specific Recommendations.

Category issue 1: All combustion sectors, all pollutants

47.   After consultation with Greece, it was established that a mix of emission factors from older versions of the EMEP/EEA Guidebook and expert judgements were used in the Energy sector. The ERT recommends that Greece harmonises reporting with the 2013 EMEP/EEA Guidebook, from the next submission round onwards. This will improve transparency and comparability with other countries and allow Greece to include all relevant pollutants in their inventory.

Category issue 2: 1.B, NMVOC and other pollutants

48.   During the review the ERT highlighted the absence of a methodology description for category 1.B fugitive emissions in the IIR. Greece provided a document during the review with emission factors used for estimating emissions from refineries, and the storage and distribution of oil products. The ERT encourages the Party to expand this documentation and include it in future submissions.

Category issue 3: Blank cells in NFR tables

49.   The ERT has noted a number of blank cells in the NFR tables provided by Greece for the years 1990-2012, as presented in the table below. The ERT strongly recommends that Greece completes the inventory and provides the missing data for all years.

1.A.1.a/b/c, 1.A.2.a/b/c/d/e, 1.A.2.f.i	All but SO_2, NO_x, NMVOC, CO, HCB, HCH
1.A.3.e, 1.A.4.a/b/c	All but SO_2, NO_x, NMVOC, CO, HCH

1.A.5.a	All but SO_2, NO_x, NMVOC, CO, HCH, PCBs

TRANSPORT

Review Scope

NFR Code	CRF_NFR Name	Reviewed	Not Reviewed	Recommendation Provided
Pollutants Reviewed		NO$_x$, SO$_2$, NMVOC, CO		
Years		1990 – 2012		
1.A.2.f.ii	Mobile Combustion in Manufacturing Industries and Construction: (Please specify in your IIR)	X		X
1.A.3.a.i.(i)	international aviation (LTO)	X		X
1.A.3.a.i.(ii)	international aviation (cruise)	X		X
1.A.3.a.ii.(i)	civil aviation (domestic, LTO)	X		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		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		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.a.ii	commercial / institutional: mobile	X		X
1.A.4.b.ii	household and gardening (mobile)	X		X
1.A.4.c.ii	off-road vehicles and other machinery	X		X
1.A.4.c.iii	national fishing	X		X
1.A.5.b	other, mobile (including military, land based and recreational boats)	X		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:

50.   The ERT notes that a significant amount of effort has been made since the last review of the Transport sector. An IIR has been provided and some IE notation keys have been replaced by emissions.

51.   During the review week, Greece provided methodology descriptions, and information on emission data as requested by the ERT. For some Transport sub-sectors the Party also referred to their NIR for more detailed data. The ERT thanks Greece for the information provided. Nonetheless, the ERT strongly recommends providing a detailed IIR in the next submission so that all data and background information are compiled in one document.

52.   Estimates are not provided at the most detailed level throughoutTransport sector or for all other mobile sources. The ERT acknowledges the effort undertaken since the last review, but the notation key "IE" (Included Elsewhere) is still used with only little information in the "Additional info" table provided in the NECD submission template. The ERT recommends that the Party provides an IIR which includes all necessary information on methodologies, data sources, EFs applied and explanatory information on all the notation keys used, as well as on recalculations and planned improvements, in its next submission.

53.   In the "Additional Info" table provided as part of the NECD submission, no information is provided regarding the basis for estimating emissions from mobile sources, e.g. fuel sold or used. The ERT strongly recommends that the Party provides such information in its next submission.

Completeness:

54.   The ERT notes that the allocation of emissions from civil aviation (1.A.3.a) results in both under- and over-estimates (see below). Hence, for the time being the inventory cannot be considered complete.

55.   In addition, the ERT cannot confirm the completeness of the Party's inventory given the use of the notation key "IE". Here, the ERT encourages the Party to continue to reduce the use of IE by reporting emissions separately in as many sub-sectors as possible, or at least to provide all necessary explanations for the use of the IE notation key.

Consistency including recalculation and time series:

56.   During the review week, information on recalculated data was provided in the IIR and the NIR. The ERT thanks Greece for the detailed information provided in these documents. Nonetheless, the ERT recommends that Greece provides an IIR in its next submission containing all this information in one document at sub-sector level and for each pollutant.

Comparability:

57.   Estimates are not provided at the most detailed level throughout transport sector or for all other mobile sources. Therefore, comparability with inventories from other countries is currently very limited. The ERT recommends that the Party provides estimates at the most detailed level for the entire Transport sector and for all other mobile sources.

Accuracy and uncertainties:

58.   Greece has not provided an uncertainty analysis. During the review week, the Party explained that the activity data used to estimate CLRTAP emissions were the same as those used in the UNFCCC report. The ERT encourages the Party to undertake an independent uncertainty analysis and to use it as a tool to prioritise improvements in the inventory and for providing an indication of the reliability of the inventory data.

Improvement:

59.   Greece has not provided an inventory improvement plan or any information on improvements already carried out in the inventory in the IIR. During the review week, the Party explained that this information had been provided in the NIR as the improvement plan was the same for the two reports. The ERT encourages the Party to implement an independent improvement plan to collect issues for further inventory improvement, to schedule the relevant tasks and to monitor the progress of the work, to provide information on tasks already carried out, and to document the inventory improvement work in the next IIR.

Sub-sector Specific Recommendations.

Category issue 1: 1.A.2.f.ii Mobile Construction- All Pollutants

60.   During the review the ERT noted that the emissions of 1.A.2.f.ii were included in 1.A.2.f.i (IE notation key used). As the fuels used might be different, the ERT recommends that the Party improves the level of detail of its National Energy Balance or investigates other data sources.

Category issue 2: 1.A.3.a Civil Aviation – all reported pollutants

61.   During the review the ERT asked the Party to explain why emissions from 1.A.3.a.i (i) were included in 1.A.3.a.i (ii), resulting in an underestimation of LTO emissions in the Greek inventory. As Greece follows the UNFCCC Reporting Guidelines for these two source categories at the moment, the ERT warmly welcomes Greece's plan to improve reporting to the CLRTAP by separating LTOs from cruise emissions, an improvement already mentioned as part of the previous Stage 3 review in 2011.

Emissions from 1.A.3.a.ii (ii) are included in 1.A.3.a.ii (i), leading to a possible overestimation of 1.A.3.a.ii LTO emissions in the Greek inventory. Again, the ERT warmly welcomes Greece's plan to improve reporting in these sub-sectors following the requirements under UNECE/CLRTAP.

Category issue 3: 1.A.3.b Road transport - all reported pollutants

62.   The ERT noted that emissions from Road Transport were reported as aggregated totals under 1.A.3.b.i. Greece already uses the COPERT model to prepare emission estimates. Similar to the recommendations of the previous Stage 3 review in 2011, the ERT recommends that the Party reports the sub-sector level emissions in its next submission.

Category issue 4: Mobile Sources in 1.A.4 - all reported pollutants

63.   The ERT noted that all emissions from mobile sources in NFR 1.A.4 were included in the corresponding sub-sectors for stationary combustion. The ERT recommends that Greece reports the emissions for NFR 1.A.4 separately from emissions from stationary combustion, as the fuels used are different.

Category issue 4: Mobile Sources in 1.A.5 - all reported pollutants

64.   The ERT noted that all emissions from mobile sources in NFR 1.A.5 were reported as IE ("included elsewhere") without any further information being provided in the "Additional Info" table. The ERT recommends that possible new data sources should be further investigated to achieve a proper allocation of the emissions.

INDUSTRIAL PROCESSES

Review Scope

	Pollutants Reviewed	SO$_2$, NO$_x$		
Years		1990 – 2012		
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			
2.A.4	soda ash production and use			
2.A.5	asphalt roofing			
2.A.6	road paving with asphalt			
2.A.7.a	Quarrying and mining of minerals other than coal			
2.A.7.b	Construction and demolition			
2.A.7.c	Storage, handling and transport of mineral products			
2.A.7.d	Other Mineral products			
2.Bb.1	ammonia production	x		x
2.B.2	nitric acid production	x		x
2.B.3	adipic acid production			
2.B.4	carbide production			
2.B.5.a	Other chemical industry			
2.B.5.b	Storage, handling and transport of chemical products			
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			
2.C.5.b	Lead Production			
2.C.5.c	Nickel Production			
2.C.5.d	Zinc Production			
2.C.5.e	Other metal production			
2.C.5.f	Storage, handling and transport of metal products			
2.D.1	pulp and paper	x		x
2.D.2	food and drink	x		x
2.D.3	Wood processing			
2.E	production of POPs			
2.F	consumption of HM and POPs (e,g. Electrica and scientific equipment)			
2.G	Other production, consumption, storage, transportation or handling of bulk products			

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:

65.   Greece has provided a short IIR for this submission, describing in a very condensed way the methodologies, data and emission factors used to estimate NO_x and SO_2 emissions. The ERT commends Greece for the effort of compiling this IIR although the condensed form still made the review difficult. The ERT recommends that Greece extends the IIR with relevant information about e.g. the methods, data and emission factors used, as well as emission trends and explanations, in a structured way and following the recommended structure for IIR reports[2].

66.   During the review Greece provided answers to questions raised by the ERT. The ERT recommends that Greece includes the information provided in the next IIR in order to increase the transparency of the estimates.

67.   The use of the notation keys "NE" and "IE" is not explained in the NFR table or in the IIR. The ERT recommends that Greece uses the appropriate notation keys for reporting emissions and to provide explanations for the notation keys used as additional information in the NFR table.

Completeness:

68.   The ERT considers the Industrial Processes sector to be incomplete. Only emissions of the main pollutants have been reported.

69.   The following emissions in the Industrial Processes sector have been reported as "NE": Emissions of NO_x from 2A6, 2A7d, 2B1and 2B5a; NMVOC emissions from 2B5a, 2B5b and 2C3; SO_2 emissions from 2A6. In response to a question from the ERT, Greece indicated that although no emission factors were reported in the EMEP/EEA Guidebook, NOx emissions of sulphuric acid production (2B5) and CO emissions of sulphuric acid production (2B5) and asphalt roofing (2A5) would be reported in the next submission using the default emission factor reported in the EMEP/EEA Guidebook. The part that was omitted referred to NO_x and CO emissions of sulphuric acid production (2B5) since, as stated above, no emission factors were reported in the EMEP/EEA Guidebook. For this reason, the inventory team would like to retain the "NE" notation key for the NO_x and CO emissions of sulphuric acid production. Emissions of other pollutants (NH_3, PMs, HMs, POPs, PCDD/F) are not reported. Instead of blank cells the notation key "NE" should be used to indicate "emissions Not Estimated".

70.   Greece has provided a full time series of emissions for the categories and the limited pollutants that they estimated.

Consistency including recalculation and time series:

71.   In the very short IIR, no recalculations in the Industrial Processes sector are mentioned. The ERT recommends that Greece provides in its next IIR specific information on whether recalculations are carried out or not in the Industrial

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[2] http://www.ceip.at/ms/ceip_home1/ceip_home/reporting_instructions/history_revisions1/

Processes sector. In case that improvements have been made, the ERT recommends that Greece includes the revised estimates, and gives the reason for the recalculations and their impact on the emission trend.

Comparability:

72.   The sparse information in the IIR still makes it difficult for the ERT to verify if the inventory is in accordance with the EMEP/EEA Guidebook methods and if the inventory is comparable with inventories from other countries.

Accuracy and uncertainties:

73.   In the IIR Greece provides a short description of the QA/QC system but no information on sector-specific QA/QC procedures.

74.   Greece has not provided an uncertainty analysis for the air pollutant inventory. The previous ERT (2011 Stage 3 report) encouraged Greece to undertake sector-specific quantitative uncertainty analyses of air pollutants emissions in the Industrial Processes sector to inform the improvement process and provide an indication of the reliability of the inventory data. The current ERT can only reiterate this recommendation.

Improvement:

75.   In the IIR no improvements are reported on industrial processes. Although the submitted IIR is a first step in the right direction towards improvements, there is still much to be done and Greece indicates some areas for improvement for its next submission in response to questions raised by the ERT (refer to point 85). The ERT recommends that Greece includes a section in the IIR about completed and planned improvements for each sub-category of the Industrial Processes sector.

Sub-sector Specific Recommendations.

Category issue 1: 2.A.1 Cement production & 2.B.1 Ammonia production – SO_2

76.   The ERT noted a strong decline in the emissions in both categories during the period 1990 to 2012 and asked Greece to provide an explanation and an overview of the emission factors for both categories. Greece provided this information as part of the review. The ERT recommends that Greece includes this information, the emission factors and explanations for varying trends, in the next IIR.

Category issue 2: 2.B.2 Nitric acid production - NOx.

77.   Greece provided information on the emissions and the emission factor applied for the sole producer in response to a question raised by the ERT. The ERT noted a varying trend in the EF. The ERT recommends that Greece includes explanations for this varying trend in its next IIR.

SOLVENTS

Review Scope

Pollutants Reviewed	NMVOC		
Years	1990 – 2012		
NFR Code	**CRF_NFR Name**	**Reviewed**	**Not Reviewed**	**Recommendation Provided**
3.A.1	Decorative coating application	x		x
3.A.2	Industrial coating application	x		x
3.A.3	Other coating application (Please specify the sources included/excluded in the notes column to the right)	x		x
3.B.1	Degreasing	x		x
3.B.2	Dry cleaning	x		x
3.C	Chemical products,	x		x
3.D.1	Printing	x		x
3.D.2	Domestic solvent use including fungicides	x		x
3.D.3	Other product use	x		x
Note: Where a sector has been partially reviewed (e.g. some of the NFR codes) please indicate whichcodes have been reviewed and which have not in the respective columns.				

General recommendations on cross-cutting issues

78.   The 2014 IIR does not contain a chapter on the Solvents and Other Product Use sector.

79.   For the review of the Solvent and Other Product Use sector, the ERT used information submitted in the 2014 NIR chapter "Solvents and Other Product Use", the 2014 CRF tables and the 2014 NFR tables. Although Greece replied to questions addressed by the ERT, it was difficult to carry out a proper review.

Transparency:

80.   The ERT notes that according to the NFR tables, 3A3, 3D2 and 3D3 are key sources of NMVOC. The ERT strongly encourages the Party to include a key source analysis for NMVOC in the next submission.

81.   The ERT also notes that in the NFR tables the notation key "blank" has been used several times. After consulting with the Party, they indicated that cells left blank should be treated as NA.

82.   Furthermore the ERT notes that Greece has reported emissions at category level (3A, 3B, etc.) in the NIR/CRF and at source category level (3A1, 3A2, etc.) in the NFR. However, in the NFR submission tables the cells for source categories 3A1 and 3A2 have been left "blank" (i.e. NA). To increase transparency, the ERT recommends that the Party reallocates the emissions reported in 3A3 to 3A1, 3A2 and 3A3 in future submissions.

Completeness:

83.   As already mentioned, Greece has not included a chapter on the Solvent and Other Product Use sector in its IIR. The ERT strongly recommends that Greece includes a chapter on Solvents and Other Product Use and describes the methods of reporting, the sources included, the emission factors used, recalculations, calculations of uncertainties and the QA/QC process in the next submission.

84.   The ERT notes that Greece is currently not reporting activity data in the NFR tables, and the ERT encourages Greece to include the activity data in future submissions.

Consistency including recalculation and time series:

85.   The ERT notes that Greece has not performed recalculations for any of the source categories within the Solvents and Other Product Use sector. The ERT found no discrepancies between the 2011 and 2012 emissions time series for the various emission sources.

86.   The ERT notes that the time series of the activity data and the EFs used to calculate emissions of the key sources are consistent.

Comparability:

87.   Greece has reported its emissions in the requested NFR format.

88.   Furthermore, the ERT notes that there are no differences between CLRTAP and NECD emissions in this sector.

89.   Due to a lack of information, the ERT cannot identify if the inventory is in accordance with the EMEP/EEA Guidebook methods and if the inventory is comparable with inventories from other countries (see also Completeness).

Accuracy and uncertainties:

90.   In the previous Stage 3 Review Report (from 2011) the ERT recommended that Greece sets up Tier 2 methods to calculate NMVOC emissions from the key sources. The ERT notes that, according to the 2014 NIR chapter "Solvents and Other Product Use", the Party still uses the Tier 1 method to calculate the NMVOC emissions. The ERT reiterates its recommendation that Greece sets up Tier 2 methods to calculate the NMVOC emissions from the key sources.

Improvement:

91.   From the 2014 NIR chapter "Solvents and Other Product Use" the ERT notes that Greece will examine the possibility (a) to collect the necessary activity data for the whole time period (1990 to date) to estimate emissions from all possible sources in Greece and (b) to develop national emission factors. The ERT commends Greece on this.

Sub-sector Specific Recommendations.

Category issue 1: 3D3 - dioxines

92.   According to the additional info sheet in the NFR table, wood preservation is one of the sources reported under 3D3. From this source also other pollutants (i.e. dioxins) can be emitted. When consulting with the Party, they replied that the Greek NFR tables covered the pollutants NO_x, NMVOC, SO_2, NH_3 and CO. There is no official national inventory of PM, POPs, HMs. Despite this, the ERT encourages Greece to report these pollutants in their next submission.

AGRICULTURE

Review Scope:

NFR Code	CRF_NFR Name	Reviewed	Not Reviewed	Recommendation Provided
Pollutants Reviewed		NH$_3$, NO$_x$ and CO		
Years		1990 – 2012		
4 B 1 a	Cattle dairy	X		X
4 B 1 b	Cattle non-dairy	X		X
4 B 2	Buffalo	X		X
4 B 3	Sheep	X		X
4 B 4	Goats	X		X
4 B 6	Horses	X		X
4 B 7	Mules and asses	X		X
4 B 8	Swine	X		X
4 B 9 a	Laying hens	X		X
4 B 9 b	Broilers	X		X
4 B 9 c	Turkeys	X		X
4 B 9 d	Other poultry	X		X
4 B 13	4 B 13 Other	Blank		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	NA		
4 D 2 b	Off-farm storage, handling and transport of bulk agricultural products	NA		
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)	Blank		
4 F	Field burning of agricultural wastes	Blank		
4 G	Agriculture other(c)	Blank		
11 A	(11 08 Volcanoes)	NO		
11 B	Forest fires	NO		

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

93.   The emission inventory covers NH$_3$ emissions for the period 1990-2012 and emissions of CO and NO$_x$ from field burning of agricultural wastes. The ERT has encouraged Greece to extend the agricultural emission inventory and estimate NO$_x$ and NMVOC emissions. The ERT acknowledges Greece's efforts to improve the emission inventory by using appropriate notation keys and by providing NO$_x$ emissions from livestock production. The ERT strongly recommends that Greece includes information in their IIR on the calculation of agricultural emissions. The ERT thanks Greece for its responsiveness and for providing informative answers during the review process.

Transparency:

94. The Agricultural sector inventory is not transparent because the IIR does not include information about agricultural emissions. The ERT recommends that Greece submits some of the most important information such as numbers of livestock, use of emission factors and an indication of references and of the methodology used.

Completeness:

95. The inventory includes NH_3 emissions from 4B and 4D1a based on a Tier 1 approach from the 2006 EMEP/EEA Guidebook. Emissions of NO_x and CO from field burning of agricultural wastes have been reported under 4F and estimated based on the 2000 IPCC Good Practice Guidance document. The ERT has encouraged Greece to extend the agricultural emission inventory with a special focus on the main pollutants; NO_x and NMVOC.

96. The ERT reiterates the recommendations from the 2011 Stage 3 Review and strongly encourages Greece to provide appropriate notation keys. The ERT strongly encourages the Party to provide the missing notation keys, including those for PM emissions even if Greece has not ratified the protocol.

Consistency including recalculation and time series:

97. The IIR provides no information regarding any recalculations in the Agricultural sector. The ERT encourages the Party to implement information on agricultural recalculations in future submissions of the IIR. This information is also important if no recalculation has taken place.

98. The ERT encourages Greece to provide time series for numbers of animals in all categories and the time series on which the emission calculations were based.

Comparability:

99. There is no information in the IIR about agricultural emissions, which makes it difficult to evaluate comparability. Comparability could be improved significantly if Greece included information on activity data and emission factors in the IIR.

Accuracy and uncertainties:

100. The IIR includes no information on uncertainty analysis or any description of QA/QC procedures undertaken in the Agricultural sector. The ERT encourages the Party to introduce uncertainty estimates and to implement QA/QC checks. A relatively simple control check of annual dips and jumps in activity data, emissions and IEF could be a good starting point.

Improvement:

101. No specific improvements for the Agricultural sector were reported in the IIR. The ERT encouraged the Party to provide an improvement plan.

Sub-sector Specific Recommendations.

Category issue 1: NMVOC – 4.F.

102.   The notation keys "NO and "NE" have been reported for NMVOC emissions from field burning of agricultural wastes. A Tier 1 emission factor is available in the EMEP/EEA Guidebook and the ERT therefore encourages Greece to estimate these emissions or use NE as appropriate notation key.

Category issue 2: 4B1b – NH$_3$

103.   The ERT identified a significant increase in emissions from "Cattle non-dairy" between 2001 and 2003. During the review week, Greece explained that the increase was due to an extension of beef production. The ERT recommends that Greece includes this explanation in the IIR for the next submission.

Sector-specific recommendations

Category issue 3: 4.B Manure management

104.   The ERT notes that no description of the methodology used for NH$_3$ emissions from 4B Manure Management is presented in the IIR. During the review process Greece provided time series data on livestock production for 1990 to 2012 and information on emission factors. The ERT appreciates Greece's efforts to provide informative data and encourages Greece to include information regarding the emission factors used and time series for livestock production in the IIR in the next submission.

105.   The ERT notes that no PM emissions from livestock production have been calculated. Greece mentioned during the review week that it had not ratified the Protocol (which includes requirements to provide a PM emission inventory). However, Greece plans to investigate the possibility of estimating PM emissions and of providing relevant figures in the next submissions.

106.   No NO$_x$ emissions from livestock production have been calculated, although a default Tier 1 emission factor is available in the EMEP/EEA Guidebook. During the review week Greece informed the ERT that NO$_x$ emissions from 4B would be estimated in the next submission.

Category issue 3: 4.D.1 Agricultural Soils- NH$_3$

107.   The IIR includes no descriptions on how NH$_3$ emission are estimated. Greece has provided time series data for 1990 - 2012 for nitrogen use in synthetic fertilisers and informed the ERT of the emission factors used during the review. The ERT encourages Greece to include information on activity data, emission factors and methodologies used in the IIR for the next submission.

Category issue 5: 4.F Agricultural Soils- NO$_x$ and CO

108.   The IIR includes no information on how emissions of NO$_x$ and CO from field burning of agricultural waste are estimated. During the review week Greece informed

the ERT that the estimation was based on IPCC Good Practice Guidance. The 2013 EMEP/EEA Guidebook Table 3-1 lists default emission factors for different pollutants, as well as for NO_x and CO. The ERT encourages Greece to estimate emissions from all pollutants based on the new 2013 EMEP/EEA Guidebook.

WASTE

Review Scope:

NFRCode	CRF_NFRName	Reviewed	Not Reviewed	Recommendation Provided
Pollutants Reviewed		SO₂, NOₓ, NMVOS and NH₃		
Years		1990 – 2012		
6.A	solid waste disposal on land		NA, NE, NO	X
6.B	waste-water handling		NA, NE, NO	X
6 C a	6 C a Clinical waste incineration (d)		NE	X
6 C b	Industrial waste incineration (d)		NE	X
6 C c	Municipal waste incineration (d)		NE	X
6 C d	Cremation		NE	X
6 C e	Small scale waste burning		NE	X
6.D	other waste (e)		NA	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.

All TCCCA and Uncertainty aspects:

109.   The NFR tables from Greece do not include emissions for the Waste sector and in the IIR no waste related sources are covered. Greece indicates in the IIR that they only ratified the Protocol on SO₂ and NOₓ and that they therefore only focus on these pollutants in their inventory. The ERT notes that several sub-categories in this sector are reported in the Greek National Inventory Report (NIR) and that, apparently, activity data is available. Furthermore, for the major sources, Tier 1 EF defaults are available in the EMEP/EEA Guidebook. During the review week Greece indicated that they were examining the applicability of a Tier 1 approach and the related default emission factors provided in the EMEP/EEA Guidebook as well as the possibility of developing more rigorous approaches for the cases where default EFs cannot be utilised.

110.   Greece further stated that it would provide estimations in the next submission. Therefore, the ERT reiterates its recommendation from the 2011 review report, namely that Greece should consider calculating emissions of all relevant pollutants from the Waste sector using methodologies from the 2013 EMEP/EEA Guidebook.

Improvement:

111.   Greece did not include any improvements in the IIR. The ERT encourages Greece to include planned improvements in the IIR in the next submission.

Sector-specific Recommendations

Category issue 1: 6A, 6B and 6D: – SO₂

112.   Greece uses the notation key NA in the NFR tables for SO₂ emissions from sources in 6A, 6B and 6D. The ERT notes that some kind of evaluation has been

made to justify this notation key. However, Greece does not describe these sub-categories in the IIR. The ERT recommends that a description of the evaluated sub-categories is included in the future submissions.

LIST OF ADDITIONAL MATERIALS PROVIDED BY THE COUNTRY DURING THE REVIEW

1. Response to preliminary question raised prior to the review
2. Response to questions raised during the review
3. Greece Stage 2 S&A report
4. Greece Stage 1 report 2014
5. Greece IIR 2014
6. Greece NIR 2014

1. Energy data: 2014 1A1a.xlsx, EFs energy combustion.xlsx, NOx EF time series.xlsx, fugitives.xlsx
2. Agriculture data: DataAgriculture.xls, Greece_Agri_Q3_Livestock production.xlsx
3. Questions Greece Industry_tables.docx