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Report for the Stage 3 in-depth review of emission inventories submitted under the UNECE LRTAP Convention and EU National Emissions Ceilings Directive for:

STAGE 3 REVIEW REPORT
CYPRUS

CONTENT

INTRODUCTION

1.   The mandate and overall objectives for the emission inventory review process under the LRTAP Convention is given by the UNECE document '*Methods and Procedures for the Technical Review of Air Pollutant Emission Inventories reported under the Convention and its Protocols'* [1] – hereafter referred to as the 'Methods and Procedures' document.

2.   This annual review has concentrated on SO_2, 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 Cyprus, 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 – Jim 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 generally in line with the 2013 EMEP/EEA Inventory Guidebook and the UNECE Reporting Guidelines, including the adoption (in 2011) of the NFR09 templates.

6.   ERT has noted that the tabulated emission data from 1990 to 2012 are presented only as national totals and not by NFR category, although more disaggregated data are presented in the figures.

7.   Emissions of $PM_{2.5}$, PM_{10} and TSP HCBs before 2000 are not reported. The ERT appreciates the improvements made to the inventory in response to previous Reviews and recommends the presentation of Key Category analyses in Annexes 1 and 2.

INVENTORY SUBMISSION

8.   In this 2012 submission Cyprus has reported emissions for its Protocol base year (1990) and a time series up to 2012 (the most recent year) for its Protocol pollutants, in the NFR format. Data are tabulated at 5-year intervals until 2005, and then for 2009 and each following year. Annual totals are presented as graphs. It would make the IIR more transparent if annual data could also be presented in tables.

9.   Cyprus has also provided a full NFR 1990 - 2012 timeseries for CO and a 2000 - 2012 timeseries for $PM_{2.5}$, PM_{10} and TSP.

10.   Cyprus has submitted a well presented IIR of good quality which is, in general, well documented.

11.   In this 2012 submission Cyprus has reported emissions for its Protocol base year (1990), 2000, 2005 and a full time series up to 2012 (the most recent year) for its protocol pollutants in the NFR format in the IIR (NO_x, SO_2, NMVOC, NH_3, CO), particulate matter ($PM_{2.5}$, PM_{10} and TSP), heavy metals (Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn) and persistent organic pollutants (POPs – PCDD/PCDF, PAHs, HCB, HCH, PCB).

KEY CATEGORIES

12.   Cyprus has compiled and presented, in its IIR, a Key Source Category Analysis for the following pollutants: NO_x, NMVOC, SO_2, NH_3, $PM2._5$ PM_{10} and TSP, CO, the heavy metals Pb, Hg, dioxins, PAHs and PCBs - calculated using a Tier 2 method. Results of the Key Category level assessments are presented for each year from 1990 to 2011. A Key Category trend analysis is also presented. Both sets of results are reported in good detail and the results of the level assessment reported in Annex 2 are particularly well presented.

QUALITY

Transparency

13.   The ERT recognises the level of effort undertaken by Cyprus in providing an inventory with a sufficient level of detail to undertake a detailed review. The Cyprus IIR is detailed and well presented. EF and some key activity time series data are usually presented in detail (NFR level). Only one assumption is indicated. The ERT encourages Cyprus to complement the excellent work done on the IIR with some additional descriptions as indicated below (for Agriculture and Waste), and to add sub-title levels for each of the detailed sources to aid navigation.

14.   The ERT also encourages Cyprus to provide more detailed descriptions of recalculations in future IIRs.

Completeness

15.   Cyprus has submitted a complete series of inventories for the years 1990 to 2012.

16.   Emissions of $PM_{2.5}$, PM_{10} and TSP, HCBs before 2000 are not reported.

17.   There are no significant gaps – neither with regard to the sectors included nor in the descriptions and sections in the IIR. The ERT acknowledges the effort to which Cyprus has gone to provide estimates of emissions for all sub-sectors and all pollutants reviewed.

Consistency, including recalculations and time series

18.   During the preparation of the 2012 submission, some methodological improvements were made by Cyprus. This led to recalculations of the time series 2008-2011 for the energy and industry sectors. These recalculations are reported in detail in section 10 of the IIR.

Comparability

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

CLRTAP/NECD comparability

20.   There were no differences between the estimates provided by the Party under LRTAP and NECD.

Accuracy and uncertainties

21.   Cyprus has compiled uncertainty estimates for its UNECE submission using the Guidebook Tier 1 method. Results are presented for each pollutant and for trends. The ERT encourages the Party to apply a Tier 2 methodology to all key courses.

Verification and quality assurance/quality control approaches

22. The IIR reports QA/QC measures but it is not clear if the QA/QC measures cited in the IIR are in accordance with the 2013 EMEP/EEA Guidebook (Inventory Management Chapter). The ERT encourages Cyprus to report whether or not the QA/QC measures are consistent with the Guidebook. QA/QC measures are not reported for each sector.

23. The ERT acknowledges the general quality assurance/quality control (QA/QC) activities that have been reported. However, sector-specific checks are not documented in the IIR. The ERT encourages Cyprus to provide sector-specific information on QA/QC procedures in future submissions.

FOLLOW-UP TO PREVIOUS REVIEWS

24. The ERT acknowledges the following major improvements of the inventory as a whole, resulting from previous reviews:

(a) Emissions for Key Categories now calculated using Tier 2 or 3 methods where possible.

(b) Chapters on Recalculations and Improvements and Projections now included.

(c) The notation key 'NE' no longer used.

(d) Projection data are included in the submission spreadsheet.

(e) A Tier 1 uncertainty assessment for the main pollutants and PM has been carried out.

(f) Trends are reported in detail and accounted for.

(g) It is now made clear that calculations have been based on fuel used.

25. The main issue identified in previous inventory review reports and still pending is:

(a) No reporting of emissions before 1990.

26. The cross-cutting recommendations made in the previous review report dated 24 November 2010 are listed below. The text in italics indicates the degree to which those recommendations have been implemented in the 2012 inventory.

(a) Possible investigations to explore alternative methods / techniques / indicators for estimating years before 1990. No references to calculations of emissions before 1990.

(b) Calculating emissions for key categories using Tier 2 or 3 methods where possible. Now done.

(c)   Following the IIR template completely by adding, in the IIR, the chapter on "Recalculations and Improvements", the chapter on "Projections" and the predefined Annexes 1 to 4. Chapters on Recalculations and Improvements and Projections are now included.

(d)   Providing information on notation keys and other issues in the NRF "additional Info" sheet. Irrelevant as NE no longer used.

(e)   To investigate sources not estimated and flagged as "NE" in the Energy, Agriculture and Waste sectors. In 2013 a methodology was established to eliminate the use of the notation key "Not Estimated'. This has eliminated "NE" from the submission. Sector experts needed to confirm.

(f)   Using the dedicated template for reporting projection data, and completing furthermore, as far as possible, projection data (different projection years, two different scenarios, emissions and activity data). Projection data are included in the submission's spreadsheet.

(g)   Implementation of at least Tier 1 uncertainty assessment for the main pollutants and PM, and use of the results to prioritise improvements for key categories. Implemented.

(h)   Providing further details on the implemented QA/QC plan and procedures in the general description and for the different sectors in the IIR. QA/QC procedures are reported but there is no evidence of a QA/QC plan, specifically for this reporting process.

(i)   To include more information on key trends, especially on trend drivers in the IIR. Trends are reported in detail and accounted for.

(j)   To include further detailed descriptions of methodologies in the IIR, especially for the transport, agriculture and energy sectors, including clearer explanations of how transport emissions are calculated (whether using a fuel-sold or fuel-used basis). It is now made clear that calculations are based on fuel used.

(k)   Inclusion of the rationale and explanations for recalculations and their implication on trends in the IIR. Where recalculations have been carried out these have been clearly reported but no implications for trends have been reported.

AREAS FOR IMPROVEMENTS IDENTIFIED BY CYPRUS

27.   The IIR does not identify any areas for improvement.

PART B: RECOMMENDATIONS FOR IMPROVEMENTS TO THE PARTY

CROSS-CUTTING IMPROVEMENTS IDENTIFIED BY THE ERT

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

(a)   Calculation of emissions of $PM_{2.5}$, PM_{10} and TSP for 1980-1999.

(b)   Calculation of emissions of all pollutants for 1980-1989.

(c)   It would make the IIR more transparent if annual data could also be presented in tables.

(d)   The ERT encourages Cyprus to provide sector-specific information on QA/QC procedures in future submissions.

(e)   The ERT encourages Cyprus to provide an improvement plan for the inventory.

SECTOR SPECIFIC RECOMMENDATIONS FOR IMPROVEMENTS IDENTIFIED BY ERT

ENERGY

Review Scope

Pollutants Reviewed		All		
Years		1980 – 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		
1.A.1.c	Manufacture of solid fuels and other energy industries		NO	
1.A.2.a	iron and steel		IE	
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 3 e	Pipeline compressors		NO	
1.A.4.a.i	commercial / institutional: stationary		IE	
1.A.4.b.i	residential plants	X		X
1.A.4.c.i	Agriculture/forestry/fishing. stationary	X		
1.A.5.a	other, stationary (including military)		IE	
1.B.1.a	coal mining and handling		NO	
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		NO	
1 B 2 a iv	Refining / storage		NO	
1 B 2 a v	Distribution of oil products	X		X
1 B 2 b	Natural gas		NO	
1 B 2 c	Venting and flaring		NO	
1 B 3	Other fugitive emissions from geothermal energy production , peat and other energy extraction not included in 1 B 2		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.

Transparency:

29.   Cyprus has provided a detailed and transparent emission inventory. The emission estimates that have been provided for the Energy sector are provided at the most detailed level of NFR and mostly in line with the requirements set out by the Reporting Guidelines and in the EMEP/EEA Guidebook.

30.   The methodology used by Cyprus and the emission factors included in the IIR are considered mostly transparent by the ERT and well described for the Energy sector, although in specific cases improvements are possible.

31.   The ERT notes that in the description of the Energy sector there is little description of the activity data and trends therein. In order to better understand the emission trends, the ERT encourages the Party to provide more information on trends in activity data, for example in the form of graphs showing fuel combustion by fuel type. The ERT recommends that Cyprus includes such information on activity data and trends in the IIR.

Completeness:

32.   The ERT considers the Energy sector to be complete and comprehensive with good levels of detail in the methodology descriptions.

33.   The use of notation keys has been clearly explained in the IIR. The ERT notes that a specific section of the IIR describes how emissions first categorised as NE have been translated into values or other notation keys.

Consistency including recalculation and time series:

34.   Cyprus has provided an inventory for all sectors up to the year 2012 (from 2008 onwards). A specific chapter has been dedicated to the identification and explanation of some of the key trends.

35.   The ERT notes that in some sectors Cyprus uses two different methodologies to estimate emissions within one sector. For the more recent years measurements are available while for earlier years Tier 1 or Tier 2 has been used. Since this might lead to time series inconsistencies, the ERT encourages Cyprus to check and compare the time series and report the findings in the IIR. In addition, the ERT recommends that Cyprus develops a methodology based on emissions from individual plants for the earlier years to include technological and abatement developments over time.

Comparability:

36.   The methodologies used by Cyprus in their inventory are generally consistent with those proposed in the 2013 EMEP/EEA Guidebook. Country-specific measures have been explained in the IIR. The IIR contains generally enough information to understand how the emissions were estimated. However, in some cases more information is needed, for instance in sector 1.B.2.a.v.

Accuracy and uncertainties:

37.   Cyprus has developed an uncertainty analysis based on the methodologies described in the 2013 EMEP/EEA Guidebook. This uncertainty analysis is used to assess for which sector future priorities should be set.

38.   The ERT notes that Cyprus has a specific section in the IIR that is dedicated to the description of QA/QC. However, this is only a generic description about the procedure. There is no section on QA/QC for the individual source categories. The

ERT encourages Cyprus to perform a QA/QC analysis for each sector, and to report the findings in the IIR.

Improvement:

39.   Cyprus undertook an uncertainty analysis in 2012. On the basis of this analysis, the most uncertain sectors were targeted under an improvement plan. However, there is no specific section on planned improvements in the IIR for the Energy sector. The ERT recommends that Cyprus adds a new section to the IIR, describing the improvements planned for the next year(s).

Sub-sector Specific Recommendations..

Category issue 1: 1.A.1.a Time series consistency

40.   The ERT notes that Cyprus uses plant specific activity data. During the review Cyprus clarified that comparisons with the national statistics were made. The ERT recommend that Cyprus includes this comparison the next IIR.

41.   The ERT notes that Cyprus uses two different methodologies to estimate emissions from this sector. For emissions prior to 2008, the Tier 2 methodology from the 2013 EMEP/EEA Guidebook is used while for emissions from 2008 onwards plant-specific measurement data are used. This implies an inconsistency in the methodology used. The ERT encourages Cyprus to compare the methods and report accordingly in the IIR. Furthermore, the ERT recommends that Cyprus tries to develop a method for the years prior to 2008 based on the emissions from individual plants to ensure consistency.

Category issue 2: 1.A.2.f.i Presentation of activity data

42.   The ERT appreciates the use of plant-specific data for this sector. Cyprus is encouraged to check the consistency of activity data by comparing company level data with national statistics. The ERT encourages Cyprus to present activity data and trends in activity data (aggregated per sector) in the IIR to improve transparency.

Category issue 3: 1.A.4.b.i Jump in emissions

43.   The ERT notes a strong decrease in SO_2 emissions from residential combustion between 2004 and 2005 which is not explained in the IIR. The ERT recommends that Cyprus checks dips and jumps in the emissions as well as activity data, and explains these in the IIR.

Category issue 4: 1.B.2.a.v Methodology description

44.   To estimate emissions from the distribution of fuels, Cyprus uses a Tier 2 methodology since this is a key source. The ERT recommends that Cyprus explains the methodology used in more detail, for example which activity data were used and how the parameters such as the True Vapour Pressure were estimated.

TRANSPORT

Review Scope

Pollutants Reviewed		All		
Years		1990 – 2012		
NFR Code	**CRF_NFR Name**	**Reviewed**	**Not Reviewed**	**Recommendation Provided**
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		X
1.A.3.d.ii	national navigation	X		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	agriculture / forestry / fishing			
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		X
1 A 3	Transport (fuel used)	X		X
Note: Where a sector has been partially reviewed (e.g. some of the NFR codes) please indicate which codes have been reviewed and which have not in the respective columns.				

General recommendations on cross-cutting issues.

45.   Cyprus has provided a detailed and generally transparent emissions inventory. Estimates are provided at the most detailed level for all transport sub-sectors. Cyprus' methodology and emission factors in the IIR are considered to be transparent by the ERT and well described for the Transport sector. The ERT encourages the Party to include more detail in the IIR including: 1 A 2 f ii (Mobile Combustion in Manufacturing Industries and Construction) the description of the used methodology, 1 A 3 a ii (i) (Civil Aviation -Domestic, LTO-) and 1 A 3 a i (i) (International Aviation - LTO) the description of activity data, 1 A 3 b * (all road transport sub sectors) the detailed description of the activity data including fuel used/fuel sale and traffic, 1 A 3 d * (navigation) a brief description of TREMOVE methodology and a detailed description of the activity data including explanations of trends.

Transparency:

46.   Cyprus has provided a detailed and generally transparent description of methods for the Transport sector in the IIR. Estimates are provided at a comprehensive level for all categories including mobile sources. A few IEs are reported for certain sub-sectors but reasons are provided in the IIR with clear reference to the sectors they are included in.

Completeness:

47.   The ERT considers the Transport sector and the other sectors including mobile sources to be generally complete for the important categories, although there are some gaps which need to be filled. The ERT notes that the NFR tables are provided only for the 2008-2012 period. The Party's answer during the review was that no different methodologies were used for the years 2007 and 2008, and that there was only a change in activity data (recalculation by the Statistical Service). The ERT recommends that the Party provides NFR tables for the complete time series.

Consistency including recalculation and time series:

48.   A few inconsistencies in the time series for certain pollutants and certain sub-categories were identified by the ERT. An explanation was provided by the Party to the ERT"s satisfaction. The ERT recommends that the Party includes a more detailed description of the reasons behind the trends and for the few inconsistencies in the time series (for more details see sub-sector specific recommendations).

Comparability:

49.   The ERT considers the Transport sector and the other sectors including mobile sources to be generally consistent with the 2013 EMEP/EEA Guidebook for the important categories.

Accuracy and uncertainties:

50.   The Party provides a detailed uncertainty analysis and reports on how its uncertainty analysis is used to prioritise further improvements in the inventory.

QA/QC Procedures:

51.   A number of general quality control checks have been introduced as part of the Party's annual work plan. The ERT encourages the Party to improve sector-specific QA/QC procedures for the Transport Sector and other sectors including mobile sources.

Improvements and recalculations:

52.   Cyprus has carried out some methodological improvements, such as removing all NE, and has estimated emission instead. The IIR includes a comprehensive explanation of the improvement process. The ERT encourages Cyprus to provide a more detailed explanation of the recalculations in the IIR, including the rationale, the impact on the sector and implications for trends in the Transport and other mobile source sectors.

Sub-sector Specific Recommendations..

Category issue 1: 1.A.3.d i (i) International Maritime Navigation - All pollutants

53.   Estimates were made for the International Maritime Navigation sector for the years 1990 – 2012 (for the main pollutants except NH_3, which is reported as NE and particulates). The ERT encourages Cyprus to provide all emission estimates and supporting information in its IIR for future submissions.

Category issue 2: 1 A 4 a ii Commercial / institutional: Mobile, 1 A 4 b ii Residential: Household and gardening (mobile) – All pollutants reported as IE

54.   The ERT encourages the Party to improve the emission estimates for the above sectors (including all previous years) in all future inventory submissions.

Category issue 3: All Transport sector NFR / All Pollutants

55.   The ERT notes that the NFR tables have only been provided for the 2008-2012 period. The ERT asked Cyprus to explain why the complete time series was not provided. The party explained that the Statistical Service had recalculated some activity data (AD) for the years 2008, 2009 and 2010. The ERT is not sure whether it was just a change in the AD level, or whether it was also a change in the methodology used to estimate the new AD. The ERT encourages the Party to provide the whole time series in the next submissions to avoid confusion.

Category issue 4: 1 A 2 f ii Mobile Combustion in manufacturing industries and construction / All pollutants

56.   During the review the ERT highlighted the absence of a methodology description for category 1 A 2 f ii emissions in the IIR. The Party provided an explanation during the review, describing the methods for estimating emissions from this sub-sector. The ERT encourages the Party to include this documentation in future submissions.

Category issue 5: 1 A 2 f ii Mobile Combustion in manufacturing industries and construction / PCDD-F

57.   During the review the ERT highlighted big dips in PCDD/F between the years 2002/2003 and 2003/2004. The Party explained, during the review, that these dips were linked to the fact that all clinical waste incinerators were shut down in March 2003. The ERT did not understand the explanations and asked for more details. The explanations given by Cyprus (use of repartition keys from national estimates) allowed the ERT to better understand the trends. The ERT encourages the Party to include a detailed explanation of emissions trends in future submissions and to improve the inventory.

Category issue 6: 1 A 3 b vi Road transport: Automobile tyre and brake wear / NH_3

58.   During the review the ERT highlighted a problem with NH_3 emissions in this sub-sector because such emissions were unexpected. This sub-sector refers to tyre and brake wear emissions and only particulates and heavy metals are expected. The

Party explained that this was a typing error. The ERT has taken note of this answer and encourages the Party to correct this error in the next submissions and to improve QC in this sector.

Category issue 7: 1 A 5 b Other, Mobile (including military, land based and recreational boats) / NMVOC, NO$_x$, PM$_{10}$, PM$_{2.5}$, TSP, SO$_2$

59.   During the review the ERT highlighted big dips in emissions for the years 2005/2006 and 2006/2007. The Party explained that the big dips observed in the emissions for category 1A5b for the years 2005/2006 and 2006/2007 were due to activity data (AD) fluctuations. The AD is only the number of military boats. From one year to another the AD is multiplied by ~19 and in the following year by ~2. The ERT does not understand how these AD could change so fast. The ERT encourages the Party to include a detailed explanation of the emissions trends in future submissions.

Category issue 8: 1 A 3 b i Road transport: Passenger cars, 1 A 3 b iv Road transport: Mopeds & motorcycles, 1 A 3 d ii National navigation (Shipping), 1 A 4 c ii Agriculture/Forestry/Fishing: Off-road vehicles and other machinery, 1A 4 c iii Agriculture/Forestry/Fishing: National fishing, 1 A 5 b Other, Mobile (including military, land based and recreational boats) / Pb

60.   During the review the ERT highlighted big dips in emissions for the years 2003/2004 and 2004/2005. The Party explained that the big dips observed in emissions were due to the fact that leaded petrol had been completely replaced on the Cyprus market by unleaded petrol since May 2004. The ERT encourages the Party to include a detailed explanation of the emissions trends in future submissions.

INDUSTRIAL PROCESSES

Review Scope

NFR Code	CRF_NFR Name	SO₂, NO_x, NMVOC, NH₃, PM₁₀ & PM₂.₅		
Pollutants Reviewed		**1990 – 2006 + (Protocol Years)**		
Years		Reviewed	Not Reviewed	Recommendation Provided
2.A.1	cement production	x		x
2.A.2	lime production			
2.A.3	limestone and dolomite use			
2.A.4	soda ash production and use			
2.A.5	asphalt roofing	x		x
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	x		
2.A.7.c	Storage, handling and transport of mineral products	x		
2.A.7.d	Other Mineral products (Please specify the source included/excluded in the notes column to the right)			
2.Bb.1	ammonia production			
2.B.2	nitric acid production			
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			
2.C.2	ferroalloys production			
2.C.3	aluminium production			
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			
2.D.2	food and drink			
2.D.3	Wood processing			
2.E	production of POPs			
2.F	consumption of HM and POPs (e.g. Electrical 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:

61.   The IIR is generally transparent and well organised except for some information about the choice of method and the EFs used for specific categories. More information is included in the sub-sector part.

62.   The ERT commends Greece for including tables with activity data in the Industrial Processes chapter following a recommendation by the previous ERT.

Completeness:

63.   The ERT considers the industrial processes sector to be complete and comprehensive with good levels of detail in the methodology descriptions.

Consistency including recalculation and time series:

64.   The ERT notes that Cyprus has recalculated emissions from one sub-sector based on changes in activity data and methodological improvements and that the IIR includes the necessary explanations in Chapter 10 Recalculations.

Comparability:

65.   The ERT notes that Cyprus uses the methods described in the 2009 EMEP/EEA Guidebook for this submission and considers that the inventory is comparable with those of other Parties. The ERT encourages the Party to use the latest 2013 EMEP/EEA Guidebook.

Accuracy and uncertainties:

66.   The ERT notes that Cyprus has implemented a QA/QC plan.

67.   In this submission Cyprus has included a quantitative uncertainty assessment for all the pollutants and sub-sectors of the Industrial Processes sector. The ERT commends Cyprus for doing so.

Improvement:

68.   The ERT notes that Cyprus does not include sector-specific improvements for the Industrial Processes sector in the IIR. The ERT encourages Cyprus to list desired sector-specific improvements (e.g. an improved method for cement production)) in its IIR to help support improvement prioritisation.

Sub-sector Specific Recommendations.

Category issue 1: 2.A.1 Cement production – $PM_{2,5}$, PM_{10} , TSP

69.   Cyprus uses a Tier 2 method to estimate emissions of this key source. It uses activity data on cement produced from the different cement producing plants and EF for the dry process kiln from the 2009 EMEP/EEA Guidebook. However, the ERT notes that the IEF (emissions related to clinker production) varies a lot. The ERT encourages Cyprus to investigate the reasons for these variations, e.g. is the variation due to variations in content of the raw material or are there other explanations?

70.   Cyprus informed the previous ERT that one of the two operating installations applied the semi-dry process until 2011. According to the current IIR, there has only been one single cement producing plant from 2012 onwards and that plant has been using the dry process. Cyprus has informed the ERT that due to the fact that there are no emission factors for the semi-dry process in the 2009 EMEP/EEA Guidebook, Cyprus uses the lower factor within the 95% confidence interval for the dry process to estimate emissions. This EF has also been used for the single cement producing plant from 2012 onwards. The ERT recommends that Cyprus includes all this information in its next IIR in order to increase transparency.

71.   Because cement production is the most important key source in the Industrial Processes sector, the previous ERT encouraged Cyprus to arrange measurements with the "semi-dry process plant", so that plant-specific EFs can be applied to derive a Tier 3 methodology in the near future. However, for this submission Cyprus still uses the same method and EFs as the 2010 submission. The ERT again encourages Cyprus to investigate the possibility of using information from measurements in order to calculate a plant-specific EF to decrease the uncertainty for this category and to report the findings of these investigations in its next IIR.

Category issue 2: 2.A.5 Asphalt roofing – $PM_{2.5}$ PM_{10}

72.   This category is a key source of $PM_{2.5}$, PM_{10} and TSP. In table 44 of the IIR EFs are shown only for TSP (not for $PM_{2.5}$ and PM_{10}). The ERT has asked Cyprus why no EFs for $PM_{2.5}$ and PM_{10} are reported in this table. Cyprus answered that they preferred to use the same emission factor as for TSP since there are no EFs for PM_{10} and $PM_{2.5}$ in the 2009 EMEP/EEA Guidebook. The ERT encourages Cyprus to use the EF from the 2013 EMEP/EEA Guidebook for its next submission as it includes EFa for $PM_{2.5}$ and PM_{10} for this activity. The ERT also recommends that Cyprus uses a Tier 2 method since this is a key category.

SOLVENTS

Review Scope

NFR Code	CRF_NFR Name	Reviewed	Not Reviewed	Recommendation Provided
Pollutants Reviewed	NMVOC			
Years	1990 – 2012			
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)		IE	x
3.B.1	Degreasing		NO	
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:

73.   The Solvents and Other Product Use sector inventory of Cyprus is not completely transparent. The ERT notes that tables with activity data and some references to the emission factors are missing. The ERT recommends that Cyprus includes these items, at least for the key categories, in the next submission. For more information see the relevant sector section.

74.   Furthermore, the ERT notes that Cyprus uses the appropriate notation keys in the NFR tables for all source categories of the Solvents and Other Product Use sector and commends Cyprus for this. The ERT notes that the explanations for the use of the notation keys NE and IE are provided in the NFR tables.

75.   The ERT notes that in the NFR tables 3A3 is included in 3A1 and 3A2. During the review Cyprus replied that activity data are collected by the Statistical Service of Cyprus. From the codes that the Statistical Service use and the data provided to us, we cannot distinguish which paints belong to source category 3A3. The ERT recommends that Cyprus contacts the Statistical Service to solve this problem.

Completeness:

76.   The ERT considers the Solvents and Other Product Use sector to be almost complete and comprehensive with good levels of detail in the methodology descriptions.

Consistency including recalculation and time series:

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

78.   The ERT notes that both the time series for the activity data and the EFs used to calculate emissions of the key source are consistent.

Comparability:

79.   Cyprus has provided its emissions inventory in accordance with the reporting requirements and submitted it in the requested NFR format.

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

Accuracy and uncertainties:

81.   The ERT notes that the Notation Key "NE" has been replaced by emission values obtained by using a certain methodology established by Cyprus national emission experts (see IIR). After consulting the Party they responded that they do not have any plans to improve these new emission values in the future, due to limited human resources. To avoid under/over-estimations, the ERT recommends that Cyprus includes plans to improve these new emission values (old NEs) in its IIR, either by obtaining data that allow an emission estimate to be made, or by reporting emissions as not applicable.

82.   The ERT notes that Cyprus has carried out a general uncertainty analysis. The ERT encourages the Party to make plans to present a quantitative estimate of inventory uncertainty for each source category in its next submission.

83.   The ERT notes that the emissions of key sources are not all calculated based on Tier 2 methodology and recommends that the Party calculates all key sources based on Tier 2 methodology. For more information see the relevant sector section.

Improvement:

84.   No sector-specific improvements have been described in Cyprus IIR. The ERT recommends that the Party implements an improvement plan to identify areas for further improvements of the inventory of the Solvents and Other Product Use sector.

Sub-sector Specific Recommendations.

Category issue 1: 3A1 and 3A2 - NMVOC

85.   In the "Other activity (specified) cells" of the NFR tables the total amount of paint consumed is included. After consultation, the Party provided the following detailed overview (per source), specifying the quantities of paint consumed in these source categories:

- 3A2: Car repairing (423tn) , Wood Coating (1693tn)

- 3A1: Water based paints (8138tn)

86.   The ERT commends the Party for this and encourages Cyprus to include this information in the next submission.

Category issue 2: 3A1 and 3A2 - NMVOC

87.   The ERT has found no explanations for the development of NMVOC emissions from these source categories during the period 1990-2012. After consulting the Party, Cyprus replied that 1990 until 2007 was a period of economic growth in Cyprus and that as a result the usage of paints increased (building of new houses, hotels, etc.). After 2008, the reductions of emissions in categories 3A1 and 3A2 were due to the abatement measures taken in 2008 and 2011.

Category issue 3 - 3D1 and 3D2

88.   Both source categories are a key source of NMVOC. However, the emissions were calculated based on the Tier 1 methodology. After consulting Cyprus, they replied that they did not have any plans to calculate emissions based on the Tier 2 methodology due to current shortages in human resources. Despite this, the ERT encourages the Party to calculate emissions on the basis of the Tier 2 methodology in the future.

Category issue 4 – 3D1 NMVOC

89.   Activity data on the consumption of ink in printing industries were provided by the Statistical Service of Cyprus and emissions were calculated based on the Tier 1 methodology of the EMEP/EEA Guidebook

90.   In the "Other activity (specified) cell" in the NFR tables the notation key "NA" instead of "the consumption of ink" is used. After consulting the Party, they responded that that was a typing error which occurred during the transfer of the data to the NFR table. Cyprus stated that it would correct this error in a revised version. Ink consumption for 2012 was 0.5202 ktonnes.

AGRICULTURE

Review Scope:

NFR Code	CRF_NFR Name	Reviewed	Not Reviewed	Recommendation Provided
Pollutants Reviewed		SO_2, NO_x, NMVOC, NH_3, PM_{10}, $PM_{2.5}$, TSP, CO, HMs, PCDD/PCDF, PAHs		
Years		1990 – 2012, PM: 2000 -2012		
4 B 1 a	Cattle dairy	x		x
4 B 1 b	Cattle non-dairy	x		x
4 B 2	Buffalo	NO		
4 B 3	Sheep	x		x
4 B 4	Goats	x		x
4 B 6	Horses	x		x
4 B 7	Mules and asses	NO		
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	NO		
4 B 13	4 B 13 Other	NO		
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		x
4 D 2 b	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)	NO		
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

91.   The emission inventory is almost complete. Cyprus has provided sufficient information in the IIR on EFs, methodologies and key source categories.

92.   The IIR is generally transparent and a Tier 1 default approach was applied for all emission sources. The ERT encourages Cyprus to estimate NH_3 emission from 4B key sources based on Tier 2 approaches, as recommended as good practice in the 2013 EMEP/EEA Guidebook.

93.   The ERT encourages Cyprus to provide a time series for the NH_3 emissions from 4 B including the numbers of animals for all years, emissions and implied emission factors.

94. The ERT commends Cyprus's efforts to implement the latest 2013 EMEP/EEA Guidebook for the next submission.

95. The ERT thanks Cyprus for its responsiveness and for providing informative answers during the review process.

Transparency:

96. Cyprus has provided sufficient information in the IIR on EFs, methodologies and key source categories and the IIR is generally transparent. The ERT encourages the Party to continue to improve the IIR by introducing some additional information e.g. activity data for field burning of agricultural wastes, descriptions of trends and explanations for the most important drivers.

Completeness:

97. The ERT considers the Agricultural sector to be almost complete. Emissions of NO_x, NMVOC, SO_2 and NH_3 are reported for 4B, 4D and 4F. Sector 4F also includes CO, Heavy Metals, PCDD/PCDF and PAHs. The ERT appreciates Cyprus's efforts to improve completeness and encourages Cyprus to estimate PM emissions from farm-level agricultural operations (4D2a).

Consistency including recalculation and time series:

98. The IIR gives no information regarding recalculations in the Agricultural sector. The ERT encourages the Party to implement information on agricultural recalculations in future submissions of the IIR. It is important to include information in case no recalculations have taken place.

99. The IIR chapter 7.2 includes information on the use of N in synthetic fertilisers and on the cultivated area. The time series indicates a significant decrease in the use of fertilisers per hectare from 1990 to 2012. The ERT encourages Cyprus to provide more detailed explanations for this decrease in the IIR.

Comparability:

100. The Cyprus emissions are based on a Tier 1 approach following recommendations given in the 2009 EMEP/EEA Guidebook for all agricultural emission sources.

Accuracy and uncertainties:

101. The Party has provided a key source analysis, which shows that dairy cattle, non-dairy cattle, sheep and swine are key sources of NH_3 emissions. As recommended in the EMEP/EEA Guidebook, it is good practice to use a Tier 2 approach for livestock categories which are a key source. The ERT has encouraged Cyprus to use a Tier 2 approach based on the 2013 EMEP/EEA Guidebook, Table 3-7 and Appendix B.

102. The Party does not provide an uncertainty analysis and there is no QA/QC procedure in place. The implementation of basic checks of time series, numbers of animals and emission factors could be a start. The ERT encourages the Party to undertake uncertainty analysis and to implement QA/QC checks to avoid errors.

Improvement:

103.   No specific improvements for the Agricultural sector have been reported in the IIR. During the review Cyprus informed the ERT that the 2013 EMEP/EEA Guidebook will be implemented in the next submission. The ERT commends the Party for its efforts to improve the national inventory.

104.   During the review certain errors were identified; definitions of key sources of 4B and the PM$_{2.5}$ emission factor for 4B8. Cyprus has confirmed that these errors will be corrected in their next submission.

Sub-sector Specific Recommendations.

Category issue 1: 4B4 and 4B8 - all Pollutants

105.   During the review the ERT noticed some discrepancies in the IIR Table 5 and the information provided in the agricultural section regarding the key source definition. Cyprus confirmed that the definition would be corrected in their next submission.

Category issue 2: 4B8 - PM$_{2.5}$

106.   IIR Table 53 shows that the emission factor used for fattening pigs was 0.18 kg/animal, which is not consistent with the Tier 1 default emission factor in the 2013 EMEP/EEA Guidebook. During the review process Cyprus responded to this question and confirmed that the emission factor used was 0.08 kg/animal as recommended in the 2009 EMEP Guidebook, Table 3-4. Cyprus will correct this for the next submission.

Category issue 3: 4B3, 4B4 – PM

107.   The ERT appreciates Cyprus's efforts to implement the latest 2013 EMEP/EEA Guidebook for the next submission. The PM emission factor for goats and sheep is available from the 2013 EMEP/EEA Guidebook and the ERT encourages Cyprus to calculate PM emissions from goats and sheep.

Category issue 4: 4B – TSP

108.   The 2013 EMEP/EEA Guidebook, Table 3.4 page 17, includes TSP emission factors for all livestock categories, which are not identical with the PM$_{10}$ emission factors used by the Party. The ERT encourages Cyprus to recalculate the TSP emissions from 4B.

Sector-specific recommendations

Category issue 5: 4.B Manure management

109.   The ERT acknowledges that Cyprus has improved the inventory, estimating the NO emission from 4B. The ERT confirms that the default emission factor given in 2013 EMEP/EEA Guidebook, Table 3-1, has to be multiplied by 46/30 for NO to NO$_2$ conversion.

110.   Around 92% of the NH$_3$ emissions occur in the Agricultural sector and livestock production is the main source. Therefore, it is particularly important to clarify

and explain the trend in NH_3 emissions from 4B. The ERT encourages Cyprus to provide a time series for animal production, not only every five years, but for all years. Providing time series for the total NH_3 emissions from 4B and implied emission factors for each livestock category is also recommended. Trends and main drivers have to be explained.

Category issue 6: 4.D.1 Agricultural Soils

111.   The notation key "NA" is used for 4D2c "N excretion on pasture, range and paddock". As long as Cyprus uses a Tier 1 approach, emissions from grazing animals are included in 4B. However, it is a fact that these emissions occur during grazing, and thus the ERT recommends using "IE" as a notation key in 4D2c for NH_3, NO_x and NMVOC emissions.

112.   The IIR Table 54 indicates a significant decrease in the use of synthetic N fertilisers. This decrease is not only visible in the total amount used but also as kg N per hectare, from 247 kg N/ha in 1990 to 129 kg N/ha in 2012. During the review Cyprus explained that, based on information from the Agricultural Ministry, the decrease was due to a combination of a training programme for farmers and the way farmers could minimise the production costs. The ERT encourages Cyprus to include this explanation of the NH_3 emission trend for synthetic fertilisers.

113.   The notation key "NA" is used for 4D2a, which covers PM emissions from farm-level agricultural operations. A Tier 1 default EF for $PM_{2.5}$ and PM_{10} is given in the 2013 EMEP/EEA Guidebook Table 3-1. The emission depends on the cultivated area and this information is available – see Table 54 in the IIR. The ERT encourages Cyprus to estimate PM emissions from 4D2a.

Category issue 7: 4.F Field burning of agricultural wastes

114.   Cyprus estimates emissions from field burning of agricultural wastes for all pollutants based on a Tier 1 approach. The ERT recommends including information on the activity data used to estimate emissions from 4F in the IIR.

WASTE

Review Scope:

Pollutants Reviewed		SO₂, NOx, NMVOC, NH3, TSP,DIOX, Hg, and Pb .		
Years		1990 – 2012		
NFR Code	**CRF_NFR Name**	**Reviewed**	**Not Reviewed**	**Recommendation Provided**
6.A	solid waste disposal on land	X		X
6.B	waste-water handling	X		X
6 C a	Clinical waste incineration (d)		X	
6 C b	Industrial waste incineration (d)		X	
6 C c	Municipal waste incineration (d)		X	
6 C d	Cremation	X		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.

Transparency:

115.   Cyprus provides a generally transparent overview of the Waste sector. Since the 2010 review, transparency has been improved. However, the ERT reiterates its encouragement from the 2010 review, i.e. to add more information on the activity data used in the calculations.

Completeness:

116.   Since the 2010 review, Cyprus has improved the completeness of the inventory. For replacing the NEs in the categories 6B and 6C Cyprus has used a method based on emission data from the other 26 EU member states. The method is described in the IIR chapter 2.4. According to this method, Cyprus calculates for each member state a contributing percentage, based on the national total and category total of the respective country. Then the percentages of all countries are averaged. Using this average, Cyprus calculates a category emission based on the Cyprus national total. The ERT notes that this method does not take into account the differences in state of the art technology and in the extent of activities between the countries. Furthermore, the method creates a mathematical underestimation of the national total of Cyprus. The ERT notes that the Eurostat website shows data on waste activity for Cyprus, based on country statistics which could possibly be used for calculating emissions. The ERT recommends that Cyprus pursues its efforts to obtain real activity data for calculating emissions based on a Tier 1 methodology.

Comparability:

117.   Cyprus has made a big improvement in quantifying the emission uncertainties using the Tier 1 methodology based on the 2013 EMEP/EEA Guidebook. The ERT encourages Cyprus to proceed further with improving uncertainty analysis.

Accuracy

118.   Cyprus uses a Tier 1 default approach for the sources that are not calculated with the 'NE replacement method', using recommended methods and default EFs from the 2009 EMEP/EEA Guidebook. The ERT reiterates its encouragement from the 2010 review, i.e. to implement Tier 2 or Tier 3 methods for the key sources.

Improvements and recalculations:

119.   The ERT complements Cyprus for the improvements implemented since the 2010 review. The ERT notes that Cyprus does not describe recalculations for the waste sector in the IIR (besides the implementation of the "NE replacement method").

120.   For the years 2008 - 2011 there are several (small) changes between the 2013 and 2014 submissions. The ERT encourages Cyprus to explain the recalculations made in future submissions.

Sub-sector Specific Recommendations..

Category issue 1: 6A Solid waste disposal on land: – all pollutants

121.   The ERT notes differences between the activity data on MSW in the NFR and those found on the Eurostat internet website and the Cyprus National Greenhouse Gases Inventory Report 1990 – 2012. Cyprus has confirmed that the compilers of the two reports follow different methodologies for estimating the amount of waste at the waste disposal sites. Cyprus states that they will look further into this in collaboration with the compiling team of the Greenhouse Gas Inventory, and make the necessary amendments for the next submission. The ERT encourages this collaboration to establish the use of concurrent data.

Category issue 2: 6A, 6B and 6D: – all relevant pollutants

122.   In the IIR Cyprus describes the methodology used for replacing the NEs from former NFR tables with NAs or with an emission. No overview of the number of cells concerned (and the percentages used for these cells) is found in the report, except for a note in the NFR at 6D. However, for several components emissions are reported while no emission factor is mentioned in the IIR. During the review Cyprus produced an overview of this. The ERT recommends implementing this overview of replaced cells and used percentages (and NAs) in the next IIR submission.

Category issue 3: 6Cd: – all relevant pollutants

123.   The ERT reiterates its encouragement of the 2010 review, i.e. to find a solution which enables a further differentiation of animal types (carcasses) by incinerator operators.

Category issue 4: 6D Other Waste: – all pollutants

124.   The emissions in this sub-sector are calculated using the "NE replacement" procedure. The compilation of sources and different pollutants can vary substantially between countries. The ERT recommends describing the efforts and the results of calculating the sources currently not covered in the inventory for this sub-sector in the next IIR submission.

LIST OF ADDITIONAL MATERIALS PROVIDED BY THE COUNTRY DURING THE REVIEW

1. Cyprus Stage 2 S&A report
2. Cyprus 2014 IIR
3. Cyprus 2010 Stage 3 report, CY_Stage3_Review_Report_2010.pdf
4. Emission estimation formula.xls
5. Response to questions raised during the review