**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
PORTUGAL

CONTENT

INTRODUCTION

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

2.   This annual review, has concentrated on SO2, NOx, NMVOC, NH$_3$, plus PM$_{10}$ & PM$_{2.5}$ for the time series years 1990 – 2011 reflecting current priorities from the EMEP Steering Body and the Task Force on Emission Inventories and Projections (TFEIP). HMs and POPs have been reviewed to the extent possible.

3.   This report covers the Stage 3 centralised reviews of the UNECE LRTAP Convention and EU NEC Directive inventories of Portugal coordinated by the EMEP emission centre CEIP acting as review secretariat. The review took place from 17th to 21st June 2013 in Copenhagen, Denmark, and was hosted by the European Environment Agency (EEA). The following team of nominated experts from the roster of experts performed the review: Generalist – Valentina Idrissova (Kazakhstan), Energy - Stephan Poupa (Austria) and Laetita Nicco (France), Transport - Michael Kotzula (Germany), Industry - Neil Passant (European Union), Agriculture +Nature - Hakam Al-Hanbali (Sweden), Waste - Intars Cakaras (Latvia). There was no expert available to review emissions from the Solvents sector.

4.   Chris Dore (United Kingdom) was the lead reviewer. The review was coordinated by Katarina Marečková, (EMEP Centre on Emission Inventories and Projections - CEIP).

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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 ERT has noted that Portugal resubmitted data on 11 June 2013. As the ERT had already started reviewing the original submission made on 22 February 2013, this review report is mainly based on the February submission data, although where time and resources have allowed, the review team have tried to consider the revised data submission, and provide comments.

6.   The ERT considers that the Portuguese inventory is in line with the EMEP/EEA Emissions Inventory guidebook and the UN/ECE Reporting Guidelines.

7.   The 2013 submission shows that the Portuguese inventory has improved since the last review in 2008, and that the Party followed most of the recommendations from the previous ERT. Nevertheless, the ERT has noted that some planned improvements (e.g. uncertainty assessment) were not undertaken due to resource constraints. The ERT also noted that the level of detail reported in the IIR varied significantly from sector to sector. The ERT recognises that emission inventory teams are often provided with limited resources and therefore need to prioritise improvement tasks.

8.   The ERT therefore strongly recommends that Portugal develop a clear plan for addressing the ERT's recommendations, in order to improve the specific aspects of the submission which are not considered to be of sufficient quality.

9.   The CLRTAP inventory submitted by Portugal is generally of good quality and is fairly well documented in the informative inventory report (IIR) for some categories. However, the ERT has noted that significant additional efforts are required to improve transparency and consistency of some chapters of the IIR (details are provided in the following sections).

INVENTORY SUBMISSION

10.   Portugal has reported emissions for a full time series from 1990 up to 2011 (the latest year) for carbon monoxide (CO), nitrogen oxides (NOx), and non-methane volatile organic compounds (NMVOC) in the NFR format. Data are also reported for sulphur oxides (SOx), ammonia (NH_3), Particulate Matter (PM, PM_{10}, $PM_{2.5}$ and PM1.0), heavy metals and persistent organic pollutants (POPs).

11.   Emissions have been reported in NFR09 and Portugal also submitted its IIR before the reporting deadline.

12.   The ERT has noted that Portugal resubmitted the full time series and the IIR on 11 June 2013 to reflect the most recent updates to the emission estimates. The ERT recommends that Portugal improve its QA/QC procedures to ensure reporting on time.

KEY CATEGORIES

13.   Portugal has compiled and presented in its IIR a Tier I level Key Source Category Analysis for all substances reported for 2011. The ERT encourages Portugal to follow the information provided in the EMEP/EEA Guidebook, which indicates that the KCA analysis should be conducted on sources up to 80% of the emission total. The results of this analysis should be used to prioritise inventory improvement.

QUALITY

Transparency

14.   The Portuguese IIR is detailed and well presented for certain categories (e.g. transport and industry). However, the ERT considers that transparency could be improved if Portugal provided an additional description of the methods used for each category (e.g. in energy sector) and generally included more information on AD and EFs (source-specific recommendations are included in Part B of this report).

Completeness

15.   Portugal's inventory is generally complete. The ERT noted that some sources were reported as Not Estimated (e.g. POPs emissions). These sources might have little influence on the national total, but the ERT encourages Portugal to assess the importance of the sources reported as not-estimated (for example by reviewing other national inventories) and report the results in its IIR. This would demonstrate that the sources reported as NE do not have a significant impact on the total emissions estimate.

Consistency, including recalculations and time-series

16.   Portugal has undertaken a number of recalculations for their 2013 submission in all sectors. The recalculations are justified, well documented and implications for trends are provided. The ERT commends Portugal for its work in detailing the impacts of the recalculations.

Comparability

17.   The ERT has noted some cases where fuel data was not disaggregated into corresponding NFR categories (particularly noticeable for mobile and stationary sources in the energy sector). This impacts on the level of comparability with data reported by other Parties. The ERT strongly recommends that Portugal provide a suitably detailed explanation in its IIR on the methodology used, and improves the allocation of activity data to different NFR categories.

Accuracy and uncertainties

18.   Portugal has not compiled an uncertainty assessment for their UN/ECE submission although it is included in the improvement plan. During the review, Portugal indicated that due to limited resources available it would be difficult to provide an uncertainty assessment for air pollutants in the near future. Whilst the ERT is sympathetic to the restrictions that result from limited resources, the ERT

reminds Portugal that an uncertainty assessment is required as part of the annual submission, and is also a useful inventory improvement tool. The ERT therefore strongly recommends that Portugal undertake a Tier 1 uncertainty assessment, report this in the IIR, and use it to prioritise inventory improvements for future submissions.

Verification and quality assurance/quality control approaches

19.   The ERT has noted that, in its IIR, Portugal has reported only general Quality Assurance/Quality Control (QA/QC) activities. Sector specific checks are not documented in the IIR. The ERT encourages Portugal to provide information on sector-specific QA/QC procedures in future submissions.

FOLLOW-UP TO PREVIOUS REVIEWS

20.   Portugal provided detailed responses to the questions on outliers of implied emissions factors identified in the Stage 2reviews. . The ERT commends the Party for its efforts in providing timely replies annually.

AREAS FOR IMPROVEMENTS IDENTIFIED BY PORTUGAL

21.   Portugal has identified the following general areas for improvement:

-   further development of country specific emission factors for combustion in energy industries;

-   develop the uncertainty analysis.

22.   The ERT considers these to be sensible topics to focus on, as well as the recommendations included in this report (particularly regarding the level of detail of the methodologies provided in the IIR).

PART B: RECOMMENDATIONS FOR IMPROVEMENTS TO THE PARTY

CROSS CUTTING IMPROVEMENTS IDENTIFIED BY THE ERT

23.   The ERT strongly recommends that Portugal develop a clear plan for addressing the ERT's recommendations from the review process.

24.   The ERT has noted that the level of detail of the methodological descriptions in the IIR varies greatly. The ERT encourages Portugal to review the current IIR text, and recommends that methodological descriptions are included for all sources.

25.   The ERT noted some cases where fuel data was not disaggregated into corresponding NFR categories (particularly noticeable for mobile and stationary sources in the energy sector). The ERT strongly recommends that Portugal provides a suitably detailed explanation in its IIR on the methodology used, and improves the allocation of activity data to different NFR categories for future submissions.

26.   Portugal did not compile an uncertainty assessment. Whilst the ERT is sympathetic to the restrictions that result from limited resources, the ERT strongly recommends that Portugal undertakes a Tier 1 uncertainty assessment, reports this in the IIR, and uses it to prioritise inventory improvements for future submissions.

SECTOR SPECIFIC RECOMMENDATIONS FOR IMPROVEMENTS IDENTIFIED BY ERT

ENERGY

Review Scope

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

	extraction not included in 1 B 2			
Note: Where a sector has been partially reviewed (e.g. some of the NFR codes) please indicate which codes have been reviewed and which have not in the respective columns.				

General recommendations on cross-cutting issues.

Transparency:

27.   Portugal has provided a detailed and generally transparent emissions inventory. Estimates, activity data and emission factors are provided at the most detailed level for nearly all energy sectors. The ERT considers Portugal's methodology and emission factors in the IIR to be transparent and well described for the energy sector. However, the ERT encourages Portugal to include details on some sectors that are missing from the current IIR as detailed below:

28.   The ERT has noted the absence of a methodology description in the IIR for NFR 1B1b, where there are emissions between 1990 and 2001. During the review week, the Party could not provide any documentation for this methodology. The ERT therefore recommends that Portugal include a methodology description for this category in its next submission.

29.   The ERT noted that several categories are reported as 'IE'. During the review week, Portugal provided comprehensive answers to indicate where emissions from these categories were included. The ERT encourages Portugal to include explanatory information on the use of notation keys in the NFR tables, in order to ensure a sufficient level of transparency.

Completeness:

30.   The ERT has noted that Portugal reports activity data in 1B1a for the years 1990-1994, but emissions are reported as 'NE'. During the review week, Portugal confirmed that coal mining had been taking place in the country during the period 1990-1994. The ERT recommends that Portugal estimate NMVOC and PM emissions following the methodologies presented in the EMEP/EEA Guidebook in order to ensure completeness over the time series.

Consistency including recalculation and time series:

31.   The ERT has noted that Portugal sometimes uses 'NE' or 'NA' to report some activity data in the NFR tables for energy activities.

32.   For all the combustion activities occurring in Portugal, fuels that are not used in each category should be reported as "NO". Portugal indicated their agreement with this observation. The ERT therefore recommends that Portugal correct the use of this notation key in the NFR tables.

Comparability:

33.	In the previous Stage 3 review (2009), the ERT recommended that Portugal should disaggregate stationary and mobile fuel consumption in the industry sector (1A2), to enable more transparent and complete reporting.

34.	The ERT has noted that this disaggregation issue is also relevant for 1A4a and 1A4b. During the review week, Portugal explained that an accurate differentiation between mobile and stationary equipments is very difficult to accomplish due to the level of fuel aggregation in the national energy balance, and that due to resource constraints this issue is not considered a priority.

35.	The ERT are sympathetic to the challenges brought about by resource constraints. Nonetheless, the ERT strongly recommends that Portugal make improvements to the current levels of aggregation in the inventory and report mobile and stationary sources separately. The ERT consider this to be an important improvement, because for many pollutants the EFs are different for mobile and stationary sources.

Accuracy and uncertainties:

36.	The ERT encourages Portugal to undertake an uncertainty analysis for the energy sector to help provide information on the improvement process and to provide an indication of the reliability of the inventory data.

Improvement:

37.	The ERT commends Portugal for the improvements that have been carried out, and the planned improvement actions described in its IIR. The ERT encourages Portugal to undertake the actions listed in the improvement plan, and to include the recommendations made by the ERT in this review.

Sub-sector Specific Recommendations.

Category issue 1: 1A1b – NCV

38.	The ERT noted discrepancies in the NCV value used for refinery gas in 1998 and 2010 in the IIR (figure 3.12).

39.	During the review week Portugal confirmed that a NCV value for one of the refineries was wrong in 1998 and that it would be corrected in next submission. Concerning 2010, one refinery has reported a low NCV value under the ETS scheme. Portugal indicated that they would contact the refinery to obtain a justification or a correction of this low value. The ERT commends Portugal for their comprehensive response, and recommends that they undertake the actions specified.

Category issue 2: 1A2 – CO in stationary engines

40.	In the previous Stage 3 review (2009), the ERT had encouraged Portugal to review the CO emission factors for stationary engines as soon as the EMEP/EEA Guidebook provided clearer information on emissions from this type of equipment.

41.   The new version of the EMEP/EEA Guidebook (2009 edition) has included an update for these EF. Portugal indicated that they had taken note of this update and would include this issue in its Methodology Development Plan for delivery in time for its next inventory submission.

Category issue 3: 1A4b

42.   The ERT has noted that Portugal reports emissions for 1A4b i and 1A4b ii in the NFR tables. This is not consistent with the explanations provided in the IIR (Chapter 3.2.4.2.1). During the review week, Portugal confirmed that the text in the IIR was correct and provided information about what was taken into account in each category.

43.   The ERT encourages Portugal to follow the guidance in the EMEP/EEA Guidebook (Chapters 1A4) in order to ensure comparability of reporting, and also to make any revisions necessary to the NFR tables and/or the IIR to ensure consistency.

Category issue 4: 1A2 – rubber industry

44.   The ERT noted a significant decrease in consumption for the year 2008 in the rubber industry due to a reclassification of a rubber plant to the cogeneration sector in the energy balance provided by DGEG.

45.   The ERT questioned whether consistency was preserved over the time series for this sector. During the review week, Portugal contacted DGEG and confirmed that the 2008 consumption was correct. The ERT encourages Portugal to include information in its IIR that explains the situation and the underlying data in order to improve transparency.

Category issue 5: 1A4 a,b,c stationary – HCB, PAH

46.   The ERT has noted that Portugal does not report HCB and PAH emissions from commercial, residential and agriculture stationary fuel combustion which is expected to be a key source of these pollutants. Portugal explained that this was due to severe resource constraints but that it would deal with this issue in the 'methodology development plan' for the next year. The ERT welcomes the efforts of Portugal to complete their estimates despite their restricted resources and recommends that Portugal report complete inventories in their next submission to ensure compliance with the POPs Protocol.

Category Issue 6: 1A4b i Residential: Stationary plants – gas/diesel oil – TSP

47.   The ERT has noted that the chosen TSP emission factor of 6.5 g/GJ is low considering that it should consider boilers and/or diesel engines. Portugal explained that it will update the emission factor accordingly. The ERT encourages Portugal to revise the emission factor for TSP.

Category Issue 7: 1A4 – gas/diesel oil emissions factors

48.   The ERT has noted that the same emission factors are used in the IIR both for calculations of gasoil boilers and diesel engines. Portugal explained that these

emission factors are derived from a mix of 50% use of gas/diesel oil for boilers and 50% for engines. The ERT encourages Portugal to describe this in their IIR to ensure a sufficient level of transparency.

TRANSPORT

Review Scope

NFR Code	CRF_NFR Name	NOx, NMVOC, NH3, SOx, PM2.5, TSP, CO, Main HM		
Pollutants Reviewed		NO_x, NMVOC, NH_3, SO_x, $PM_{2.5.}$, PM_{10}, TSP, CO, Main HM		
Years		1990, 2010, 2011		
		Reviewed	**Not Reviewed**	**Recommendation Provided**
1.A.3.a.i.(i)	international aviation (LTO)	x		x
1.A.3.a.i.(ii)	international aviation (cruise)	x		
1.A.3.a.ii.(i)	civil aviation (domestic, LTO)	x		x
1.A.3.a.ii.(ii)	civil aviation (domestic, cruise)	x		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		
1.A.3.b.vii	road transport, automobile road abrasion		IE	
1.A.3.c	railways	x		x
1.A.3.d.i (ii)	international inland navigation	x		x
1.A.3.d.ii	national navigation	x		
1.A.4.b.ii	household and gardening (mobile)	x		
1.A.4.c	agriculture / forestry / fishing	x		x
1.A.4.c.ii	off-road vehicles and other machinery			
1.A.4.c.iii	national fishing			
1.A.5.b	other, mobile (including military, land based and recreational boats)			
1 A 3 d i (i)	International maritime navigation	x		x
1 A 3	Transport (fuel used)		NE	
Note: Where a sector has been partially reviewed (e.g. some of the NFR codes) please indicate which codes have been reviewed and which have not in the respective columns.				

General recommendations on cross-cutting issues.

Transparency:

49.   For mobile sources, Portugal has provided a very comprehensive IIR with broad and detailed descriptions of the models and methodologies applied (e.g. COPERT IV v10). The ERT commends Portugal for the efforts made to improve the inventory's transparency and comparability. Nonetheless, the ERT considers the readability of the IIR to be impacted by the large amount of technical details. Therefore, the ERT encourages the party to consider restructuring the Chapter, and in particular suggests moving parts of the methodology descriptions to an Annex or to a separate report, which can be referenced from the IIR.

50.   During the review week, the ERT noticed some problems regarding the transparent and consistent use of notation keys. In particular for emissions of NH_3, the notation keys "NA" and "NE" have been used in a contradictory way for related sectors (e.g. NFRs 1.A.3.d ii, 1.A.4.c iii and 1.A.3.d i(i)). Portugal confirmed that the notation key "NA" was used by error, and indicated that this would be corrected in time for the next submission. The ERT commends Portugal for their willingness to harmonise the use of notation keys, which will improve the transparency and consistency of the inventory.

51.   The ERT has noted a rather intransparent and inconsistent way of reporting PM emissions from mobile sources. PM exhaust emissions are provided for all mobile sources, but use rather variable $PM_{2.5}$: PM_{10} : TSP ratios. During the review week, the ERT asked Portugal to provide some information on the background and the formation of the different ratios. Some errors were confirmed and corrected by Portugal during the review (see Category Issue 6: 1.A.3.a - exhaust TSP emissions below), but they also explained that emission factors for all sources are displayed in the IIR together with the related bibliographical sources. Portugal acknowledged that the sources and assumptions presented for some of the ratios are rather old, and proposed a revision of these data as soon as their resources allowed. The ERT warmly welcomes the explanations provided by Portugal, and commends their plan to further investigate these issues and to provide corrected estimates, and encourages Portugal to undertake this work in time for the next submission.

Completeness:

52.   As pointed out under Transparency above, the ERT noted that several sectors are reported with notation keys "NA" and/or "NE" instead of emission estimates.

53.   Emissions from 1.A.3.b vi - RT: Automobile tyre and brake wear and 1.A.3.b vii - RT: Automobile road abrasion are reported as NE. However, during the review week Portugal stated that the emissions were included in the individual 1.A.3.b exhaust emission estimates reported for the different vehicle types, confirming that notation key "IE" was more appropriate, and would be used in future submissions. The ERT acknowledged this confirmation and thanked Portugal for making this change to their use of notation keys. However, the ERT encourages Portugal to make efforts to improve the resolution of the reported emissions to allow brake and tyre wear and road abrasion emissions to be reported separately in the relevant NFR categories.

54.   The ERT noted several problems regarding the reporting of the following pollutants with "NE" (and "NA"):

55.   Ammonia - NH_3 from:

- 1.A.2.f ii - Mobile combustion in manufacturing industries and construction,
- 1.A.3.a - Civil aviation sub-sectors,
- 1.A.3.d ii - National Navigation (Shipping)

- 1.A.4.b ii - Residential: Household and gardening (mobile)
- 1.A.4.c iii - Agriculture/Forestry/Fishing: National Fishing
- 1.A.3.d i (i) International maritime navigation

56. Total suspended particles - TSP from:
- 1.A.3.b - Road Transport: exhaust emissions

57. POPs / PAHs from:
- nearly all mobile sources (only few estimates for "PAHs Total 1-4" provided)

58. Again, the ERT encourages Portugal to further check these issues and to provide emission estimates in future submissions to improve the transparency and completeness of the inventory. Where it is not possible to report emission estimates, the ERT recommends that Portugal provide explanatory information on these missing estimates in the NFR tables and the IIR to ensure a sufficient level of transparency.

59. Regarding the possible underestimation of NH_3 emissions (see Sub-Sector Specific Recommendations below) the ERT asked Portugal about the reasons for excluding these emissions from the inventory (e.g. were the emissions considered too small), and recommends that this issue be reviewed and addressed to improve the completeness and comparability of the inventory. In order to do this, the ERT proposed that Portugal use the emission factors from the 2009 EMEP/EEA Guidebook allowing the Party to estimate emissions for some of the sectors discussed.

Consistency including recalculation and time series:

60. The ERT commends the provision of reasoning for recalculations in both chapter 9 (overview of recalculations) and the effected sectoral chapters of the IIR. As no additional data has been provided so far, the ERT encourages Portugal to also present all underlying data (old and new time series, absolute and relative changes).

Comparability:

61. The IIR includes comprehensive, detailed and transparent descriptions of country specific methods in the IIR, and the ERT commends Portugal for the inventory's good comparability.

62. However, as an issue of both comparability and transparency, the ERT noted several sectors were reported as included elsewhere ("IE") with no explanatory information provided in either the IIR or the NFR (table1, column "Notes" and "Additional info" table). In order to prevent any underestimation, and in order to improve the inventory's transparency and comparability the ERT recommends that Portugal include all necessary explanatory information on emission estimates reported as IE in the IIR and the corresponding NFR table. The ERT suggests that this kind of information could be included in the IIR as part of chapter 1.10 – Overview of the completeness.

Accuracy and uncertainties:

63.   Until now, an uncertainty analysis has only been performed for the direct GHG. Hence, in the IIR uncertainty estimates are provided only for activity data. The ERT welcomes Portugal's plan to extend the assessment of uncertainty to their NEC and CLRTAP inventories.

Improvement:

64.   No further specific improvements are announced in the IIR for any mobile-source sector. Given the issues discussed during the review week, the ERT warmly encourages Portugal to adopt and consider the agreed tasks for the next submission.

Sub-sector Specific Recommendations.

Category issue 1: 1.A.3.a i and 1.A.3.d i – International bunker fuels - fuel shares

65.   Within the IIR, information on fuel use for international bunkers is provided for 2008. This also includes the percentage shares of the total energy used in civil aviation and marine navigation, respectively. Portugal confirmed that discrepancies occur between the activity data submitted to IEA and the activity data used in the inventory. Efforts are already underway to solve these reporting inconsistencies. In order to improve the inventory's transparency and comparability the ERT encouraged Portugal to provide entire time series for this data for the review. The ERT commends Portugal for the explanation and data provided, encouraging them to include the entire time series for this data in future IIRs to better display developments and trends.

Category issue 2: 1.A.3.b v - NMVOC - uncommented "IE"

66.   "IE" is used for evaporative NMVOC emissions from road transport (NFR 1.A.3.b v) in NFR table1. The ERT noted that in addition to the missing "Additional info" table, there is no explanatory information in the IIR. Portugal explained that evaporative NMVOC emissions from road transportation are included in the respective exhaust emissions reported for the different vehicle categories. The ERT therefore recommends that Portugal improve the explanations provided in the next submission, and Portugal indicated their willingness to do so.

Category issue 3: 1.A.3.b - exhaust emissions from road transport vehicles: Pb (lead)

67.   Lead emissions are provided for all mobile sources in the NFR tables, and source specific information on underlying heavy metals contents in fuels and the emission factors is provided in the relevant IIR chapters. As the ERT noted during the review week, this information was provided for all heavy metals; lead emissions, however, were reported in NFR 1.A.3.b. During the review week, Portugal provided input data used in the COPERT IV model, and indicated their willingness to update the relevant sections of the IIR for the next submission. The ERT thanks Portugal for their readiness to make these improvements, and encourages them to do so.

Category issue 4: 1.A.3.b vi and vii - PM emissions from tyre and brake wear and road abrasion

68.   The ERT noted that particulate matter emissions from road abrasion and tyre and brake wear are reported as not estimated (NE), with no further information being provided in the NFR tables or the IIR. Therefore, the ERT asked Portugal to provide some details on their reasons for excluding these main PM sources from their inventory. Portugal explained that "IE" should have been used instead of "NE" because PM emissions from tyre and break wear are included in each vehicle category's exhaust emissions. The ERT thanks Portugal for the explanation provided and recommends that they correct this mistake in time for their next submission. In addition, the ERT encourages Portugal to try to report PM emissions from tyre and brake wear and road surface abrasion separately from the exhaust emissions, which will improve the transparency of these important sources of PM.

Category Issue 5: 1.A.4.c iii - Agriculture/Forestry/Fishing: National Fishing & 1.A.3.d i (i) International maritime Navigation: Ammonia emissions reported as "NE"

69.   The ERT has noted that within the NFR tables the notation key "NE" is used for NH_3, although the ERT considers that emissions are likely to occur.

70.   As the exclusion of emissions from NFR 1.A.4.c iii might result in an underestimation of the national total, the ERT asked Portugal to provide further information on the use of NE, and whether real emissions data could be provided in future submissions. Portugal agreed to further look into this issue and to try and consider this category in a future submission - which the ERT warmly welcomes and encourages.

Category Issue 6: 1.A.3.d ii - National navigation & 1.A.5.b - Other, Mobile: Ammonia emissions reported as "NA"

71.   In addition to the issue discussed above, the ERT further noted that within the NFR tables the notation key "NA" is used for the sub-sectors 1.A.3.d ii and 1.A.5.b, although the ERT considers it likely that ammonia emissions occur. The ERT asked Portugal to provide further information on these issues in order to prevent any underestimation. Portugal confirmed the use of an incorrect notation key and that they would correct it to "NE" for their next submission. The ERT welcomes this approach and recommends that Portugal undertake the necessary corrections. However, the ERT encourages Portugal to check whether data can be made available to report emission estimates instead of "NE". In order to do so, the ERT referred to the 2009 EMEP/EEA Guidebook, chapter "Non-road mobile sources and machinery", where NH_3 EFs are provided for a broad variety of controlled and uncontrolled NRMM (table 3-10 on page 34 and following tables).

Category Issue 7: 1.A.3.a - exhaust TSP emissions

72.   In addition to the PM issue discussed under Transparency, the ERT has noted that for NFRs 1.A.3.a ii (i) and 1.A.3.a i (i) TSP emissions have been reported as "NE", and asked Portugal to explain this. Portugal indicated that TSP emissions had been estimated, but were not presented in the NFR tables due to an error. The

ERT commends Portugal's plan to provide updated estimates in their next submission, and recommends that they do so.

Category Issue 8: 1.A.3.c - trend of AD (and emissions)

73.   The ERT has noted that in contrast to the ever declining trend of fuel use in NFR 1.A.3.c, there is an increase for the years 2006 to 2008. The ERT asked Portugal to provide background information on this trend. Portugal replied that the National Energy Authority (DGEG) had been contacted to ascertain the reason for the displayed increase in liquid fuel consumption. The ERT thanks Portugal for forwarding this issue to the Energy National Authority, and encourages Portugal to include explanatory information in the IIR as soon as it is available, or to revise the data wherever necessary.

INDUSTRIAL PROCESSES

Review Scope

Pollutants Reviewed		SOx, NOx, NMVOC, NH$_3$, PM$_{10}$ & PM$_{2.5}$, Pb, Cd, Hg, POPs		
Years		1990 - 2011		
NFR Code	**CRF_NFR Name**	**Reviewed**	**Not Reviewed**	**Recommendation Provided**
2.A.1	cement production		IE	
2.A.2	lime production		x	
2.A.3	limestone and dolomite use		NA, NE	
2.A.4	soda ash production and use		NA, NE	
2.A.5	asphalt roofing		NA, NE	
2.A.6	road paving with asphalt	x		
2.A.7.a	Quarrying and mining of minerals other than coal		IE	x
2.A.7.b	Construction and demolition		IE	x
2.A.7.c	Storage, handling and transport of mineral products		IE	
2.A.7.d	Other Mineral products (Please specify the sources included/excluded in the notes column to the right)	x		
2.Bb.1	ammonia production	x		
2.B.2	nitric acid production	x		
2.B.3	adipic acid production		NO	
2.B.4	carbide production		NO	
2.B.5.a	Other chemical industry (Please specify the sources included/excluded in the notes column to the right)	x		
2.B.5.b	Storage, handling and transport of chemical products (Please specify the sources included/excluded in the notes column to the right)		IE	
2.C.1	iron and steel production	x		x
2.C.2	ferroalloys production		NO	
2.C.3	aluminium production		NO	
2.C.5.a	Copper Production		NO	
2.C.5.b	Lead Production		NO	
2.C.5.c	Nickel Production		NO	
2.C.5.d	Zinc Production		NO	
2.C.5.e	Other metal production (Please specify the sources included/excluded in the notes column to the right)		NO	
2.C.5.f	Storage, handling and transport of metal products (Please specify the sources included/excluded in the notes column to the right)		NO	

2.D.1	pulp and paper	x		
2.D.2	food and drink	x		
2.D.3	Wood processing		NA, NE	
2.E	production of POPs		NA, NE	
2.F	consumption of HM and POPs (e,g. Electrical an dscientific equipment)		NA, NE	
2.G	Other production, consumption, storage, transportation or handling of bulk products (Please specify the sources included/excluded in the notes column to the right)		x	
Note: Where a sector has been partially reviewed (e.g. some of the NFR codes) please indicate which codes have been reviewed and which have not in the respective columns.				

General recommendations on cross-cutting issues

Transparency:

74.   The IIR generally provides information on industrial sectors which are key categories, including information on the number of plants (where applicable), estimation methods and trends in activity data. However, the IIR does not contain any information on 2.A.7.d Other Mineral Products, which is a key category for NMVOC, particulate matter, and many heavy metals. Portugal did resubmit an IIR just before the review week, and this included a new section dealing with this source category, but it was not possible to review the resubmitted IIR in detail. However, the ERT commends Portugal for their actions towards resolving this issue.

75.   For source categories where information is provided in the IIR, this is detailed and informative. The ERT has noted that there is a good level of explanation of e.g. trends in activity data. Emission factors are tabulated clearly in the IIR, and methodologies are transparent.

76.   However, there is no information on the non-key category sources in the IIR. The ERT recommends that Portugal include at least some description of each reported emission category, and a description of the methodology which allows for the approach to be understood. The ERT recognises that the information included in the IIR for sectors that are non-key categories does not need to be as detailed as the information for key categories.

77.   The Notation key IE is used in some cases without any information on where these emissions are reported. The ERT recommends that Portugal make clear where the emissions reported as IE are included, and refers Portugal to Table F2 in the data submission for providing this information.

78.   The notation key NA is used in some cases where the ERT considers that NO or NE are likely to better represent the national circumstances. Portugal has confirmed that the use of notation keys need to be reviewed and potentially revised in several cases (see the Sub-sectoral Recommendations section below). The ERT recommends that Portugal review the use of NA in all cases where this is not pre-

filled in the reporting template, to ensure appropriate use of NKs throughout the inventory submission.

Completeness:

79.   The data submission indicates that many categories of emission sources do not occur in Portugal. However, the ERT has noted that no estimates were made for a number of sources from which emissions would be expected. The ERT notes that Table 1.4 in the Portuguese IIR states that work is underway to address one case where NE is reported (NMVOC emissions from 2.A.5 Asphalt Roofing), and the ERT encourages Portugal to continue to improve the level of completeness of the inventory and to aim to eliminate the use of NE in the data submission.

Consistency including recalculation and time series:

80.   The ERT has not identified any major problems with time series' consistency, and the IIR is helpful in this respect in that activity data time series are given and trends explained. During the review week, the ERT sought some clarification for a large step-change in emissions for 2.C.1 Iron and Steel Production, and Portugal provided the necessary information. The ERT recommends that Portugal include this supporting information in future versions of the IIR.

Comparability:

81.   The ERT found that the methods used seem to be consistent with the EMEP/EEA Emissions Inventory Guidebook, with emission factors from the Guidebook being used for many source categories, or country-specific factors used, where available. Country-specific methods are described to an appropriate level of detail. Some emission factors were taken from other sources, principally USEPA publications and the IIR did not specify whether this was due to no EFs being available from the EMEP/EEA Guidebook or whether the EFs used were considered to be more reliable for Portugal. The ERT encourages Portugal to provide more information in the IIR on the rationale behind the choice of literature emission factors, where these are not taken from the EMEP/EEA Guidebook.

82.   Portugal used the most up to date reporting templates for their data submission (NFR09), and structured the IIR as recommended in the Reporting Guidelines. This facilitates comparisons with data submitted by other Parties.

Accuracy and uncertainties:

83.   Portugal does not provide any quantitative or qualitative assessment of uncertainty for emission estimates in the industrial processes sector. The ERT strongly recommends that Portugal undertake an uncertainty assessment.

84.   The ERT has not found any reasons to question the accuracy of the emission estimates. Literature emission factors (including Guidebook emission factors) are used quite extensively throughout the industrial processes sector, and the inventory is therefore assumed to be of a basic quality for the relevant sources. However, the use of default emission factors is complemented with facility-level data in some limited areas, raising the confidence that can be placed in the emission estimates.

Improvement

85.   Portugal includes some information on planned improvements in Section 1.10 and Table 1.4 of the IIR to address completeness issues. However, the ERT encourages Portugal to include more detailed information on improvement plans to improve the transparency of reporting.

86.   The IIR does include a discussion of issues and potential improvements at a sectoral level for existing emission estimates. The ERT encourages Portugal to continue to improve the quality of emission estimates made for the industrial processes sector.

Sub-sector Specific Recommendations.

Category issue 1: 2.A.7.a & 2.A.7.b Other Mineral Products

87.   The ERT noted that Portugal used the notation key IE for the above mentioned emission categories but that it was not clear where these emissions were actually reported. The ERT requested information on the methods used etc. Portugal confirmed that the notation key should have been changed to NE for particulate matter (2.A.7.a & 2.A.7.b) and for VOC (2.A.7.b only), and NA for all other pollutants. Portugal has also indicated that they would address the issue of missing emission estimates for these sources in the next submission, and the ERT recommends that Portugal make this improvement to the industrial process inventory.

SOLVENTS

Review Scope

Pollutants Reviewed	SO_2, NOx, NMVOC, NH_3, PM_{10} & $PM_{2.5}$		
Years	1990 – 2006 + (Protocol Years)		
NFR Code	**CRF_NFR Name**	**Reviewed**	**Not Reviewed**	**Recommendation Provided**
3.A.1	Decorative coating application		x	
3.A.2	Industrial coating application		x	
3.A.3	Other coating application (Please specify the sources included/excluded in the notes column to the right)		x	
3.B.1	Degreasing		x	
3.B.2	Dry cleaning		x	
3.C	Chemical products,		x	
3.D.1	Printing		x	
3.D.2	Domestic solvent use including fungicides		x	
3.D.3	Other product use		x	
Note: Where a sector has been partially reviewed (e.g. some of the NFR codes) please indicate which codes have been reviewed and which have not in the respective columns.				

No solvents experts were available for the review.

AGRICULTURE

Review Scope:

NFR Code	CRF_NFR Name	Reviewed	Not Reviewed	Recommendation Provided
Pollutants Reviewed		NOx, NMVOC, NH_3 and PM_{10} & $PM_{2.5}$,		
Years		1990 – 2011		
4 B 1 a	Cattle dairy	X		X
4 B 1 b	Cattle non-dairy	X		X
4 B 2	Buffalo	X		
4 B 3	Sheep	X		X
4 B 4	Goats	X		X
4 B 6	Horses	X		X
4 B 7	Mules and asses	X		X
4 B 8	Swine	X		X
4 B 9 a	Laying hens	X		X
4 B 9 b	Broilers	X		X
4 B 9 c	Turkeys	X		X
4 B 9 d	Other poultry	X		X
4 B 13	4 B 13 Other	X		X
4 D 1 a	Synthetic N-fertilizers	X		X
4 D 2 a	Farm-level agricultural operations including storage, handling and transport of agricultural products			
4 D 2 a	Off-farm storage, handling and transport of bulk agricultural products			
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)			
4 F	Field burning of agricultural wastes	X		
4 G	Agriculture other(c)	X		X
11 A	(11 08 Volcanoes)			
11 B	Forest fires			
Note: Where a sector has been partially reviewed (e.g. some of the NFR codes) please indicate which codes have been reviewed and which have not in the respective columns.				

General recommendations on cross cutting issues

88.   The agriculture inventory submission 2013 of Portugal includes emissions for the 1990-2011 time series. Portugal has estimated emissions for manure management (4B), agricultural soils (4D1) and emissions related to field burning of agricultural wastes (4F). Emissions related to agriculture other (4G) were reported using the notation keys not occurring "NO" and not estimated "NE". Only emissions of NH_3 were reported from 4B and 4D1.

89.   The ERT recommends that Portugal estimate emissions of PM_{10} and $PM_{2.5}$ and other relevant pollutant emissions from 4B and 4D in future submissions. The

ERT also encourages the Party to estimate emissions for the pollutants reported as not estimated "NE" in 4F and 4G in future submissions.

90.   The ERT has noted that there is limited information on emission trends in the IIR. The ERT therefore recommends that Portugal include detailed information and an analysis of the emission trends in the agricultural sector by including more diagrams of different sub-categories in the IIR, in order to improve the quality of reporting and enhance the transparency of the agricultural sector in future submissions.

91.   The ERT noted that the populations of different animal categories (AD) reported in the NFR tables differ substantially from those reported in the National Inventory Report/Common Reporting Format (NIR/CRF) for the GHG inventory. During the review week, Portugal explained that this was an error and that it would be corrected in time for the next submission. The ERT strongly recommends that Portugal correct this error and harmonise the activity data between the CLRTAP and UNFCCC emission inventories in order to ensure consistency.

Transparency:

92.   The IIR includes good descriptions of the activity indicators, data sources and methodologies. The IIR is generally transparent for the agricultural sector with some exceptions concerning activity data for 4B since there is a discrepancy between the CLRTAP inventory (IIR/NFR) and the UNFCCC inventory (NIR/CRF). The ERT recommends that Portugal enhance the transparency of the IIR and harmonise the activity data used for the different reporting obligations.

Completeness:

93.   Portugal's 2013 agriculture inventory submission is generally complete with respect to the most important sources of pollutant emissions. Only NH_3 emissions were estimated from 4B and 4D. The ERT recommends that Portugal include estimates of emission of PM_{10} and $PM_{2.5}$ and other relevant pollutants from these sources. In addition, the ERT recommends that Portugal estimate emissions for the sub-categories reported as "NE" in 4F and 4G to further improve the completeness of the agricultural inventory.

94.   The use of notation keys in the NFR tables, especially for 4D can be further improved. The ERT noted that the Party reported a notation key not applicable "NA" instead of "NE" for NH_3 emissions from (4D2) Crop production and agricultural soils. The ERT recommends that the Party use the appropriate notation keys for reporting in order to improve the quality of the inventory.

Consistency including recalculation and time series:

95.   Emission data from the agriculture sector is generally consistent over the reported time series. The ERT recognises Portugal's efforts regarding the consistency of the agricultural inventory and encourages the Party to keep its inventory consistent for the main pollutants emissions and other relevant pollutants in the future submissions.

Comparability:

96.   Portugal has prepared its agricultural inventory in accordance with the recommendations given in the EMEP/EEA Emissions Inventory Guidebook (EEA, 2002) and the IPCC Guidance (1996 Revised IPCC Guidelines and Good Practice Guidebook). The ERT encourages the Party to continue with this approach and to ensure that the methodologies applied are as far as possible consistent with international guidance.

Accuracy and uncertainties:

97.   Portugal has indicated in the IIR that it has undertaken QA/QC procedures for the emission inventory. Portugal has also compiled a QA/QC procedures manual and annually elaborates a QA/QC plan for the UNFCCC and UNECE/CLRTAP inventories. The Party does not specify whether or not it has undertaken a consistent uncertainty analysis for the agriculture sector. The ERT recommends that Portugal provide more information on QA/QC procedures in the IIR, and give an indication of the reliability of the inventory data for this sector in the next submission.

Improvement:

98.   Portugal has indicated that activities such as the burning of agricultural waste (4F) e.g. hedgerows and some weeds are still practiced in Portugal but no data is available. Portugal is aiming to gain an insight into this subject and emissions from this source category, and plans to report on this in future inventories. In addition, Portugal indicated that the adoption of a three year average for crop area and emissions will be discussed in the future. To estimate emissions from forest fires is also part of the improvement plan of the Portuguese emission inventory. The ERT commends Portugal for having an improvement plan in place, and encourages them to continue this good practice.

Recalculations:

99.   The ERT has noted that Portugal has made recalculations for its agricultural inventory. These recalculations include a revision of the crop data for 2010 and corrections of the calculation spreadsheet for some pollutants using the total amount of crop residue produced and not the actual residue burned. The ERT acknowledges Portugal's efforts in undertaking these revisions and encourages Portugal to continue with this process in future submissions.

Sub-sector Specific Recommendations.

100.   No sub-sector specific recommendations are included.

WASTE

Review Scope:

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

101.   The ERT commends Portugal for the work undertaken to ensure that the waste sector (data submission and IIR) in the inventory is of good quality.

Transparency:

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

103.   The notation key IE is used in 6Cc Municipal Waste Incineration for all pollutants across the entire time series. The ERT encourages Portugal to report sources which do not have energy recovery in 6Cc. If there are no such sources, then the ERT encourages Portugal to report the emissions as NO and not IE. Emissions for 6Ce Small Scale Waste Burning are also reported as IE. The ERT could not find any explanatory information for this in the IIR, and therefore recommends that Portugal add information to the IIR that explains the use of this notation key, and also encourages Portugal to estimate emissions from Small Scale Waste Burning and report them in 6Ce.

Completeness:

104.   The ERT considers the waste sector to be complete, and commends Portugal for compiling a complete inventory.

Consistency, including recalculation and time series:

105.   The ERT considers the NFR tables and the IIR to be consistent.

Comparability:

106. Portugal has prepared the waste inventory in accordance with the recommendations given in the EMEP/EEA Emissions Inventory Guidebook.

Accuracy and uncertainties:

107. The ERT considers the inventory to have an acceptable level of accuracy.

Improvement:

108. Portugal has identified improvements for the waste sector, and reports these in the IIR. The ERT has included some additional sector specific recommendations (for details see below).

Sub-sector Specific Recommendations.

Category issue 1: 6.C.e – Small scale waste burning

109. Portugal has not calculated emissions from small scale waste burning; the notation key "IE" is reported. The ERT encourages Portugal to review possible sources of emissions according to the guidelines.

LIST OF ADDITIONAL MATERIALS PROVIDED BY THE COUNTRY DURING THE REVIEW