

**UNITED
NATIONS**

Distr.
GENERAL

CEIP/S3.RR/2017/EU
5/10/2017

ENGLISH ONLY

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

European Union

CONTENT

INTRODUCTION.....	3
PART A: KEY REVIEW FINDINGS	4
INVENTORY SUBMISSION	4
KEY CATEGORIES	5
QUALITY.....	5
Transparency	5
Completeness	7
Consistency, including recalculations and time-series	8
Comparability	9
CLRTAP/NECD comparability	9
Accuracy and uncertainties.....	9
Verification and quality assurance/quality control approaches	10
FOLLOW-UP TO PREVIOUS REVIEWS	10
AREAS FOR IMPROVEMENTS IDENTIFIED BY THE EU	11
TECHNICAL CORRECTIONS CONSIDERED AND OR CALCULATED BY ERT	12
PART B: RECOMMENDATIONS FOR IMPROVEMENTS TO THE PARTY	13
CROSS CUTTING IMPROVEMENTS IDENTIFIED BY THE ERT	13
SECTOR SPECIFIC RECOMMENDATIONS FOR IMPROVEMENTS IDENTIFIED BY ERT.....	15
ENERGY	15
TRANSPORT	23
INDUSTRIAL PROCESSES	27
SOLVENTS.....	32
AGRICULTURE	33
WASTE.....	36
MATERIALS USED BY THE REVIEW TEAM.....	38
LIST OF ADDITIONAL MATERIALS PROVIDED BY THE COUNTRY DURING THE REVIEW	38
REFERENCES.....	39
ANNEX I POTENTIAL TECHNICAL CORRECTIONS	FEHLER! TEXTMARKE NICHT DEFINIERT.

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. This year an updated version² of the “Methods and procedures” document proposed by the Task Force on Emission Inventories and Projections (TFEIP) was tested.
2. This annual review, has concentrated on SO₂, NO_x, NMVOC, NH₃, plus PM₁₀ & PM_{2.5} for the time series years 1990 – 2015 reflecting current priorities from 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 the EU, coordinated by the EMEP emission centre CEIP acting as review secretariat. The review took place from 19th June 2017 to 23th June 2017 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 – Eva Krtkova (CZ), energy - Glen Thistlethwaite (UK), transport – Giannis Papadimitriou (EU), industry and solvents - Neil Passant (UK) , agriculture - Hakam Al Hanbali (SE), waste - Intars Cakars (LV).
4. Jean-Pierre Chang (FR) was the lead reviewer. The review was coordinated by Katarina Marečková (EMEP Centre on Emission Inventories and Projections - CEIP).
5. The EU emission inventory is compiled by aggregating information from a large number of countries. The unique nature of this inventory means that the ERT needs to sometimes adapt a standard approach for the stage 3 review. For example, it is not practical to assess whether methodologies are in line with the EMEP/EEA Guidebook for the different sectors at EU level (which would require to carry out such assessments for all MS). Concerning the completeness and inconsistency, such assessment of at EU level is not an easy task because of possible of completeness and inconsistency issues at MS level, and because of limitations of the gap filling procedure (use of available national data from previous CLRTAP inventories or from other international reporting obligations e.g. from UNFCCC GHG inventories).

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.ceip.at/fileadmin/inhalte/emep/review/review_guidelines.pdf

² Proposal for updating the 'Methods and procedures' document laying down the process for the EMEP emission inventory review Available at: http://www.unece.org/fileadmin/DAM/env/documents/2016/AIR/EMEP/Informal_Document/3_Methods_Procedures_update_proposal_May2016_ISSUE1_TFEIP.pdf

PART A: KEY REVIEW FINDINGS

6. Reviewing the EU inventory is particularly challenging because the review framework is not designed for reviewing an inventory that represents a compilation of numerous national emission inventories. As a result, less focus was put on assessing whether methodologies are in line with the EMEP/EEA Guidebook at EU level, but more focus was put on strategic issues at EU level such as better EU monitoring of the quality of MS inventories to be reflected in the EU inventory and IIR. For instance, that could be implemented through reinforced internal EU QA/QC procedures and/or through a possible EU air pollutant inventory working group (similar to WG1 within the EU Climate Change Committee). Indeed, such monitoring would be the basis for further improvements of the transparency, the consistency, the completeness, the comparability and also the accuracy of the EU air pollutant inventories.

7. Nevertheless, generally the ERT tried to assess EU inventory like a standard Party, resulting in general and sector specific comments and recommendations.

8. The EU inventory is generally in line with the UNECE Reporting Guidelines and the ERT appreciates the effort of EU to report the EU inventory in the same way as for an individual Party.

9. The EU inventory depends on the quality of the MS's inventories, especially concerning completeness. The EU implements a gap-filling procedure to address missing data from MS inventories. This procedure has been negotiated with the Parties and is well designed in a mostly automated way by using already existing official data from the Parties (reported under the CLRTAP or other international frameworks, e.g. UNFCCC and NECD). Nevertheless, there is room for improving the gap filling procedure to go beyond automated processes. Furthermore, despite improved transparency, more detailed information at a sectoral level would be useful concerning the gap-filling procedure.

10. Concerning QA/QC, the EU inventory system has been improved particularly during 2017 with the reinforcement of the EU inventory's own QA/QC activities through the implementation of the EU 2017 NECD comprehensive review. However, there is still a need to set and follow an improvement plan specific to the EU inventory.

INVENTORY SUBMISSION

11. In 2017 submissions, the EU has reported emissions for its protocol base year (1990) and a full time series to 2015 (the latest year) for its protocol pollutants in the NFR14 format. The EU also submitted a detailed IIR.

12. Emissions are reported in NFR14 categories. Notation keys NE and NR are used where Member States have not reported information or where data is not required to be provided. As an aggregation of MS inventory, transport emissions are based on a mixture of fuel used and fuel sold (cf. item 34).

13. The CLRTAP inventory submitted by the EU is of good quality; however there is still room for improvement. The majority of the emission estimates that are reported by the EU Member States are considered to be of good quality. However by combining data from different Member States, any underlying issues within the MS inventories are then also reflected in the EU's inventory. Whilst the ERT acknowledges that it is not feasible for the EU to rigorously address all such issues within tight time and resource limitations, there is scope to improve the system of managing inventory quality at EU level.

14. In some cases the gap-filling procedure does not generate a reliable representation of the emissions from the source categories because of limits of the gap-filling procedure; the ERT therefore recommends the EU to keep improving the gap-filling procedure.

15. The ERT commends the EU for including explanations for outliers in the current IIR. However, as presented also in the IIR, Table 5.3, the explanations for outliers have only partly been implemented following a recommendation from the previous stage 3 review. The ERT recommends that the EU maintains its efforts to address outliers and to continue to improve the documentation in the IIR of data outliers and steps taken to minimise them in the EU inventory.

16. The ERT commends the EU on the improvement of the IIR and encourages the EU to keep improving the document following recommendations listed in this report.

KEY CATEGORIES

17. The EU has compiled and presented a level key category analysis (hereafter KCA) of 2015 data for NO_x, NMVOCs, SO_x, NH₃, PM_{2.5}, PM₁₀, CO, HMs (Pb, Cd and Hg) and POPs (PCDD/Fs, total PAHs, B(a)P, HCB and PCBs) in its IIR. The EU does not consider additional HMs, TSP and the remaining POPs. The use of the notation key "IE" (included elsewhere) in the MS inventories may influence the KCA. Further, activities listed under "Other" may differ between the Member States. Due to the reasons mentioned above the KCA may not accurately reflect all main emission sources.

QUALITY

Transparency

18. The ERT acknowledges that the quality of the EU inventory is to a large extent dependent on the quality and timeliness of the reporting by the Member States and that the compilation and reporting of the EU submission is subject to unique time constraints, compared to the submissions from other Parties. The EU IIR presents an overview of the key data sources and a general approach to inventory compilation from across all Member States, reflecting that the detailed information is available within the 28 individual IIRs.

19. The ERT recognises the level of effort undertaken by the EU in providing an inventory from collecting Member States inventories. The EU's IIR is mostly detailed and well presented. However, the IIR could be improved by elaborating the gap-filling procedure in more detail. Indeed, the EU has implemented a gap-filling procedure to reduce under-reporting in the EU inventory, and detailed data (by Member State, by source category and by pollutant) are provided transparently within Annex D of the IIR. The ERT commends the EU on its efforts to present detailed MS data used to compute the reported EU totals, including transparency on remaining sources that are reported as "NE", or "NA", and hence are gaps or potential gaps in the reported EU totals. However, the ERT notes that the IIR sections on *General assessment of completeness* (section 1.8), *Underestimations* (section 1.9), and the graphs presented to summarise the impacts of the gap-filling procedure (Figures 1.2 and 1.3), are short summaries that provide only a high-level commentary, which, in the ERT's view, present a somewhat misleading picture of the level of under-reporting in the EU inventories. Specifically, the Figures 1.2 and 1.3 infer that the inventories for many pollutants (including NO_x, NMVOC, SO₂) are "100%" complete after the gap-filling procedures are conducted, whereas the tables in Annex D highlight numerous instances of "NE" reporting that have not been addressed by the EU gap-filling (e.g. in some cases for energy sector key categories). Whilst the ERT acknowledges that it is neither practicable nor resource-efficient for the EU to address all of these data gaps and fill them prior to the EU submission, the ERT considers it important that the report confers a clear message regarding completeness and priorities for improvement across member states. Therefore the ERT strongly encourages the EU to revise and expand these sections of the IIR to present a more detailed, accurate description of data gaps and improvement priorities (especially prioritising effort on key categories).

20. The EU data inventory uses notation keys "NE" and "NR", where estimates are not available or not required to report. However this use of notation keys is not always accurate. The ERT reiterates the recommendation from the previous stage 3 review to improve the use of notation keys in the inventory. Further, relevant recommendations are listed in Part B of this report.

21. Recalculations were carried out for all pollutants. The significant recalculations were explained in the IIR following an encouragement from the last review report. The ERT welcomes this improvement and encourages the EU to keep improving the transparency of recalculation explanations for future submissions.

22. Member States are encouraged to use appropriate QA/QC procedures to ensure the data quality of the reporting. Following the recommendation from the last review the EU included explanations of QA/QC procedures applied to the EU inventory in its IIR. The ERT commends the EU for including such information in the IIR and recommends that the EU further improves the documentation of the EU's own QA/QC procedures.

23. The transparency of the EU IIR could be improved in several respects, to provide a more detailed analysis of the key limitations and uncertainties in the information that the EU receives from Member States which then impact on the

overall quality (notably completeness and accuracy) of the EU inventory. The ERT commends the EU for developing the parallel inventory review and ongoing improvement processes via the NEC Directive reviews, and notes that through this processes the data provided by Member States is expected to become more complete, consistent and transparent. However, the ERT encourages the EU to further improve the IIR through the provision of more detailed information to highlight key data and information deficiencies in the Member State submissions, including: (i) data gaps for key categories, (ii) outlier level and trend emissions data from Member States for key categories, and (iii) identifying where lower-tier methods are used by Member States that contribute significantly to the reported EU total for a key category. The ERT notes that the EU is in a unique position to progress such an analysis and reporting, and communicate findings (either within the IIR or via separate reports later in the spring/summer) to the Member States, in order to identify improvement priorities in future inventory cycles. The ERT further notes that such detailed analysis and reporting, at the source category level, even if conducted only for key categories, would require additional resources for the EU inventory compilers, and that to perform this analysis prior to EU inventory submission is unlikely to be feasible. The ERT further notes that a system analogous to the EU Working Group 1 (WG1) for GHG inventory reporting would provide an arena for communication of such improvement priorities to Member State CLRTAP inventory compilers, and encourages the EU to consider such an approach to improve the Member State and EU CLRTAP submissions.

24. During the Stage 3 review, the ERT raised again the issue of no activity data (AD) provided at EU level due to incomplete and possibly not consistent AD reporting from the individual MS (this issue was also raised in the previous Stage 3 review in 2012). In general, the ERT acknowledges the difficulties of this task and the efforts of EU to collect activity data from each MS. Furthermore, the ERT recommended that a possible solution to this might be to further enhance the gap-filling procedures (already planned improvement, IIR 2017 p. 124) in order to finally provide activity data at EU level. For example, gap-filling by utilizing data from EUROSTAT statistics, or data from another country (e.g. with similar population, GDP, or other indicator) that could be an interim solution to overcome the difficulties. The EU answered that reporting under the new NECD will improve reporting of activity data in the future – it is now mandatory for Member States to report this. Later this year, the EU will review the activity data reported by MS in February 2017 under the new NECD with the aim to improve the EU reporting of activity data under CLRTAP in the future. The ERT welcomes this plan and encourages the EU to report AD, if available, for its next submission.

Completeness

25. The ERT acknowledges the effort to which the EU has gone to provide estimates of emissions for all sub-sectors and all pollutants reviewed.

26. EU's inventory for the pollutants reviewed is generally complete. Since not all of the individual Member State inventories were complete in terms of pollutants, categories and time-series, gap-filling procedures have been undertaken in order to

reduce the number of missing values in the inventory. In 2017, 27 Member States submitted their inventories and time series, Greece made no submission. Three Member States didn't provide complete time series. The ERT notes that generally speaking the completeness of the EU submission is largely dependent on the completeness of the Member State submissions and the effectiveness of the gap-filling procedures. The ERT commends the EU for its efforts to implement and develop the gap-filling procedure. The ERT agrees with the EU's own assessment in the *Planned Improvements* section of the IIR (section 5.3) that there is room for further improvement in the gap-filling procedures, such as the development of more manual interventions, taking into account that in spite of the gap-filling procedure, there remain cases at EU level where there are notable gaps or potential gaps.

27. Improving the completeness of reporting from the MS is considered to be the highest priority in improving the quality of the EU inventory. On the question raised during the review, the EU clarified that gaps in reporting have been communicated to the European Commission (EC), the Member States and the Expert Group. Furthermore, to implement a mechanism of continuous improvements concerning completeness, accuracy and timeliness of MS reporting, the European Commission (EC) is conducting a comprehensive review of emission inventories submitted by the Member States during the first reporting round under the new NECD in 2017. The emission inventory expert reviewers are required to estimate technical corrections of MS inventory results to address issues of completeness. MS must subsequently include these corrections in their national inventories which will therefore improve the completeness in future years. The ERT welcomes the efforts undertaken by EU; however the ERT reiterates the recommendation from the last review report, to develop the EU level inventory improvement programme, which should include actions at the EU level to target improvements of the completeness of reporting from the MS. It may be that more complete reporting from the MS to the EU can only be achieved by the introduction of more binding/stringent requirements.

Consistency, including recalculations and time-series

28. The EU carried out number of recalculations following recalculations of the inventories of the Member States. The main recalculations are explained in the IIR of each Member State. The ERT encourages the EU to explain also the rest of the recalculations including their implication on the trends, and especially to explain recalculations due to changes in the EU gap-filling method.

29. There are number of categories, where the time series is not consistent due to incomplete reporting by the Member States, as far as the consistency of the EU inventory is primarily defined by the consistency and completeness over time of the reporting by Member States. Comments on improving the completeness of reporting Member States are provided in different paragraphs on completeness (general and sectoral sections) of this report.

Comparability

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

CLRTAP/NECD comparability

31. The IIR provides information, that reporting obligations under the LRTAP Convention and NEC Directive have now been harmonised since the adoption of the updated reporting guidelines and the revision of the NEC Directive. They differ from the UNFCCC obligations by including domestic and international aviation and navigation in the reported national totals. Table 1.3 in the IIR summarises the main differences between the reporting instruments. The overall impact of these differences is small for most Member States of the EU.

Accuracy and uncertainties

32. In the previous Stage 3 review in 2012, the ERT had recommended that the EU investigate alternative techniques for making uncertainty estimates for the emission inventory, understanding the difficulties to combine the uncertainty analyses from all MS. The EU has not yet compiled uncertainty estimates for its UNECE 2017 submission, stating in the IIR that it is not possible to conduct a quantitative uncertainty analysis due to incomplete reporting of uncertainty analyses by Member States (only 15 Member States provided the uncertainty analysis of their inventories). Following a question raised during the review, the EU clarified, that uncertainty analysis is in the improvement plan for near future, since under the new NECD Member States shall provide information on uncertainties. It is therefore planned to assess and evaluate if the uncertainty analysis for the EU can be generated. The ERT welcomes the plans of EU. The ERT however recommends the EU to develop procedures for an uncertainty analysis, where EU would not only be dependent on the Member States submissions (for instance qualitative uncertainty analysis of the uncertainty).

33. The ERT noted that no impact assessment of the gap-filling procedures on the overall uncertainty is provided in the IIR. In response to the question raised during the review, the EU clarified, that gap-filling is primarily performed only in cases where values were reported previously, and the EU considers that since the procedures improves inventory completeness it also decreases uncertainty. The ERT recommends the EU to assess the impact of the gap-filling procedure on inventory uncertainty, e.g. assessment of uncertainties linked to the EU gap-filling process and its combination with MS inventory uncertainties.

34. The EU inventory for road transport is based on a mixture of fuel sold and fuel used, depending on what MS choose to report. Only one member state reported emissions from transport based on fuel used. The combination of the approaches may lead to inaccuracies in the dataset and is not fully in line with the EMEP/UNECE

Reporting Guidelines (nevertheless such deviation for one MS does not have a significant impact at EU level). The ERT recognises the challenges associated with aligning the reports from all MS, but reiterates the recommendation from the last review that consideration be given to reporting emissions data on a consistent basis.

Verification and quality assurance/quality control approaches

35. Member States are encouraged to use appropriate QA and QC procedures to ensure data quality and to verify and validate their emission data. The ERT however encourages the EU to not rely only on Member State actions and continue to further develop its own EU QA/QC activities and plan (e.g. the 2017 NECD EU comprehensive review is an important milestone of the reinforcement of EU own QA/QC activities for its air pollutant inventory).

36. The ERT commends the EU on its general quality assurance/quality control (QA/QC) activities, which are listed in Table 1.5 in the IIR. For example, the ERT noted that EU QC procedures identified an inconsistency in the data submitted by Portugal, whereby the sum of the sectors did not equal the national total. The ERT welcomes the efforts on QC and encourages the EU to keep working on improving the QA/QC for future submissions.

FOLLOW-UP TO PREVIOUS REVIEWS

37. The EU provided responses to the recommendations identified in the previous stage 3 review, which was held in 2012, in the section 5.4 of its IIR. The responses also include short comments on how and if the recommendations were implemented. The ERT recognises the difficult situation of the EU in implementing those recommendations, however the ERT reiterates that these recommendations are to be implemented in the EU's future submissions. The recommendations which were not addressed, or were partly addressed, are:

- (a) Explanation of largest variations in the trends, at least for the key categories – partly implemented
- (b) Further improvement of the gap-filling procedures, outliers checks, review of sectoral methods used by the Member States – partly implemented
- (c) Addressing of potential underestimations, usage of “NO” and “NA”, review using of “NE” – partly implemented
- (d) Encouragement to request information on recalculations from the Member States – partly implemented
- (e) Sector-specific checks in QA/QC procedures – partly implemented
- (f) Emissions data for road transport shall be reported on a consistent basis, not as a mix of fuel sold and fuel used – partly implemented
- (g) Explanation of “NE” – not implemented

- (h) Providing further clarity on the largest sources included and not included in particular sectors – not implemented
- (i) Development of the EU-level inventory programme: actions to target improvements of the completeness of reporting by Member States – not implemented
- (j) Completeness checks by comparing emissions reported by the Member States for specific source categories, by comparing emissions reported by the Member States with information from other sources – not implemented
- (k) Inter-country comparison into the QA/QC procedures – not implemented
- (l) Activity data reporting – not implemented
- (m) Ensure comparability of the data across Member States – not implemented
- (n) Uncertainty analysis – not implemented
- (o) Checks to ensure that compounds that should be included as components of SO_x and NO₂ emissions are captured in the individual Member State emission inventories – not implemented
- (p) Check of the allocation of the emissions between industrial processes and energy sectors – not implemented

AREAS FOR IMPROVEMENTS IDENTIFIED BY THE EU

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

39. Further progress concerning completeness of reporting: although clear progress has been made in recent years on making reporting complete, a full set of emission inventory data for air pollutants is still not available for all Member States, as noted earlier in this report. Further, for certain pollutants (including PMs, HMs and POPs), data could not be fully gap-filled, because some Member States had not reported emission values in any years.

40. Updating of emission data by Member States, for past years too: the ETC/ACM has also identified a problem with filling gaps by using data submitted several years ago. In a number of cases, because countries have not since submitted corrected or updated data sets, the EU-28 inventory unavoidably contains inconsistencies. The quality of the EU's inventory will thus be enhanced if the consistency and completeness of Member States' submissions improves. Such improvements would help reliable trend analysis to inform policy.

41. Reviewing current gap-filling procedures to ensure that they use the best approach, reflecting real emissions: the improved inventory gap-filling procedure performed in 2011 has helped develop a more complete EU emission inventory, but there is room for improvement (e.g. by including manual changes in the procedure).

42. Reducing the need for gap-filling: this is achievable if Member States report complete time series as far as possible, and also if they have already provided the data in earlier submissions under the CLRTAP. Current gap-filling procedures first use submissions received in the current reporting years under various reporting mechanisms, and then use older CLRTAP submissions.

43. More explanatory information on trends and recalculations: this would be possible if the IIRs contained such information.

44. Further research on outliers in Member States' emission data to help ensure that they reflect real emissions: a comparison of Member States' contributions to the EU-28 total reveals extraordinarily high proportions in some instances, e.g. for SO_x in Poland (25 %), Pb in Poland (28 %), Cu in Germany (57 %), Zn in Germany (30 %), IP in Poland (40 %) and total PAHs in Spain (28 %). Future investigation could determine whether these high proportions reflect actual emissions or they are ascribable to incomplete reporting (or underestimates) by other Member States.

45. More attention to data quality: in several submissions from Member States and as a result of the gap-filling procedure, values of BC exceed PM_{2.5} values, values of PM_{2.5} exceed PM₁₀ values, or values of PM₁₀ exceed TSP values — which should be impossible. Changes in the gap-filling results and improved Member State emission data should resolve these problems.

46. Basis of emissions from transport: according to the reporting guidelines (UNECE, 2014a), all Member States should calculate and report emissions from road vehicle transport on the basis of fuel sold. For the purpose of comparison with the ceilings only, Austria, Belgium, Ireland, Lithuania, Luxembourg, the Netherlands and the United Kingdom may choose to use the national emission total calculated on the basis of fuel used. This year again, the United Kingdom submitted data based only on fuel used. The aim is to compile EU total emissions from transport based on fuel sold.

TECHNICAL CORRECTIONS CONSIDERED AND OR CALCULATED BY ERT

47. Within this 2017 trial exercise for technical corrections, the ERT did not identify significant inconsistencies in the inventories (higher than the 2% threshold) that result in potential technical corrections (PTC) or in a request for revised estimates from the Party. The ERT notes that in the specific case of the EU inventory, the ERT did not seek to identify any examples of PTCs that may be due to the limitations of the gap-filling procedure (e.g. case of missing data for one MS but no gap filling implementation because of no available previous official data from the MS or within other reporting obligations).

PART B: RECOMMENDATIONS FOR IMPROVEMENTS TO THE PARTY

CROSS CUTTING IMPROVEMENTS IDENTIFIED BY THE ERT

48. The ERT identifies the following cross-cutting issues for improvement:
49. The ERT encourages the EU to include more detailed information about QA/QC procedures used by MS and to further keep using and broadening the EU QA/QC procedures, which are already in place. The ERT further encourages the EU to develop and apply specific QC systems for the MS inventories, which would allow EU to assess and evaluate each MS inventory. Such initial checks of the MS inventories would increase accuracy of the inventory.
50. The ERT recommends the EU to include further explanations on recalculations carried out by different member states in the future IIR, including explanations of specific recalculations in each sector.
51. In order to increase the transparency of the reporting, the ERT encourages the EU to include information on reported/not reported sectors and pollutants for the key categories for each year and MS in future IIRs. The ERT recognizes the amount of work related to this requirement, however such information would provide a more clear understanding on the data treatment and gap-filling procedures in the EU inventory.
52. Please note, that no technical correction was applied in the case of gap-filling procedures in the EU inventory, since the review guidelines are not clear on the approach, which should be undertaken in such a specific case, like the EU. However, the ERT strongly recommends the EU to improve the gap-filling procedures in order to address all possible sources of emissions in the EU across the whole time-series. Please refer to the specific paragraphs for the sector specific information of this report.
53. The Figures 1.2 and 1.3 in the IIR show the effect of the gap-filling on the emissions towards 100% in case of NO_x, NMVOCs, SO_x, NH₃ and CO. However, in the official reported data are still in some categories for these pollutants where the notation key “NE” is reported. “NE” indicates, that emissions might occur in the category, therefore the gap-filling does not deliver an EU inventory to 100% completeness. The ERT therefore recommends the EU to revise the gap-filling procedures and the use of notation key “NE” in the inventory. The ERT further recommends the EU to include an appropriate explanation of the issue in its future IIRs.
54. The ERT also encourages the EU to implement procedures to assess relations between different pollutants and sectors; such analyses would increase the completeness of the inventory.

55. The ERT strongly recommends the EU to develop own methods for an uncertainty analysis, not relying on the uncertainty analyses of specific Member States, including the uncertainty assessment of the gap-filling procedures.
56. The ERT recommends the EU to develop a comprehensive improvement plan.,
57. The ERT noted, that EU is not reporting activity data in its 2017 submission. Following the question raised during the review week, the EU informed the ERT, that not all Member States had reported activity data in their inventories. The EU hopes that reporting under the new NECD will improve reporting of activity data in the future – it is now mandatory for Member States to report the activity data. The ERT recommends the EU to include activity data in future reporting.
58. The ERT encourages the EU to investigate on the possible ways to summarize information about methodologies used by the different Member States for specific pollutants for the key categories. Such information in the IIR will increase the transparency of the reporting and the assessment of the mix of methodologies in the EU inventory.
59. The ERT recommends the EU to provide full assessment of the gridded data, LPSs and projections submitted by Member States in its future submission.
60. Recommended improvements relating to specific source categories are presented in the relevant sector sections of this report.

SECTOR SPECIFIC RECOMMENDATIONS FOR IMPROVEMENTS IDENTIFIED BY ERT

ENERGY

Review Scope

Pollutants Reviewed		SO ₂ , NO _x , NMVOC, NH ₃ , PM ₁₀ & PM _{2.5} , Cd, Hg, Pb, Dioxin, PAH		
Years		1990 – 2015		
Code	Name	Reviewed	Not Reviewed	Recommendation Provided
1A1a	Public electricity and heat production	X		X
1A1b	Petroleum refining	X		X
1A1c	Manufacture of solid fuels and other energy industries	X		X
1A2a	Iron and steel	X		X
1A2b	Non-ferrous metals	X		X
1A2c	Chemicals	X		
1A2d	Pulp, Paper and Print	X		X
1A2e	Food processing, beverages and tobacco	X		
1A2f	Stationary combustion in manufacturing industries and construction: Non-metallic minerals	X		X
1A2gviii	Stationary combustion in manufacturing industries and construction: Other	X		X
1A3ei	Pipeline transport	X		
1A3eii	Other	X		
1A4ai	Commercial/institutional: Stationary	X		X
1A4bi	Residential: Stationary	X		X
1A4ci	Agriculture/Forestry/Fishing: Stationary	X		
1A5a	Other stationary (including military)	X		
1B1a	Fugitive emission from solid fuels: Coal mining and handling	X		
1B1b	Fugitive emission from solid fuels: Solid fuel transformation	X		X
1B1c	Other fugitive emissions from solid fuels	X		
1B2ai	Fugitive emissions oil: Exploration, production, transport	X		
1B2aiv	Fugitive emissions oil: Refining / storage	X		X
1B2av	Distribution of oil products	X		X
1B2b	Fugitive emissions from natural gas (exploration, production, processing, transmission, storage, distribution and other)	X		
1B2c	Venting and flaring (oil, gas, combined oil and gas)	X		
1B2d	Other fugitive emissions from energy production	X		
Note: Where a sector has been partially reviewed (e.g. some of the NFR codes) please indicate which have and which have not in the respective columns.				

General recommendations on cross cutting issues

Transparency

61. The methodology of compiling, gap-filling and quality checking the EU submission is outlined at the overall inventory level, with limited insight provided specific to the energy sector. The ERT commends the EU for the efforts undertaken to present information in a clear report, albeit with limited details specific to the energy sector.

62. The ERT commends the EU for presenting useful commentary for the key trends reported in the energy sector within sections 4.1, 4.2 and 4.4. However, the ERT notes that the reported emissions data (by source category, Member State, and pollutant) within Annex D provides a useful dataset, even without the level of detail of activity data and emission factors, to help identify significant potential issues and outliers in Member State inventories. The ERT encourages the EU to conduct more detailed analysis of the Annex D information in order to identify and communicate potential outliers and inconsistencies between Member States in their methods and EF selection, several examples of which are presented in the sector-specific comments below, and to report on the most significant emission levels and trends for energy sector key categories within future submissions. The ERT notes that the EU is in a unique position to conduct such cross-cutting quality checks to identify issues that may highlight inconsistent methods or EF selection between Member States, and to report on its findings, further noting that additional time and resources would be needed for the EU inventory agency to conduct such analysis and reporting.

63. In spite of the general need of continuous improvement concerning an harmonised and complete reporting of activity data from Member States, the ERT further notes, however, that for many energy sector key categories (such as 1A1a, 1A1b, 1A4bi) the data from Member States and EUROSTAT provide a complete (or near-complete) dataset to underpin further analysis of the reported trends in emissions and IEFs, which in turn will help to improve the understanding of the EU inventory uncertainties and priorities for improvement. The ERT encourages the EU to review the completeness of the activity data reported by Member States and prioritise improvements to the reporting of EU-level activity data for key categories in the energy sector, perhaps phased according to key category significance for priority pollutants, to improve the transparency of the time series of IEFs in the EU dataset and identify priorities for improvement.

Completeness

64. In spite of the general gap filling procedure, the ERT notes that there remain many Energy sector estimates at EU level where there are notable gaps or potential gaps (indicated in Annex D where countries report “NE”, “NO” or “NA”), including for key categories. Further, the ERT also notes that there are instances evident in Annex D where the existing gap-filling procedures do not appear to have resolved non-reporting as expected. For example, where a source is reported as “NE” just in 2015, the ERT expects that the gap-filling procedures steps 10b and 10c as described in

Box 1.1 of the EU IIR should have filled that gap, yet there are several examples where this is not the case (see the sector-specific recommendations below). Therefore the ERT recommends that the EU reviews and updates the gap-filling procedures, implementing all steps described in the IIR and addressing gaps in energy sector key categories via manual interventions. The ERT encourages the EU to strengthen its QA/QC of the gap-filling procedures in order to minimise the risk of: (i) under-reporting in the EU submission, and (ii) of the gap-filling process itself introducing implausible step-changes in the reported trends.

Consistency including recalculation and time series

65. The ERT notes that the consistency of the EU inventory is primarily defined by the consistency and completeness over time of the reporting by Member States. There are many examples in the Annex D dataset of large step-changes in the time series of emissions reported by Member States. In addition the ERT observes that the reported EU trend is heavily influenced by the selection of different methods and EFs across Member States. There are a number of examples where the level and trend of emissions in one country has a marked an impact on the EU trend, but the understanding of why that Member State has such a marked impact is not clear. The ERT understands the difficulty for the EU to ensure a time series consistent submission, but encourages the EU to conduct time series consistency checks on Member State submissions at least for energy sector key categories and report on the findings in future submissions.

66. The IIR provides an overview of the recalculations performed across the EU submission, focussing on the most significant recalculations to POPs and heavy metals at the Member State level. The ERT notes that to improve the description of recalculations specific to the energy sector would be resource intensive and that the EU has limited time to produce the IIR, whilst the full details of recalculations should be available within the IIRs of individual Member States. The ERT encourages the EU to continue in its efforts to improve the transparency of recalculation explanations in future submissions, including to clearly document in the IIR where recalculations are due to changes in the EU gap-filling method and QA/QC activities.

Comparability

67. The ERT notes that the EU inventory submission is comparable with those of other reporting parties, using the NFR reporting template and with allocation of source category emissions consistent with the EMEP/UNECE Reporting Guidelines. The ERT notes that the allocation decisions by Member States in their submissions will impact upon the internal consistency of the EU CLRTAP submission, but this is an intractable issue for the EU to address directly. The ERT encourages the EU to continue with its efforts to develop more consistent reporting (regarding allocations to specific NFR sectors, e.g. between 1A2f and 2A1, 2A2, and across iron and steel sector source categories) by Member States.

Accuracy and uncertainties

68. Concerning the lack of uncertainty reporting at EU level, the ERT's view is that the lack of complete data from all Member States is a problem that is likely to persist, and ought not to be an obstacle to the EU conducting its own qualitative assessment of uncertainties, especially associated with the energy sector estimates, in order to help identify improvement priorities.

Improvement

69. The ERT commends the EU for its efforts to implement improvements to the IIR and to improve the transparency, consistency and completeness of the energy sector reporting, notably through the improvements and development of reporting on the gap-filling procedures. The ERT encourages the EU to continue to improve the analysis, presentation and communication of findings within the EU submission, and in its wider efforts to promote improvements in reporting across Member States.

Sub-Sector Specific Recommendations

Category issue 1: 1.A.2.f Stationary Combustion: Non-Metallic Minerals - NO_x

70. NL has reported "NE" across the time series (for all pollutants) from this key category, whilst the data for RO has been gap-filled for 1990-2004 but with a step change of >1000% in emissions between 2004 and 2005. This indicates a potentially significant under-report in the case of NL and also highlights a limitation of the current gap-filling procedure which has introduced a large step-change part-way through the time series. The ERT encourages the EU to review these reported data in the next submission to improve completeness and time series consistency.

Category issue 2: 1.A.2.g.viii Industrial Combustion – Other - NO_x

71. BG has reported "NE" across the time series for this key category, whilst HR reports "NO" across all years and PL reports "NA" across all years. The ERT notes that this indicates a gap and potential gaps in the EU inventory and encourages the EU to review these reported data in the next submission to improve completeness.

Category issue 3: 1.A.4.a.i Commercial Combustion – NO_x

72. FI has reported an 88% reduction in emissions between 1999 and 2000, which is a large change in one year for this key category. The ERT encourages the EU to review these reported data in the next submission to improve time series consistency.

Category issue 4: 1.A.1.c Manufacture of solid fuels and other energy industries – NMVOC

73. BE has reported "NE" in 2015 for this non-key category, but has reported emissions up to 2014 and also reports NO_x from this source in 2015. Further, NL has

reported NE since 2012, but also reports NO_x from this source throughout the time series. These examples appear to be gaps that have been missed by the gap-filling procedure (steps 10b, 10c), and whilst the emissions are relatively low from a non-key category the ERT encourages the EU to review these reported data in the next submission to improve completeness and strengthen the gap-filling QA/QC.

Category issue 5: 1.B.2.a.v Fugitive emissions from distribution of oil products – NMVOC

74. NL and MT have both reported “NE” across the time series for this key category, which in most Member State inventories comprises typically 2-5% of the national total for NMVOCs. Further, energy statistics are available that provide sales data for petroleum fuels in every Member State, to underpin estimates for this source. The ERT therefore encourages the EU to review these reported data in consultation with NL and MT to improve completeness in the next submission.

75. Also in this key category, FR shows a 7-fold reduction in emissions but still accounts for 14% of all EU reported emissions in 2015, which even for a large economy is a very large share of the EU total. It is also notable that the combined emissions of FR, DE, GB and IT together account for 77% of EU emissions in 1990 and still 59% of EU emissions in 2015. ES shows a 9-fold decrease in emissions since a peak in 1994, and as mentioned above there are gaps in the EU data from the Netherlands and Malta that report “NE” for this KC. The ERT encourages the EU to review the methods and EFs applied in detail for this source category to determine whether methods and EFs applied across the Member States are consistent and comparable, in order to improve accuracy of the level and trend reported.

Category issue 6: 1.B.2.a.iv Fugitive emissions oil: Refining / storage – NMVOC

76. BG reports emissions from this key category as “NA” in 1990, and then reports an increase in emissions of >500% between 2004 and 2005, and then a further >160% increase in emissions 2005-2015. LT reports a high share of the EU total across the time series (8% in 1990 to 5% in 2015) considering it only has a much lower share of the EU refinery capacity. PL shows a doubling of emissions 1990-2015, to increase from 4% of the EU total for this source in 1990 to 18% in 2015. The ERT encourages the EU to review whether the methods and EFs applied across the Member States are consistent and comparable, in order to improve accuracy of the level and trend reported and to improve time series consistency.

Category issue 7: 1.A.4.b.i Residential combustion – NMVOC

77. FR has a very high share of the EU total of this key category across the time series (40% in 1990 down to 16% in 2015), and shows a very strong decline. IT is another major contributor to the EU total and trend (8% of the EU total in 1990, 20% in 2015), and the trend shows a large increase in emissions. The ERT encourages the EU to review the methods and EFs applied across these Member States to determine whether the notable trends and high share of the EU total are based on

methods, AD and EF selection that are consistent and comparable with other Member States, to improve time series consistency and accuracy of the reported EU level and trends.

Category issue 8: 1.B.2.a.iv Fugitive emissions oil: Refining / storage – SO₂

78. LT reports NE up to 2000 for this key category, and then reports emissions that account for 15-35% of the LT national SO₂ inventory total, whilst NL reports “NE” across the time series, but do estimate NMVOC for this source. In addition, FI reports “NA” from 2010 onwards but does report NMVOC from this source throughout the time series, whilst AT reports “NA” across the time series but does report NMVOC from this source. The ERT notes that this indicates potential under-reports in the cases of NL, FI and AT, whilst the LT trend will be undermining the accuracy of the reported EU trend, and encourages the EU to review these reported data in the next submission to improve completeness and time series consistency.

Category issue 9: 1.B.1.b Fugitive emission from solid fuels: Solid fuel transformation – SO₂

79. PL reports “NE” for 1B1b to 2009 and then reports data from 2010 onwards which in 2010 and 2015 are 29% of the EU source category total, and hence this gap significantly affects the reported EU trend. The source is not a key category, and the step-change in total emissions from this gap is around 0.1% of the total EU inventory for SO₂, but the ERT encourages the EU to review whether the current gap-filling procedures as documented in the IIR Box 1.1 ought to have resolved this type of time series inconsistency, which may be significant for this or other source categories.

Category issue 10: 1.A.1.b Refinery combustion – SO₂

80. SE reports “NO” for the first time in 2015 for this key category, and also reports “NO” for the first time in 2015 for 1A2b non-ferrous metal combustion, and SE also reports emission data for 1B2ai for 2006-2011, but reports “NO” before that and “NA” after that. The ERT notes that the refineries in Sweden are still operating, at least, and that for other pollutants SE has reported “C” in 2015 for 1A1b. Other than 1A1b these are not key categories, but there appears to be inconsistent and potentially incomplete reporting of SO₂ emissions from several sources in SE. The ERT encourages the EU to review these reported data in the next submission to improve completeness and time series consistency.

81. A more general observation from the Annex D dataset is that many countries show very significant reductions in SO₂ emissions across the time series, including PT, FR, IT, ES, HR, LT, SK. These trends include some large step-changes, such as in BG which reports a 99% reduction from 2007 to 2008. A few countries such as PL buck the EU trend and show relatively flat emissions 1990-2015, with PL’s share of the EU total increasing from 1.5% in 1990 to 7.5% in 2015. Given the high impact of the sector trend on the overall EU inventory trend for SO₂, the ERT encourages the EU to consult with MS to review the reported data, to assure time series consistency.

Category issue 11: 1.A.2.a Iron and steel combustion – PCDD/Fs

82. PT reports “NE” for across the time series for this key category, whilst SE also reports “NE” in several years and RO reports “NE” in all years up to 2005. The ERT notes that these indicate potentially significant gaps in the reported EU inventory affecting the reported trend and encourages the EU to review these reported data in the next submission to improve completeness and time series consistency.

83. A more general observation from the Annex D dataset is that large reductions in emissions over time are reported for many countries, including FR and CZ, that significantly affect the EU total and trend. BG shows a large step change with reductions of 99% between 2007 and 2009, whilst the emissions from SK are 24% of the EU total in 2015. The ERT acknowledges that dioxin emissions from this source may vary for many reasons (e.g. abatement, changes in plant operation and utilisation), but given the high impact of the sector trend on the overall EU inventory trend for dioxins, the ERT encourages the EU to consult with MS to review the reported data, to assure time series consistency.

Category issue 12: 1.A.2.f Stationary Combustion: Non-Metallic Minerals – PCDD/Fs

84. NL and GR report “NE” in all years for this key category, whilst RO reports “NE” up to 2005 and in DE the emissions are reported as “NA” in all years. The ERT notes that these indicate potentially significant gaps in the reported EU inventory affecting the reported trend and encourages the EU to review these reported data in the next submission to improve completeness and time series consistency.

85. The ERT further notes that in 2015 the sum of emissions reported by IT and RO accounts for over 90% of the EU sector total. The ERT encourages the EU to review these estimates in consultation with Member States to assure the accuracy of the reported level and trend of emissions in this EU key category.

Category issue 13: 1.A.2.b Non Ferrous Metal combustion – PCDD/Fs

86. DE and GR report “NE” for all years for this key category; RO also reports “NE” from 2005 onwards, whilst in 2004 the RO estimates comprised 45% of the EU total. The ERT notes that these indicate potentially significant gaps in the EU inventory affecting the reported trend and encourages the EU to review these reported data in the next submission to improve completeness and time series consistency.

87. The ERT further notes that large reductions are reported in many countries including AT where ~99% reductions are reported between 1990 and 1992. Aside from the “NE” reports noted above, there are also some increases reported, notably in PL and ES, which now together account for over 85% of the EU total in 2015. The ERT encourages the EU to review these estimates in consultation with Member States to assure the accuracy of the reported level and trend of emissions.

Category issue 14: 1.A.2.d Pulp, Paper and Print combustion – PCDD/Fs

88. SE reports “NE” for the first time in 2015, and this is notable as SE’s contribution to the EU sector total was 47.5% in 2014. Whilst this is a non-key category, given the very high significance of SE’s contribution to the sector total in earlier years, the ERT encourages the EU to review these reported data in the next submission to improve completeness and time series consistency.

Category issue 15: 1.A.1.a Public electricity and heat production – PCDD/Fs

89. The ERT notes that large reductions are reported across many MS for this key category including: BG, FR, DE, NL, ES, GB, CZ, RO. Bucking this trend there are estimates from SE that in 2015 constitute 23% of the national dioxin total and 11% of the EU sector total, whilst PL emissions have slightly increased since 1990 and now account for 22% of the EU sector total. Given the high impact of the reported sector emissions level and trend on the EU inventory for dioxins, the ERT encourages the EU review these estimates in consultation with Member States to assure the accuracy of the reported level and trend of emissions.

TRANSPORT

Review Scope

Pollutants Reviewed		All		
Years		1990 – 2015		
Code	Name	Reviewed	Not Reviewed	Recommendation Provided
1A2gvii	Mobile Combustion in manufacturing industries and construction	X		
1A3ai(i)	International aviation LTO (civil)	X		X
1A3ai(ii)	International aviation cruise (civil)	X		X
1A3aii(i)	Domestic aviation LTO (civil)	X		X
1A3aii(ii)	Domestic aviation cruise (civil)	X		X
1A3bi	Road transport: Passenger cars	X		
1A3bii	Road transport: Light duty vehicles	X		X
1A3biii	Road transport: Heavy duty vehicles and buses	X		X
1A3biv	Road transport: Mopeds & motorcycles	X		X
1A3bv	Road transport: Gasoline evaporation	X		X
1A3bvi	Road transport: Automobile tyre and brake wear	X		X
1A3bvii	Road transport: Automobile road abrasion	X		X
1A3c	Railways	X		
1A3di(ii)	International inland waterways	X		X
1A3dii	National navigation (shipping)	X		
1A4aii	Commercial/institutional: Mobile	X		
1A4bii	Residential: Household and gardening (mobile)	X		
1A4cii	Agriculture/Forestry/Fishing: Off-road vehicles and other machinery	X		
1A4ciii	Agriculture/Forestry/Fishing: National fishing	X		
1A5b	Other, Mobile (including military, land based and recreational boats)	X		
1A3di(i)	International maritime navigation	X		X
1A3	Transport (fuel used)		X	

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

General recommendations on cross cutting issues

Transparency

90. The EU has provided a detailed and generally transparent emission inventory for the transport sector. Sectoral analysis and emission trends are provided for road and non-road transport in the IIR, with some explanations related to contribution of

countries for each pollutant. The ERT acknowledges the work performed, but encourages EU to continue improving the transparency of the inventory by including more information and details on sector and sub-sector descriptions and the explanation of emission trends.

Completeness

91. The ERT considers the transport sector to be as complete and as comprehensive as possible given the available MS data and methodology descriptions. The EU provides a general assessment of completeness at an aggregated level in the IIR. However, the ERT encourages the EU to provide sector-specific assessment of completeness and focus on improvements of the gap-filling procedures and provision of activity data (and, consequently, IEFs) at EU-level.

Consistency including recalculation and time series

92. The EU provides detailed information on recalculations on an aggregated level in the IIR. The ERT encourages EU to provide sector-specific recalculation information wherever possible.

Comparability

93. No activity data are provided, hence, it is not possible to calculate IEFs at EU-level for comparison with individual countries. The ERT recognises the challenges associated with compiling activity data from enough MS to provide suitably complete and accurate data. However, the ERT recommends that the EU strives to obtain activity data at EU level to allow IEFs to be determined and, therefore, comparability studies to be undertaken.

Accuracy and uncertainties

94. The EU cannot estimate the overall uncertainty of the EU inventory for the transport sector neither for the other sectors (cf. general section).

95. The EU provides an overview of quality (internal) checks that are undertaken when compiling the annual inventory in the IIR. As part of the annual QA/QC programme of the EU, the outcome of these checks is a list of 'potential' issues which were communicated to the respective MS for verification and with a request to re-submit data if considered appropriate. The ERT acknowledges this process and encourages the EU again to implement sector-specific QA/QC procedures that investigate the data in more detail and allow a more thorough explanation of unusual sector trends, especially for the transport sector.

Improvement

96. The ERT commends EU for all the improvements made in the transport sector since the previous Stage 3 review in 2012 and also acknowledges the difficulties and efforts undertaken by EU to collect, synthesize, and gap-fill (where necessary) the transport data from each Member State. The ERT also notes that in

section 5 of the 2017 IIR, the EU explicitly provides responses to all the recommendations of the previous Stage 3 review in 2012 (Table 5.3 and Table 5.4, implemented improvements and not implemented findings, respectively).

97. During the current Stage 3 review process, the ERT identified some sub-sector specific issues, which are described below, and encourages EU to address them in order to further enhance the transport sector of the inventory.

Sub-Sector Specific Recommendations

Category issue 1: 1.A.3.b.v Road transport: gasoline evaporation - All pollutants (except NMVOC)

98. The ERT noted that all emissions (except NMVOC) from sub-sector 1A3bv are reported as “NE” and suggested that the correct notation key should be “NA”, since there is nothing to estimate in this NFR category apart from NMVOC. The EU agreed with this suggestion and will change the notation key to “NA”. Furthermore, the new NECD 2017 review also addresses consistency in reporting and improving the use of notation keys. As part of these EU improvement actions, improved consistency in the use of notation keys is expected in the future. The ERT welcomes this plan.

Category issue 2: 1.A.3.b.vi, 1.A.3.b.vii Road transport: automobile tyre and brake wear, Road transport: automobile road abrasion - NO_x, NMVOC, SO_x, NH₃, CO

99. The ERT noted that the NO_x, NMVOC, SO_x, NH₃ and CO emissions from sub-sectors 1A3bvi, 1A3bvii are reported as “NE” and suggested that the correct notation key should be “NA”, since there is nothing to estimate in these NFR categories for these specific pollutants. The EU agreed with this suggestion and will change the notation key to “NA”. Furthermore, the EU made a reference to the plan described in category issue 1 above. The ERT welcomes this plan.

100. The ERT noted that there are NMVOC emissions (values) provided from sub-sector 1A3bvi in years 2009-2011 and suggested that this needs correction (notation key “NA” should be used for all years, since it has no purpose to provide NMVOC emissions in this NFR category). The ERT also noted that this issue is due to Latvia’s inventory submission (double counting emissions of NMVOC from 1A3bv gasoline evaporation, into 1A3bvi road transport: automobile tyre and brake wear). The EU answered that it will raise this question to the country and agrees that it indeed appears to be an error. This overestimation of NMVOC represents an insignificant amount of emissions (largely under the 2% threshold), so no potential technical correction has been calculated for this issue, but a recommendation to correct this issue for the next submission.

Category issue 3: 1.A.3.a.i(i), 1.A.3.a.i(ii), 1.A.3.a.ii(i), 1.A.3.a.ii(ii), 1.A.3.d.i(i) International/domestic aviation and shipping - All pollutants

101. During the Stage 3 review, the issue of reporting the emissions from international/domestic aviation and shipping was discussed again. Following up on the discussion from previous review in 2012, the ERT had recommended (in 2012) that explanations and contextual information should be included in the IIR (and, perhaps, in the NFR) and, if possible, to split these emissions into activities within the EU and those that cross the geographical boundaries of the EU (although EU has no obligation to do so). The EU addressed this issue by providing some text explanation in section 4.6 of the IIR and clarified that there is no plan to split emissions from international/domestic aviation and shipping into those occurring in the EU and those that cross the geographical boundaries of the EU. According to EU, the current reporting is consistent with the reporting obligations for regional entities (as the EU) under international conventions and the same reporting approach is applied under the UNFCCC. Regarding the question on how it is ensured that NFR data are not used inappropriately by users, the EU answered that it is not possible to impose conditions on how NFR data is used by third parties. The ERT acknowledges the answers provided by EU on this issue.

Category issue 4: 1.A.3.b.ii Light duty vehicles - As, Hg

102. The ERT noted that there is an increasing trend for As and Hg emissions from 1A3bii in the years 2000-2007 and then a decreasing trend in the years 2007-2014, which is not observed in other categories, i.e., 1A3bi. The EU answered that this trend reflects data from Spain; however, no explanation was found in Spain's IIR. The ERT recommends the EU to contact Spain in order to clarify this issue.

Category issue 5: 1.A.3.b.iii, 1.A.3.b.iv Heavy duty vehicles and buses, Mopeds and motorcycles - Hg

103. The ERT noted that there is a sudden jump in Hg emissions for the year 2010 only (compared to the trend line for other years) in categories 1A3biii and 1A3biv and suggests that the EU checks and clarifies this issue.

Category issue 6: 1.A.3.d.i(ii) International inland waterways - (NMVOC, PM₁₀), (As, Cd, Cr, Cu, HCB, Hg, Ni, Pb, PCBs, Se, Zn)

104. The ERT noted that there are significant recalculations for NMVOC and PM₁₀ emissions for some years in category 1A3di(ii), which give the impression that errors in previous submissions have been corrected or gap-filling procedures were carried out. For other pollutants (As, Cd, Cr, Cu, HCB, Hg, Ni, Pb, PCBs, Se, Zn) in this category there are still dips and jumps in the time series. The ERT suggests that the EU checks and clarifies this issue.

INDUSTRIAL PROCESSES

Review Scope

Pollutants Reviewed		SO ₂ , NO _x , NMVOC, NH ₃ , PM ₁₀ & PM _{2.5}		
Years		1990 – 2015 + (Protocol Years)		
Code	Name	Reviewed	Not Reviewed	Recommendation Provided
2A1	Cement production	X		X
2A2	Lime production	X		X
2A3	Glass production	X		X
2A5a	Quarrying and mining of minerals other than coal	X		X
2A5b	Construction and demolition	X		X
2A5c	Storage, handling and transport of mineral products		X	
2A6	Other mineral products		X	
2B1	Ammonia production	X		X
2B2	Nitric acid production	X		X
2B3	Adipic acid production	X		X
2B5	Carbide production			X
2B6	Titanium dioxide production	X		X
2B7	Soda ash production	X		X
2B10a	Chemical industry: Other	X		X
2B10b	Storage, handling and transport of chemical products		X	
2C1	Iron and steel production	X		X
2C2	Ferroalloys production		X	
2C3	Aluminium production	X		
2C4	Magnesium production		X	
2C5	Lead production	X		
2C6	Zinc production		X	
2C7a	Copper production	X		
2C7b	Nickel production		X	
2C7c	Other metal production		X	
2C7d	Storage, handling and transport of metal products		X	
2D3b	Road paving with asphalt		X	
2D3c	Asphalt roofing		X	
2H1	Pulp and paper industry		X	
2H2	Food and beverages industry	X		X
2H3	Other industrial processes		X	
2I	Wood processing	X		
2J	Production of POPs		X	
2K	Consumption of POPs and heavy metals (e.g. electrical and scientific equipment)	X		
2L	Other production, consumption, storage, transportation or handling of bulk products	X		

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

General recommendations on cross cutting issues

Transparency

105. The EU inventory is a compilation of data from member states with some gap-filling. A full set of emission data and notation keys is provided in Annex D of the IIR.

106. However, the IIR also contains some high level discussion of the emission estimates, mainly by pollutant. There is a short (3 page) section discussing the results for industrial processes and product use, but no systematic review of the data for individual NFR categories or even for key categories. The ERT accepts that the EU IIR cannot contain a detailed description of methodologies for individual countries and NFR categories; however the IIR could usefully contain more information on the consistency of reporting across countries and could easily indicate the number of countries that don't provide estimates for each NFR category.

107. The IIR contains information on trends with some comments on dips and jumps. The ERT accepts that it would be difficult for the Party to provide explanations for these dips and jumps. It would be useful, however, if the discussions of trends was more systematic with sections for each key category.

Completeness

108. The EU inventory is a compilation of data from member states with some gap-filling, however the gap-filling procedure does not allow for all gaps to be filled. The EU inventory is therefore incomplete. While Annex D provides detailed information at NFR/country/pollutant/year level that can be analysed by a user, there is very little discussion of any problems that remain after gap-filling, or assessment of the significance of these gaps in the IIR. As with other issues, it would be useful to include details at the level of individual NFR categories for the industrial sector as for the other sectors.

Consistency including recalculation and time series

109. The EU inventory is a compilation of data from member states with some gap-filling which will help to reduce any time series inconsistencies in the raw data. The IIR includes a high level summary of recalculations but no summary for the industrial processes and product use sector. It might be useful to include a table for the IPPU sector, similar to Table 5.1, so as to provide transparency regarding the development of estimates for the IPPU sector across the EU.

Comparability

110. The EU inventory is a compilation of data from member states with some gap-filling. However, it is clear from the detailed data provided in Annex D that, for example, there are many instances where some countries report emissions for a particular NFR category and pollutant, while other countries use the notation key "NA". The ERT believes that it would be immensely useful for this type of issue to be highlighted in the IIR at the level of individual NFR categories: it would highlight

issues in the inventories of member states that potentially could then be addressed by those countries.

111. There is no attempt to systematically review emissions data at the level of individual NFR categories in the IIR. The ERT accepts that this would be a major task to do for all sources, and that it is hindered anyway by the absence of activity data for all countries. There are perhaps also issues regarding the time available to produce the IIR. Nonetheless, the ERT believes that some analysis would be better than nothing, and that some simple analyses of data for a few selected NFR categories could be introduced in the IIR for the industrial processes and product use sector. This could help member states to identify potential problems in their inventory and thus encourage improvement.

Accuracy and uncertainties

112. The Party does not perform an uncertainty analysis, citing as reason the fact that only a few member states provide an uncertainty estimate.

Sub-Sector Specific Recommendations

Category issue 1: 2.A.1 Cement production

113. The ERT notes that, for pollutants such as NO_x and SO₂, some member states provide emission estimates for NFR category 2A1, while others use “IE” or “NE”, thus still implying that cement kilns are a source of emissions of these pollutants. But other member states use “NA”, implying that the activity occurs but that emissions do not. These different approaches do not seem consistent, and could indicate that some member states do not estimate emissions from cement kilns.

114. The ERT notes that the Netherlands reports PM_{2.5} emissions from 2A1 for some years while the Party uses the notation key “NA” for other years. This does not seem to be consistent – if there is cement production in multiple years, then the ERT would expect the same pollutants to be emitted in each year.

115. The ERT therefore encourages the EU to take steps to ensure consistent and complete reporting of emissions from cement production for all member states.

Category issue 2: 2.A.2 Lime production

116. The ERT notes that, for pollutants such as NO_x and SO₂, some member states provide emission estimates for NFR category 2A2, while others use “IE” or “NE”, thus still implying that lime kilns are a source of emissions of these pollutants. But other member states use the notation key “NA”, implying that the activity occurs but that emissions do not. These different approaches do not seem consistent, and could indicate that some member states do not estimate emissions from lime kilns.

117. The ERT notes that Finland reports NO_x emissions from 2A2 for some years while the Party uses the notation key “NA” for other years. This does not seem to be consistent – if there is lime production in multiple years, then the ERT would expect

the same pollutants to be emitted in each year. Similarly, the Czech Republic reports NO_x emissions for some years and uses “NE” for others.

118. The ERT therefore encourages the EU to take steps to ensure consistent and complete reporting of emissions from lime production for all member states.

Category issue 3: 2.A.3 Glass production

119. The ERT notes that, for pollutants such as PM_{2.5}, some member states provide emission estimates for the NFR category 2A3, while others use “IE” or “NE”, thus still implying that glass kilns are a source of emissions of these pollutants. But other member states use “NA”, implying that the activity occurs but that emissions do not. These different approaches do not seem consistent, and could indicate that some member states do not estimate emissions from glass kilns. The ERT therefore encourages the EU to take steps to ensure consistent and complete reporting of emissions from glass production for all member states.

Category issue 4: 2.A.5.a Quarrying of minerals other than coal

120. The ERT notes that, for pollutants such as PM_{2.5}, some member states provide emission estimates for the NFR category 2A5a, while others use “IE” or “NE”, thus still implying that quarries are a source of emissions of these pollutants. But other member states use “NA”, implying that the activity occurs but that emissions do not. These different approaches do not seem consistent, and could indicate that some member states do not estimate emissions from quarrying activities. The ERT therefore encourages the EU to take steps to ensure consistent and complete reporting of emissions from quarrying for all member states.

Category issue 5: 2.A.5.b Construction and demolition

121. The ERT notes that, for pollutants such as PM_{2.5}, some member states provide emission estimates for the NFR category 2A5b, while others use “IE” or “NE”, thus still implying that construction and demolition is a source of emissions of these pollutants. But other member states use “NA”, implying that the activity occurs but that emissions do not. These different approaches do not seem consistent, and could indicate that some member states do not estimate emissions from this source.

122. The ERT notes that the PM_{2.5} reported by countries for 2A5b cover a very wide range and that just 3 countries (Germany, France, United Kingdom) contributed 89% of emissions in 2000 and 85% in 2015, with France contributing over 50%. This could indicate that emission estimates across the EU are not comparable.

123. The ERT therefore encourages the EU to take steps to ensure consistent and complete reporting of emissions from construction and demolition for all member states.

Category issue 6: 2.B Chemical production

124. The ERT notes that for NO_x and NH₃ from 2B1 and NO_x from 2.B.3, some member states provide emission estimates, while others use “IE” or “NE”, thus still implying that ammonia and adipic acid production are sources of emissions of these pollutants. But other member states use “NA” in these cases, implying that the activity occurs but that emissions do not. These different approaches do not seem consistent, and could indicate that some member states do not estimate emissions from ammonia and adipic acid production. The ERT therefore encourages the EU to take steps to ensure consistent and complete reporting of emissions from chemical production processes such as ammonia and adipic acid for all member states.

125. For Romania, NMVOC emissions from 2B10a are 10% of EU-28 total in 2005 but not occurring in 2004. This dramatic change in the timeframe of one year is surprising and the ERT notes that the “NO” value for 2004 was the result of the gap-filling procedures. The ERT encourages the EU to highlight large inter-annual changes in emissions for industrial processes and product use, in cases where these involve gap-filled data.

Category issue 7: 2.C.1 Iron & Steel

126. The ERT notes that for NO_x and SO₂ from 2C1, the emissions from different countries cover a wide range with Germany contributing 61% of the total EU-28 emissions of NO_x in 2015 and 72% of SO₂ in 2015. This is surprising and might indicate that the methods used by different member states are not comparable or perhaps that some member states might report emissions in other categories such as 1A2a.

127. More generally, there is a mixture of reporting of emissions and various notation keys by different countries. In some cases, member states use “NA” in contexts where this appears questionable. For example Bulgaria reports NO_x and SO₂ from 2C1 but reports that emissions of PM_{2.5} are not applicable.

128. The ERT therefore encourages the EU to take steps to ensure consistent and complete reporting of emissions from iron and steel for all member states.

Category issue 8: 2.H.2 Food & drink production

129. The ERT notes that Luxembourg reports that emissions of NMVOC are not applicable (“NA”) for 2H2. This sector covers processes such as bread baking, wine production and beer production which are likely to occur in all countries, so the use of “NA” by Luxembourg is surprising. The food and drink production is an important source of NMVOC emissions in some countries so the ERT encourages the EU to take steps to ensure consistent and complete reporting of emissions from food and drink processes by all member states.

SOLVENTS

Review Scope

Pollutants Reviewed		SO ₂ , NO _x , NMVOC, NH ₃ , PM ₁₀ & PM _{2.5}		
Years		1990 – 2015 + (Protocol Years)		
Code	Name	Reviewed	Not Reviewed	Recommendation Provided
2D3a	Domestic solvent use including fungicides	X		
2D3d	Coating applications	X		x
2D3e	Degreasing	X		
2D3f	Dry cleaning	X		
2D3g	Chemical products	X		
2D3h	Printing	X		
2D3i	Other solvent use	X		
2G	Other product use	X		x

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

General recommendations on cross cutting issues

130. The same general TCCCA recommendations as for the industrial processes sector (cf. previous section) are relevant here.

Sub-Sector Specific Recommendations

Category issue 1: 2.D.3 Solvent use

131. The EU inventory for NMVOC emissions from 2D3 is based on reported data for most countries and in most cases these countries report emissions in each of the sub-categories of 2D3. The ERT notes one potential issue - Malta does not report emissions for some sub-categories such as domestic solvent use and coating application and the ERT encourages the EU to take steps to ensure complete reporting.

Category issue 3: 2.G Other product use

132. Sector 2G covers at least some emission sources which are ubiquitous, such as use of tobacco and, perhaps also, the use of fireworks. The 2016 Guidebook provides emission factors for a large number of pollutants emitted from these sources but some countries either do not estimate emissions or report that emissions are not applicable. For example, for PM_{2.5}, Italy, Spain, Bulgaria, Hungary and Malta report emissions as NA. This suggests that the EU data for these sources are incomplete and the ERT encourages the EU to take steps to ensure consistent and complete reporting of emissions from other product use by all member states.

AGRICULTURE

Review Scope

Pollutants Reviewed		SO ₂ , NO _x , NMVOC, NH ₃ , PM ₁₀ & PM _{2.5}		
Years		1990 – 2015 + (Protocol Years)		
Code	Name	Reviewed	Not Reviewed	Recommendation Provided
3B1a	Dairy cattle	X		X
3B1b	Non-dairy cattle	X		X
3B2	Sheep	X		X
3B3	Swine	X		X
3B4a	Buffalo	X		X
3B4d	Goats	X		X
3B4e	Horses	X		X
3B4f	Mules and asses	X		X
3B4gi	Laying hens	X		X
3B4gii	Broilers	X		X
3B4giii	Turkeys	X		X
3B4giv	Other poultry	X		X
3B4h	Other animals	X		X
3Da1	Inorganic N-fertilizers (includes also urea application)	X		
3Da2a	Animal manure applied to soils	X		
3Da2b	Sewage sludge applied to soils	X		
3Da2c	Other organic fertilisers applied to soils (including compost)	X		
3Da3	Urine and dung deposited by grazing animals	X		
3Da4	Crop residues applied to soils	X		
3Db	Indirect emissions from managed soils	X		
3Dc	Farm-level agricultural operations including storage, handling and transport of agricultural products	X		
3Dd	Off-farm storage, handling and transport of bulk agricultural products	X		
3De	Cultivated crops	X		
3Df	Use of pesticides	X		X
3F	Field burning of agricultural residues	X		
3I	Agriculture other	X		
11A	Volcanoes		X	
11B	Forest fires		X	

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

General recommendations on cross cutting issues

Transparency

134. The ERT commends the EU for including more background information regarding emissions from the agriculture sector, specifically manure management (3B), use of pesticides (3Df) and field burning of agriculture residues (3F). The ERT recognizes that not all Member States (MS) always provide background information in their IIRs. However, and in order to enhance the quality and transparency of the inventory, the ERT recommends that the EU continues working with individual MS to ensure complete and transparent reporting of background information.

135. The ERT notes that AD is not reported in the NFR tables as not all MS always provide AD in their IIRs or NFR tables. The ERT encourages the EU to further support the MS to provide AD in the inventories.

Completeness

136. The agriculture inventory of the EU covers a wide set of pollutants and is relatively complete with respect to the most important sources of emissions with an exception of the reporting of activity data that were not reported in IIR or NFR tables. As not all MS report pollutant emissions from all the subcategories of the inventory, this may result in underestimation of the aggregated totals. The ERT recommends that the EU continues working with individual MS to ensure reporting of all subcategories that are considered to be small in order to enhance the completeness and the quality of its inventory, cf. specific agriculture sub-sector recommendations.

Consistency including recalculation and time series

137. The ERT notes that recalculations for the agriculture inventory have been undertaken by a number of MS and the EU has included information on significant recalculations in its IIR. The ERT commends the EU for including this information.

Comparability

138. The ERT notes that a variety of methods and EFs are used by the individual MS for estimating emissions from the agriculture sector. The EU referred to these methodologies by links to the Member States' IIRs. The ERT encourages EU to develop tools and/or a mechanism to better ensure and report on the comparability of the data between the MS.

Accuracy and uncertainties

139. The ERT commends the EU for improving the quality of its inventory by performing checks on the status of each MS submission which allows assessing the current accuracy and reliability of the compiled data and helps to identify improvement needs in the inventory.

140. The ERT recommends that the EU continues to work with MS that did not quantify uncertainties in their emission inventories to ensure that the MS quantify uncertainties in the future in order to quantify uncertainties for the EU CLRTAP emission inventory.

Improvement

141. The EU has not identified areas for improvement in the inventory of the agriculture sector. The ERT recommends that the EU identifies areas for further improvement based on parts identified by the ERT, and issues identified by MS.

Sub-Sector Specific Recommendations

Category issue 1: 3.B Manure management – TSP and PM₁₀

142. The ERT notes the reported TSP emissions from inorganic N-fertilizers (3Da1) for 2005, 2010 and 2015 in the NFR tables are much lower than the reported value for PM₁₀. In response to a question raised by the ERT during the review regarding this issue, the EU indicated that the EU inventory is a sum of the single Member States' inventories. In this case, Romania reported data for PM_{2.5} but none for TSP (here, the notation key "NA" was reported). Therefore, the EU-28 sum of PM₁₀ is higher than the EU-28 sum of TSP. The ERT recommends that the EU continues to work with individual MS to enhance the completeness and the transparency of its inventory.

Category issue 2: 3.B Manure management, 3.D Agricultural soils – SO₂

143. The ERT notes that the EU reports emissions of SO₂ from manure management (3B) and agricultural soils (3D) in the NFR tables using the notation key not estimated ("NE"). 3B and 3D are not sources for SO₂ emissions. In response to a question raised by the ERT during the review regarding this issue, the EU indicated that the use of the notation key "NE" is not appropriate in this case as the EU is currently conducting a comprehensive review of emission inventories submitted by the MS during the first reporting round under the new NECD in 2017. The review also addresses consistency in reporting and improving the use of notation keys. As part of these EU's improvement actions enhanced consistency in the use of notation keys is expected in the future. The ERT commends the EU for undertaking a comprehensive review of the emission inventories submitted by the MS. The ERT recommends that the EU includes results of the revision in its next annual submission to enhance the quality of its inventory.

Category issue 3: 3.D.f Use of pesticides – Zn

144. The ERT notes that the EU reports zinc from the use of pesticides (3Df) in the NFR tables for 2005, 2010 and 2015. 3Df is not a source of Zn. The ERT recommends that the EU corrects this error in its next annual submission.

WASTE

Review Scope

Pollutants Reviewed		All		
Years		1990 – 2015		
Code	Name	Reviewed	Not Reviewed	Recommendation Provided
5A	Solid waste disposal on land	X		
5B1	Biological treatment of waste - Composting	X		
5B2	Biological treatment of waste - Anaerobic digestion at biogas facilities	X		
5C1a	Municipal waste incineration	X		
5C1bi	Industrial waste incineration	X		
5C1bii	Hazardous waste incineration	X		
5C1biii	Clinical waste incineration	X		
5C1biv	Sewage sludge incineration	X		
5C1bv	Cremation	X		
5C1bvi	Other waste incineration	X		
5C2	Open burning of waste	X		
5D1	Domestic wastewater handling	X		
5D2	Industrial wastewater handling	X		
5D3	Other wastewater handling	X		
5E	Other waste	X		

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

General recommendations on cross cutting issues

145. For the year 2015 the EU reports emissions in all 15 waste sub-sectors.

Transparency

146. As the EU's inventory is compiled from 28 MS reports the IIR does not provide descriptions on emissions factors and methodologies used to calculate emissions. The ERT encourages the EU to create a summary for each sub-sector on how many MS reported emissions and how many used notation keys. If there are some MS that have a big influence on sub-sector emissions the ERT recommends the EU to include that information in the IIR. The ERT encourages to add an explanation in IIR about the use of notation key "NE" in IIR.

Completeness

147. The ERT notes that the waste sector is complete as emissions are reported for all sub-sectors. There is no information provided on how many MS reported emissions for each sub-sector. The ERT has noted that the completeness of the reported emissions strongly depends on the input of the MS.

Consistency, including recalculation and time series

148. The ERT reviewed the time series emissions of EU-28 for the waste sector. Three inconsistencies were found. The ERT asked the EU questions. The EU responded that emissions jump and that there are different uses of notation keys throughout the time series due to reporting changes of one country. The ERT recommends the EU to contact the MS directly in cases of significant changes to check the information and then clarify the inconsistencies in IIR. As gap filling approach is used mostly emissions time series are consistent.

Comparability

149. As the EU inventory is the sum of the individual MS inventories it is not feasible to compare the inventory to other CLRTAP inventories. However, EU inventory quality depends on the quality and completeness of the MS inventories.

Accuracy and uncertainties

150. In the IIR the EU references the MS inventories about QA/QC procedures and uncertainty analyses. The ERT encourages the EU verify dips and jumps in time series and the use of various notation keys.

Improvement

151. There are improvements mentioned for the waste sector in the EU's IIR. The ERT encourages the EU to improve the waste sector regarding completeness and transparency of the inventory.

MATERIALS USED BY THE REVIEW TEAM

1. EU's Inventory: Annex I 1990-2015 (EU-9 – EU-28; Zip Files including Excel files), Gridded data, LPS, Annex B EU NOx emissions 1987-1989 (Excel files)
2. EU Notification templates (EU9 – EU28)
3. EU Stage 1 report 2017
4. EU Stage 2 S&A report 2017
5. Previous Stage 3 Review Report of the EU (2010)
6. Data and tools developed by CEIP (<http://unece-stage3.wikidot.com/data-analysis>)

LIST OF ADDITIONAL MATERIALS PROVIDED BY THE COUNTRY DURING THE REVIEW

1. Response to preliminary questions raised prior to the review (wiki)
2. Response to questions raised during the review (wiki)
3. Document: "Proposed unified EU and EMEP gap-filling" (Doc file) (wiki)
4. Annex D European Union gap-filled inventory (Excel file) (wiki)
5. Annex J Emission data sources (Excel file) (wiki)

REFERENCES

- EMEP/EEA, 2016. EMEP/EEA air pollutant emission inventory guidebook – 2016. EEA Technical report No 21/2016. Available at: www.eea.europa.eu/publications/emep-eea-guidebook-2016
- EMEP/EEA, 2013. EMEP/EEA air pollutant emission inventory guidebook – 2013. EEA technical report No. 1209/2013. European Environment Agency, Copenhagen. Available at: www.eea.europa.eu/publications/emep-eea-guidebook-2013
- TFEIP, 2017. A Process for Technical Revisions During CLRTAP Emissions Inventory Review. Available at: http://webdab1.umweltbundesamt.at/Inventory_Review_2017/00_General/Technical%20corrections%20guidance/CLRTAP_Technical_Revisions_v3.pdf
- TFEIP, 2016. Proposal for updating the ‘Methods and procedures’ document laying down the process for the EMEP emission inventory review. Available at: www.unece.org/fileadmin/DAM/env/documents/2016/AIR/EMEP/Informal_Document/3_Methods_Procedures_update_proposal_May2016_ISSUE1_TFEIP.pdf
- UNECE, 2007. Methods and procedures for the technical review of air pollutant emission inventories reported under the Convention and its protocols (EB.AIR/GE.1/2007/16). Available at: www.ceip.at/fileadmin/inhalte/emep/review/RevGuid_ece.eb.air.ge.1.2007.16.e.pdf
- UNECE, 2014. Guidelines for Reporting Emissions and Projections Data under the Convention on Long-range Transboundary Air Pollution (ECE/EB.AIR/125). Available at: www.ceip.at/fileadmin/inhalte/emep/reporting_2009/Rep_Guidelines_ECE_EB_AIR_97_e.pdf