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

EUROPEAN UNION

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INTRODUCTION

The mandate and overall objectives for the emission inventory review process under the LRTAP Convention is given by the UNECE document '*Updated methods and procedures for the technical reviews of air pollutant emission inventories reported under the Convention*'⁽¹⁾ – hereafter referred to as the 'Review guidelines 2018'.

1. Under this annual review, all pollutants covered by the LRTAP Convention and its protocols (SO_x, NO_x, NMVOC, NH₃, plus PM₁₀, PM_{2.5}, BC, 3 HMs and POPs) have been checked for the time series years 1990 – 2018, reflecting current priorities of the EMEP Steering Body and the Task Force on Emission Inventories and Projections (TFEIP). HMs and POPs have been reviewed to the extent possible.
2. This report covers the Stage 3 centralised review under the UNECE LRTAP Convention of the EU coordinated by the EMEP Centre on Emission Inventories and Projections (CEIP) acting as review secretariat. The remotely conducted review was performed by ERT during May and June 2020.. The following team of nominated experts from the roster of experts performed the review: Generalists – Risto Saarikivi (CZ), Ben Richmond (UK), Energy – Erik Honig (NL), Marion Pinterits (EU/AT), Garnt Jans Venhuis (NL) and Kristina Jurich (DE), Transport – Giannis Papadimitriou (EU/GR) and Magdalena Zimakowska-Laskowska (PL), IPPU Mirela Poljanac (HR), Juan Luis Martin Ortega (ES), Michaela Titz (AT), Agriculture - Peder Gjølstad Røhnebæk (NO), Hakam Al-Hanbali (SE) and Gwenaëlle Le Borge (FR), Waste – Zuzana Jonacek (SK) and Sabino Del Vento (UK).
3. Kristina Saarinen (FI) was the lead reviewer. The review was coordinated by Katarina Marečková (CEIP).

¹ Decision 2018/1 adopted by EB: *Updated methods and procedures for the technical review of air pollutant emission Inventories reported under the Convention*. ECE/EB.AIR/142/Add.1
http://www.unece.org/fileadmin/DAM/env/documents/2002/eb/air/EB%20Decisions/Decision_2018_1.pdf

PART A: KEY REVIEW FINDINGS

1. The ERT recognises the level of effort undertaken by the EU in providing an inventory with a sufficient level of detail to enable a detailed review and thanks the Party for providing timely responses to the questions of the ERT during the review that enabled the ERT to give recommendations for the further development of the inventory. The EU inventory is a compilation of Member State inventories. With reference to the challenges of incomplete MS' inventories the ERT notes that the EU could confirm with the responsible bodies of the CLRTAP the reporting requirements generally set for Parties of the Convention whether some deviations could be given to the reporting requirements of the EU as a reporting Party.
2. The EU provided NFR tables for 1990-2018 on 30th April 2020 for EU-28, EU-27, EU-15, EU-12 and EU-9, within the reporting deadline of 30th April. The IIR was submitted on 4th June 2020 after the reporting deadline of 30th May. In 2017 and in 2020 the EU submitted gridded emissions for Gothenburg protocol pollutants, but no LPS data.
3. The 2020 submission shows improvements since the last submission.
4. The ERT found the inventory to be generally transparent. There is a need to check the use of notation keys to follow the definitions in paragraph 12 of the Reporting Guidelines. The IIR has been prepared according to the template provided in the Annex I to the Reporting Guidelines and includes a key category analysis but not yet an uncertainty analysis.
5. The inventory is generally complete; however, the ERT noted that emissions from some sources were not included.
6. The inventory methodologies are not fully transparent. Reporting is mainly in line with the UNECE Reporting Guidelines (hereafter Reporting Guidelines), thus the inventory is partly comparable with those of other reporting Parties.
7. The use of Tier 2 methods for the EU's key categories is not clear. The ERT has not identified systematic under- or over-estimates.
8. Transport emissions are calculated on the basis of fuels sold.
9. As a summary of the main findings, further need for improvement was identified in the following areas:
 - a) Transparency: information on methodologies and use of notation keys, justifications for trends and their drivers, information on QA/QC, uncertainties, recalculations and gap-filling
 - b) Completeness: sector-specific assessment of completeness
 - a) Accuracy: use of T2 methods for key categories, inclusion of an uncertainty analysis

INVENTORY SUBMISSION

10. In its 2020 submission, the EU has reported emissions for its Protocol base years (1990) and a time series to 2018 (the latest year) in the NFR 2019 format. In addition, the EU has provided time series 1990-2018 for CO, PM₁₀, PM_{2.5}, and heavy metal and POP emissions.
11. The EU's submission in 2017 covered gridded emissions for Gothenburg protocol pollutants, and the 2020 submission gridded data for eight MSs (MSs) as presented in Appendix 3 of the IIR. The EU provided information on projections from four MSs in Annex E in the 2020 IIR.
12. The ERT agrees with the EU that the data for gridded emissions, LPS and projections are already available via the CEIP and EIONET CDR websites and that there is no need to provide such large annexes when data are readily available on these websites. The ERT recommends that the EU make links available in the IIR to the data and relevant websites.
13. The CLRTAP inventory submitted by the EU is documented in the Informative Inventory Report (IIR).
14. National totals in row 141 of the NFR 2019 table are reported for the entire territory and are based on fuel sold, but the EU does not provide information based on fuel used (rows 143-149). Totals for compliance are not reported in row 152.

KEY CATEGORIES

15. The EU has compiled and presented in its IIR a level Key Source Category Analysis (KCA) for the following pollutants: NO_x, NMVOCs, SO_x, NH₃, PM_{2.5}, PM₁₀, BC, CO, HMs (Pb, Cd and Hg) and POPs (PCDD/Fs, total PAHs, B(a)P, HCB and PCBs). The EU does not include additional heavy metals, TSPs or the following three of the 4 PAH indicator species B(b)P, B(k)F or IP in the KCA.
16. The EU states in the IIR that "When a Member State used the notation 'included elsewhere' (IE) for a particular source/pollutant combination, the KCA is likely to have underestimated the category concerned and overestimated the one in which emissions were reported instead." The ERT takes note of this remark and that the KCA may not accurately present the main emission sources.
17. The ERT notes that the EU did not carry out a trend analysis for the KCs and encourages the Party to include this in future submissions.
18. The ERT notes that the EU does not elaborate on using T2 or higher methods for KCs, although on page 139 of the IIR it is stated: "... the EU is making efforts to compile information on methodologies used by Member States for key categories. It is planned to implement this encouragement in future submissions". The ERT acknowledges the efforts of the EU and recommends that the EU summarise information in the IIR about methodologies used by the MSs for emissions in the EU's key categories, e.g. using the results of the NECD review.
19. The ERT notes that the EU does not specify in the IIR how the EU uses KCA results to prioritise the development of the inventory. The ERT recommends that the EU use the results of the KCA to prioritise the development of the inventory, that it add this

issue to the improvement plan with clear steps and a schedule, and report on progress in the next submissions.

QUALITY

Transparency

20. The ERT recognises that according to the UNECE Reporting Guidelines (ECE/EB.AIR/125) the Parties should, to improve "Transparency", clearly explain which data sources, assumptions and methodologies are used for an inventory (para 12). The submission of an IIR is strongly encouraged (para 43). As a lack of sufficient documentation in an IIR prevents the ERT from performing a technical review, the Party would need to provide the missing information during the review. For this reason, in this technical review report, recommendations are given instead of encouragements in cases where there is a need to improve the documentation of data, methods and assumptions used in the inventory.

21. The ERT notes that the 2020 IIR submission follows the recommended structure in Annex II of the Reporting Guidelines and provides information on emissions, methodology and recalculation on sub-category level. The ERT considers the inventory in general to be transparent and acknowledges that the quality of the EU inventory is dependent on the quality of MSs inventories and represents thus the overall information compiled from all MSs.

22. The ERT commends the EU for presenting useful information regarding key trends. However, the information on emission trends does not cover the following categories in the Industry sector: "2A6 Other mineral products", "2B10a Chemical industry: Other" and "Other metal production" and 5Cbv, 5D1 and 5E in the Waste sector. The ERT encourages the EU to include explanations of trends in all categories.

23. The EU has included detailed information at sector level about the gap-filling procedure in Annex D. The ERT recommends that the EU continue adding more detailed information on sector level about the gap-filling procedure in the main text of the IIR, or that it at least provide Annex D as a public part of the IIR.

Completeness

24. The ERT acknowledges the effort that the EU has taken to provide estimates of emissions for all sub-sectors and all pollutants reviewed. The ERT considers the inventory for the pollutants reviewed to be complete regarding the geographical coverage.

25. Regarding the sources and pollutants included in the inventory the ERT acknowledges that the EU inventory is a compilation of data from the MSs and that it is gap-filled in certain cases. According to the IIR, the gap-filling procedure uses the data reported by each MS in previous years or other submissions to the EU (e.g. the EU Greenhouse Gas Monitoring Mechanism and the EU NEC Directive). However, if a given MS has not reported a particular pollutant in a specific category in any of its submissions to the EU, the EU inventory does not fill the gap as this is the responsibility of the Member States. Furthermore, even if inconsistencies are found in MS reporting, the EU takes into consideration the individual MS's reporting to CLRTAP. For this reason, the EU inventory

cannot be considered complete, accurate or consistent. For instance, in the 2020 submission, all but one MS, Malta, provided a complete time series for the mandatory pollutants while Austria submitted only total PAHs. For the voluntary pollutants, Austria and Luxembourg submitted no data for BC and as for additional heavy metals, Finland did not report national total for the additional heavy metal Se.

26. The EU notes in the improvement plan: “A full set of emission inventory data for air pollutants is still not available for all MSs. In addition, for certain pollutants (including PM, HMs and POPs), data could not be fully gap-filled because some MSs had not reported emission values in any years”. On page 44 of the IIR, the EU provides information on potential underestimations of emissions by MS and pollutant, following estimated shares of the emissions of the MS compared to the EU total. The ERT acknowledges the challenges the incomplete MS reports create and notes the decreased need for gap-filling in the latest submission compared to the previous submission, because Greece submitted an inventory in 2020. According to the IIR, chapter 1.9, for all mandatory pollutants the share of gap-filled data was below 1%, while for the voluntary pollutants the share was 9%. This procedure could be used to gap-fill the EU inventory and to avoid underestimations. The ERT recommends that the EU study possibilities in consultation with the MSs to improve the completeness of its inventory by dealing with underestimations identified for sources that are known to exist in a MS. In response to a question concerning the topic, the EU stated during the review that it was currently checking if Eurostat data could be used for gap-filling. The ERT additionally recommends that the EU further develop the gap-filling procedures in consultation with the MSs, e.g. by exploring possibilities of using the Eurostat data in cases where there are methods in the Guidebook and where the existence of a source is known in a MS but related emissions are not reported.

27. The ERT takes note of the EU’s institutional arrangements including the annual NECD review carried out to improve the quality and completeness of MS data. The ERT notes that reporting activity data (AD) is mandatory under the NECD. The EU states in the IIR, chapter 1.9, that all 28 MSs reported activity data, 27 of them for the complete time series (1990-2018); however, the ERT notes that the EU does not report activity data. In response to a question about the issue, the EU stated that “the EU was making efforts to improve the reporting of AD by MSs, by installing the annual NECD review in order to provide AD for the EU CLRTAP submission, where AD from all MSs in same units is available, in future submissions “. The ERT recommends continuing this process.

28. The ERT commends the EU for revising and expanding sections of the IIR on the General assessment of completeness and Underestimations, and for improving the graphical presentation, and recommends that the EU provide a sector-specific assessment of completeness.

29. The ERT notes that the EU uses the notation ney NE in some cases where the Guidebook does not provide methods and the notation key NA is expected, e.g. 1B1a for NO_x, SO_x, NH₃, CO and all POPS, 1B2ai for all HMs (except Pb) and POPs, 1B2aiv for HCB and PCB, 1B2av for NO_x, NH₃, BC, CO, HMs, and POPs, 1B2b for NH₃, PM, HMs (except Hg) and POPs, 1A3a sectors for HCB and PCBs etc. The ERT refers to the Sector Specific Recommendations for further details on the correct use of notation keys in line with paragraph 12 of the Reporting Guidelines. The EU elaborates on the use of notation keys on page 139 of the IIR by stating that “in 2020, 12% of submitted data in the EU inventory contains the notation keys 'NR' or 'NE'. To improve the completeness of data

reporting, including the use of notation keys such as “NE” and the use of Tier 1 methods, the EC was conducting a comprehensive review of emission inventories submitted by the MSs during the first reporting round under the new NECD in 2017 and has since then conducted yearly reviews under the NECD. The emissions inventory expert reviewers are required to check the appropriate use of notation keys and methods for key sources. When used inappropriately, technical corrections of the MSs’ inventories are made. The MSs must subsequently include these corrections in their national inventories which will therefore see improved completeness and consistency in future years.” The ERT recommends using the notation key “NA” where the Guidebook does not offer a suitable methodology, and in general, checking all notation keys for compliance with paragraph 12 of the Reporting Guidelines.

30. The ERT notes that some individual MSs have not reported emissions of some pollutants from the following agriculture sources: NO_x from Inorganic N fertilisers (NFR 3D1a), NO_x and NMVOC from Animal manure applied to soils (NFR 3Da2a), Urine and dung deposited by grazing animals (NFR 3Da3) or HCB from the Use of pesticides (NFR 3Df), although methods for estimating emissions from these sources are available from the Guidebook. The ERT notes that this could result in an underestimate which would have an impact on the aggregated emissions of these pollutants of the EU inventory. The ERT recommends that the EU continues working with the individual MSs to ensure reporting of emissions from all subcategories in all the sectors, taking consideration the fact that methods for estimating emissions are available in the Guidebook.

Consistency, including recalculations and time-series

31. The ERT commends the EU for providing detailed information on recalculations and their impacts on an aggregated level in the IIR. The EU refers to the IIRs of the individual MSs for detailed explanations of recalculations and provides a list of countries making significant recalculations by gas (Table 5.2) and compares the emissions reported by the MSs in 2019 with those of 2020 (Table 5.1). On page 130 of the IIR, the EU describes the rationales behind the recalculations for Pb, Cu, Zn, POPs, PAH, HCB and PCB. The ERT recommends that the EU provide sector-specific information on recalculations wherever possible.

32. The ERT notes that EU provides reasons for recalculations based on gap-filling; however, the EU does not specify the impacts of the recalculations based on gap-filling. The ERT recommends that the EU provide information of the impacts of recalculations based on gap-filling.

33. The ERT notes that the emission trends of the pollutants follow different trends within the same activity, especially for the main pollutants and particle matter in some Industry sector categories. The EU acknowledged this phenomenon and clarified that no manual changes were foreseen for MS reporting and that any of those inconsistencies were addressed during the NECD review. The ERT recognises that not all MS always provide background information in their IIRs. The EU states in its improvement plan that “more explanatory information on trends and recalculations would only be possible if the IIRs included such information. Thus, countries are encouraged to provide it.” The ERT recommends that the EU implement sector-specific QA/QC procedures to investigate the data in detail and find explanations in cases of real but unusual sector trends and that

the EU continue working with the individual MSs to provide more details on the drivers behind the emission trends.

Comparability

34. The ERT considers that although the methods to calculate the emissions mostly originate from the latest version of the Guidebook and the emissions are reported using the latest NFR version (2019), the estimates of the EU inventory are not comparable to other CLRTAP inventories reported by other Parties. The EU inventory aggregates the emissions provided by the MSs, which in some cases are not comparable with each other and follow different allocation principles. For instance, regarding cement production, some countries report their emissions under category 1A2, some under 2A1 and some use the notation key IE or NE. The aggregation of inventories that are not comparable also makes the EU's inventory not comparable. Furthermore, the MSs might be using different Guidebook versions or other methods that are not in line with the Guidebook for estimating the emissions, although the NECD technical review is improving the situation.

35. During the review, the EU stated that the EU checks the correct use of NFR tables, but for the methodology and the use of the latest Guidebook version, the NECD technical review is used to improve MS reporting and consequently EU reporting. The ERT acknowledges the information provided by the EU.

Accuracy and uncertainties

36. The ERT was not able to analyse systematic under- or over-estimates due to the above-mentioned reasons.

37. The ERT notes that in its improvement plan, the EU does not have a detailed schedule for developing an EU level uncertainty analysis. The EU IIR states that "the EU performed an assessment in 2017 as to whether an uncertainty analysis can be generated. The pollutants considered and the assumptions behind the uncertainty analysis vary across the MSs; as so few provide an uncertainty estimate, the overall uncertainty of the EU CLRTAP inventory cannot be estimated. The EU is making efforts to receive an uncertainty analysis from the MSs to provide an accurate uncertainty analysis in future submissions." The ERT recommends that the EU add a detailed plan to increase uncertainty reporting in the MSs and that it provide information about progress with the work on this issue in the IIR, and also reiterates the previous recommendation that a parallel uncertainty analysis should be developed which would not be dependent on MS submissions.

38. The ERT notes that the EU has not evaluated the impact of the gap-filling procedure on inventory uncertainty. The EU comments in the IIR, p. 142, that "the EU was making efforts in order to receive an uncertainty analysis from the MSs to provide an accurate uncertainty analysis in future submissions." The ERT reiterates the previous recommendation that the impact of the gap-filling procedure on inventory uncertainty should be evaluated and the results be reported annually.

Verification and quality assurance/quality control approaches

39. The EU has developed and implemented a quality assurance/quality control (QA/QC) plan in accordance with the Guidebook (Inventory Management Chapter). The

ERT commends EU for the QA/QC checks implemented and documented on the EU level; however, the ERT notes that according to Table 1.5 of the IIR, the MSs are notified of inconsistencies found in their time series and about the results of the analysis of the use of the notation key NE; data from MS submissions are corrected for the EU submission only in the case of a resubmission containing corrections from the MS. The ERT notes that 149 findings for 26 MSs were reported in Table 1.6 for the time series and 655 findings of the use of the notation key NE for 27 MSs. The ERT notes that part of these findings may include incorrect uses of the notation key NE in addition to not estimated emissions reported by the MSs and recommends that the EU support the MSs in their response to all the QC findings.

40. The ERT commends the EU on its general quality assurance/quality control (QA/QC) activities. However, sector specific checks are not documented in the IIR. The ERT recommends that the EU provide sector specific information on QA/QC procedures in future submissions.

Reporting of Condensable Particulate Matter

41. The EU does not provide information on the condensable component of PM and does not provide information in Table A6.1 of the IIR. The EU states in the IIR that “in 2020, 18 MSs provided information using this table. Finland and the Netherlands did not provide this table but reported information on condensable components in their IIRs. The level of information is rather inhomogeneous and for many categories no information is available at all.” The ERT encourages the EU to support the MSs on reporting this information and recommends that the EU report summary information on sector level on whether the condensable component of PM is included or not in MS inventories.

FOLLOW-UP TO PREVIOUS REVIEWS

42. The EU provided detailed responses to the questions in the Stage 2 review about outliers of implied emissions factors.

43. Due to the quality of the IIR and the EU’s responsiveness, the ERT has been able to review the inventory in detail and to provide a number of detailed recommendations.

44. The ERT notes that the EU has fully or partly implemented the following recommendations from the previous S3 reviews:

- (a) Revision of sections of the IIR on General assessment of completeness and Underestimations and editing Fig. 1.5 and 1.6 by adding “data not estimated”, and not claiming 100% completeness.
- (b) Providing the information on planned improvements on the EU level and on the MS level.
- (c) Partly implemented: more detailed information on sector level about the gap-filling procedure in Annex D.
- (d) Partly implemented: a summary for each subsector on how many MSs reported emissions and how many used notation keys in Annex K. The ERT reiterates the recommendation that explanations should be included in the IIR about the use of the notation key NE at MS level under Chapter 4, and notes that there may be incorrect uses of the notation key NE,

although the correct use of the notation keys is explained in paragraph 12 of the Reporting Guidelines.

45. The ERT notes that the EU has not yet implemented the following recommendations from the previous S3 reviews and the ERT reiterates the previous recommendations:

- (a) Further enhance the gap-filling procedure by providing activity data at EU level: for example, gap-filling using data from Eurostat statistics or data from another country (e.g. with a similar population, gross domestic product or other indicator) could be an interim solution to overcome any difficulties; however, it should be clearly marked which data are EU estimates and which data are reported by the Party. In response to a question from the 2017 review, the EU responded that “the EU was making efforts to improve the reporting of AD by MSs, by installing the annual NECD review in order to provide AD for the EU CLRTAP submission. The EU is currently evaluating if gap-filling for a certain subcategory is possible by using Eurostat data. The EU will calculate AD for those categories where AD from all MSs in the same units is available in future submissions.”
- (b) Summarise information about the methodologies used by the different MSs for the specific pollutants in the key categories (according to the information in the IIR p.139 that this is planned for future submissions).
- (c) Provide more detailed information to highlight key data and information deficiencies in MS submissions, including: (1) data gaps for key categories; (2) outlier level and trend emission data from the MSs for key categories; and (3) identifying where lower-tier methods are used by the MSs that contribute significantly to the reported EU total for a key category.
- (d) Improve the use of notation keys, especially NE and NR by strictly using the notation keys in line with paragraph 12 of the Reporting Guidelines;
- (e) Add the development of an uncertainty analysis to the improvement plan for the near future, since, under the new NEC Directive, the MSs will provide information on uncertainties.
- (f) Provide more detailed information to highlight key data and information deficiencies in MS submissions, including: (1) data gaps for key categories; (2) information on outlier levels; (3) trend emission data from the MSs for key categories; and (4) identifying where lower-tier methods are used by the MSs that contribute significantly to the reported EU total for a key category. The ERT notes that the EU has included the recommendation in the improvement plan, but that the EU also states that the analysis is not feasible within the currently limited time frame. The ERT further recommends that the EU provide a schedule for the improvements.

AREAS FOR IMPROVEMENTS IDENTIFIED BY THE EU

46. The EU 2020 IIR identifies data quality, completeness and consistency of MS submissions as well as the inclusion of more explanatory information as areas for improvement.

47. In its response to previous reviews (S2 in 2020 and previous S3 reviews), the EU indicates that it is working to improve its estimates in the following areas:

- (a) Further progress towards the completeness of reporting: a full set of emission inventory data for air pollutants is still not available for all MSs. In addition, for certain pollutants (including PM, HMs and POPs), data could not be fully gap-filled because some MSs had not reported emission values in any years; this being specially the case for pollutants where reporting is not obligatory.
- (b) Updating of emission data by the MSs, including previous years: the ETC/ATNI also identified a problem with gap-filling when using data submitted several years ago. In a number of cases, because countries have submitted no corrected or updated data sets, the EU inventory inevitably includes inconsistencies. Therefore, to enhance the quality of the EU's inventory, the consistency and completeness of MS submissions need to be improved. Such improvements would help to establish a reliable trend analysis to inform policy making. Since 2017, a review process has been conducted under the NEC Directive. The results of the review of this process should be used to improve the quality of the CLRTAP submissions.
- (c) Review of the current gap-filling procedures to ensure they use the best approach, reflecting real emissions: although the improved inventory gap-filling procedure carried out in 2011 has helped to develop a more complete EU emission inventory, there is still room for improvement (for example, by including manual changes in the procedure).
- (d) More explanatory information on trends and recalculations would only be possible if the IIRs included such information. Thus, countries are encouraged to provide it.
- (e) Further research on outliers in the MS emission data would help ensure they reflect real emissions: a comparison of the MS contributions to the EU total reveals unusually high emissions in some instances and closer investigation could determine whether these high proportions reflect actual emissions or if they are attributable to incomplete reporting or underestimates in some MSs.
- (f) More attention should be paid to data quality: in several submissions from the MSs and as a result of the gap-filling procedure, values of BC exceed $PM_{2.5}$ values, values of $PM_{2.5}$ exceed PM_{10} values, or values of PM_{10} exceed TSP values — all of which should be impossible. Changes in the gap-filling results and improved MS emission data should resolve these problems.

Technical corrections considered and or calculated by the ERT

48. The ERT has not considered technical corrections for the EU.

PART B: RECOMMENDATIONS FOR IMPROVEMENTS TO THE PARTY

CROSS CUTTING IMPROVEMENTS IDENTIFIED BY THE ERT

49. The ERT has identified the following cross-cutting issues for improvement and recommends that the Party:

- (a) Submit the IIR already a few weeks before the due date of 30th May, or, if that is not possible, provide the ERT with a draft IIR a few weeks earlier in those years when EU is being reviewed, to facilitate the work of the ERT.
- (b) Include in the IIR
 - Summarised information about methodologies used by the MSs for emissions in the EU's key categories.
 - Explanations for all emission trends of the EU inventory, in consultation with the MSs
 - Sub-sector level information on methods used to calculate emissions
 - Sub-sector level information on sources included in the inventory, especially in the Industry sector
 - Sector-specific assessment of the completeness of the inventory
 - Information on sector level in the main text of the IIR about the gap-filling procedure, or at least providing Annex D containing this information as a public part of the IIR
 - Sector specific information on QA/QC procedures
 - Sector-specific information on recalculations wherever possible
 - Information of the impacts of recalculations based on gap-filling
 - Information on improvements and progress with improvement work
 - Summary information on sector level on whether the condensable component of PM is included or not in MS inventories
 - Include links in the IIR to relevant websites where gridded data and LPS data are available
- (c) Always use notation keys in line with the paragraph 12 of the Reporting Guidelines, and especially check that the use of the notation key NE is in line with the Reporting Guidelines. Include information in the IIR to justify the uses of the notation keys; for IE also document where the emissions are included.
- (d) Further improve the completeness and comparability of the inventory in consultation with the MSs by:
 - Exploring possibilities to use the Eurostat data or other data sources in cases where a MS does not include an existing source in its inventory although methods are available in the Guidebook.
 - Using the results of the NECD technical review to improve reporting of AD in the EU submission
 - Ensuring the comparability of MS data before aggregation on EU level.
 - Including fuel data in the NFR tables for the years and the sectors where this is possible.

- (e) Use the results of the EU inventory's KCA to prioritise improvements in the inventory, include this issue in the improvement plan with clear steps and a schedule and report on progress in the next submissions.
- (f) Implement sector-specific QA/QC procedures to investigate the data in detail and find explanations for real but unusual sector trends, and work with the individual MSs to provide more details on the drivers behind the trends.
- (g) The ERT recommends that the Party include an uncertainty analysis in line with paragraph 31 of the Reporting Guidelines and
 - work with the MSs to increase their reporting on uncertainties in their inventories and report on summarised information on uncertainties
 - develop a parallel uncertainty analysis independent of the MS submissions including an assessment of the impacts of the gap-filling procedure and improvements following the NECD technical reviews on inventory uncertainty.
- (h) Complete the implementation of recommendations from previous reviews
- (i) Implement the sub-sector specific detailed recommendations as indicated under Sub-Sector Specific Recommendations.

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, PCDD/F, PAHs		
Years		1990 – 2018		
Code	Name	Reviewed	Not Reviewed	Recommendation Provided
1A1a	Public electricity and heat production	X		
1A1b	Petroleum refining	X		
1A1c	Manufacture of solid fuels and other energy industries	X		X
1A2a	Iron and steel	X		
1A2b	Non-ferrous metals	X		
1A2c	Chemicals	X		
1A2d	Pulp, Paper and Print	X		
1A2e	Food processing, beverages and tobacco	X		
1A2f	Stationary combustion in manufacturing industries and construction: Non-metallic minerals	X		
1A2gviii	Stationary combustion in manufacturing industries and construction: Other	X		X
1A3ei	Pipeline transport	X		X
1A3eii	Other	X		
1A4ai	Commercial/institutional: Stationary	X		
1A4bi	Residential: Stationary	X		
1A4ci	Agriculture/Forestry/Fishing: Stationary	X		
1A5a	Other stationary (including military)	X		X
1B1a	Fugitive emission from solid fuels: Coal mining and handling	X		X
1B1b	Fugitive emission from solid fuels: Solid fuel transformation	X		
1B1c	Other fugitive emissions from solid fuels	X		X
1B2ai	Fugitive emissions oil: Exploration, production, transport	X		X
1B2aiv	Fugitive emissions oil: Refining / storage	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		

General recommendations on cross cutting issues

Transparency

50. The ERT considers the Energy sector inventory to be transparent. The IIR contains all important information. The Energy chapter includes specific trend descriptions with information on the main drivers. The ERT is aware that the quality of the trend description depends on the availability of information from the individual countries, as in the case, for instance, of the conspicuous emission trend for Pb which is very much influenced by source category 1A2b from Bulgaria, with no information available to justify the trend. The ERT recommends that the Party contact the country in order to find an explanation which should be included in the IIR and also recommends that the EU do this in all other similar cases.

51. According to the Reporting Guidelines Annex II, methods such as emission factors and data sources that are used should be documented in the IIR. However, since the EU inventory is an aggregation of a large number of individual inventories, such an overview would mean a disproportionate effort. The ERT notes that the review of the country-specific emission factors and methods is already carried out under the NECD Technical Review of the MSs' inventories.

52. The ERT notes that for the Energy sector, gap-filling of the different pollutants in the IIR is clearly described. The IIR provides an overview list of all countries and pollutants where gap-fills in time series are marked. As additional information, the ERT has received a spreadsheet (Annex D) which is not publicly available, and which contains more information on the gap-filling process. The ERT considers that Annex D provides sufficient information and encourages the Party to find a way for publishing this document in order to increase transparency for institutions using the EU inventory. Furthermore, the ERT encourages the Party to include the information on gap-filling PM₁₀ and PM_{2.5} emissions for the years 1990 – 1999 in the IIR (pages 66 and 68). The ERT notes that there is no reporting obligation for PM before 2000; however, providing a complete picture of the gap-filling process would improve transparency significantly.

Completeness

53. The ERT notes that the inclusion of all fuel data for the whole time series would be resource intensive and that gap-filling using Eurostat data could cause other problems since Eurostat data and air pollutant inventory data are not always consistent and that there may be good reasons for the differences. However, the reporting of fuel data for the subsectors 1A1 and 1A4 should be possible for the recent years. The ERT recommends that the EU include fuel data in the NFR tables for the years and the sectors where this is possible.

54. The ERT considers the inventory of the different subcategories to be largely complete. Malta does not report emissions for the years prior to 2001 and Austria and Luxembourg do not report BC and additional heavy metal emissions for all source categories. There are some NEs for different countries for NH₃; however, NH₃ emissions are not so relevant in the Energy sector. Besides, there are some minor gaps for different countries in heavy metals and POPs. The ERT encourages the Party to contact Belgium, Lithuania and Malta which report emissions from 1A5a as NE. It is unclear if this is a real gap or if the emissions are included in source category 1A4ai. The ERT notes that the

national energy balance should include fuel data from military in the commercial institutional sector.

Consistency including recalculation and time series

55. The ERT notes that over the last few years the quality of the country-specific inventories has considerably improved and that this has had a positive impact on the EU inventory: currently the inventory for sub category 1B2av is complete and reporting of emissions from category 1B2aiv is consistent with source category 1A1b, which is consistent with the CRF tables of the individual countries. That means that only countries which have no refineries are using the notation key NO, in line with paragraph 12 of the Reporting Guidelines, for the source categories 1A1b and 1B2aiv.

Comparability

56. The ERT notes that the quality of the EU inventory depends very much on the quality of the country-specific inventories. Apart from activity data quality, different measurement standards affect the reported emissions in the European countries. For example, it is well known that there are differences in TSP measurements; however, differences in PCB measurements have the largest impact on emission factors². While being aware that a fully consistent emission inventory is not possible, the ERT encourages the Party to include the information in the IIR that among other things differences related to emission measurements also have an influence on uncertainty and the comparability of emissions between the different countries and source categories.

Accuracy and uncertainties

57. As mentioned above, the ERT notes that the accuracy and uncertainty of the EU inventory depends very much on the quality of the country-specific inventories and notes that as a result of the EU NECD Technical Review of inventories, accuracy has greatly improved and uncertainty decreased.

Condensable

58. The Party provided general information on the reporting of condensable organics mentioning that 18 countries used the new reporting table given in Annex II. The ERT notes that the information of the individual countries is rather inhomogeneous. Based on discussions during the review, the ERT understands the problem and notes that the reporting of condensable particles is not mandatory and that the issue is essentially relevant for small combustion plants. During the review, the EU provided the ERT with analyses for the reporting structure in source category 1A4 (PDF document on “PM reporting of small combustion”) that the ERT encourages the Party to include in the IIR by listing those MSs that are using default values and those that are using their own measurement data. The above mentioned document gives some additional information about the interpretation of the default values and the documentation of country-specific

² Between the Ballschmiter PCB value and the PCBs according to the WHO Teq is a factor of more than 1000 and even the EMEP/EEA Guidebook contains PCB emission factors from the different measurement methods <https://tejp-secretariat.org/assets/Meetings/Presentations/Krakow-2017/Day-2-meeting/POPs-measurements-waste-combustion-and-cremation.pdf>.

emission factors regarding condensable organics. The main focus should be on the residential sector because this is the most important emission source.

Improvement

59. As mentioned above, the ERT notes that due to the EU NECD Technical Review of inventories, the accuracy of the EU inventory has greatly improved and the uncertainty decreased.

Potential Technical Corrections

60. The ERT has not suggested any technical corrections.

Sub-Sector Specific Recommendations

61. The ERT is aware that compiling the EU inventory is a complex process where some formal decisions have to be made. However, the ERT identified some uses of notation keys in the EU inventory that lead to misinterpretations e.g. in cases where emissions are not expected to occur. Therefore, the ERT recommends that the Party use the following notations keys to be in line with paragraph 12 of the Reporting Guidelines:

Category issue 1: 1B1a – Pollutants: NO_x, SO_x, NH₃, CO and all POPs

62. The ERT recommends that the EU change the notation key from NE to NA according to paragraph 12 of the Reporting Guidelines.

Category issue 2: 1B1c – Pollutants: BC, heavy metals and POPs

63. The ERT recommends that the EU change the notation key from NE to NA according to paragraph 12 of the Reporting Guidelines .

Category issue 3: 1B2ai – Pollutants: all heavy metals, except Pb and all POPs

64. The ERT recommends that the EU change the notation key from NE to NA according to paragraph 12 of the Reporting Guidelines.

Category issue 4: 1B2av – Pollutants: NO_x, NH₃, BC, CO, heavy metals and POPs

65. The ERT recommends that the EU change the notation key from NE to NA according to paragraph 12 of the Reporting Guidelines.

Category issue 5: 1B2b – Pollutants: NH₃, PM, heavy metals, except Hg, and all POPS

66. The ERT recommends that the EU change the notation key from NE to NA according to paragraph 12 of the Reporting Guidelines.

Category issue 6: 1.B (All)

67. The ERT notes that the EU correctly uses some NE notation keys in the fugitive emissions sector e.g. for heavy metals from 1B1a, HCB from 1B1b, HCB and PCB from 1B2c and NO_x, NMVOC, SO_x, PM, BC, CO, Zn and POPs from 1B2d. The ERT considers

these emissions as negligible and notes that according to paragraph 12(a) of the Reporting Guidelines the notation key NE can be used when a Party considers emissions insignificant in terms of the overall level and trend in national emissions and will in the IIR provide justifications for the use of the NE notation key.

Category issue 7: 1A1c & 1B1b – (All)

68. The ERT notes that Bulgaria reports NO from 2009 onwards but according to Eurostat there is a conversion of lignite which is an indication of potential emissions in both source categories. The ERT recommends that the EU contact the country in order to clarify this issue and include the missing emissions in the inventory.

Category issue 8: 1A2gviii – (All)

69. Bulgaria uses the notation key NO for this source category; however, the ERT notes that in the CRF tables fuel data and emissions are reported. The ERT recommends that the Party contact Bulgaria to clarify this situation and include the missing emissions in the inventory.

Category issue 9: 1A3ei NO_x

70. The ERT notes that the use of the notation keys by the individual countries can be considered to be mainly correct. Some countries (Greece, the Netherlands and the UK) are using the notation key IE in a considerable number of the NFR categories and that in these cases the allocation is not completely clear. The ERT is aware that all individual allocation methods cannot transparently be explained in the EU IIR as this would increase the complexity of the report and reduce readability. However, there are two cases which need further attention: Bulgaria uses the notation key NO but reports gaseous fuel data and emissions in the CRF tables and Romania uses the notation key NA in the NFR tables but reports liquid and gaseous fuel data and related emissions in the CRF tables. Regarding source category 1A3ei, NO_x is the most important pollutant while the other pollutants are negligible and there are no other methods in the Guidebook but those for compressor stations in NFR 1A1a. The ERT recommends that the EU contact the countries concerned for clarification.

TRANSPORT

Review Scope

Pollutants Reviewed		All		
Years		1990 – 2018		
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		
1A3biii	Road transport: Heavy duty vehicles and buses	X		
1A3biv	Road transport: Mopeds & motorcycles	X		
1A3bv	Road transport: Gasoline evaporation	X		
1A3bvi	Road transport: Automobile tyre and brake wear	X		
1A3bvii	Road transport: Automobile road abrasion	X		
1A3c	Railways	X		
1A3di(ii)	International inland waterways	X		
1A3dii	National navigation (shipping)	X		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		
1A3	Transport (fuel used)	X		X

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

General recommendations on cross cutting issues

Transparency

71. 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 the contributions that MS make to emissions of each pollutant. The ERT acknowledges the work done by the EU; however, it recommends that the EU further improve the transparency of the inventory by including more information and details of methodologies used in the MSs on sector and sub-sector level as well as explanations of the drivers of emission trends.

Completeness

72. The ERT considers the Transport sector to be as complete as possible given the availability of data from the MSs. The EU provides a general assessment of the completeness at an aggregated level in the IIR. However, the ERT recommends that the EU provide sector-specific assessments of completeness and focus on improvements achieved by the gap-filling procedures and the provision of activity data on EU level.

Consistency including recalculation and time series

73. The EU provides detailed information on recalculations on an aggregated level in the IIR, but not on sub-sector level. The ERT recommends that the EU provide sector-specific information on recalculations wherever possible.

74. The ERT notes an inconsistent use of notation keys in the following sectors in the NFR tables: for sectors 1A3ai(i), 1A3aii(i), 1A3ai(ii), 1A3aii(ii) for HCB and PCBs, excl. 1A3aii(i), the notation key "NE" is used although there is no methodology in the 2019 Guidebook, thus the ERT recommends changing the notation key to NA in line with paragraph 12 of the Reporting Guidelines. The ERT notes that the issue concerns mainly Moldova.

Comparability

75. The ERT notes that no activity data are provided and recognises the challenges associated with compiling activity data from all MSs to provide complete and accurate data. However, the ERT encourages the EU to strive to obtain activity data at EU level.

Accuracy and uncertainties

76. The ERT notes that the EU cannot estimate the overall uncertainty of the EU inventory for the Transport sector due to limited information on uncertainty in the IIRs of the MSs and recommends that the Party work with the MSs to provide this information in future submissions.

77. The EU provides an overview of internal quality checks undertaken when compiling the annual inventory. As part of the annual QA/QC programme of the EU, the outcome of these checks is a list of 'potential' issues which are communicated to the respective MSs for verification with a request to re-submit data if considered appropriate. The ERT acknowledges this process and encourages the EU to document improvements made in the EU submission as a result of improvements in MS inventories since the last NECD review.

Condensable component of Particulate Matter

78. The Party has not provided information on the condensable component of PM for the transport sector. The ERT recommends that the EU include such information in the next submission.

Improvement

79. The ERT commends the EU for all the improvements made in the Transport sector since the previous Stage 3 review in 2017 and also acknowledges the efforts undertaken by the EU to collect, synthesise, and gap-fill the data. The ERT also notes

that in section 5 of the 2020 IIR, the EU explicitly provides responses to all the recommendations of the previous Stage 3 review in 2017 (Table 5.3. implemented improvements and findings that have not been implemented, respectively).

Potential Technical Corrections

80. The ERT has not prepared any technical corrections for the Transport sector inventory of EU.

Sub-Sector Specific Recommendations

Category issue 1: 1A3dii National navigation (shipping) – BC, NO_x

81. The ERT notes that significant recalculations have been made for BC emissions for the years 1990 – 2016 in category 1A3dii, which gives the impression that errors in previous submissions have been corrected or gap-filling procedures were carried out. The ERT suggests that the EU checks and clarifies this issue and documents all the corrections and recalculations made to the inventory since the last submission.

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		
2A5a	Quarrying and mining of minerals other than coal	X		
2A5b	Construction and demolition	X		
2A5c	Storage, handling and transport of mineral products	X		X
2A6	Other mineral products	X		X
2B1	Ammonia production	X		
2B2	Nitric acid production	X		
2B3	Adipic acid production	X		
2B5	Carbide production	X		
2B6	Titanium dioxide production	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		
2C2	Ferroalloys production	X		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		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		
2H3	Other industrial processes	X		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		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

82. The ERT notes that the Industrial Processes sector is in general transparent. The overall transparency of the Industrial Processes sector of the EU inventory has been improved since the previous Stage 3 Review carried out in 2017; however, several issues have not been entirely solved. The ERT recommends that the EU implement the following procedures, which have already been addressed in previous reviews:

- (a) include more information and detail in sector and subsector descriptions
- (b) provide explanations of emission trends
- (c) further enhance the gap-filling procedure to provide activity data at EU level: for example, gap-filling by utilising data from Eurostat statistics, or data from another country (e.g. with a similar population, gross domestic product or other indicator) that could be an interim solution to overcome any difficulties.

83. The EU uses the Notation Key “NE” where MSs do not report emissions. The ERT notes the following cases and recommends that the EU use “NA” instead of NE in line with paragraph 12 of the Reporting Guidelines because no methods are provided in the Guidebook:

- 2A5a Quarrying and mining of minerals other than coal. The EU reports NE for NH₃, BC, Cd, Hg and all additional heavy metals and POPs although there is no method in the Guidebook.
- 2A5b Construction and demolition. The EU reports NE for all pollutants except for TSP, PM₁₀ and PM_{2.5} although there are methods in the Guidebook only for TSP, PM₁₀ and PM_{2.5}.
- 2A5c Storage, handling, and transport of mineral products. The EU reports NE for all pollutants except for TSP, PM₁₀ and PM_{2.5} although there are methods in the Guidebook only for TSP, PM₁₀ and PM_{2.5}.
- 2A6 Other mineral products. The EU reports NE for 4 POPs, and emissions for all the other pollutants although there are no methods for POPs in the Guidebook.
- 2B1 Ammonia production. The EU reports emissions of main pollutants, particulate matter and CO, and NE for all the remaining pollutants although there are methods only for NO_x, NH₃, NMVOC and CO in the Guidebook
- 2B2 Nitric acid production. The EU reports NE for all pollutants except for NO_x, NH₃, PM_{2.5}, BC and CO, although there are methods in the Guidebook only for NO_x.
- 2B3 Adipic acid production. The EU reports NE for all pollutants except for NO_x, NMVOC and CO, although there are methods in the Guidebook only for NO_x and CO.
- 2B5 Carbide production. The EU reports NE for all pollutants except for NO_x, NMVOC, SO_x, PM₁₀, PM_{2.5}, TSP, BC and CO, for which the EU reports emissions. There are methods only for TSP in the Guidebook.

- 2C2 Ferroalloys production. The EU reports emissions for all pollutants except for Se, PCDD/ PCDF, benzo(k) fluoranthene, HCB and PCB, for which the EU reports NE. In the Guidebook there are no methods for PCBs and HCB.
- 2C7b Nickel production. The EU reports NEs for most pollutants. The Guidebook provides methods only for SO_x, TSP and Ni.

84. The emission sources included under the following NFR categories are not specified in the IIR: “2A6 Other mineral products”, “2B10a Chemical industry: Other” and “Other metal production”. The ERT recommends that the EU provide a description of emission sources which are reported by the MSs under these categories, as they are included in the EU inventory.

Completeness

85. The ERT considers the EU inventory partly complete regarding the pollutants, sources and years reported, and recognises that it is a compilation of data from the MSs and that it is gap-filled in certain cases using the data reported by the Parties in the previous years or in other submissions to the EU (e.g. the EU Greenhouse Gas Monitoring Mechanism and the NEC Directive). However, as described in section 1.4.5 of the IIR, if a given MS has not reported a particular pollutant in a category in any of its submissions to the EU, the EU inventory does not apply the gap filling procedure. Furthermore, even if inconsistencies are found in the reporting processes of a MS, the EU takes into consideration the individual MS’s reporting under the CLRTAP. For this reason, the EU inventory may not be complete, accurate or consistent. During the review, the EU confirmed the principle of respecting individual MS reporting. Furthermore, as stated in section 1.4.5 of the IIR for various pollutants (BC, additional HMs, B(a)P, B(b)F, B(k)F and IP), the EU inventory is not considered to be complete if the MSs do not provide emission data and the submissions are not gap-filled or adjusted for existing gaps (section 1.9 of the IIR) and inconsistencies (see Sub-Sector Specific Recommendations).

86. On pages 43-44 of the IIR, the EU provides information on potential underestimations of emissions by MS and gas, following a procedure which takes into consideration the share of the emissions of each MS compared to the EU total. For example, for PCBs the estimated underestimation of emissions reaches approximately 30 per cent of EU emissions for the year 2018. The ERT commends the EU for the information provided in the IIR regarding the assessment of completeness of the inventory and recommends that the EU clarify with the MSs the reasons for not reporting, and, in cases where existing emissions are not reported by the MSs, to find ways to fill in the gaps to enhance the completeness of the inventory.

87. For several categories in the Industry sector, the Guidebook provides default Tier 1 factors for BC based on PM_{2.5} emissions (e.g. table 3.1, chapter 2B Chemical Industry). However, there are a few cases where the EU reports PM_{2.5} emissions but no BC emissions (such as category 2B1 Ammonia production). The ERT notes that in those cases BC emissions could be included in the EU inventory to enhance completeness. During the review week, the Party clarified that the EU CLRTAP emission inventory was based on an aggregation of data reported by the MSs and that the calculation of emissions in subcategories for certain pollutants was not within the scope of the EU inventory. Further, the Party clarified that the EU was addressing the improvement of MS reporting through the NECD Technical Inventory reviews. The ERT acknowledges this

information and encourages the Party to enhance the completeness of the inventory through improvements in MS submissions.

Consistency including recalculation and time series

88. In section 5 of the IIR, the EU provides an overview of the recalculations made by MS and gas. The EU refers to the IIRs of individual MSs for detailed explanations of recalculations and provides a list of countries making significant recalculations by gas (Table 5.2) as well as a comparison of emissions reported by the MSs in 2019 and in 2020 (Table 5.1). On page 130 of the IIR, the EU describes the rationale behind the recalculations for Pb, Cu, Zn, POPs, PAH, HCB and PCB. In some cases, the reasons provided have affected the Industrial Processes sector, e.g. in the case of PCB from category '2C1 — Iron and steel production'. The approach followed on page 130 enhances the transparency of the report regarding the recalculations made for each gas. However, the descriptions of the rationale behind the recalculations affecting the Industrial Processes sector of the EU inventory are not provided in the IIR. The ERT recommends that the EU provide more detailed explanations of recalculations on NFR sector level, including the rationale, the impact on the sector and the implication for trends in the Industrial Processes sector, in its IIR.

89. Several issues affecting the consistency of the emission trends have been identified as described in Sub-Sector Specific Recommendations below. In response to a question about these issues, the EU informed the ERT that the inconsistencies in MS reporting as described in section 1.7 of the IIR had not been corrected in the inventory, except in those cases where the emissions of particulate matter are not consistent (i.e. emissions from BC > PM_{2.5} > PM₁₀ > TSP). Furthermore, the EU clarified that inconsistencies identified in MS reporting had been addressed during the NECD review. The ERT encourages the EU to continue with its checks to identify outliers and inconsistencies in emission trends to further improve the consistency of emission trends in the EU inventory.

90. For several NFR activities, the ERT has found that the emissions follow different trends within the same activity, especially for the main pollutants and particulate matter e.g. in categories 2A5c, 2A6, 2B7, 2C2, 2C7b and 2D3i. The EU has clarified that information on checks and adjustments performed by the EU to ensure the consistency of emissions is provided in Table 1.5 of the EU's IIR (p. 39). The EU continuously aims to improve the air pollutant emissions inventories of its MSs, here particularly via improving QA/QC checks for reporting under the NEC Directive. The ERT acknowledges the information provided by the EU and recommends that the Party include consistency checks by taking into consideration the evolution of the different pollutants (especially for main pollutants and particle matter emissions) and that it include explanations where the reasons behind the trends are known to inform readers of the report accordingly.

Comparability

91. The ERT considers the EU inventory not comparable to those of other reporting Parties under the CLRTAP. This is because the EU inventory aggregates the emissions provided by the MSs, which in some cases are not comparable with each other, sometimes for good reasons, or follow different allocation principles. For instance, under category 2A1 cement production, numerous countries report their emissions under

category 1A2, while others use IE or NE. The aggregation of not comparable inventories makes also the EU's inventory not comparable. Furthermore, the MSs might use different versions of the Guidebook for estimating emissions, and the EU inventory cannot correct this. This leads to the fact that the EU inventory is not comparable to other CLRTAP inventories where only one methodology is used for each NFR category and pollutant when calculating emissions. During the S3 review, the EU clarified that the EU was checking for the correct use of NFR tables but not whether the MSs applied the latest edition of the Guidebook to estimate emissions, an issue addressed during the NECD review. The ERT acknowledges the information provided by the EU and encourages the Party to continue checking the comparability of MSs data before aggregation.

Accuracy and uncertainties

92. The ERT did not find systematic under- or over-estimates in the Industrial Processes sector. However, the ERT notes that there are deficiencies in MS submissions, including missing emissions in MS key categories or inaccurate estimates, e.g. not using Tier 2 or higher methods for key categories, and that these issues may contribute significantly to the (in)accuracy of key category emissions in the EU inventory.

93. The ERT notes that the Party does not perform an uncertainty analysis, citing as the reason the fact that only a few MSs provide an uncertainty analysis. The ERT recommends that the EU implement the previous S3 review encouragement, i.e. that it assesses the impact of the gap-filling procedure on inventory uncertainty, e.g. by performing an assessment of uncertainties linked to the EU gap-filling process and also taking into account the uncertainties of MS inventories.

Condensable Particulate Matter

94. The Party includes in section 1.5.5. of the IIR descriptive information on the status of reporting the condensable component of PM₁₀ and PM_{2.5} emissions. Nevertheless, in the IIR there is no clear information on whether PM_{2.5} and PM₁₀ include or exclude the condensable component. The ERT recommends that the Party include such information in the next submission.

Improvement

95. The ERT commends the Party for the overall improvement of the EU inventory regarding all principles for inventory compilation, as described in Table 5.3. of the IIR. Furthermore, the ERT notes the Party's intention to further improve the EU inventory, as specified in section 5.1.4 of the IIR on the improvements planned at EU level. Nevertheless, the ERT notes that areas of sector-specific improvements are not identified in the IIR. The ERT recommends that the Party identify and report improvement areas by NFR sector. Furthermore, the ERT recommends that the Party implement the improvements described in section 5.1.4, finalise the ongoing activities described in Table 5.3. of the IIR and continue reporting in the IIR on progress made with ongoing work.

Sub-Sector Specific Recommendations

Category issue 1: 2.A.1 & 2.A.2 Cement and lime production

96. The ERT notes that for pollutants NO_x and SO₂, some MSs provide emission estimates for NFR category 2A1 and 2A2 while others use “IE”, “NE”, or “NA”, and that the EU just sums up the data provided by those Parties that report emissions and does not include any further information about this. Although this is an issue that affects the transparency and comparability of the EU inventory, the ERT notes that not much can be done as there may be good reasons for the MSs to report this way. The ERT, however, recommends that the EU describe in the IIR the different allocations of emissions made by the MSs under categories 2A1 and 2A2, as well as the implications for EU trend analysis, with the aim to improve the transparency of the information reported and to help the reader understand the scope of the NFR categories of the EU inventory.

Category issue 2: 2A5c Storage, handling and transport of mineral products

97. The ERT found an inconsistency in the reported emissions of TSP, PM₁₀ and PM_{2.5} under NFR 2A5c. The increase in PM₁₀ and TSP emissions is not consistent with the increase in PM_{2.5} emissions for years 2011-2015. During the review week, the EU clarified that the reason for this inconsistency could be found in the emissions reported by Lithuania, which allocates these emissions under categories 2A1, 2A2 and 2A3 for the period 1990-2010, and emissions since 2011 under category 2A5c. The ERT notes that this is an inconsistency in the time series for TSP, PM₁₀ and PM_{2.5} in the EU inventory for this specific NFR category and recommends that the EU describe the reasons for this trend in the next submission. The ERT also notes that it would be helpful to include in the IIR a description of where the emissions are allocated in those cases where “IE” is used.

Category issue 3: 2A6 Other mineral products

98. The ERT has noted that TSP emissions from NFR 2A6 drop sharply in 1991, from 63.63 kt to 10.61 kt and that the trend then stabilises at about 10 kt. During the review week, the EU clarified that the reason for the drop was the use of statistics from the German Democratic Republic on mineral products in 1990. The ERT encourages the EU to address this issue together with Germany to clarify these figures and, if appropriate, to recalculate TSP emissions for the year 1990 in NFR category 2A6, and in any case to provide an explanation of the trend in the IIR.

Category issue 4: 2B7 Soda ash production

99. The ERT found an inconsistency in the emissions of TSP, PM₁₀, PM_{2.5} from NFR 2B7. The increase in TSP emissions is not consistent with the trend in PM₁₀ and PM_{2.5} emissions, especially for the years 2008-2010. During the review week, the EU clarified that PM₁₀ and PM_{2.5} emissions had only been reported by the UK, Spain and Italy and that TSP emissions had also been reported by Poland, Romania, Bulgaria, France and Germany. Therefore, the trend for the different fractions is not fully comparable. Furthermore, the EU described that inconsistencies in MS reporting were addressed during the NECD review in order to improve reporting of the countries. The ERT recommends that the EU either correct this inconsistency or describe the reasons for this inconsistent trend in its next CRLTAP submission.

Category issue 5: 2C2 Ferroalloy production

100. The ERT found an outlier in TSP emissions from NFR 2C2 Ferroalloy production in 1991. During the review week, the Party clarified that the high value of 1991 resulted from the data reported by Germany. The German IIR does not provide information on the reason for this outlier. Further, the EU clarified that when an outlier is found in the information reported by a MS, the MS is contacted by the EEA to clarify the issue. Nevertheless, the EU has not received any feedback about this error this year. The ERT recommends that the EU either correct this outlier or describe the reasons for this inconsistent trend in its next CRLTAP submission.

Category issue 6: 2C7b Nickel production

101. The ERT found large variations of SO_x emissions for the years 2016, 2017 and 2018 in category 2C7b caused by emissions reported by Finland, which is the only country reporting SO_x emissions in the EU. However, FI does not provide any further explanations of the emissions in its IIR. The ERT recommends that the EU describe the reasons for this inconsistent trend in its next CRLTAP submission.

Category issue 7: 2A6 Other mineral products, 2B10a Chemical industry: Other, 2L Other production, consumption, storage, transportation or handling of bulk products and 2H3 Other industrial processes

102. The ERT has noted that the emission sources considered within categories "Other" are not specified in the EU submission. The NFR categories in question are 2A6 Other mineral products, 2B10a Chemical industry: Other, 2L Other production, consumption, storage, transportation or handling of bulk products and 2H3 Other industrial processes. According to the guidance in the NFR template ("please specify in the IIR"), Parties should specify in the IIR which emission sources are considered in these categories. During the review week, the Party clarified which emission sources were considered within each of these NFR categories and referred to the IIRs of the individual MSs for further information. The ERT recommends that the EU include a description of the emission sources included in these NFR categories to further enhance the transparency of the EU submission.

SOLVENT AND OTHER PRODUCT USE

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		
2D3b	Road paving with asphalt			X
2D3d	Coating applications	X		
2D3e	Degreasing	X		
2D3f	Dry cleaning	X		
2D3g	Chemical products	X		
2D3h	Printing	X		
2D3i	Other solvent use	X		X
2G	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.				

General recommendations on cross cutting issues

103. See observations and recommendations provided under the Industrial Processes review chapter for Transparency, Completeness, Consistency, Comparability, Accuracy and Uncertainties.

Sub-Sector Specific Recommendations

Category issue 1: 2D3i Other solvent use– PCDD/ PCDF

104. The ERT noted an increasing trend in PCDD/PCDF emissions from NFR 2D3i since 2016, while emissions of NMVOC in the same category have been decreasing. The ERT did not find an explanation for the trends with the information provided in the EU's IIR. During the review week, the EU clarified that these emissions originated from the treatment of wood with Pentachlorophenol (PCP). Further, the EU clarified that the emissions from this category had been reported by Denmark (about 60-80% of total reported EU28 emissions) and Portugal. For Denmark, a linear reduction in dioxin emissions was assumed because PCP was banned in 1989. Portugal applied the EF from the 2016 version of the Guidebook for the whole time series. The ERT recommends that the Party describe the emission sources included in this category in its IIR to enhance the transparency of the report. Furthermore, the ERT recommends that the EU promote consistency between the Parties in the application of the latest version of the Guidebook.

Category issue 2: 2D3b Road paving with asphalt – TSP

105. The ERT notes that NFR 2D3b Road paving with asphalt is the second largest TSP emission source in the EU inventory. The ERT notes that the emission factor provided by the Guidebook comes from US EPA and is a very high value which is representative of the situation in the US. During the review week, the ERT asked the EU whether any of the MSs was using a country specific emission factor for this NFR category. The EU clarified that PT, PL and BG emissions accounted for 57% of the TSP

emissions in category 2D3b of the EU. PT applies an emission factor from USEPA (2000) while PL and BG apply default EFs provided in the Guidebook to estimate TSP emissions from this source. The ERT recommends that the EU promote consistency between the Parties in the application of the Guidebook and review the methods of the Guidebook regularly, taking into account observations from the MSs and individuals about the suitability of the methods.

AGRICULTURE

Review Scope

Pollutants Reviewed		SO ₂ , NO _x , NMVOC, NH ₃ , PM ₁₀ & PM _{2.5} , CO, HM and POPs + (activity data)		
Years		1990 – 2018 + (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 fertilisers (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		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

107. The ERT commends the EU for presenting useful information on emissions and their key trends in the agriculture sector, specifically for Manure management (3B), Inorganic N fertilisers (3Da1), Use of pesticides (3Df) and Field burning of agriculture

residues (3F). The ERT recognises that not all MS always provide background information in their IIRs. The ERT recommends that the EU continues working with the individual MSs and provides more detailed analysis of the completeness of the inventory to ensure transparency of the inventory.

108. The ERT notes that the use of “NE” is not always accurate in the Agriculture sector inventory of the EU as the EU sometimes uses incorrect notation keys, such as not estimated “NE”, also in cases where emissions are not expected and thus not required to be reported. The ERT reiterates the recommendation from the 2017 Stage 3 review that the use of notation keys in the inventory should be improved.

Completeness

109. 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 the exception of activity data (AD). The ERT noted that no AD was presented in the NFR tables as not all MSs always provide AD in their submissions. The ERT raised a question regarding this issue during the review and the EU responded that it was making efforts to improve the reporting of AD by MSs, by implementing the annual NECD review in order to provide AD for the EU CLRTAP submission. The EU has also indicated that it is currently checking whether gap-filling is possible for a certain subcategory by using Eurostat data, and the EU aims at continuously improving AD reporting under the NEC Directive, which will positively affect EU reporting of activity data under the CLRTAP as well.

110. The ERT commends the EU for making efforts to improve reporting of AD in the MSs in the future. The ERT recommends that the EU requests the MSs to report AD in their inventories and that the EU includes AD for the Agriculture sector in the NFR tables in the next submission, or in cases where this is not possible, that it clearly explains the reasons for not reporting in the IIR.

111. The ERT noted that some individual MSs did not report emissions of a number of pollutants from some important sources such as NO_x from Inorganic N fertilisers (3D1a), NO_x and NMVOC from Animal manure applied to soils (3Da2a); Urine and dung deposited by grazing animals (3Da3) and HCB from the Use of pesticides (3Df) although methods for emission estimation from these sources are presented in the Guidebook. Not reporting emissions results in an underestimate of the aggregated emissions of these pollutants in the EU inventory. The ERT recommends that the EU continues working with the individual MSs to ensure completeness of emission reporting for all subcategories, taking into consideration the fact that methods for estimating emission are available in the Guidebook, see specific sub-sector recommendations below.

Consistency including recalculation and time series

112. The ERT notes that recalculations of emissions for the Agriculture inventory have been undertaken by a number of individual MSs and that the EU has provided information on the impact of these recalculations in sufficient detail. The ERT commends the EU for the detailed information and encourages the EU to continue providing this information in future submissions.

Comparability

113. The ERT notes that the Agriculture 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 to ensure comparability of the reported data between the Parties.

Accuracy and uncertainties

114. The ERT commends the EU for improving the quality of its inventory by performing checks through the NECD technical review on the submission of each MS, to assess the accuracy and the reliability of the compiled data and identify improvement needs in the inventories.

115. Concerning the lack of an uncertainty analysis for the EU inventory, the EU stated that it was making efforts to receive uncertainty analyses from the MSs from 2020 onwards in order to provide an uncertainty analysis in its future submissions. The ERT commends this approach and encourages the EU to continue working with those MSs that have not yet quantified uncertainties.

Improvement

116. The EU has identified some areas for improvement in the inventory such as the reporting of activity data. The EU indicated in its submission that it was making efforts to compile information on methodologies used by the MSs for future submissions. The ERT commends the EU for its efforts and encourages the EU to continue working on the improvements of issues identified by the ERT and issues identified by the MS.

Sub-Sector Specific Recommendations

Category issue 1: inorganic N fertilisers (3D1a), Animal manure applied to soils (3Da2a), Urine and dung deposited by grazing animals (3Da3), Other organic fertilizers applied to soils (3Da4) and Use of pesticides (3Df) - NO_x, NMVOC and HCB

117. The ERT noted that some individual MSs had not reported emissions of NO_x, NMVOC, NH₃ and HCB from some important sources in their inventories although methods for emission estimation are presented in the Guidebook. For example, the Czech Republic did not report NO_x emissions from Inorganic N fertilisers (3D1a); emissions of NO_x and NMVOC from animal manure applied to soils (3Da2a) and NO_x and NMVOC from Urine and dung deposited by grazing animals (3Da3). As another example, several MSs (such as Belgium, Croatia, Germany, Greece, Ireland and Poland) did not report emissions of NMVOC from Animal manure applied to soils (3Da2a) and Urine and dung deposited by grazing animals (3Da3). In addition, many MSs (e.g. Belgium, Bulgaria, Estonia, Greece and Poland) did not report emission of HCB from the Use of pesticides (3Df).

118. The ERT recognizes the level of effort undertaken by the EU in providing an inventory by compiling data from MS inventories and also recognizes that the completeness of the EU submission is largely dependent on the completeness of the MSs' submissions. Improving the completeness of MS submissions is a priority when it

comes to improving the quality of the EU inventory. Such improvements would help to produce a reliable trend analysis for political decision-making.

119. Incomplete reporting of some sources results in an underestimate that could have an impact on the aggregated emissions of pollutants of the EU inventory. The ERT recommends that the EU continues working with individual MSs, addressing the issue of completeness to ensure that emissions are reported from all subcategories, and to enhance the completeness of the EU's inventory.

Category issue 2: Manure management (3B), Agriculture soils 3D and Agriculture other (3I) – Notation keys

120. The ERT notes that the EU uses a single notation key (not estimated “NE”) in the NFR tables where estimates are not expected to be reported according to the Guidebook. For example, the EU uses “NE” to report emissions of SO₂, CO, PM, HM and POPs from subcategories that are not supposed to emit such pollutants (e.g., SO₂, HM and POPs from Manure management (3B)). The ERT recommends that the EU use the notation key NA in cases where no methods are provided in the Guidebook in line with paragraph 12 of the Reporting Guidelines.

121. As regards notation keys, the EU indicated in the previous review that the EU conducted a comprehensive review of emission inventories submitted by the MS under the new NECD in 2017. The review also addresses consistency in reporting and improvements in the use of notation keys. As part of these improvement actions, an enhanced consistency in the use of notation keys is expected in the future. The ERT recognises the level of effort undertaken by the EU in producing an aggregated inventory from the MSs' inventories and also recognises that the completeness of the EU submission is largely dependent on the completeness of the MS submissions.

122. The ERT reiterates its recommendation from the previous Stage 3 review that the use of notation keys should be aligned with paragraph 12 of the Reporting Guidelines as the correct use of notation keys in the NFR tables enhances the comparability of the Agriculture sector inventory with those of other reporting Parties.

Category issue 3: 3Df Use of pesticides – Zn

123. Following a recommendation from the previous 2017 Stage 3 Review related to zinc “Zn” emissions from the Use of pesticides (3Df), the ERT notes that this issue has not been resolved in the subsequent submissions. The ERT reminded the EU during the review that NFR 3Df is not a relevant source for emissions of Zn. The EU clarified during the current review that Zn emission from 3Df reflected data from the Netherlands as stated in the IIR (p.130), where the NL explains that Zn emissions in category 3Df occur due to the use of pesticides. Zinc emissions have decreased by 35% from 2005 to 2018, due to a reduction in pesticide use. Before 2005, there were no zinc emissions related to pesticide use. The ERT thanks the EU for its response and for clarifying this issue and recommends that the EU includes this information in its next submission.

WASTE

Review Scope

Pollutants Reviewed		SO ₂ , NO _x , NMVOC, NH ₃ , PM ₁₀ & PM _{2.5} , HMs, POPs		
Years		1990 – 2018 + (Protocol Years)		
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		X
5C1bvi	Other waste incineration	X		X
5C2	Open burning of waste	X		X
5D1	Domestic wastewater handling	X		X
5D2	Industrial wastewater handling	X		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 codes have been reviewed and which have not in the respective columns.				

General recommendations on cross cutting issues

Transparency

124. The ERT considers the Waste sector inventory to be partly transparent. The EU has provided a detailed emissions inventory; however, the following improvement needs have been identified:

- (a) The emission trends are not sufficiently explained, the ERT recommends that the Party include explanation for the fluctuations in the IIR.
- (b) The methodologies used for calculations are not sufficiently explained. The ERT recommends that the Party improve the transparency of the IIR and include information on the methodology used for calculations and the gap-filling of the inventory.
- (c) The ERT notes that notation key NE is reported in cases where no methods are provided in the Guidebook, and thus recommends that the Party use the notation key NA instead of NE in compliance with paragraph 12 of the Reporting Guidelines, for example in the following cases:
 - NFR 5A for HMs and POPs
 - NFR 5B1 for HMs and POPs
 - NFR 5B1 for As, Cu, Ni, Se

- NFR 5B1 for As, Cu, Ni, Se
 - NFRs 5D1 and 5D2 for SO_x, CO and POPs
- (d) The significant increase in the emissions of main pollutants and PAHs in the category 5C1bv in the year 2001 is not explained in the IIR. Similarly, the increase of PM_{2.5}, PM₁₀ and TSP emissions in the year 2006 and the increase of PAHs emissions in 2016 are not explained in the IIR. The ERT recommends that the Party include information as explained in detail under Sub-sector Specific Recommendations.

Completeness

125. The ERT cannot consider the inventory of the Waste sector to be complete., due to the abundant use of the notation key NE. The ERT notes that the notation key NE is used for several categories and years, but that there is no explanation of the use of NE in the IIR. The ERT recommends that the Party correct the notation key or that it provide detailed information on the usage of the notation key NE in the following cases, which are inconsistent or not reported in line with paragraph 12 of the Reporting Guidelines:

- (a) NFR 5A: BC, As, Cu, PAHs for the years 1990-2004 and Cr, Ni, Se, Zn, HCB for years 1990-2018;
- (b) NFR 5B1: HMs, POPs for the years 1990-2018;
- (c) NFR 5B2: NO_x, SO_x for the years 1990-1993, NMVOC for the years 1990-2010, CO for the years 1990-2001 and S, Cu, Ni, Se for the years 1990-2018;
- (d) NFR 5C1bvi: NO_x for the years 2003, 2006, 2007, SO_x for the years 2000, 2003,2006,2007, Pb for the years 1994, 2000-2018, Cd, Hg, Cr, Cu, Ni for the years 1990-1997 and 2000-2018;
- (e) NFR 5D1: SO_x, PCDD/F, PAHs, HCB, PCBs for the years 1990-2018;
- (f) NFR 5D2: SO_x for the years 1990-1990 and 200-2003, NH₃ and As for the period 1990-1995 and 1998-2007, PCDD/F, PAHs, HCB, PCBs for the years 1990-2018;
- (g) NFR 5D3: SO_x, PCDD/F, PAHs, HCB, PCBs for the years 1990-2018.

Consistency, including recalculation and time series

126. The ERT notes that recalculations have been performed and considers the recalculations to be justified and documented in the IIR, with information on their impacts on emissions in the IIR.

127. The ERT found the time series to be not fully consistent and the explanation for the fluctuations to be missing in the IIR. The ERT recommends that the Party include detailed information for the following categories:

- (a) NFR 5C1bv: high increase of emissions in the year 2001 for NO_x, SO_x, PM_{2.5}, PM₁₀, TSP, BC, CO, B(a)P, B(b)F, B(k)F, I(123-cd);
- (b) NFR 5D1: high increase in emissions in the year 2006 for PM_{2.5}, PM₁₀, TSP;

- (c) NFR 5E: high increase in emissions in the year 2016 for Ni, Se, B(a)P, B(b)F, B(k)F and I(123-cd)P.

Comparability

128. The ERT notes that the methods used in the Waste sector are consistent with the 2019 version of the EMEP/EEA Guidebook, and that the emissions are reported in the NFR 2019 format and that the Waste sector inventory is thus comparable with those of other reporting Parties.

Accuracy and uncertainties

129. The ERT identified no any over and/or under estimates in the inventory of the EU except the issue with NFR 5C2 as explained under Sub-Sector Specific Recommendations.

130. The ERT notes that Party does not provide information on uncertainties in the IIR. The ERT recommends that the EU include an uncertainty analysis in the next submission in line with paragraph 31 of the Reporting Guidelines.

131. The ERT notes that the Party does not provide information on whether T2 or higher methods are used for key categories as requested in paragraph 21 of the Reporting Guidelines and recommends that the Party include this information in the next submission of the IIR.

132. The ERT considers that the EU performs some basic QA/QC checks as documented in the IIR. The ERT recommends that the Party provide more details on QA/QC procedures to ensure the required quality of the reported data.

Condensable Particulate Matter

133. The EU did not provide explanatory information on the condensable component of particulate matter in the IIR and recommends that the EU include this information in the next submission.

Improvement

134. The ERT commends the EU for its improvements in gap-filling. The ERT notes the EU is working on improvements of the use of notation keys, reporting of the activity data, development of an EU inventory improvement programme and on an uncertainty analysis. The ERT encourages the EU to implement the ongoing improvements in the next submission and to initialize the implementation of the previous recommendations listed in Table 5.3 in Chapter 5.2 of the IIR as soon as possible.

Potential Technical Corrections

135. No potential technical corrections were made during the review.

Sub-Sector Specific Recommendations

Category issue 1: 5C1bv Cremation - Transparency

136. A high increase in emissions of NO_x, SO_x, PM_{2.5}, PM₁₀, TSP, BC, CO, B(a)P, B(b)F, B(k)F, I(123-cd) was identified in the category 5C1bv Cremation in the EU emissions inventory for the year 2001. The Party stated that the issue was connected to the emission inventory of the UK and that the peak in 2001 was due to animal cremations occurring due to the foot and mouth outbreak in the UK in that year. The ERT recommends that the Party include this information in its IIR in the next submission.

Category issue 2: 5C1bvi Other waste incineration – Transparency

137. The ERT identified inconsistency in the years 2000, 2003, 2006 and 2007 reported as NE for NO_x, SO_x and CO, although emissions for the other years are reported. This issue was already raised in the 2017 review and it was recommended that the EU to obtain a clarification from Belgium. In response to a question about the issue, the Party responded that Belgium was the only country reporting emissions from 5C1bvi, hence the emissions reported by the EU were equal the ones reported by Belgium. Belgium explains in its IIR that the notation key NE is applied for the respective years as there are no detailed data available or EFs. The ERT notes that in case no emissions are expected from a source and the Guidebook does not provide a method, the notation key NA should be used in line with paragraph 12 of the Reporting Guidelines. The ERT recommends that the EU correct the notation key to NA or that it provide a reference on this issue in the next submission.

Category issue 3: 5C2 Open burning of waste – Accuracy

138. The ERT identified a problem with reporting of emissions of NH₃ in the category 5C2. EU reports the same value for NH₃ emissions for all years. To a question on the issue the Party responded that the issue was connected with the emissions inventory of the Netherlands, as the same value for all reporting years is reported in its inventory. The ERT recommends the Party to contact the Netherlands to gain explanation of this issue and to include the information in the next submission.

Category issue 4: 5D1 Domestic Wastewater handling – Transparency

139. The ERT identified a high increase in emissions in the year 2006 for PM_{2.5}, PM₁₀, TSP. Emissions of PM_{2.5} are about 9 times higher and emissions of PM₁₀ and TSP about 26 times higher in 2006 in comparison to 2005. The Party responded that particle emissions from this category were reported by Spain for the whole time series and the Netherlands, which only reports for 1995 and 2005, and that this was the reason for the strong dips and jumps. The ERT recommends that the Party include this information in the next submission.

Category issue 5: 5D2 Industrial wastewater handling – Transparency

140. The ERT identified a problem with the consistency of the data reported in the category. The EU reported the notation key NE for the years 1990-1992, 2002 and 2003 while for the other years emissions are provided. This issue was already raised during the 2017 review. The Party responded that the reported values corresponded to the

reported values of Belgium which does not provide a full time series. The ERT recommends that the Party include this information in the next IIR.

Category issue 6: 5E Other waste - Transparency

141. The ERT notes that there is a peak in the emissions of Ni, Se, B(a)P, B(b)F, B(k)F and I(123-cd)P in the category 5E in the year 2016. In addition, comparing data of each of the PAHs with Annex I submitted in 2019, emissions of B(a)P have risen by 588%, B(b)F by 370%, B(k)F by 1048% and I(123-cd)P by 418%. In response to a question about the issue, the Party responded that the peak resulted from a single high value reported by Spain in 2016, resulting from the accidental tyre fire in Seseña. The ERT recommends that the EU include this information in the next submission of the IIR.

MATERIALS PROVIDED TO ERTs

1. EU's NFR tables 2020
2. EU IIR 2020
3. EU Stage 2 S&A report
4. EU Stage 1 report
5. Results of extended checks

LIST OF ADDITIONAL MATERIALS PROVIDED BY THE COUNTRY DURING THE REVIEW

6. Responses to preliminary question raised prior to the review
7. Responses to questions raised during the review

ANNEX I POTENTIAL TECHNICAL CORRECTIONS

142. No technical corrections have been proposed by the ERT.