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

**STAGE 3 REVIEW REPORT
SERBIA**

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INTRODUCTION

1. The mandate and overall objectives for the emission inventory review process under the LRTAP Convention are 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'.
2. This annual review, has checked all pollutants covered by LRTAP Convention and its protocols (NO_x, NMVOC, SO_x, NH₃, plus PM_{2.5}, PM₁₀, BC, 3 HMs and POP_s) for the time series years 1990 - 2017 reflecting current priorities from EMEP Steering Body and the Task Force on Emission Inventories and Projections (TFEIP). HMs and POPs have been reviewed to the extent possible.
3. This report covers the stage 3 centralised review of the UNECE LRTAP Convention inventory of Serbia coordinated by the EMEP emission centre CEIP acting as review secretariat. The review took place from 25th June 2019 to 28th June 2019 in Copenhagen (Denmark) and was hosted by the European Environment Agency (EEA). The following team of nominated experts from the roster of experts performed the review: Generalist - Elo Mandel (Estonia), Energy - Marion Pinterits (EU), Transport - Magdalena Zimakowska-Laskowska (Poland), IPPU - Mirela Poljanac (Croatia), Agriculture & Nature - Rikke Albrektsen (Denmark), Waste - Intars Cakars (Latvia).
4. Germán Méndez Magaña (Spain) was the lead reviewer. The review was coordinated by Katarina Marečková, (EMEP Centre on Emission Inventories and Projections - 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

5. The ERT recognises the significant improvement of the transparency undertaken by Serbia in its IIR, which has more than doubled the extension of its report since the 2016 submission, by including new information and adapting its format to the latest UNECE Reporting Guidelines. The ERT commends the Party for it and encourages Serbia to continue in the current direction in order to further develop its IIR by implementing the ERT's recommendations on transparency.

6. The ERT also recognises the effort done by Serbia in providing an emission inventory and an IIR with a significant level of information available which made it possible to undertake a detailed review. The ERT thanks the Party for participating actively in the Stage 3 review process by providing further information and data when requested. Based on that information, the ERT was able to review the inventory in detail and to provide a number of detailed recommendations.

7. The inventory is generally in line with the EMEP/EEA air pollutant emission inventory guidebook 2016 (hereafter referred to as the EMEP/EEA GB 2016) and the UNECE Reporting Guidelines (ECE/EB.AIR/125). However, the ERT noted that emissions for a number of categories and pollutants are reported as not estimated ("NE") despite the EMEP/EEA GB 2016 providing methodology for its estimation. Furthermore, tier 2 or higher methods have been applied only to a limited number of key categories. These issues might have an impact on the quality of the inventory in terms of comparability and accuracy.

8. The ERT also noted that descriptions of recalculations are very limited and the Party has not reported an uncertainty analysis. The ERT acknowledges that improvements performed by parties in their inventories might have an impact on recalculations and uncertainties. For this reason, good monitoring, quantification and descriptions of improvements, recalculations and uncertainties would contribute to the overall quality of the inventory.

INVENTORY SUBMISSION

9. Serbia submitted NFR tables under the CLRTAP on 13th February 2019 by the deadline of 15th February and made a resubmission on the 4th of March. The submission, included data for the Protocol base years and a complete time-series 1990-2017 (the most recent year), for the Protocol pollutants in the NFR 2014-2 format. Transport emissions are reported based on fuels sold.

10. The IIR was submitted on 14th March 2019 within the deadline of 15th March.

11. The ERT commends Serbia for submitting their LPS data for the year 2016 within their 2018 submission as it was recommended in the previous 2016 review report. The submission did not include data on projections or gridded emissions data. The ERT encourages Serbia to include data on projections and gridded emissions in its future submissions.

KEY CATEGORIES

12. Serbia has carried out a level and trend key category analysis (KCA) consistent with the EMEP/EEA GB 2016 for the following pollutants: NO_x, NMVOC,

SO_x, NH₃, PM_{2.5}, PM₁₀ and TSP, BC, CO, heavy metals, PCDD/F, PAHs, HCB and PCBs. The KCA performed is coherent with the EMEP emission centre's key category determination.

13. Serbia does not specify in the IIR if the results of the KCA are used to identify priorities in improvements of the inventory. The ERT recommends that the Party uses the results to prioritise improvements in the inventory.

QUALITY

Transparency

14. The ERT found Serbia's inventory to be detailed and generally transparent. The IIR mainly follows the recommended structure of the IIR according to Annex II of the Reporting Guidelines. The IIR provides brief information about the trends of the main pollutants, a table for key categories, a QA/QC plan, and information on the completeness of the inventory as well as some information on how emissions are estimated. The ERT commends Serbia for that. The ERT encourages the Party to provide more information on assumptions made in the calculations and activity data to further improve transparency.

15. The ERT identified a number of inconsistencies as not correct tier method or not renewed references were found in the report. The ERT encourages Party to attempt to resolve these inconsistencies in the next submissions in order to improve the navigation within the IIR.

16. Serbia uses the notation keys "NE" (Not estimated) and "IE" (Included Elsewhere) in a number of areas. An explanation for the use of the notation key "IE" (Included Elsewhere) is provided directly in NFR tables. The ERT encourages the Party to include an explanation in the IIR. For the notation keys "NE" (Not estimated) Serbia provides explanations mostly in their IIR under section 1.8 (General assessment of completeness). The ERT encourages the Party to provide information for all subcategories where the notation keys "NE" (Not estimated) used in in the next submissions.

Completeness

17. Serbia uses the notation key "NE" (Not estimated) in a number of areas, and an explanation is mostly provided in the 2019 IIR under section 1.8 (General assessment of completeness). However, the ERT recommends the Party to give an effort to calculate and report all relevant emissions from all source categories.

18. The ERT commends Serbia for reducing the use of zero values in the NFR tables as recommended in the 2016 CLRTAP S3 in-depth review report. However, in the transport, industry and waste sectors Serbia still uses zero values for some pollutants. The ERT encourages Party to use the appropriate notation keys e.g. "NO" where emissions are "not occurring", "NE" where emissions are "not estimated" and "IE" where emissions are "included elsewhere" for reporting where estimates are not available or necessary according to the definitions of notation keys in the Reporting Guidelines.

Consistency, including recalculations and time-series

19. The ERT notes that Serbia has recalculated its emissions for 14 categories (out of 128 categories accounting for the national total, 11%) and all pollutants. Some of these recalculations are significantly relevant for certain pollutants and years (especially Ni). The IIR, in its chapter 8 (Recalculations and improvements), states that Serbia has carried out recalculations only for category 1.A.2.g.viii (Stationary combustion in manufacturing industries and construction: Other), for the entire time series, however, the energy chapter also recognises recalculations in category 1.A.2.a. The ERT is aware that the major recalculation performed by Serbia is in category 1.A.2.g.viii, however, in order to assess the consistency of the recalculations, the ERT recommends Serbia to enhance the transparency of the IIR regarding recalculations. Any recalculation should be clearly documented, explaining the reason (change of methodology, new activity data available, error correction, etc.) and the impact of the recalculation on the time-series and on the national total.

Comparability

20. The ERT notes that the inventory of Serbia is comparable with those of other reporting Parties. The allocation of source categories follows mainly that of the EMEP/UNECE Reporting Guidelines. The ERT commends Serbia for this and encourages the Party to continue with this approach in the national inventory calculation.

Accuracy and uncertainties

21. The ERT noted that tier 2 or higher methodologies have been applied only to some of the key categories. The ERT reiterates the recommendation to use higher tier methods for all key categories in line with the Reporting Guidelines in order to increase the accuracy of the inventory.

22. Serbia did not perform an uncertainty analysis as part of the 2019 submission. In its IIR under the chapter of general uncertainty evaluation the Party states that they will present the uncertainty analysis in next submissions. The ERT commends Serbia for that and recommends the Party to describe the quantification of uncertainties and the results in the IIR.

Verification and quality assurance/quality control approaches

23. The quality assurance/quality control (QA/QC) plan implemented for its inventory is in accordance with the EMEP/EEA GB 2016 (Inventory Management Chapter) and it is described in the IIR under the chapter of QA/QC and verification methods. The ERT commends Serbia for that. However, sector-specific checks are not documented in the IIR. The ERT encourages the Party to provide information on sector-specific QA/QC procedures and their results in future submissions.

Reporting of Condensable

24. Serbia did not provide any information on the condensable component of PM emissions for relevant sectors/ categories in their IIR. The ERT recommends Serbia to

include such information in the next submission according to Annex II (v.2018) of the 2014 Reporting Guidelines.

FOLLOW-UP TO PREVIOUS REVIEWS

25. Results from Stage 1 and Stage 2 reviews on the 2019 emission data were used in this Stage 3 review.

26. The ERT acknowledges the effort made by Serbia to implement many of the recommendations made in the previous Stage 3 review report. In its 2019 submission, Serbia has reported emissions in NFR 2014-2 format, has a) included activity data in the reporting tables for many sources; b) provided explanations for many of the dips and jumps observed in trends; c) has performed a trend assessment for key categories analysis; d) provided an explanation for the use of "NE" in many categories and e) established a QA/QC plan. The ERT commends Serbia for these improvements. However, there are still some issues that should be improved (i.e. to perform an uncertainty analysis and to use higher tier methodologies for key categories). The ERT identified issues that should be further improved in the general issues as explained above and in sub-sector specific areas as explained in Part B.

27. The ERT notes the importance of providing information on compliance with previous inventory reviews in the IIR. Despite not being specifically requested by the latest Reporting Guidelines, the ERT encourages Serbia to include an appendix in the IIR assessing the status of implementation of recommendations contained in the latest review report.

AREAS FOR IMPROVEMENTS IDENTIFIED BY SERBIA

28. The IIR identifies a few areas for improvement in the sector-specific chapters. These include:

- (a) Report on a higher tier level in category 1.A.1.a.
- (b) Collect all missing data and recalculate emissions for the whole period under 2.B.10.a category for styrene-butadiene rubber (SBR) production.

29. The ERT welcomes the information provided by the Party during the review on the following future inventory improvements:

- (a) Report on a higher tier level in the agriculture sector.
- (b) Update inventory improvement plan according to the ERT recommendations during the review.
- (c) Report activity data for the whole time-series for several categories (i.e 1.B.2.a.iv, transport sector).
- (d) Correct some information provided in the IIR (i.e 1.B.2.d, 2.A.3, 2.D.3.a).

- (e) Estimate emissions for missing pollutants/categories (PAHs/1.A.2.g.vii; Cd,Se/1.A.3.b.iv; SOx/1.A.3.c).
- (f) Use the correct notations keys in NFR tables and to further explain the use of “NE” and “IE” in the IIR.

30. The ERT encourages Serbia to include the updated inventory improvement plan with deadlines and the nature of the improvement in the next IIR to enhance the transparency of the inventory and traceability of those improvements.

TECHNICAL CORRECTIONS CONSIDERED AND OR CALCULATED BY ERT

31. The ERT did not identify significant inconsistencies in the inventory (higher than the 2% threshold) which would result in potential technical corrections (PTC) or in a request for revised estimates from the Party.

PART B: RECOMMENDATIONS FOR IMPROVEMENTS TO THE PARTY

CROSS CUTTING IMPROVEMENTS IDENTIFIED BY THE ERT

32. The ERT identifies the following cross-cutting issues for improvement and recommends Serbia to:

- (a) include more detailed information on emission factors, activity data, methodologies and emissions trends in its IIR.
- (b) use the appropriate notations keys following guidance provided in the latest available Reporting Guidelines.
- (c) investigate the relevance of sources currently reported as “NE” and to estimate and report the occurring emissions.
- (d) perform and present an uncertainty analysis and use it as a tool to focus planned improvements for the key categories.
- (e) use tier 2 or higher methods for all key categories.
- (f) include information on the condensable component of PM emissions in the IIR for the different sectors following the guidance provided in Annex II (v.2018) of the 2014 Reporting Guidelines.
- (g) include detailed information on recalculations (categories and pollutants affected and reasons) and their impact in the IIR as a result of the emission changes performed.
- (h) further develop a detailed improvement plan including all the needs for improvement self-identified by the Party as well as the recommendations derived from the review processes. Items included in the improvement plan should be specific (well defined), measurable (measure progress), achievable (realistic goals), relevant (set a priority order based on key categories and uncertainty analysis) and time bound (to establish a timeframe).

33. Recommended improvements relating to specific source categories are presented in the relevant sector sections of this report.

SECTOR SPECIFIC RECOMMENDATIONS FOR IMPROVEMENTS IDENTIFIED BY ERT

ENERGY

Review Scope

Pollutants Reviewed		All pollutants, activity data		
Years		1990 - 2017		
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		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		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		
1B2ai	Fugitive emissions oil: Exploration, production, transport	X		
1B2aiv	Fugitive emissions oil: Refining / storage	X		X
1B2av	Distribution of oil products	X		
1B2b	Fugitive emissions from natural gas (exploration, production, processing, transmission, storage, distribution and other)	X		
1B2c	Venting and flaring (oil, gas, combined oil and gas)	X		
1B2d	Other fugitive emissions from energy production	X		

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

General recommendations on cross cutting issues

Transparency

34. Serbia's IIR contains a generally transparent emission inventory; applied methodologies are described in the IIR for the source categories. The ERT encourages Serbia to correct and update information for all subcategories in the IIR and to describe the use of notation keys consistent with the information provided in the NFR tables. Furthermore, the ERT recommends Serbia to provide information on the reasons for significant dips and jumps in the time series to enhance the transparency of the inventory.

Completeness

35. The ERT considers the energy sector as generally complete and comprehensive with a good level on detail in the methodology descriptions.

36. The Party reports emissions in certain subcategories as not estimated (notation key "NE") which are a very likely source of emissions (see para. 50). The ERT recommends Serbia to estimate emissions in those categories, where activity data, a methodology and default emission factors are available.

Consistency including recalculation and time series

37. The ERT noted that the time series in several categories show significant dips and jumps but the Party does not provide information to describe these outliers (see para. 44) in its IIR. The ERT recommends Serbia to include information on significant outliers in its IIR.

Comparability

38. The ERT notes that the methods used are in line with the EMEP/EEA GB 2016.

39. In several categories, Serbia applies incorrect notation keys in the NFR tables (see paras. 47 and 50). The ERT recommends the Party to apply correct notation keys in its inventory and to provide a consistent description in the IIR.

Accuracy and uncertainties

40. The ERT encourages Serbia to undertake an uncertainty analysis for the energy Sector in order to help inform the improvement process and to provide an indication of the reliability of the inventory data.

41. To estimate emissions, Serbia applies a tier 1 methodology with default emission factors for almost all key categories. The ERT encourages Serbia to develop higher tier methods for key categories (see also para. 45).

Condensable

42. Serbia did not provide explanatory information on the condensable component of PM emissions for the energy sector in the IIR, there is no clear information of whether PM_{2.5} includes or excludes the condensable component. The ERT

recommends Serbia to include such information in the next submission according to Annex II (v.2018) of the 2014 Reporting Guidelines.

Improvement

43. The ERT commends Serbia for its improvement to subsequently reduce the number of the notation keys “not estimated” (NE) and “included elsewhere” (IE). The ERT encourages Serbia to check and update its IIR to be consistent with the NFR tables, to include information and also to implement its planned improvements.

Sub-Sector Specific Recommendations

Category issue 1: 1.A.1.a, 1.A.1.c, 1.A.2.a & 1.B.1.a - All Pollutants

44. Emissions of all pollutants and activity data in categories 1.A.1.a, 1.A.1.c, 1.A.2.a & 1.B.1.a show significant dips and jumps in the time series (1.A.1.c: decrease of -60% for the years 2013-2014, -40% for the years 2016-2017 in activity data; 1.A.2.a: 2011-2012: -65%, 2013-2014: +51%, 2015-2016: -56%, 2016-2017:+101% in CO emissions; 1.A.1.a and 1.B.1.a: a decrease in 2013-2014 of around -20% for all pollutants). Information on major changes in the time series is not provided in the Party’s IIR. During the review, Serbia clarified the reasons for significant outliers to the ERT. The ERT recommends Serbia to provide information on significant dips and jumps of all categories in the IIR to enhance the transparency of the submission.

45. The ERT noted that Serbia applies a tier 1 methodology to calculate NMVOC emissions from subcategory 1.B.1.a, which is a key category for NMVOC emissions. According to the EMEP/EEA GB 2016, it is good practice to estimate emissions from key categories with higher tier methods. After a question raised by the ERT during the review regarding the use of higher tier methods for key categories, Serbia responded to include the development of higher tier methods for key categories in its improvement plan. The ERT recommends Serbia to collect activity data that allows to distinguish between open cast mining and underground mining and to shift to a higher tier method to estimate NMVOC emissions from this source.

Category issue 2: 1.A.2.f & 1.A.2.g.viii Stationary Combustion - All Pollutants

46. Serbia states in its IIR (p. 120), that subcategory 1.A.2.g.viii includes activity data from Non-Metallic Minerals, Transport equipment, Machinery, Mining and Quarrying , Wood and wood Products, Textiles and leather, Non-specified (industry) and Auto-producers. A description of the methodology to estimate emissions from subcategory 1.A.2.f (Stationary combustion in manufacturing industries and construction: Non-metallic minerals) is not included in the IIR. The ERT noted, that Serbia reports emissions under subcategory 1.A.2.f in its NFR tables. After a question was raised during the review, the Party stated, that all emissions from non-metallic minerals are included in subcategory 1.A.2.f. The ERT recommends the Party to correct this information in the IIR and also to provide a description of the applied methodology to estimate emissions from non-metallic minerals in the IIR.

Category issue 3: 1.A.5.a Other Stationary - all pollutants

47. The ERT identified that Serbia reports emissions from category 1.A.5.a as not applicable (notation key "NA") in its NFR tables and states in its IIR (p. 126) that emissions from this category are included in category 1.A.4.ai. After a question was raised during the review, Serbia clarified, that all emissions from subcategory 1.A.5.a are included in subcategory 1.A.4.a.i (Commercial/institutional: Stationary). The ERT recommends Serbia to correct the notation key in the NFR tables for subcategory 1.A.5.a from "NA" to "IE" to enhance the comparability and transparency of the inventory.

Category issue 4: 1.B.2 Fugitive emissions - activity data, NH₃, Hg, As

48. Serbia states in its IIR (p. 128), that activity data for category 1.B.2.a.iv was obtained from the National Energy balance for the period 2005 - 2011 but did not provide information on activity data for the years 1990-2004 and 2012-2017. Serbia stated during the review that activity data for this source was obtained for the whole time series (1990-2017) and has indicated that they will include this information in future submissions.

49. During the review the ERT highlighted, that Serbia reports emissions from geothermal energy, peat and other energy extraction under category 1.B.3. According to the EMEP/EEA GB 2016, emissions from these sources are to be reported under subcategory 1.B.2.d. Serbia responded to a question raised by the ERT that this information will be corrected in its next submission. The ERT encourages Serbia to correct this information in the IIR.

50. NH₃-, Hg- and As-emissions from subcategory 1.B.2.d are reported in Serbia's NFR tables as not applicable (notation key "NA"), while all other pollutants from this source are reported as not estimated (notation key "NE"). The ERT identified, that - according to data from Eurostat - a small amount of geothermal energy is reported by Serbia; default emission factors to estimate NH₃-, Hg- and As- emissions are provided by the EMEP/EEA GB 2016. The ERT recommends Serbia to clarify whether emissions from this source do occur and provide estimates of NH₃- Hg- and As-emissions in its next submission or describe in the IIR, why emissions from this source are not estimated and to apply the correct notation key ("NE") in the NFR tables.

Category issue 5: 1.A.3.e.i Pipeline transport - all pollutants

51. Serbia reports 1.A.3.e.i (Pipeline transport) as not occurring (notation key "NO"). Following the encouragement from Serbia's Stage 3 review report 2016 (para. 46), the ERT reiterates the encouragement to investigate on which techniques are applied to maintain pressure in pipelines and to report the results of the investigation in the IIR and - if possible - to estimate and report the missing emissions or change the notation keys according to the results of the investigation to improve the completeness of the inventory.

TRANSPORT

Review Scope

Pollutants Reviewed		All pollutants		
Years		1990 - 2017		
Code	Name	Reviewed	Not Reviewed	Recommendation Provided
1A2gvii	Mobile Combustion in manufacturing industries and construction	X		X
1A3ai(i)	International aviation LTO (civil)	X		X
1A3ai(ii)	International aviation cruise (civil)	X		
1A3aii(i)	Domestic aviation LTO (civil)	X		
1A3aii(ii)	Domestic aviation cruise (civil)	X		
1A3bi	Road transport: Passenger cars	X		X
1A3bii	Road transport: Light duty vehicles	X		X
1A3biii	Road transport: Heavy duty vehicles and buses	X		X
1A3biv	Road transport: Mopeds & motorcycles	X		X
1A3bv	Road transport: Gasoline evaporation	X		X
1A3bvi	Road transport: Automobile tyre and brake wear	X		X
1A3bvii	Road transport: Automobile road abrasion	X		X
1A3c	Railways	X		X
1A3di(ii)	International inland waterways	X		
1A3dii	National navigation (shipping)	X		
1A4aii	Commercial/institutional: Mobile	X		X
1A4bii	Residential: Household and gardening (mobile)	X		X
1A4cii	Agriculture/Forestry/Fishing: Off-road vehicles and other machinery	X		X
1A4ciii	Agriculture/Forestry/Fishing: National fishing	X		X
1A5b	Other, Mobile (including military, land based and recreational boats)	X		X
1A3di(i)	International maritime navigation	X		
1A3	Transport (fuel used)	X		

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

General recommendations on cross cutting issues

Transparency

52. The ERT commends Serbia for providing a detailed and generally transparent transport emission inventory. However, no activity data have been reported in the NFR tables and only limited information on activity data and emission factors used for the estimation of emissions has been provided in the IIR. To further improve the transparency of the inventory, the ERT encourages the Party to include more information on the sector description, time series of emissions and explanations, activity data and emission factors used.

53. Serbia uses zero-values in a number of areas in the reporting tables. The ERT recommends the Party to include the actual emission values or to use the appropriate notation keys (e.g. "NO" where the activity does not exist in the country "not occurring", "NE" where emissions are "not estimated" and "IE" where emissions are "included elsewhere").

Completeness

54. The ERT considers the transport sector to be complete and comprehensive. There are a couple of subsectors for which emissions have not been estimated. The ERT encourages Serbia to include elements on how to increase the completeness of the transport sector inventory in a future inventory improvement plan.

55. The ERT notes there are a few "IE" reported for a number of subsectors. The ERT encourages the Party to make an effort to report emissions for as many subsectors as feasible.

56. For missing emission estimates in the NFR tables the ERT recommends the Party to include the actual emission values.

Consistency including recalculation and time series

57. Serbia has calculated the road transport sector using a version (v11.3) of the COPERT 4 model for period 1990-2016 and for 2017 has made an extrapolation, however very little information has been provided in the IIR on the calculation. During the review, the Party provided a file with total fuel consumption from road transport, this information was considered as confidential by the Party and will not be attached to this report. The ERT notes the compatibility of the emission trend with the trend of fuel consumption. The Party has also calculated the emissions from off road mobile machinery. The ERT encourages the Party to provide a more detailed explanation of calculations, and extrapolation including the rationale, as well as information on the impact of the sector on total emissions and implication to trends for the transport sector in its IIR.

58. The ERT considers the time series of emissions to be generally consistent.

Comparability

59. The ERT considers the description of methodologies used for the calculation of emissions from the transport sector to be comprehensive and consistent with the Guidebook.

Accuracy and uncertainties

60. Serbia uses extrapolation for 1.A.3.b category for 2017. The ERT recommends the Party to calculate an emission value on the basis of the EMEP/EEA GB 2016.

61. The ERT did not identify any over or underestimates.

62. The ERT encourages the Party to undertake an uncertainty analysis and to use it as a tool for prioritising improvements in the inventory and for providing an indication of the reliability of the inventory data.

63. Serbia did not provide information about the availability of a QA/QC system or a QA/QC plan for the Transport sector. The ERT encourages the Party to implement sector-specific QA/QC procedures and to provide a description of the system and its results in the IIR.

Condensable

64. The Party did not provide explanatory information on the condensable component of PM emissions for the transport sector. In the IIR, there is no clear information on whether PM_{2.5} emissions include or exclude the condensable component. The ERT recommends Serbia to include such information in the next submission according to Annex II (v.2018) of the 2014 Reporting Guidelines.

Improvement

65. The ERT commends Serbia for its improvement in the transport sector and in particular for using the latest COPERT 5 version for calculating road transport emissions.

66. The ERT notes that the Party made no improvements in the IIR since the last Stage 3 review,. The ERT strongly encourages the Party to implement recommendations derived from the review processes in order to improve its inventory. Encouragements and recommendations should be included in the IIR improvement plan.

67. The Party does not present planned improvements for the transport sector in the IIR. During the review, Serbia indicated their intention to include the missing activity data in the NFR tables. The ERT welcomes this and encourages the Party to put an effort into further improving their inventory, such as using higher tier methods for the non-road transport sector.

Sub-Sector Specific Recommendations

Category issue 1: 1.A.3.b Road Transport - Activity data, Transparency

68. The ERT noted that different versions of the COPERT 4 model, namely v9.1 and v11.3, are mentioned in different parts of the IIR. During the review, Serbia clarified that the latest COPERT 4 v11.3 has been used for calculating road transport emissions. The ERT recommends the Party to correct this information in the IIR.

Category issue 2: 1.A.3.b Road transport - All Pollutants, Transparency

69. The ERT noted that for the road transport sector (1.A.3.b) the Party used the COPERT 4 model. The ERT recommends using the last version of the COPERT 5 model.

Category issue 3: 1.A.2.g.v.ii Mobile Combustion in manufacturing industries and construction - PAHs, Completeness, Transparency

70. The ERT noted that emissions from off-road mobile machinery in manufacturing industries and construction from 1990 to 2005 for PAHs are reported with zero ("0") values while emissions for the rest of pollutants are calculated. During the review, Serbia indicated that they will consider estimating PAHs emissions from this sector in one of their next submissions. The ERT welcomes this plan and recommends the Party to complete the inventory with these estimates or if there is no data to estimate PAHs emissions, to use the proper notation key.

Category issue 4: 1.A.3.b.iv Road transport: Mopeds & motorcycles - Se, Cd, Completeness, Transparency

71. The ERT noted that Cd and Se emissions from 1.A.3.iv road transport: mopeds & motorcycles from 1990 to 2016 are reported with zero ("0") values. During the review, Serbia indicated that they could not find data regarding emissions of Cd and Se in software reports and has indicated that they will consider estimating emissions from this sector in one of their next submissions. The ERT acknowledges the answer provided and recommends the Party to make an effort to calculate missing emissions in the respective subsectors in order to improve its national inventory.

Category issue 5: 1.A.4.a.ii, 1.A.4.b.ii, 1.A.4.c.iii, 1.A.5.b - All pollutants, Transparency, Comparability

72. The ERT noted that emissions from off-road mobile machinery in these sectors are reported as "IE" and that it is indicated in the IIR that they are included under NFR 1.A.3 (transport (fuel used)). However, emissions under NFR 1.A.3 are reported as "NO". During the review, the Party acknowledged the mistake and indicated that they will ensure that the correct notation keys will be used in their next submission. The ERT welcomes this plan and recommends correcting the notation keys.

Category issue 6: 1.A.3.c, Railways - SO_x, Transparency, Comparability

73. The ERT noted that emissions from Railways are reported as "NE", however, the information on the sulphur content in fuel in Serbia should be publicly available. During the review, Serbia answered that they will estimate emissions from this sector

in the next submissions. The ERT acknowledges the answer provided and recommends the Party to make an effort to calculate emissions in the respective subsectors in order to improve its national inventory.

Category issue 7: 1.A.3.b.v, 1.A.3.b.vi, Road transport - NMVOC and PMs, Accuracy

74. The ERT noted that in the IIR it is indicated that Serbia uses tier 1 emission factors taken from the Guidebook 2013 for estimating emissions from gasoline evaporation and vehicle tire and brake wear. Since Serbia already uses the COPERT model to calculate exhaust emissions from road transport (NFR 1.A.3.b.i-iv) and the model also calculates non-exhaust emissions (NFR 1.A.3.b.v-vi), the ERT recommends the Party to use the results of the model for reporting emissions from these subsectors.

Category issue 8: 1.A.3.a.ii(ii), International aviation cruise (civil), - All pollutants, Transparency, Comparability

75. The ERT noted that in the reporting template in the "memo items" for the years 1991 and 1993 for domestic aviation cruise (civil) category, there are negative activity data values and emissions. During the review, Serbia answered that it was a mistake. The Party obtained data directly from the Civil Aviation Directorate of Serbia, and promised to correct the data for the entire period in the following submission. The ERT acknowledges the answer provided and recommends the Party to make an effort to calculate emissions in order to improve its national inventory.

INDUSTRIAL PROCESSES

Review Scope

Pollutants Reviewed		All pollutants		
Years		1990 - 2017		
Code	Name	Reviewed	Not Reviewed	Recommendation Provided
2A1	Cement production	X		X
2A2	Lime production	X		X
2A3	Glass production	X		X
2A5a	Quarrying and mining of minerals other than coal	X		X
2A5b	Construction and demolition	X		X
2A5c	Storage, handling and transport of mineral products	X		X
2A6	Other mineral products	NE		
2B1	Ammonia production	X		
2B2	Nitric acid production	X		
2B3	Adipic acid production	NO		
2B5	Carbide production	NO		
2B6	Titanium dioxide production	NO		
2B7	Soda ash production	NO		
2B10a	Chemical industry: Other	X		X
2B10b	Storage, handling and transport of chemical products	IE		
2C1	Iron and steel production	X		X
2C2	Ferroalloys production	NO		
2C3	Aluminium production	X		X
2C4	Magnesium production	X		X
2C5	Lead production			
2C6	Zinc production	X		X
2C7a	Copper production	X		
2C7b	Nickel production	NO		
2C7c	Other metal production	NO		
2C7d	Storage, handling and transport of metal products	NO		
2D3b	Road paving with asphalt	X		X
2D3c	Asphalt roofing	X		X
2H1	Pulp and paper industry	X		
2H2	Food and beverages industry	X		X
2H3	Other industrial processes	NO		
2I	Wood processing	X		
2J	Production of POPs	NO		
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	NE		

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

General recommendations on cross cutting issues

76. Serbia has provided a generally transparent emission inventory for the industrial processes sector. Estimates are provided for almost all categories in the scope of the industrial processes sector. Serbia's methodology and emission factors in the IIR are considered by the ERT to be generally transparent.

Transparency

77. The ERT considers the Serbian emission inventory for the industrial processes sector to be generally transparent.

78. Serbia does report activity data for the industrial processes categories in NFR14 tables and in the IIR. The ERT commends Serbia on this and encourages Serbia to further improve regarding reporting of activity data as indicated in the sub-sector specific recommendations.

79. The ERT noted that reasons for dips and jumps in the time series are not included in the IIR. Therefore the ERT recommends Serbia to include missing trend descriptions in the IIR to the next submission.

80. Serbia occasionally uses notation keys in the reporting tables for the industrial processes sector and the appropriate notation keys are not always applied for emissions and activity data. The ERT recommends Serbia to use appropriate notation keys (e.g. "NO" where emissions are "not occurring", "NE" where emissions are "not estimated", "IE" where emissions are "included elsewhere" and "NA" where emissions are "not applicable") for the reporting of emissions and activity data. The ERT also recommends Serbia to explain the usage of notation keys in Chapter "1.8 General assessment of completeness" of the IIR for each of source for which Serbia uses "NE", "IE" and "NO".

Completeness

81. In the 2019 submission, Serbia has reported emissions for almost all source categories for the whole historic trend (1990-2017) in the latest NFR14 format.

82. The ERT considers the industrial processes sector to be almost complete and comprehensive. However, there is a place for additional improvements as explained under the sub-sector specific recommendations.

83. The ERT commends Serbia for including black carbon emissions for the whole time series in the relevant source categories of the industrial processes sector.

Consistency including recalculation and time series

84. The emission trends and activity data trend are in general consistent. However, during the review, the ERT identified some outliers out of which Serbia explained some. The ERT recommends Serbia to include detailed explanations for all existent outliers in the time series for activity data and emissions in the next IIR.

85. The ERT notes that Serbia has not performed recalculations nor other changes for any pollutant emission, source category or year in the latest submission. However, during the review, the ERT has pointed to the need for improvement in a

few source categories, as presented in the sub-sector specific recommendations, which will result in relevant pollutant emission changes when performed. Therefore, the ERT recommends Serbia to include all information on future recalculations and other changes made for the industrial processes sector in the IIR, such as the rationale, the impact on the sector and implication on emission trends.

Comparability

86. Serbia uses the EMEP/EEA GB 2016 methodology for estimating emissions from the industrial processes sector. The methods used by Serbia for the inventory creation are consistent with the EMEP/EEA GB 2016. Serbia does not use country-specific methods for the industrial processes sector. Methodology, emission factors and activity data in Serbia's inventory are well documented in the IIR and in Annex I (NFRs 1990-2017) and enabled the ERT to compare the inventory with those of other Parties.

87. The ERT found possible overestimates and underestimation as explained under sub-sector sector-specific recommendations.

Accuracy and uncertainties

88. Serbia provided a description of the quality management system in the IIR. Serbia has QA/QC checks procedures for the industrial processes sector. The ERT commends Serbia on its general quality assurance/quality control (QA/QC) activities.

89. Serbia did not provide a quantitative nor a qualitative uncertainty analysis for the industrial processes sector. The ERT recommends Serbia to include an uncertainty quantification in its emission estimates for all pollutants using the most appropriate methodologies available, taking into account guidance provided in the EMEP/EEA GB 2016 as requested in the LRTAP Convention Guidelines for reporting emissions and projections data (ECE/EB.AIR/125) (para. 31) and to use it as a tool for prioritising improvements in the inventory and for providing an indication of the reliability of the inventory data and also recommends that this information is included in the IIR.

Condensable

90. Serbia does not provide explanatory information in the IIR of whether PM_{2.5} emissions include or exclude the condensable component. The ERT recommends Serbia to include such information in the next submission following Annex II (v.2018) of the 2014 Reporting Guidelines.

Improvement

91. In the current IIR Serbia did not mention improvements carried out, but has one improvement planned for the next period. However, the ERT identified some needs for improvement as explained under sub-sector specific recommendations.

Sub-Sector Specific Recommendations

Category issue 1: 2.A.1 Cement production - all

92. During the review, the ERT noted that on p. 131, table 77 of Serbia's IIR submitted in 2019, there is information on the amount of cement production in Serbia in the period 1990 - 2017 and in Annex I (NFR tables 1990-2017) there is information on clinker production in category 2.A.1 and that values for clinker and cement production are the same. Following a question raised by the ERT, Serbia responded that the activity data are the amount of cement produced and the emission factor refers to g/Mg clinker. The ERT noted that the correct activity data for the PM emission calculation from 2.A.1 according to EMEP/EEA GB 2016 is clinker production. Since emission factors are expressed per mass of clinker produced, activity statistics must be recalculated from cement to clinker production statistics. Most cement produced is Portland cement, which has an average clinker content of 90-97 % (IPCC, 2006) according to EMEP/EEA GB 2016. Serbia was asked to do this conversion and to calculate clinker production from cement production and then recalculate PM emissions from 2.A.1 by using clinker production. The ERT noted that the potential overestimation is below the threshold of significance. After consulting, Serbia responded that in the next submission in 2020 the Party will calculate clinker production from cement production according to the EMEP/EEA GB 2016 and then recalculate PM emissions from 2.A.1 by using clinker production. The ERT recommends Serbia to do so.

93. In Serbia's IIR 2019, there is no information regarding peaks and dips in activity data trend for source category 2.A.1. Serbia was asked to explain the reasons for the dips in cement/clinker production in 1993, 2000 and 2009 and to include all new information in its IIR for the next submission. Serbia responded that the amount of cement produced is directly taken from the Statistical Office of the Republic Serbia, which means that the result of the increase and the decrease are directly related to the activity data reported by the cement industry to the Statistical Office of the Republic Serbia. The ERT understands the response provided, but for transparency and completeness reasons, the ERT encourages Serbia to contact the cement industry to get the needed information and to include all new information in its IIR as soon as possible.

94. During the review, the ERT noted that on p. 12 of the IIR, information on sources reported as "NE" was included. However, the ERT notes that Serbia uses "NE" for category 2.A.1 and pollutants NO_x, NMVOC, SO_x, CO, HMs and POPs (except PCBs) in Annex I (NFR tables 1990-2017) while no explanation on the use of these notation keys can be found in the IIR. After a question raised by the ERT, Serbia confirmed that category 2.A.1 included emission estimates for PM_{2.5}, PM₁₀, TSP and BC, while the rest of pollutants had been reported in the energy sector under category 1.A.2.f. The ERT recommends Serbia to correct the notation keys used for pollutants NO_x, NMVOC, SO_x, CO, HMs and POPs (except PCBs) in Annex I (NFR tables 1990-2017) from "NE" to "IE" and to clearly state this in the IIR for the next submission.

Category issue 2: 2.A.2 Lime production

95. During the review, the ERT noted that on p. 132, table 79 of the IIR, there is information on the amount of lime production in Serbia in the period 1990 - 2017 but explanations regarding peaks and dips in activity data are missing. To the question on the issue to explain the reason for the dip in lime production in 1994 and the peak in 1998 Serbia responded that the amount of lime production was directly taken from the Statistical Office of Serbia, more precisely from the statistical yearbook and, consequently, the dip was directly related to the fact that the industry applied to the Statistical Office of Serbia. The ERT understands the response provided but for transparency and completeness reasons recommends Serbia to contact the lime producers to get the needed information and to include all new information in its IIR as soon as possible.

96. During the review, the ERT noted that on p. 12 of the IIR, information on sources reported as "NE" was included. However, the ERT notes that Serbia uses "NE" for category 2.A.2 and pollutants NO_x, NMVOC, SO_x, CO and priority HMs in Annex I (NFR tables 1990-2017) while no explanation on the use of these notation keys can be found in the IIR. After a question raised by the ERT, Serbia confirmed that category 2.A.2 included emissions estimates for PM_{2.5}, PM₁₀, TSP and BC, while emissions estimates for NO_x, SO_x and CO had been reported in the energy sector under category 1.A.2.f (the rest of pollutants are not estimated). The ERT recommends Serbia to correct the notation keys used for the reporting of NO_x, SO_x and CO emissions under category 2.A.2 in Annex I (NFR tables 1990-2017) from "NE" to "IE" and to clearly state this in its IIR for the next submission.

97. To the question on the issue to provide the ERT information on where lime production exists in Serbia and to clarify if the amount of lime reported includes non-market lime produced for the needs of sugar refining, in pig iron production plants or maybe in some other non-market lime production activities in the country, Serbia responded that the Statistical Office covers the total quantities of lime produced on the territory of Serbia. The ERT recommends Serbia to contact the Statistical Office of Serbia to get the information on the existence of all non-market lime production in Serbia (sugar refining, in pig iron production plants or maybe some other non-market lime production activities) and to include this new information in the IIR for the next submission in 2020.

Category issue 3: 2.A.3 Glass production - all

98. During the review, the ERT noted that on p. 132, table 79 of the IIR there is information on the amount of glass production in the period 1990 - 2017 while the title of table 79 refers to the total amount of lime production. In response to a question raised by the ERT, Serbia recognized an error in the title of table 79 which should refer to the amount of glass production and confirmed that it will be amended in the next IIR. The ERT recommends Serbia to implement this correction in its next IIR submission

99. The ERT noted that in the IIR there is no information regarding the trend of activity data for glass production. To the question on the issue to provide the reason for sharp decrease in glass production and to include all new information in the IIR for

the next submission, Serbia responded that the amount of glass production was directly taken from the Statistical Office of Serbia, and, consequently, the decrease was directly related to the fact that the industry applied to the Statistical Office of Serbia. Due to transparency and completeness reasons, the ERT recommends Serbia to contact the Statistical Office of Serbia and/or the glass producers to get the needed information on present fluctuations in the trend of glass production and to include all new information in the IIR for the next submission in 2020.

100. The ERT noted that on p. 12 of the IIR, there is information on sources reported as “NE” but here is no information for the sector 2.A.3 and that Serbia uses “NE” for reporting pollutant (NO_x, NMVOC, SO_x, CO, NH₃ and POPs (except PCBs) emissions in Annex I (NFR tables 1990-2017). To the question on the issue to explain this and to confirm that previously mentioned pollutant emissions are not included in the energy industry - stationary combustion in manufacturing industries and construction (NFR 1.A.2) Serbia responded that NO_x, SO_x and CO emissions are included in NFR 1.A.2.f, PM_{2.5}, PM₁₀, TSP, BC and heavy metals emissions are included in NFR 2.A.3. NMVOC, NH₃ and POPs are reported with the notation key “NE” in both NFR categories. The ERT recommends Serbia to correct the notation keys used for the reporting of NO_x, SO_x and CO emissions in Annex I (NFR tables 1990-2017) from “NE” to “IE” and to clearly state this in its IIR for the next submission in 2020.

Category issue 4: 2.A.5.a Quarrying and mining minerals other than coal - PM_{2.5}, PM₁₀ and TSP

101. During the review, the ERT noted that on the p. 132 of the IIR, there is information on a tier 1 methodology and emission factors used for emission calculation. The ERT noted that 2.A.5.a is a key category for PM₁₀ emissions and that, according to EMEP/EEA methodology, a tier 2 method should be applied. To the question on the issue about Serbia’s plan to move to tier 2 for source category 2.A.5.a for the next submission or in the near future, Serbia responded that they were discussing the issue of moving to tier 2, but for now they do not have the capacity and that they will put this activity in the improvement plan. The ERT recommends Serbia to include this activity in the improvement plan and to reflect this information in the next submission of IIR in 2020.

102. During the review, the ERT noted that in the period, 1990 - 2017, the trend of TSP, PM₁₀ and PM_{2.5} emissions from for 2.A.5.a has big fluctuation. To the question on the issue Serbia responded that the amount of category 2.A.5.a quarrying and mining of minerals other than coal, was directly taken from the Statistical Office of Serbia and “Industrial Bilten”, the fall was directly related to the fact that the industry applied to the Statistical Office of Serbia. Due to transparency and completeness reasons, the ERT recommends Serbia to contact the Statistical Office of Serbia to get the needed information on the present fluctuations in the trend of activity data for the category 2.A.5.a and to include all new information in the IIR for the next submission in 2020.

103. The ERT noted that text referring to emission factors, activity data used and recalculations and other changes performed has been duplicated for category 2.A.5.a

(p. 132, 133). After consultation, Serbia confirmed that that the same sentence related to emission factors had been mistakenly written twice and that they will correct this in the next IIR. The ERT recommends Serbia to correct this point for the next submission.

Category issue 5: 2.A.5.b Construction and demolition - TSP, PM₁₀, PM_{2.5}

104. During the review, the ERT noted that on the p. 133 of the IIR, there is information on methodology and planned improvements for source category 2.A.5.b, however no information on emission factors used, source of activity data used and recalculations and other changes performed can be found. To the question on the issue to provide missing information Serbia responded that for this category, tier 1 emission factors from EMEP/EEA GB 2016 have been used (PM_{2.5} = 0.0086, PM₁₀ = 0.086 and TSP = 0.29, all expressed in kg/[m².year]), that no recalculations for this category had been performed and that the source for activity data is the Statistical Office of Serbia. The ERT notes that the emission factors used correspond to those of the construction of houses (table 3.1, chapter 2.A.5.b of the EMEP/EEA GB 2016), whereas activity data reported in the IIR is the amount of asphalt used for road paving and the AD reported in NFR tables is floor space constructed/demolished (km²). The ERT recommends Serbia to clearly specify in the IIR the source of emission factors used and to include information on recalculations and the source of activity data used for this category. The ERT also recommends Serbia to check consistency between IIR and NFR tables regarding reported AD.

105. According to the emission factor used, the ERT noted that Serbia seems to calculate emissions only for the construction of houses. However, according to EMEP/EEA GB 2016, this source category also includes: the construction of apartments (all types), non-residential construction (all construction except residential construction and road construction) and road construction, and provides a tier 1 methodology. This could lead to a potential underestimation of PM emissions. After being consulted, Serbia stated they currently do not have all the necessary activity data for the calculation of the different sources of emissions under category 2.A.5.b. Serbia confirmed the ERT that this issue will be included in its improvement plan in the next IIR submission. The ERT encourages Serbia to do the necessary effort to complete estimates for all sources under this category by following the latest EMEP/EEA methodology.

Category issue 6: 2.A.5.c Storage- handling and transport of mineral products - TSP, PM₁₀, PM_{2.5}

106. The ERT noted that on p. 133-134 of the IIR, there is information on a tier 1 EMEP/EEA GB 2016 methodology used for 2.A.5.c emission estimation, while the Guidebook 2016 provides only a tier 2 methodology. To the question on the issue to provide an explanation and information on the origin of the total amount of mineral products that are storage, handling and transport (cement industry, lime industry, etc.), Serbia responded that the methodology used for category 2.A.5.c is the tier 2 method from the EMEP/EEA GB 2016 and that they noticed that there was a mistake in IIR and that it will be corrected in next submission. The ERT recommends Serbia to correct this information in the IIR of the submission in 2020.

107. The ERT notes that EMEP/EEA GB 2016 does not provide tier 1 emission factors and at this level, it is assumed that these emissions are accounted for in the relevant mineral chapter. For example, emissions from storage, handling and transport of cement during the cement production are covered by the tier 1 emission factors for cement production (see chapter 2.A.1, p. 10 of the EMEP/EEA GB 2016 for reference). This is the case in all relevant mineral sectors for which Serbia applies tier 1 EMEP/EEA GB 2016 methodology. As suggested by the guidebook (chapter 2.A.5.c, p. 7), the ERT noted that double-counting of TSP, PM₁₀ and PM_{2.5} emissions might be occurring when using a tier 2 method for 2.A.5.c combined with a tier 1 method for 2.A.1, 2.A.2 and 2.A.3. The ERT recommends Serbia to verify that methods applied in the relevant processes of the mineral industry do not include these emissions. If emissions from 2.A.5.c were already being included in the tier 1 method of the 2.A technical chapters, the ERT recommends Serbia to change current emissions estimates to the notation key "IE" and to clearly specify in the IIR where these emissions are included.

Category issue 7: 2 Industrial processes - all

108. During the review, the ERT noted that on p. 130 and 134 of IIR, there is information on source categories in the scope of the industrial processes and product use sector for which Serbia uses the old NFR09 codes for some of the categories. To the question on the issue Serbia confirmed that it was a mistake and will be amended in the next IIR. The ERT recommends Serbia to correct the mistake in the IIR of the submission in 2020.

Category issue 8: 2.B.10.a Other chemical industry - all

109. The ERT commends Serbia for reporting activity data for lots of activities under source category 2.B.10.a. However, during the review, the ERT noted that Serbia uses zero ("0") values when presenting the total amount of manufactured products. This is the case in table 87 (p.137), table 89 (p.138), table 90 (p.138), table 91 (p.139) and table 93 (p.140). Following a question raised by the ERT, Serbia indicated that in the particular case of data related to ethylene and polyethylene production, the source of information was the Statistical Office of Serbia which did not have data available for some years, so a "0" value was reported. The ERT recommends Serbia to use the appropriate notation key ("NO" or "NE") instead of "0" and to include an appropriate explanation for it in the IIR (e.g. stop of manufacturing due to the maintenance of plant, plant closure, economic reasons, missing AD, etc.) to the next submission.

110. During the review, the ERT noted that in the IIR, there is no information about the existence of activities in the scope of category 2.B.10.a for which there are available emission factors in EMEP/EEA GB 2016 such as: SNAP 040404 Ammonium sulphate, SNAP 040406 Ammonium phosphate, SNAP 040407 NPK fertilisers, SNAP 040409 Carbon black, SNAP 040410 Titanium dioxide SNAP 040411 Graphite, SNAP 040413 Chlorine production, SNAP 040505 1,2 dichloroethane + vinylchloride (balanced), SNAP 040508 Polyvinylchloride, SNAP 040510 Styrene, SNAP 040511 Polystyrene, SNAP 040512 Styrene butadiene, SNAP 040513 Styrene-butadiene latex, SNAP 040515 Acrylonitrile Butadiene Styrene (ABS) resins, SNAP 040516 Ethylene oxide, SNAP 040517 Formaldehyde, SNAP 040518 Ethylbenzene, SNAP

040519 Phthalic anhydride, SNAP 040520 Acrylonitrile, SNAP 040523 Glyoxylic acid, SNAP 040525 Pesticide production. The ERT recommends Serbia to provide the missing information on the existence of all activities mentioned above for the period 1990 - 2017 and to include all new information in the IIR to the next submission. The ERT also recommends Serbia to include these activities in the improvement plan and to document the planned improvements in the IIR for the next submission.

Category issue 9: 2.C.1 Iron and steel production - all

111. During the review, the ERT noted that on the p. 140 of the IIR there is information that data for the emission calculation in category 2.C.1 iron and steel is provided by sinter and pellet plant operators and according to their information, no production of pellet and sinter was registered before 2003. The ERT also notes that there is no information on other possible activities included in the scope of source category 2.C.1, such as SNAP 040202 Blast furnace charging, SNAP 040203 Pig iron tapping, SNAP 040205 Open hearth furnace steel plant, SNAP 040206 Basic oxygen furnace steel plant, SNAP 040207 Electric furnace steel plant and SNAP 040208 Rolling mills. The ERT recommends Serbia to provide the missing information about the existence of activities mentioned above in the period 1990-2017 in the IIR to the next submission. The ERT also recommends Serbia to include these activities in the improvement plan and to document the planned improvements in the IIR to the next submission.

Category issue 10: 2.C Metal production - all

112. During the review, the ERT noted that Serbia uses "0" values or the "NA" notation key when reporting activity data in the IIR and in the NFR tables. Cases when Serbia uses "0" values, can be found in table 94 (p.141), table 95 (p.141-142), table 96 (p.142) and table 98 (p.143). Cases when Serbia uses the notation key "NA" for reporting activity data in Annex I (NFR 1990-2017), can be found in source categories for years: 2.C.3 (1998, 1999), 2.C.4 (1993, 1994, 2000, 2002-2004), 2.C.5 (2014-2017) and 2.C.6 (2005-2017). The ERT recommends Serbia to use the appropriate notation key ("NO" or "NE") instead of "0" or "NA" and to include appropriate explanations for it (e.g. stop of manufacturing due to the maintenance of plant, the plant closure, economic reasons, missing AD, etc.) in the IIR and Annex I on the next submission.

Category issue 11: 2.H.2 Food and beverages industry - NMVOC

113. The ERT commends Serbia for reporting activity data for lots of activities under source category 2.H.2. However, during the review, the ERT noted a significant decrease for the NMVOC implied emission factor in period 1994-2001 and in 2015 compared to the historic trend. To the question on the issue, Serbia responded that from 1994 there were lower production values for spirits, which is in line with NMVOC decrease, for the year 2015 there was a smaller production of sugar in the country. The ERT recommends Serbia to include this information in the IIR to the next submission.

Category issue 12: 2.D.3.b Road paving with asphalt - all

114. During the review, Serbia was asked to explain the trend in activity data (decrease during the following periods: 1990-1993, 2007-2013 and increase during the following periods: 2004-2007, 2014-2016) and to include all new information in the IIR of the next submission. To the question on the issue, Serbia responded that the data used for category 2.D.3.b road paving with asphalt are from the Statistical Office of Serbia and the results of the increase and the decrease are directly related to data deliverables from the operators to Statistical office. The ERT recommends Serbia to contact the Statistical Office of Serbia to get the needed information and to include all new information in the IIR as soon as possible.

Category issue 13: 2.D.3.c Asphalt roofing - all

115. During the review, the ERT noticed that Serbia uses tier 2 EMEP/EEA GB 2016 methodology for emission estimation and that total amount of asphalt for asphalt roofing is used as activity data. The ERT notes that according to the Guidebook, the relevant activity statistics for tier 1 and tier 2 is the production of shingles. To the question on the issue, Serbia explained that there is a mistake which will be solved in the next submission of IIR as the methodology used for category 2.D.3.c is tier 1 and not tier 2. The ERT, therefore, recommends Serbia to correct the mistake to the next submission.

SOLVENTS

Review Scope

Pollutants Reviewed		All pollutants		
Years		1990 - 2017		
Code	Name	Reviewed	Not Reviewed	Recommendation Provided
2D3a	Domestic solvent use including fungicides	X		X
2D3d	Coating applications	X		X
2D3e	Degreasing	X		X
2D3f	Dry cleaning	X		X
2D3g	Chemical products	X		X
2D3h	Printing	X		X
2D3i	Other solvent use	X		X
2G	Other product use	NO		X
Note: Where a sector has been partially reviewed (e.g. some of the NFR codes please indicate which have and which have not in the respective columns.				

General recommendations on cross cutting issues

116. Serbia has provided a generally transparent emission inventory for the solvents sector. Estimates are provided for almost all categories in the scope of the solvents sector. Serbia's methodology and emission factors in the IIR are considered by the ERT to be generally transparent.

Transparency

117. The ERT considers the Serbian emission inventory for the solvents sector to be generally transparent.

118. Serbia does report activity data for the solvents sector categories in NFR14 tables and in the IIR. The ERT commends Serbia on this and encourages Serbia to further improve regarding the reporting of activity data as indicated in the sub-sector specific recommendations.

119. The ERT noted that reasons for dips and jumps in the time series are not included in the IIR. Therefore, the ERT recommends Serbia to include missing trend descriptions in the IIR to the next submission.

120. Serbia occasionally uses notation keys in the reporting tables for the solvents sector. The ERT notes that Serbia uses the appropriate notation keys when reporting emissions and activity data in NFR14 tables for the solvents sector.

Completeness

121. In the 2019 submission, Serbia has reported emissions for the whole historic trend (1990-2017) for the solvents sector in the latest NFR14 format.

122. The ERT considers the solvents sector to be almost complete and comprehensive. However, there is a space for additional improvements (e.g. 2.D.3.d,

2.D.3.e, 2.D.3.g, 2.D.3.h, 2.D.3.i, 2.G) as explained under the sub-sector specific recommendations.

123. The ERT commends Serbia for including black carbon emissions for the whole time series in the relevant source category of the solvents sector.

Consistency including recalculation and time series

124. The emission trends and activity data trends are in general consistent. During the review, the ERT did not identify any outliers for the solvents sector. The ERT, therefore, encourages Serbia to report on outliers in the time series for activity data and emissions for the solvent sector and to provide explanations for them in its IIR when they occur.

125. The ERT notes that Serbia has not performed recalculations nor other changes for any pollutant, source category or year in the latest submission. However, during the review, the ERT has indicated the need for improvement in a few source categories, as presented in the sub-sector specific recommendations, which will result in relevant emission changes when performed. Therefore, the ERT recommends Serbia to include all information on future recalculations and other changes made for the solvents sector in its IIR, such as the rationale, the impact on the sector and the implication on emission trends.

Comparability

126. Serbia uses the EMEP/EEA methodology for estimating emissions from the solvent sector. The methods used by Serbia in the inventory are consistent with the EMEP/EEA GB 2016. Serbia does not use country-specific methods for the solvents sector. Methodology, emission factors and activity data in Serbia's inventory are generally well documented in the IIR and in Annex I (NFRs 1990-2017) and enabled the ERT to compare the inventory with those of other Parties.

The ERT found possible underestimation as explained under sub-sector specific recommendations.

Accuracy and uncertainties

127. Serbia provided a description of the quality management system in use in the IIR. Serbia applies QA/QC check procedures for the solvents sector. The ERT commends Serbia on its general quality assurance/quality control (QA/QC) activities.

128. Serbia did not provide a quantitative nor a qualitative uncertainty analysis for the solvents sector. The ERT recommends Serbia to include an uncertainty quantification in its emission estimates for all pollutants with the most appropriate methodologies available, taking into account guidance provided in the EMEP/EEA GB 2016 as requested in the LRTAP Convention Guidelines for reporting emissions and projections data (ECE/EB.AIR/125) (para. 31) and to use it as a tool for prioritising improvements in the inventory, as well as for providing an indication of the reliability of the inventory data and recommends that this information is included in the IIR.

Condensable

129. Serbia does not provide explanatory information in the IIR of whether PM_{2.5} emissions include or exclude the condensable component. The ERT recommends Serbia to include such information in the next submission following Annex II (v.2018) of the 2014 Reporting Guidelines.

Improvement

130. Serbia mentioned no improvements, neither made nor planned, for the next period in the last submitted IIR. However, the ERT identified some needs for improvement as explained under sub-sector specific recommendations.

Sub-Sector Specific Recommendations

Category issue 1: 2.D.3.a Domestic solvent use including fungicides - NMVOC, Hg

131. During the review, the ERT noted that on p. 144 of the IIR, it is stated that emissions were calculated using a tier 2 method, which implies multiplication with appropriate default emission factors. When asked to provide the ERT emission factors used for NMVOC and Hg emission calculations, as well as activity data concerning this category Serbia responded that this is a mistake and that a tier 1 methodology was used for the emission calculation, that they will correct this in the following submissions and that the used input data are the number of inhabitants. The ERT recommends Serbia to correct the mistake made and due to accuracy and transparency reasons, to revise the information on the methodology used for this source category emission calculations in the IIR for the next submission.

Category issue 2: 2.D.3.d Coating applications - NMVOC

132. The ERT commends Serbia for reporting activity data for lots of activities under source category 2.D.3.d. However, during the review, the ERT noted that Serbia has not provided information on the existence of other possible coating applications in the country such as: wire coating, truck cabin coating, wood coating, coil coating, car repairing, domestic use of paint, other non-industrial paint application (i.e. the application of high performance protective anti corrosive and/or fire resistant coatings to buildings and other large metallic structures, as well as coatings for concrete, road marking, etc.). Some of the mentioned coating applications are likely to exist in almost all countries. To the question raised on the issue to confirm that no other possible coating applications occur in the country, Serbia responded that the activity data used for this category come from the Statistical Office and no information on other activities under category 2.D.3.d is currently available. As Serbia answered during the review, the ERT recommends the Party to include the improvement of completeness of this source category in its IIR's improvement plan and to make the necessary efforts to gather activity data and to estimate the remaining activities under this category in the future.

Category issue 3: 2.D.3.e Degreasing, 2.D.3.f Dry cleaning, 2.D.3.h Printing - NMVOC

133. During the review, the ERT noted that on p. 147 and 148 of the IIR, there is information on the methodology applied for emission calculations that is based on the tier 2 method from EMEP/EEA GB 2016 and that Serbia uses population size as activity data (noted from NFR tables). The ERT also noted that according to tier 2 EMEP/EEA GB 2016 methodology, the activity data concerning source category 2.D.3.e is kg of cleaning products used in the metal degreasing activities or tons of wafer used in the manufacturing of electronic components (if such manufacturing exists in the country); the activity data concerning source category 2.D.3.f is kg of textiles cleaned and the activity data concerning source category 2.D.3.h is kg of ink used in the printing industry (non-diluted or ready to use). To the question on the issue, Serbia responded that the emission factor used for the emission calculation was taken from the EMEP/EEA GB 2016 and that this information was not provided in the IIR. The ERT recommends Serbia to correct this in the next submission of the IIR in 2020. For accuracy and transparency reasons the ERT recommends Serbia to use the latest EMEP/EEA methodology for NMVOC emission calculations.

Category issue 4: 2.D.3.g Chemical products - NMVOC, Benzo(a)pyrene

134. During the review, the ERT noted that Serbia doesn't calculate the emissions of benzo(a)pyrene from asphalt blowing while the EMEP/EEA GB 2016 provides a tier 2 emission factor for benzo(a)pyrene emission calculation for asphalt blowing. Serbia responded that they are not sure that the emission factor is applicable to their country. The ERT accepts Serbia's response. The 2019 review is taken against the EMEP/EEA GB 2016, however, the ERT is aware that there will be changes in the 2019 version of the Guidebook for this sector. Therefore the ERT recommends that Serbia gets familiar with the updated methods from the 2019 Guidebook and uses those in the 2020 submission.

135. The ERT also noted that Serbia did not include all activities under the source category 2.D.3.g in the inventory, such as Polyester processing, Polyurethane foam processing, Polystyrene foam processing, Tyre production, Pharmaceutical products manufacturing and Adhesive, magnetic tapes, films and photographs manufacturing for which the EMEP/EEA GB 2016 provides a methodology for emissions calculation. The ERT finds this may have an impact on underestimating relevant pollutant emissions. To the question on the issue about the rationale for not including these activities in the inventory and to provide information on the existence of previously mentioned activities in the country for the period 1990 - 2017, as well as to include all new information in the IIR for the next submission, Serbia only answered that they will include all the non-estimated activities from category 2.D.3.g in the IIR's improvement plan. The ERT recommends Serbia to include it in the improvement plan and to make the necessary efforts to provide complete emission estimates for this category as soon as possible.

Category issue 5: 2.D.3.i, 2.G Other solvent and product use - NMVOC

136. The ERT commends Serbia for reporting activity data for lots of activities under source category 2.D.3.i. However, during the review the ERT noted that Serbia did not

include emission estimates for activities like Glass wool and Mineral wool enduction, Application of glues and adhesives, Use of Fireworks, Tobacco combustion, Other (Concrete additive, Cooling lubricant, Lubricant, Pesticide, Aeroplane de-icing Agent) for which methodologies are available in the EMEP/EEA GB 2016. The ERT notes this may have an impact on the underestimation of relevant pollutant emissions. To the question on the issue to provide the rationale for not including these activities in the inventory, Serbia responded that activity data for these activities are not currently available and that they will put this in the improvement plan. The ERT recommends Serbia to report on the existence of activities mentioned above in the IIR and to include them in the improvement plan for the next submission.

137. During the review the ERT noted that, according to a mapping table (name of Excel file: ConversionTableReporting Codes_October2015.xlsx, available on link: https://www.ceip.at/reporting_instructions) activities such as: Glass wool enduction, Mineral wool enduction, Fat, edible and non edible oil extraction, Application of glues and adhesives, Preservation of wood, Underseal treatment and conservation of vehicles and Vehicles dewaxing should be reported under category NFR 2.D.3.i. However, activities such as Use of fireworks, Use of tobacco, Use of shoes and Barbeque should be under 2.G category. After consulting, Serbia admitted that all activities were being reported under 2.D.3.i and they agreed to split them into 2.D.3.i and 2.G. The ERT recommends Serbia to separate these emissions into both categories and to report recalculations and changes performed in the IIR of the next submission.

AGRICULTURE

Review Scope

Pollutants Reviewed		SO _x , NO _x , NMVOC, NH ₃ , PM ₁₀ & PM _{2.5}		
Years		1990 - 2017		
Code	Name	Reviewed	Not Reviewed	Recommendation Provided
3B1a	Dairy cattle	X		X
3B1b	Non-dairy cattle	X		X
3B2	Sheep	X		X
3B3	Swine	X		X
3B4a	Buffalo	X		X
3B4d	Goats	X		X
3B4e	Horses	X		X
3B4f	Mules and asses	X		X
3B4gi	Laying hens	X		X
3B4gii	Broilers	X		X
3B4giii	Turkeys	X		X
3B4giv	Other poultry	X		X
3B4h	Other animals	X		X
3Da1	Inorganic N-fertilizers (includes also urea application)	X		X
3Da2a	Animal manure applied to soils	X		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		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		
3F	Field burning of agricultural residues	X		X
3I	Agriculture other	X		
11A	Volcanoes	NO		
11B	Forest fires		X	
Note: Where a sector has been partially reviewed (e.g. some of the NFR codes please indicate which have and which have not in the respective columns.				

General recommendations on cross cutting issues

Transparency

138. Serbia has provided a detailed and generally transparent emission inventory. Estimates are provided for most of the categories in the agriculture sector. The Party's methodology and emission factors in the IIR are considered by the ERT to be generally transparent. The ERT encourages the Party to include more details in the

IIR regarding the information on methodologies and emission factors and an explanation of the rationale for the selection the notation keys.

Completeness

139. The ERT considers the agriculture sector to be generally complete. However, the ERT noted that there are some categories and pollutants not covered by the current estimations as explained under sub-sector specific findings below, and recommends that the Party estimates and reports these emissions.

Consistency including recalculation and time series

140. In the IIR Serbia did not report any recalculation of emissions in this submission, but during the review, some recalculations were noted by the ERT. The ERT encourages the Party to explain all recalculations in the IIR.

Comparability

141. Serbia has used the Guidebook 2016 methodologies for almost all of its emission estimates and most of the methods are tier 1.

Accuracy and uncertainties

142. There might be an overestimation of manure management emissions for several pollutants as explained in the sub-sector specific recommendations below. The ERT recommends that the Party checks the methodology and recalculates emissions for the next submission.

143. Serbia did not report an uncertainty analysis of the agriculture sector. The ERT encourages the Party to carry out an uncertainty analysis for the agriculture sector in order to help inform the improvement process and to provide an indication of the reliability of the inventory data.

144. Serbia did not provide information on QA/QC procedures for the inventory. The ERT encourages the Party to implement sector-specific QA/QC procedures and include the information on these in the IIR.

Condensable

145. Serbia does not provide explanatory information in the IIR of whether PM_{2.5} emissions include or exclude the condensable component. The ERT recommends Serbia to include such information in the next submission following Annex II (v.2018) of the 2014 Reporting Guidelines.

Improvement

146. Serbia did not present information on planned improvements for the agriculture sector in its IIR. However, during the review, the Party expressed their intention to improve the estimates and their transparency in several categories for the next submission. The ERT welcomes these improvements and encourages the Party to describe the improvement plans in the IIR.

Sub-Sector Specific Recommendations

Category issue 1: 3.B Manure management, All animals - NMVOC - Accuracy

147. In the 2016 Stage 3 review report Serbia was encouraged to provide the rationale for the selection of emission factors for NMVOC for NFR 3.B - manure management “with silage feeding” in the IIR or to recalculate the emissions using a mix of with/without silage of the country taking into account possible changes of silage feeding in the time series. ERT noted that this is not implemented and recommends the Party to do this in its next submission.

Category issue 2: 3.B.1.b Manure management, Non Dairy Cattle - Particulate Matter - Accuracy

148. In the 2016 Stage 3 review report the ERT encouraged Serbia to recalculate emissions of particulate matter from NFR 3.B.1.b - manure management non-dairy cattle using emission factors which take the information provided in the Guidebook in the row “calves” into account. During the review, the Party indicated that it will be a part of the improvement plan for next submissions and that it will switch the methodology from EMEP/EEA 2013 to the EMEP/EEA GB 2016. The ERT welcomes the planned improvement.

Category issue 3: 3.D.1.a Inorganic N-fertilizers - All pollutants - Transparency

149. The ERT noted that in the 2012 and 2016 Stage 3 review report it was recommended that Serbia provides detailed information on the breakdown of the national fertiliser consumption into the relevant compounds in use. This information was not provided in the IIR. During the review, the Party informed the ERT that they do not have information on the distribution of the national fertilizer consumption into the relevant compounds in use, but will put this in the improvement plan for the next period and will include this information in the IIR when it gets the information. The ERT welcomes this improvement and encourages the Party to describe the plan for improvements in the IIR.

Category issue 4: 3.B Manure management, All animals - NH₃ - Transparency and Accuracy

150. The ERT noted that Serbia indicates that it uses a tier 2 methodology for emission of NH₃ from 3B manure management. The review showed that due to the lack of national parameters the methodology used is basically a tier 1 methodology. For key categories, a tier 2 Methodology should be used. The ERT recommends the Party to establish a work plan for estimating the national parameters used in the tier 2 methodology and to describe this in the IIR.

Category issue 5: 3.B.1.a and 3.B.1.b Manure management, Dairy and Non Dairy Cattle - NH₃ and NO_x - Accuracy

151. In the 2016 Stage 3 review report Serbia was encouraged to provide a rationale of the selection of the emission factors used for NRFs 3.B.1.a and 3.B.1.b - dairy and non-dairy cattle - from the Guidebook row “slurry”, in the IIR or to recalculate

with a mix of slurry and solid manure. This was not implemented but during the review, the Party indicated that this will be a part of the improvement plan for next submissions. The ERT welcomes this improvement.

Category issue 6: 3.D.a.2.a Animal manure applied to soils and 3.D.a.3 Urine and dung deposited by grazing animals - NH₃ - Completeness

152. The ERT noted that Serbia reports emissions of NH₃ from 3.D.a.2.a and 3.D.a.3 as “NE”. When using the excel calculation worksheet the emissions of NH₃ are divided into emissions from manure management, application and grazing. During the review, the Party informed the ERT that it will be a part of the improvement plan for next submissions. The ERT welcomes this improvement.

Category issue 7: 3.D.a.2.a Animal manure applied to soils - NO_x - Completeness

153. The ERT noted Serbia reports emissions of NO_x from 3.D.a.2.a as “NE”. For calculating NO_x from 3.D.a.2.a an estimation of N applied to soil should be used and multiplied with the emission factor given in table 3.1 in the chapter “3.D Crop production and agricultural soils” in the EMEP/EEA GB 2016. N applied to soil is estimated in the calculations in the excel calculation worksheet. During the review, the Party informed the ERT that it will be a part of the improvement plan for next submissions. The ERT welcomes this improvement.

Category issue 8: 3.D.a.3 Urine and dung deposited by grazing animals - NO_x - Completeness

154. The ERT noted Serbia reports emissions of NO_x from 3.D.a.3 as “NE”. For calculating NO_x from 3.D.a.3 an estimation of N deposited by grazing animals should be used and multiplied with the emission factor given in table 3.1 in chapter “3.D Crop production and agricultural soils” in the EMEP/EEA GB 2016. N deposited by grazing animals is estimated in the calculations in the excel calculation worksheet. During the review, the Party informed the ERT that it will be a part of the improvement plan for next submissions. The ERT welcomes this improvement.

Category issue 9: 3.F Field burning of agricultural residues

155. Serbia reports the emissions from NFR 3.F - field burning of agricultural residues as “NO” for all pollutants and years. In the IIR it is stated that the field burning of agricultural residues is legally restricted in Serbia. ERT encourages the Party to provide a reference for this in the IIR.

WASTE

Review Scope

Pollutants Reviewed		All pollutants		
Years		1990 - 2017		
Code	Name	Reviewed	Not Reviewed	Recommendation Provided
5A	Solid waste disposal on land	X		X
5B1	Biological treatment of waste - Composting	X		X
5B2	Biological treatment of waste - Anaerobic digestion at biogas facilities	X		X
5C1a	Municipal waste incineration	X		X
5C1bi	Industrial waste incineration	X		X
5C1bii	Hazardous waste incineration	X		X
5C1biii	Clinical waste incineration	X		X
5C1biv	Sewage sludge incineration	X		X
5C1bv	Cremation	X		
5C1bvi	Other waste incineration	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		X
5E	Other waste	X		X

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

General recommendations on cross cutting issues

Transparency

156. Serbia provides brief descriptions of the calculation of emissions in the IIR including some general references to activity data and emission factor sources. The ERT encourages the Party to explain the calculation methods, emission factors and data sources in more detail in the IIR.

Completeness

157. The inventory for the waste sector is not complete for all years and for all sub-categories. For the year 2017, 4 out of 15 sub-categories are reported for the waste sector.

Consistency, including recalculation and time series

158. Based on the information provided in the NFR tables and in the IIR the ERT concluded that the inventory for the waste sector is not completely consistent, because of the varying use of notation keys between the years reported. No further explanation is provided in the IIR. The ERT encourages Serbia to examine the use of notation keys and to provide explanations on their application in the IIR.

159. In the IIR, waste sector specific recalculations are not mentioned.

Comparability

160. The emissions estimates in the waste sector, except for emissions from 5.A solid waste disposal, are comparable to estimates of other Parties because the Guidebook 2016 methodology is used. For 5.D sub-sectors, the IIR mentions that EMEP/CORINAIR Guidebook 2007 emission factors have been used, however, after a question raised by the ERT, Serbia answered that the EMEP/EEA GB 2016 has been used. The ERT recommends Serbia to correct the explanations in its next IIR.

Accuracy and uncertainties

161. Serbia does not report an uncertainty analysis for the waste sector. Only a general overview for uncertainties is available. The ERT encourages the Party to establish an uncertainty analysis for the waste sector according to the EMEP/EEA GB 2016.

Condensable

162. Serbia did not provide explanatory information on condensable components of PM emissions for the waste sector in the IIR, there is no clear information of whether PM_{2.5} emissions include or exclude the condensable component. The ERT recommends Serbia to include such information in the next submission according to Annex II (v.2018) of the 2014 Reporting Guidelines.

Improvement

163. Serbia states in its IIR that it does not intend to perform any improvements in this sector. The ERT encourages the Party to consider the sub-sector specific recommendations as mentioned in the section below.

Sub-Sector Specific Recommendations

Category issue 1: 5.A. Solid waste disposal on land - NMVOC

164. Serbia reports NMVOC emissions from solid waste disposal on land. The ERT found the description of the calculation of the emissions not to be transparent and that the model (Ukrainian LFG model) used for landfill gas estimation does not provide a full overview of possible NMVOC emissions from solid waste disposal on land. The ERT encourages the Party to provide a more detailed explanation about the model used for landfill gas estimation, including the general assumptions of the model.

Category issue 2: 5.A. Solid waste disposal on land - PM_{2.5}, PM₁₀ and TSP

165. Serbia does not estimate PM_{2.5}, PM₁₀ and TSP emissions from solid waste disposal on land. The ERT recommends the Party to calculate PM_{2.5}, PM₁₀ and TSP emissions according to EMEP/EEA GB 2016 methodology using the annual amounts of waste disposed. The amount of waste disposed is one of the general figures in the waste planning process of every country. In the used Ukrainian model for landfill gas estimations from disposal sites, at least the amount of projected disposed waste should be available.

Category issue 3: 5.B.1- Biological treatment of waste - Composting

166. Serbia does not report emissions from composting. As household composting occurs in every European country, the ERT recommends the Party to establish data collection or an estimation system for composted waste amounts and to estimate and report the emissions using the methodology in the Guidebook. In the NFR tables Serbia uses the notation key "NO". Because emissions are not estimated, the ERT recommends to use notation key "NE".

Category issue 3: 5.B.2 - Biological treatment of waste - Anaerobic digestion at biogas facilities

167. Serbia does not report emissions from anaerobic digestions in biogas facilities. The notation key "NO" is used instead. According to internet sources (http://www.bioenergy-serbia.rs/images/documents/studies/Biogas_Market_in_Serbia_Asessement_2014.pdf) anaerobic digestion takes place in Serbia. The ERT encourages Serbia to calculate emissions from anaerobic digestion according to the EMEP/EEA GB 2016. If activity data are not possible to obtain, then the notation key "NE" should be used.

Category issue 4: 5.D.2 Industrial Waste water handling - NMVOC

168. Serbia reports NMVOC emissions as "0" from industrial wastewater handling for the years 1990-2003. The ERT recommends calculating real emissions or the use of the notation key "NE". Furthermore, more detailed explanations from Serbia about data sources and availability would be appreciated in the next IIR.

169. According to the CEIP Data Reviewer Tool NMVOC emissions from industrial waste waters decrease from year 2004. The ERT encourages the Party to explain this decrease of emissions in the next IIR.

Category issue 5: 5.D.1 Domestic Wastewater handling - NH₃

170. During the review the ERT raised questions about emission calculations in this sector. Serbia does not provide a clear description of the methodology used in the calculation of emissions. The ERT recommends the Party to provide a detailed description in the IIR about the methodology used in emissions calculations and activity data acquisition. Data about inhabitant's connection to centralised wastewater treatment systems should be provided.

Category issue 6: 5.C - Waste incineration

171. Serbia reports "NO" for most of the waste incineration sub-categories. The ERT recommends the Party to investigate the existence of these sources in the country and to estimate and report emissions from existing sources using the EMEP/EEA GB 2016 methodologies.

Category issue 7: 5.C.2 - Open burning of wastes

172. During the review, the ERT raised questions about the data availability of open burning. Serbia responded that such kind of action is prohibited by law. Serbia does not report emissions from the open burning of wastes, instead notation key "NE" is

used. The ERT encourages the Party to investigate the existence of the activity in the country and to estimate and report emissions for the next submission.

Category issue 8: 5.E - Other waste

173. Serbia reports “NO” for category 5.E. According to EMEP/EEA GB 2016, accidental fires could be included in this sector. During the review, the ERT raised a question regarding fires emissions to the Party. The Party responded that there is room for inventory improvements. The ERT encourages Serbia to gather data about accidental fire and to calculate these emissions for next submissions. If precise data for accidental fires is not possible to obtain, then an average number of fires per inhabitant from neighbouring countries could be used. Meanwhile, the ERT recommends the use of the notation key “NE”.

INFORMATION submitted by the Party in 2019

Filename	Short description of content
CLRTAP_NFRtable_Version_2.0.xlsx	Annex I, MS Excel file , years 2016, 2017
CLRTAP_Serbia_IIR_2017_14032019.pdf	IIR 2019, pdf-document ; 188 pg

LIST OF ADDITIONAL MATERIALS PROVIDED BY THE COUNTRY DURING THE REVIEW

1. Response to preliminary question raised prior to the review (wiki)
2. Response to questions raised during the review week (wiki)
3. Excel file: Info on Fuel consumption (confidential)

ANNEX I POTENTIAL TECHNICAL CORRECTIONS

No potential technical corrections were identified during the review.