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**Report for the Stage 3 *ad-hoc* review of emission
inventories submitted under the UNECE LRTAP
Convention:**

2023

Finland

FINAL REPORT

CONTENT

| | |
|---|----|
| INTRODUCTION | 3 |
| PART B: SPECIFIC RECOMMENDATIONS FOR THE SECTOR AGRICULTURE..... | 5 |
| PART C: SPECIFIC RECOMMENDATIONS FOR THE GRIDDED EMISSION DATA FOR THE SECTOR AGRICULTURE..... | 8 |
| REVISED ESTIMATES AND TECHNICAL CORRECTIONS CONSIDERED AND/OR CALCULATED BY ERT | 9 |
| LIST OF MATERIALS PROVIDED TO ERT..... | 10 |
| LIST OF ADDITIONAL MATERIALS PROVIDED BY THE COUNTRY DURING THE REVIEW | 10 |
| ANNEX I TECHNICAL CORRECTIONS AND REVISED ESTIMATES | 11 |
| ABBREVIATIONS..... | 12 |
| LIST OF REFERENCES AND SUPPORTING DOCUMENTS..... | 14 |

INTRODUCTION

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

2. Paragraph 7 (c) of the 'Review Guidelines 2018' defines that Stage 3 Reviews may be annual centralized reviews or ad hoc reviews. Paragraph 18 of the 'Review Guidelines 2018' further specifies that such ad hoc reviews could, for instance, focus on specific source sectors, specific pollutants such as heavy metals or persistent organic pollutants, gridded and projections data, or on other areas as requested by the Implementation Committee and that where appropriate, ad hoc reviews could be conducted in line with the present Methods and Procedures for the In-depth (Stage 3) review.

3. At its eighth joint session in September 2022, the Steering Body and the Working Group on Effects approved the plan that the in-depth review in 2023 focuses on emissions from agriculture with a special emphasis on ammonia, NMVOC and NO_x emissions including gridded data. While the focus was set on NH₃, NMVOC and NO_x emissions, also all other pollutants covered by LRTAP Convention and its protocols (i.e. SO₂, NO_x, NMVOC, NH₃, plus PM₁₀, PM_{2.5}, BC, priority HMs and POP_S) have been checked for the time series years 1990 – 2021 to the extent possible. For these other pollutants especially completeness of reporting was assessed.

4. This report covers the results of the Stage 3 Review (ad hoc review) 2023 of Finland's air emission inventory submitted under the UNECE LRTAP Convention. The review was coordinated by the EMEP Centre on Emission Inventories and Projections (CEIP) acting as Review Secretariat. The review took place between April and June 2023 and was performed as a desk review between 31 March to 5 May 2023 and an in-person meeting between 22 of May 2023 and 26 May 2023 (centralized review). The following team of nominated experts from the Roster of Experts performed the review.

Agriculture experts:

Ms. Armine ARTENYAN (Republic of Armenia)

Ms. Ajla BASOVIC (Montenegro)

Ms. Aleksandra NESTOROVSKA-KRSTESKA (North Macedonia)

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

Mr. Lasha AKHALAIA (Georgia)

Mr. Hakam AL-HANBALI (Sweden)

Ms. Susana LOPEZ-APARICIO (EU/ETC(EEA))

Ms. Simone MAYER (Austria)

Ms. Andjelka RADOSAVLJEVIC (Serbia)

Ms. Kristina Tonhauzer (Slovakia)

Mr. Tim VAN DER ZEE (Netherlands)

Experts for gridded emission data:

Ms. Christine BRENDLE (Austria)

Mr. Christopher EVANGELIDES (United Kingdom)

Mr. Christian MIELKE (Germany)

Mr. Ben RICHMOND (United Kingdom), Ms. Rikke ALBREKTSEN (Denmark), Mr. Etienne MATHIAS (France), Ms. Kristina SAARINEN (Finland) were the lead reviewers. The review was coordinated by Ms. Sabine Schindlbacher and Mr. Bernhard Ullrich (EMEP Centre on Emission Inventories and Projections - CEIP).

5. The review was performed on the basis of CLRTAP emission data officially reported by Finland, due by 15 February 2023. The Informative Inventory Reports (IIR), reported due by 15 March 2023 under the CLRTAP, informed the review.

6. The EMEP/EEA Guidebook 2019² was used as a base for the review.

7. The emission inventory of Finland was received on 14 February 2023 and thus by the deadline of 15 February. The Informative Inventory Report was received on 14 March 2023 and thus by the deadline of 15 March.

² EMEP/EEA: EMEP/EEA air pollutant emission inventory guidebook 2019, EEA Report No. 13/2019 European Environment Agency, Copenhagen. Available at: <https://www.eea.europa.eu/publications/emep-eea-guidebook-2019> EU 2019

PART A: GENERAL RECOMMENDATIONS FOR THE CHAPTER AGRICULTURE

8. The ERT recognises the level of effort undertaken by Finland in providing an inventory including a significant level of detail.

The IIR describes the methods used for the sector agriculture transparently. The ERT considers the agriculture part of the inventory submission to be of very good quality in terms of completeness and of very good quality in terms of accuracy, comparability and consistency.

To improve the overall quality of the agriculture air emission inventory the ERT encourages Finland to enhance its quality procedures in order to avoid update mistakes and ensure consistency between NFR tables and IIR.

Finland collected new data on manure management practices in a survey in early 2021 (Agricultural Census 2020). The ERT commends Finland for its efforts and encourages to keep on conducting surveys and collecting data on the agricultural practice in order to keep the high quality of the inventory.

PART B: SPECIFIC RECOMMENDATIONS FOR THE SECTOR AGRICULTURE

9. Table 1 provides the findings from the 2023 CLRTAP Stage 3 Review including those not implemented from previous CLTRAP Stage 3 Reviews. While the focus was set on NH₃, NMVOC and NO_x emissions, also all other pollutants covered by the LRTAP Convention and its protocols (i.e. SO₂, NO_x, NMVOC, NH₃, plus PM₁₀ PM_{2.5}, BC, priority HMs and POP_s) have been checked for the years 1990 – 2021 to the extent possible, especially regarding the completeness of reporting. The implementation of the recommendations will be followed up in a future CLRTAP inventory review.

Table 1: Findings from the CLRTAP Stage 3 Review 2023 for the Sector Agriculture³

| ID | Pollutants | NFR category | Key Category | Tier level | Type | TAC ₁ C ₂ C ₃ |
|---|------------|------------------|------------------|------------|------|--|
| Finland-2023-3B-1 | NMVOG | 3B1a, 3B1b, 3B4e | Yes (3B1a, 3B1b) | T2 | R | T |
| <p>Observation The ERT noted that small recalculations of NMVOG emissions for NFR categories 3B1a (2018-2020), 3B1b (2019, 2020) and 3.B.4.e (nearly entire time series) were not described in the IIR (p. 47, 48). During the review Finland provided detailed information on the recalculations and informed the ERT that both issues will be documented in the next IIR.</p> <p>Recommendation The ERT recommends Finland to describe recalculations transparently in its IIR for future submissions.</p> | | | | | | |
| ID | Pollutants | NFR category | Key Category | Tier level | Type | TAC ₁ C ₂ C ₃ |
| Finland-2023-3D-1 | PM | 3Da1 | No | - | R | C ₂ |
| <p>Observation For PM emissions from category 3Da1 the notation key IE is reported in the NFR. This issue was already questioned in the previous CLRTAP Review and it was recommended that Finland reports the notation key “NE” for TSP, PM₁₀ and PM_{2.5} emissions from NFR category 3Da1. During the review Finland explained that the notation key will be changed to NE in the next submission.</p> | | | | | | |

³ Note: There are four possible types of findings: R: Recommendation, TC: Technical Correction, PTC: Potential Technical Correction; RE : Revised Estimate

The findings have been assigned to one or more of the following criteria: TACCC T (Transparency), A (Accuracy), C₁ (Completeness), C₂(Comparability), C₃ (Consistency) for definitions of these criteria see EMEP/EEA Guidebook 2019

Recommendation

The ERT recommends Finland to change the notation key from “IE” to “NE” for TSP, PM₁₀ and PM_{2.5} emissions from NFR category 3.D.a.1.

| ID | Pollutants | NFR category | Key Category | Tier level | Type | TAC ₁ C ₂ C ₃ |
|-------------------|-----------------------------------|--------------|--------------|--|------|--|
| Finland-2023-3D-2 | NH ₃ , NO _x | 3Da1 | Yes | T2 (NH ₃), T1 (NO _x) | R | AC ₃ |

Observation

The ERT noted that for NFR category 3Da1 NH₃ and NO_x emission values are exactly the same for 2020 and 2021. The amount of mineral fertilizer reported in the NFR for 2021 equals also the value for 2020. However, this is not consistent with the values in Table 5.26 of the IIR. During the review Finland explained that the emission values for 2021 have not been updated in the NFR table and that the values in the IIR are the correct ones. The ERT was informed that this issue will be corrected in the next reporting.

Recommendation

The ERT recommends Finland to update emissions values for NH₃ and NO_x of NFR category 3.D.a.1 in the NFR tables for the next submission and to strengthen its quality procedures in order to avoid update mistakes.

| ID | Pollutants | NFR category | Key Category | Tier level | Type | TAC ₁ C ₂ C ₃ |
|--------------------|-----------------|--------------|--------------|------------|------|--|
| Finland-2023-5B2-1 | NH ₃ | 5B2 | No | T2 | R | T |

Observation

The ERT noted, that in the waste chapter of the IIR it is described that the digestion of manures is calculated separately from the digestion of other organic wastes and of energy crops, because the manure calculation in 5B2 is linked with the calculation of manure management (3.B) and manure application (3Da2a). During the review Finland provided the calculations and informed the ERT that it would be possible to add this kind of additional information on nitrogen flows in the Agriculture chapter for future submissions.

Encouragement

The ERT encourages Finland to include additional information on nitrogen flows (e.g. N amounts digested) of NFR category 5B2 in the IIR chapter on Agriculture in order to increase transparency in future submissions.

PART C: SPECIFIC RECOMMENDATIONS FOR THE GRIDDED EMISSION DATA FOR THE SECTOR AGRICULTURE

For the 2023 Review of the gridded emission data the focus was set on ammonia, NMVOC, NO_x and PM_{2.5} emissions.

10. The methods used by Finland to grid sectoral emissions are described transparently in the IIR.

11. The description includes data sources that have been used for spatial distribution.

12. Gridded emissions reported for GNFR K_AgriLivestock and L_AgriOther are consistent with the corresponding NFR categories reported in Annex I.

13. There are no additional comments.

REVISED ESTIMATES AND TECHNICAL CORRECTIONS CONSIDERED AND/OR CALCULATED BY ERT

14. In the Appendix of the 'EMEP/UNECE Review Guidelines 2018'⁴ it is stated that if the ERT considers that emissions are significantly under- or overestimated, the Party is during the review invited to submit 'Revised Estimates' that address the issue raised. Should the Party decline to do this, or should it not be possible to agree on the quantification of a Revised Estimate i.e. the ERT does not accept a Revised Estimate provided by the Party, the ERT may calculate a 'Technical Correction'. The threshold for significance for a Technical Correction for the in-depth review in 2023 was set at 2% of the national total, i.e. a finding that has been identified to result in an over- or underestimate of emissions of more than 2% of the national total. The methods for calculating Technical Corrections are set up in the 'EMEP/UNECE Review Guidelines 2018' and use the EMEP/EEA Emission 'Inventory Guidebook' as a reference for methods and emission factors.

15. The ERT did not calculate any Technical Corrections and Finland did not provide any Revised Estimates.

⁴ https://www.ceip.at/fileadmin/inhalte/ceip/3_review/advance_version_ece_eb.air_142_add.1.pdf

LIST OF MATERIALS PROVIDED TO ERT

1. Finland Annex I reporting template
2. Finland Stage 2 S&A report
3. Finland Stage 1 report 2023
4. Finland IIR 2023
5. Repdab-Report
6. Extended checks

LIST OF ADDITIONAL MATERIALS PROVIDED BY THE COUNTRY DURING THE REVIEW

1. Responses to the question raised by ERT during the review
2. Material received from the Party during the Review:
 - Calculation Sheet of NFR category 5B2 for NH3
 - Link to national documentation and calculation system "Calculation of atmospheric nitrogen and NMVOC emissions from Finnish agriculture
https://helda.helsinki.fi/bitstream/handle/10138/229364/SYKEre_37_2017.pdf?sequence=1&isAllowed=y

ANNEX I TECHNICAL CORRECTIONS AND REVISED ESTIMATES

16. The ERT did not calculate any Technical Corrections and Finland did not provide any Revised Estimates.

ABBREVIATIONS

This list includes abbreviations commonly used in the Review Reports

| | |
|------------------|--|
| AD | Activity data |
| BaP | Benzo[a]pyrene |
| BC | Black Carbon |
| C | Confidential |
| Cd | Cadmium |
| CEIP | Centre on Emission Inventories and Projections |
| CLRTAP | Convention on Long-range Transboundary Air Pollution – ‘the Air Convention’ |
| CO | Carbon Monoxide |
| E-PRTR | European Pollutant Release and Transfer Register |
| EEA | European Environment Agency |
| EF | Emission factor |
| EMEP | The co-operative programme for monitoring and evaluation of the long-range transmission of air pollutants in Europe (unofficially ‘European Monitoring and Evaluation Programme’ = EMEP) |
| ERC | Emission Reduction Commitment |
| ERT | Expert Review Team |
| GHG | Greenhouse gas |
| GIS | Geo Information System |
| GNFR | NFR Aggregation for Gridding and LPS |
| HCB | Hexachlorobenzene |
| Hg | Mercury |
| HM | Heavy metals |
| IEF | Implied emission factor |
| kt | Kilotonnes |
| LPS | Large Point Sources |
| NA | Not applicable |
| NE | Not Estimated |
| NECD | National Emission reduction Commitments Directive |
| NFR | Nomenclature for reporting |
| NH ₃ | Ammonia |
| NMVOG | Non-methane volatile organic compounds |
| NO | Not Occuring |
| NO _x | Nitrogen oxides |
| NR | Not relevant/Not Reported |
| PAHs | Polycyclic aromatic hydrocarbons |
| Pb | Lead |
| PCB | Polychlorinated biphenyls |
| PCDD/F | Polychlorinated dibenzo-p-dioxins and dibenzofurans |
| PM ₁₀ | Fine particulate matter: particles with an aerodynamic diameter equal to or less than 10 micrometres (µm) |

| | |
|-------------------|--|
| PM _{2.5} | Fine particulate matter: particles with an aerodynamic diameter equal to or less than 2.5 micrometres (µm) |
| POPs | Persistent organic pollutants |
| PTC | Potential technical correction |
| RE | Revised estimate |
| SO ₂ | Sulphur dioxide |
| SO _x | Sulphur oxides |
| TC | Technical correction |
| TSP | Total suspended particulates |

LIST OF REFERENCES AND SUPPORTING DOCUMENTS

1. Annex I emission reporting template. Available at <https://www.ceip.at/reporting-instructions>
2. ECE/EB.AIR/111/Add.1: Decision 2012/3: Adjustments under the Gothenburg Protocol to emission reduction commitments or to inventories for the purposes of comparing total national emissions with them
https://unece.org/DAM/env/documents/2013/air/ECE_EB.AIR_111_Add.1_ENG_DE_CISION_3.pdf
3. ECE/EB.AIR/113/Add.1: Decision 2012/12: Guidance for adjustments under the 1999 Protocol to Abate Acidification, Eutrophication and Ground-level Ozone to emission reduction commitments or to inventories for the purposes of comparing total national emissions with them
https://unece.org/DAM/env/documents/2012/EB/Decision_2012_12.pdf
4. ECE/EB.AIR/125: 2014 Reporting Guidelines for Estimating and Reporting Emission Data under CLRTAP
https://unece.org/fileadmin/DAM/env/documents/2013/air/eb/ece.eb.air.125_E_ODS.pdf
5. ECE/EB.AIR/127/Add.1: Decision 2014/1: Improving the guidance for adjustments under the 1999 Protocol to Abate Acidification, Eutrophication and Ground-level Ozone to emission reduction commitments or to inventories for the purposes of comparing total national emissions with them
https://unece.org/DAM/env/documents/2014/AIR/EB/Decision_2014_1.pdf
6. ECE/EB.AIR/130: Technical Guidance for Parties Making Adjustment Applications and for the Expert Review of Adjustment Applications, 14 April 2015
https://unece.org/DAM/env/documents/2014/AIR/EB/ECE_EB_AIR_130_ENG.pdf
7. [ECE/EB.AIR/142/Add.1: Decision 2018/1: Updated methods and procedures for the technical reviews of air pollutant emission inventories reported under the Convention](https://www.ceip.at/fileadmin/inhalte/ceip/00_pdf_other/2019/decision_2018_1_advance_version_ece_eb.air_142_add.1.pdf)
https://www.ceip.at/fileadmin/inhalte/ceip/00_pdf_other/2019/decision_2018_1_advance_version_ece_eb.air_142_add.1.pdf
8. EMEP/EEA: EMEP/EEA air pollutant emission inventory guidebook 2016, EEA Report No. 21/2016 European Environment Agency, Copenhagen. Available at: <http://www.eea.europa.eu/publications/emep-eea-guidebook-2016>
9. EMEP/EEA: EMEP/EEA air pollutant emission inventory guidebook 2019, EEA Report No. 13/2019 European Environment Agency, Copenhagen. Available at: <https://www.eea.europa.eu/publications/emep-eea-guidebook-2019>
10. TFEIP (2022): "Inventory adjustments in the context of emission reduction commitments (ERC)" available at: https://www.ceip.at/fileadmin/inhalte/ceip/00_pdf_other/2022/technical_guidance_for_erc_adjustments_issue1.1.pdf