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

**2023**

**HUNGARY**

**FINAL REPORT**

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# 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'<sup>(1)</sup> – 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<sub>x</sub> emissions including gridded data. While the focus was set on NH<sub>3</sub>, NMVOC and NO<sub>x</sub> emissions, also all other pollutants covered by LRTAP Convention and its protocols (i.e. SO<sub>2</sub>, NO<sub>x</sub>, NMVOC, NH<sub>3</sub>, plus PM<sub>10</sub> PM<sub>2.5</sub>, BC, priority HMs and POP<sub>S</sub>) 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 Hungary'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)

Mr. Lasha AKHALAIA (Georgia)

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<sup>1</sup> 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](http://www.unece.org/fileadmin/DAM/env/documents/2002/eb/air/EB%20Decisions/Decision_2018_1.pdf)

Mr. Hakam AL-HANBALI (Sweden)

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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)

5. 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).

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

7. The EMEP/EEA Guidebook 2019<sup>2</sup> was used as a base for the review.

8. The emission inventory of Hungary was received on 15 February 2023 and thus by the deadline of 15 February. The Informative Inventory Report was received on 21 March 2023 and thus after the deadline of 15 March. Hungary provided a resubmission of the emission inventory on 21 March 2023. The resubmission has been considered for the review.

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<sup>2</sup> EMEP/EEA: EMEP/EEA 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**

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

The IIR does not describe the methods used for the sector agriculture transparently enough. The ERT considers the agriculture part of the inventory submission to be of adequate quality in terms of completeness and of adequate quality in terms of accuracy, comparability and consistency.

To improve the overall quality of the agriculture air emission inventory the ERT recommends Hungary to

- provide a chapter on the status of implementation of CLRTAP S3 review recommendations (and if applicable on NECD review recommendations in chapter 8.3 in Annex II of the Reporting Guidelines)
- provide information on the progress with clear steps and a schedule for the implementation if recommendations have not been (fully) implemented as required in chapter 8.3 in Annex II of the Reporting Guidelines
- apply a Tier 2 for the key category 3De for NMVOC
- provide transparent information on all recalculations in the IIR
- ensure that the time series are consistent and justify possible fluctuations in the IIR
- provide documentation in the IIR of the methods used in the preparation of the gridded data

## **PART B: SPECIFIC RECOMMENDATIONS FOR THE SECTOR AGRICULTURE**

10. 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 NH<sub>3</sub>, NMVOC and NO<sub>x</sub> emissions, also all other pollutants covered by the LRTAP Convention and its protocols (i.e. SO<sub>2</sub>, NO<sub>x</sub>, NMVOC, NH<sub>3</sub>, plus PM<sub>10</sub> PM<sub>2.5</sub>, BC, priority HMs and POP<sub>s</sub>) 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 Agriculture<sup>3</sup>**

ID	Pollutants	NFR category	Key Category	Tier level		Type	TAC <sub>1</sub> C <sub>2</sub> C <sub>3</sub>
Hungary-2023-3B-1	NH <sub>3</sub>	3B1b	Yes	Tier 2		R	T
	<p><b>Observation</b>                      The ERT noted with reference to the 2014 Stage 3 inventory review, that the recommendation to include information on the IEF for non-dairy cattle was partially implemented regarding the housing period but not on the regulation on housing spreading. Hungary did not respond to the question of their plan to fully implement this recommendation.</p> <p><b>Recommendation</b>                      The ERT recommends Hungary to include information on the regulation on housing spreading in in the next IIR.</p>						

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<sup>3</sup> 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), C<sub>1</sub> (Completeness), C<sub>2</sub> (Comparability), C<sub>3</sub> (Consistency) for definitions of these criteria see EMEP/EEA Guidebook 2019

ID	Pollutants	NFR category	Key Category	Tier 1 used for KC		Type	TAC <sub>1</sub> C <sub>2</sub> C <sub>3</sub>
Hungary-2023-0-1	NH <sub>3</sub>	General	/	/		R	T
	<p><b>Observation</b> ERT noted that one of the planned improvements is a general uncertainty evaluation. Hungary has not included NH<sub>3</sub> in the planned evaluation mentioned on page 17 of its IIR. Hungary did not respond the question on the issue.</p> <p><b>Recommendation</b> <b>The ERT recommends the Party to include NH<sub>3</sub> in the planned general uncertainty evaluation.</b></p>						
ID	Pollutants	NFR category	Key Category	Tier level		Type	TAC <sub>1</sub> C <sub>2</sub> C <sub>3</sub>
Hungary-2023-3B-2	NH <sub>3</sub>	3B3	Yes	Tier 2		R	T
	<p><b>Observation</b> The IIR does not provide information on the reasons for recalculating PM emissions from NFR category 3B3. Hungary did not respond the question on the reasons behind this recalculation</p> <p><b>Recommendation</b> <b>To enhance transparency of its IIR, the ERT encourages the Party to include justifications for recalculations in the next submission.</b></p>						

ID	Pollutants	NFR category	Key Category	Tier level		Type	TAC <sub>1</sub> C <sub>2</sub> C <sub>3</sub>
Hungary-2023-3D-1	NMVOG	3De	Yes	Tier 1		R	T
	<p><b>Observation</b> The ERT noted with reference to the Stage 2 review report on the CEIP website a dip in NMVOG emissions time series for the period 1999-2000. Hungary did not respond the question on the issue.</p> <p><b>Recommendation</b> <b>To increase the transparency of the inventory the ERT recommend Hungary to include information for all fluctuations in emissions time series in the next IIR submission.</b></p>						
ID	Pollutants	NFR category	Key Category	Tier level		Type	TAC <sub>1</sub> C <sub>2</sub> C <sub>3</sub>
Hungary-2023-3D-2	NO <sub>x</sub>	3Da2a	Yes	Tier 1		R	T
	<p><b>Observation:</b> The ERT noted with reference to the Stage 2 review report available on the following available on the CEIP website, a jump in NO<sub>x</sub> emissions time series for the period 1990-1991. Hungary did not respond to the question on the issue.</p> <p><b>Recommendation</b> <b>The ERT recommends the Party to include information on the reasons behind fluctuations in the time series in the next IIR submission.</b></p>						



ID	Pollutants	NFR category	Key Category	Tier level		Type	TAC <sub>1</sub> C <sub>2</sub> C <sub>3</sub>
Hungary-2023-3B-3	NOx	3B1b	No	Tier 2		R	T/A
	<p><b>Observation</b> The ERT noted within Table 5.8 presented on page 167 of the IIR that there was a jump of around 235% for mature non-dairy population between 2020 and 2021, and that no explanation was provided for the jump. Hungary did not respond the question on the issue.</p> <p><b>Recommendation</b> <b>The ERT recommends the Party to include information on the reasons behind fluctuations in the timeseries in the next IIR submission.</b></p>						
ID	Pollutants	NFR category	Key Category	Tier level		Type	TAC <sub>1</sub> C <sub>2</sub> C <sub>3</sub>
Hungary-2023-3D-3	NMVOG	3De	Yes	Tier 1		R	A
	<p><b>Observation</b> The ERT noted that 3De Cultivated crops is a key category for NMVOG emissions and that a Tier 1 methodology is used. In line with Reporting Guidelines paragraph 21 Parties should make every effort to use a Tier 2 or higher (detailed) methodology, including country-specific information. Hungary did not respond to the question of its plans of moving to higher Tier methods.</p> <p><b>Recommendation</b> <b>The ERT recommends the Party to collect activity data needed for a Tier 2 methodology and to estimate and report the emissions in the next submission using a Tier 2 methodology.</b></p>						

## **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<sub>x</sub> and PM<sub>2.5</sub> emissions.

11. The methods used by Hungary to spatially resolve sectoral emissions are not described in the IIR.
12. No information on data sources that have been used for spatial distribution is included in the IIR.
13. Gridded emissions reported for e.g. GNFR K\_AgriLivestock and L\_AgriOther are consistent with the corresponding NFR categories reported in Annex I.
14. Table 2 provides the findings from the ERT related to the gridded data.
15. The implementation of the recommendations will be followed up in a future CLRTAP inventory review.

**Table 2: Findings from the CLRTAP stage 3 review 2023 for gridded emissions from the sector agriculture<sup>4</sup>**

ID	Pollutants	GNFR category	TAC <sub>1</sub> C <sub>2</sub> C <sub>3</sub>
Hungary-2023-GRID-GL-1	All	GNFR-L	
<p><b>Observation</b>                      The expert review team notes that there is no description regarding the methodologies and assumptions used to generate the gridded data. The IIR does not contain a chapter outlining the methods used to generate the gridded estimates as outlined in Annex II of the reporting guidelines.</p> <p><b>Recommendation</b>                      The expert review team recommends Hungary to add the missing chapter on methodologies used for the gridding of emissions data and to include the assumptions and methods used for LPS and gridded data in the IIR of the next submission.</p>			

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<sup>4</sup> The findings have been assigned to one or more of the following criteria: TACCC T (Transparency), A (Accuracy), C<sub>1</sub> (Completeness), C<sub>2</sub> (Comparability), C<sub>3</sub> (Consistency) for definitions of these criteria see EMEP/EEA Guidebook 2019

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

16. The ERT did not identified any significant inconsistencies in the inventories and hence, did not propose any Technical Corrections and Hungary did not provide any Revised Estimates.

## **LIST OF MATERIALS PROVIDED TO ERT**

1. Hungary Annex I reporting template
2. Hungary Stage 2 S&A report
3. Hungary Stage 1 report 2023
4. Hungary IIR 2023,2016
5. Repdab-Report
6. Report for the Stage 3 in-depth review of emission inventories submitted under the UNECE LRTAP Convention and EU NEC Directive for Hungary, September 2014

## **LIST OF ADDITIONAL MATERIALS PROVIDED BY THE COUNTRY DURING THE REVIEW**

No additional information was provided by Hungary either before or during the review

## **ANNEX I TECHNICAL CORRECTIONS AND REVISED ESTIMATES**

Hungary provided no Revised Estimates and the TERT did not calculate any Potential Technical Corrections.

## 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 <sub>3</sub>	Ammonia
NMVOG	Non-methane volatile organic compounds
NO	Not Occuring
NO <sub>x</sub>	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 <sub>10</sub>	Fine particulate matter: particles with an aerodynamic diameter equal to or less than 10 micrometres (µm)

PM <sub>2.5</sub>	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 <sub>2</sub>	Sulphur dioxide
SO <sub>x</sub>	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](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](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](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](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](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](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](https://www.ceip.at/fileadmin/inhalte/ceip/00_pdf_other/2022/technical_guidance_for_erc_adjustments_issue1.1.pdf)