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

**2023**

**GREECE**

**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 Greece'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)

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)

5. Mr. Ben RICHMOND (United Kingdom), Ms. Rikke ALBREKTSSEN (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 the basis of CLRTAP emission data officially reported by Greece, 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 Greece was received on 16 February 2023 and thus one day after the deadline of 15 February. The Informative Inventory Report was received on 13 March 2023 and thus by the deadline of 15 March. Greece provided two successive resubmissions of the emission inventory, on 3 March 2023 and 13 March 2023. These resubmissions have been considered for the review.

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<sup>2</sup> 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**

9. The ERT recognises the level of effort undertaken by Greece 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 recommends Greece to

- apply a Tier 2 or higher method to all key categories.
- use the latest available version of the EMEP/EEA air pollutant emission inventory guidebook 2019.
- ensure that the agriculture emission inventory is complete.
- Provide necessary information on 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>
GR-2023-3D-1	HCB	3Df	No	Indeterminate	R	T

**Observation**

The ERT noted in the IIR (p136) that "most of the pesticides listed in the EMEP/EEA methodology are banned in Greece" and that "the collection of relevant data on the consumption of these pesticides has not been carried out because there is no systematic recording of their consumption and for this reason Greece reports emissions as "NE", until the moment when official consumption data is available ». However, the ERT stated that in the NFR tables for category 3Df, the reported notification keys are "NA" and "NO". It was not clear whether pesticide use was prohibited for the entire time series. If this activity is not reported due to lack of data collection, then a "NE" notification key would be more appropriate in the NFR tables. During the review, Greece explained that most pesticides were banned for use in Greece before 2010. After 2010, the only pesticides that have not been banned to this day are those containing clopyralid. However, the collection of relevant data on the consumption of these pesticides was not carried out because there is no systematic recording of their consumption.

**Recommendation**

The ERT recommends Greece to change the notification keys "NA" and "NO" in NFR tables for HCB emissions from category 3Df and to put the notification key "NE" in the next submission.

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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 level	Type	TAC <sub>1</sub> C <sub>2</sub> C <sub>3</sub>
GR-2023-3B-1	NH <sub>3</sub> , NO <sub>x</sub> , NMVOC, TSP, PM <sub>10</sub> , PM <sub>2.5</sub>	3B4	No	Indeterminate	R	AC <sub>2</sub>

**Observation**

The ERT noted that Greece applied a Tier 2 methodology for NH<sub>3</sub> emissions from category 3B4g (laying hens and broilers) and that a Tier 1 methodology from the EMEP/EEA 2016 guide was applied for other poultry emissions although the latest EMEP/EEA Guidebook 2019 provides information on emission factors for a Tier 1 method. During the review, Greece explained that the total emissions from these categories are below 1.18% of the total NH<sub>3</sub> emissions for 2021 and that, as part of the improvement of the inventory, it will investigate the issue of improving the relevant methodologies based on the EMEP/EEA 2019 Guidebook in the next submission.

**Recommendation**

The ERT recommends Greece to use emission factors from the latest version of EMEP/EEA 2019 Guidebook in the next submission for all categories of animals.

ID	Pollutants	NFR category	Key Category	Tier level	Type	TAC <sub>1</sub> C <sub>2</sub> C <sub>3</sub>
GR-2023-3B-2	NMVOC	3B4gii	Yes	Tier 1	R	C <sub>2</sub>

**Observation**

The ERT noted that for category 3B4gii Manure Management – Broilers, NMVOCs, Greece uses a Tier 1 method while it is a key category. During the review Greece indicated that they will investigate the possibility to improve the methodology approach on the estimation of NMVOC emissions from 3B4gii Manure management - Broilers to Tier 2 as per EMEP/EEA 2019 Guidebook and that more information will be provided in the next submission.

**Recommendation**

The ERT recommends Greece to apply the Tier 2 Method from the EMEP/EEA 2019 for NMVOCs emission from category 3B4gii Manure Management – Broilers.



## **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 Greece to grid sectoral emissions are not described transparently in the IIR as Greece does not provide an IIR chapter. According to the first reply of Greece to the ERT question Greece is only planning to implement a gridding chapter in future IIR submissions.

12. Therefore, the main sources of data used for the gridding in Greece are not transparent to the ERT. However, Greece stated that the gridding was based on a government report: "Mapping of Atmospheric Pollution in Greece. Implementation of air pollutants measurements and chemical analyses, development of emission inventories and application of 3-D atmospheric models", which was elaborated by the Ministry of Environment and ENERGY (MEEN) in 2015, as stated by Greece. The ERT have requested access to this report to bridge the transparency gap between the current status and the implementation of a gridding chapter in the future. Greece sent the related document but it could not be used efficiently by the ERT as it was in Greek.

13. Gridded emissions reported for 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> [an example of a possible recommendation]**

ID	Pollutants	GNFR category	TAC <sub>1</sub> C <sub>2</sub> C <sub>3</sub>
GR-2023-GRID-GL-1	All provided	GNFR-K&L	T
<p><b>Observation</b>                      The expert review team notes that the IIR does not contain a chapter on gridding. After communication with Greece the country stated that its gridding method was based on: "Mapping of Atmospheric Pollution in Greece. Implementation of air pollutants measurements and chemical analyses, development of emission inventories and application of 3-D atmospheric models", which was elaborated by the Ministry of Environment and ENERGY (MEEN) in 2015." During the review Greece sent the related document but it could not be used efficiently by the ERT as it was in Greek.</p> <p><b>Recommendation</b>                      The ERT recommends Greece to include a gridding chapter its IIR in future submissions and to ensure that related documents are easily available for transparency.</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**

11. In the Appendix of the 'EMEP/UNECE Review Guidelines 2018'<sup>5</sup> 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.

12. The ERT did not calculate any Technical Corrections and Greece did not provide any Revised Estimates.

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<sup>5</sup> [https://www.ceip.at/fileadmin/inhalte/ceip/3\\_review/advance\\_version\\_ece\\_eb.air\\_142\\_add.1.pdf](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. Greece Annex I reporting template
2. Greece Stage 2 S&A report
3. Greece Stage 1 report 2023
4. Greece 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
  - Mapping of Atmospheric Pollution in Greece. Implementation of air pollutants measurements and chemical analyses, development of emission inventories and application of 3-D atmospheric models (<https://ypen.gov.gr/perivallon/poiotita-tis-atmosfairas/chartografisi-atmosfairikis-rypansis/> and [https://mapsportal.ypen.gr/maps/?limit=20&offset=0&category\\_\\_identifier\\_\\_in=environment%2Fatmosphere](https://mapsportal.ypen.gr/maps/?limit=20&offset=0&category__identifier__in=environment%2Fatmosphere))

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

The ERT did not calculate any Technical Corrections and Greece 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 <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)