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

STAGE 3 REVIEW REPORT

GREECE

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INTRODUCTION

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

1. 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.

2. At its seventh joint session in September 2021 the Steering Body and the Working Group on Effects approved the plan to perform (in 2022) an in-depth review of PM_{2.5} emissions from residential heating and road transport, with a special focus on the topic of '*condensable particulate matter*' and a follow-up review of the implementation of recommendations given as part of the review carried out in 2021. The Parties reviewed in 2021 are Kazakhstan, Liechtenstein, Monaco and Montenegro.

3. Particulate matter can exist as solid or liquid matter (the "filterable" portion) or as gases (the "condensable" portion). Condensable particulate matter is vapour phase at stack conditions, but condenses and/or reacts upon cooling and dilution upon discharge into ambient air to form solid or liquid PM. All condensable PM is assumed to be in the PM_{2.5} size fraction². The inclusion of the condensable component of PM_{2.5} emissions can have a big impact on the emission estimate for certain sources³.

4. This ad-hoc review, has assessed PM_{2.5} emission estimates with a special focus on the topic of '*condensables*' for the years 2000 to 2020.

5. This report covers the results of the stage 3 centralised review (ad hoc review) 2022 of the UNECE LRTAP Convention of Greece coordinated by the EMEP emission centre CEIP acting as review secretariat. The review took place between April and June 2022 and was performed as desk review with an in person meeting between 30 of May 2022 and 3 June 2022. The following team of nominated experts from the roster of experts performed the review.

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
https://unece.org/fileadmin/DAM/env/documents/2018/Air/EB/ECE_EB.AIR_142_Add.1-1902937E.pdf

² [Condensable Particulate Matter Definition | Law Insider](#)

³ For more technical details please refer to the EMEP/EEA Guidebook (<https://www.eea.europa.eu/publications/emep-eea-guidebook-2019>) or the report 'How should condensables be included in PM emission inventories reported to EMEP/CLRTAP?' https://emep.int/publ/reports/2020/emep_mscw_technical_report_4_2020.pdf

1A3b Road Transport: Gudrun Stranner, Katrina Young, Magdalena Zimakowska-Laskowska, Martina Toceva and Rebecca Rose

1A4bi Residential: stationary: Aleksandra Nestorovska-Krsteska, André Amaro, Benjamin Cuniasse, Canan Esin Köksal, Damian Zasina, Laureta Dibra, Marion Pinterits, Sam Gorji and Wolfgang Schieder

6. Kristina Saarinen, Jeroen Kuenen and Ben Richmond were the lead reviewers. The review was coordinated by Sabine Schindlbacher (EMEP Centre on Emission Inventories and Projections - CEIP).

7. The review was performed on the basis of CLRTAP emission data officially reported by Greece, due by 15 February 2022 for emission inventories. The Informative Inventory Reports (IIR), reported due 15 March 2022 under the CLRTAP, informed the review.

8. The emission inventory of Greece was received on 18 February 2022 and thus after the deadline of 15 February. The Informative Inventory Report was received on 15 March 2022 and thus by the deadline of 15 March.

RECOMMENDATIONS FOR IMPROVEMENTS TO THE PARTY

1.A.4.b.i Residential: stationary

9. Greece uses a Tier 2 methodology for calculating PM_{2.5} emissions from '1A4bi – Residential: stationary'.

10. The activity data is taken from official statistics, i.e. from the national energy balance provided by the Greek Ministry of Environment and Energy. The ERT noted that the activity data could be described in a more transparent way in the Informative Inventory Report. The ERT recommends that Greece include in its IIR the amount of solid biomass consumed in residential combustion (NFR category 1A4bi) broken down into the two categories used: (a) fuel wood, wood residues and by-products (b) wood pellets.

11. The activity data for Greece provided in the national energy balance does include collected wood, i.e. wood directly harvested from the forest outside formal market activity. The ERT recommends that Greece add this information to the IIR for the next submission in order to improve overall transparency.

12. Greece has not provided in its IIR the stratified total fuel consumption for each fuel type into different appliance types e.g. boilers, stoves, in a consistent and complete manner. In order to improve overall transparency, the ERT recommends Greece to include in its IIR the fuel consumption disaggregated by appliance type used in the Greek inventory (i.e. for pellet stoves and boilers, for open fireplaces, for high-efficient fireplaces, for conventional stoves, for high-efficient stoves, and for conventional boilers), for all relevant years.

13. In response to a question raised during the review, Greece explained that the emission factor of appliance type "high-efficient stoves" was used for "high-efficient fireplaces". In order to improve transparency, the ERT recommends that Greece document this assumption in its IIR for the next submission.

14. Greece uses the EMEP/EEA Guidebook 2019 for the compilation of its emissions from this category.

15. The emission factors partially include the condensable component of PM_{2.5} emissions (Table 1).

Table 1: Inclusion of condensables per fuel type

Fuel Type	Includes the condensable component of PM _{2.5} emissions
Biomass	Yes
Coal	Unknown (EMEP/EEA Guidebook 2019)
Liquid	Unknown (EMEP/EEA Guidebook 2019)
Gaseous	Unknown (EMEP/EEA Guidebook 2019)

16. Overall, the ERT noted that the time series is consistent. When asked about minor inconsistencies between biomass activity data for the stationary residential combustion (NFR category 1A4bi) reported in the NFR tables and those reported in the 2022 IIR (page 61 - table 3-9) for all years between 2010 and 2020, the Party answered that the consumption of pellets was missing in the NFR table activity data but that the emission calculation is correct. The ERT recommends the Party to include

the amount of pellets used in the NFR tables for the next submission in order to improve consistency.

17. The ERT noted that there was a significant decrease between 2009 and 2010 in the 1A4bi sector, in emissions for TSP (-15%), PM₁₀ (-15%), PM_{2.5} (-15%) and BC (-13%). The ERT was not able to find any explanation in the IIR regarding this decrease. In response to a question asked during the review, Greece answered that it was due to a decrease in biomass activity data between 2009 and 2010. The ERT recommends that Greece include this explanation in its IIR for the next submission in order to improve overall transparency and to add, if possible, the reason for the decrease in biomass activity data (because of environmental or political reasons for instance).

18. In response to a question raised during the review, the Party reminded the ERT of the explanation given for their 2021 reporting of gridded data (sector small combustion GNFR C). The PM_{2.5} emissions from small combustion are spatially distributed using land uses defined and available Greek regional energy statistics. It remains unclear whether emissions of different fuels from residential stationary sector were distributed distinctly. In order to improve overall transparency, the ERT suggests that the Party :

- Add a chapter in its IIR about the methodology used in the reporting of gridded emissions for every submission even for non-reporting years.
- Specify in this chapter whether different fuels from residential stationary sector were distributed distinctly.

19. Greece does not list any specific planned improvements for future submissions in their 2022 IIR but states it will implement recommendations from the different reviews.

1.A.3.b.i-iv Road transport exhaust emissions

20. Greece PM transport sector emissions are calculated using COPERT version 5.5. All emission factors in COPERT are based on the Tier 3 methodology in the 2019 EMEP/EEA Guidebook. The IIR provides details of the main features of the model. The IIR describes the calculation of transport emissions transparently.

21. The activity data is taken from official statistics provided by the Hellenic Statistical Authority.

22. The PM_{2.5} emissions from road transport exhaust include the condensable component of PM_{2.5} emissions.

23. The ERT notes that the method is documented transparently in the IIR.

24. The time series is consistent.

25. Greece lists no specific planned improvements in their 2022 IIR for PM emissions from sectors 1A3bi-iv.

26. The ERT recommends implementing the following:

- In response to a question raised during the review, Greece confirmed that the condensable component of PM emissions is included. The ERT recommends Greece to include this statement in future submissions of the IIR.
- In response to a question raised during the review, Greece explained that information on vehicle fleet data is provided in the National Inventory Report (NIR) submitted as part of the greenhouse gas inventory. The ERT recommends Greece to include this transparency information also in the IIR, or as a minimum provide a link to where this data can be found.

The ERT encourages implementing the following:

- The ERT encourages Greece to follow the recommended structure of the IIR detailed in Annex II of the 2014 Guidelines for Estimating and Reporting Emission Data, which includes an appendix with a table summarising the use of PM emission factors that include/exclude the condensable component, where available.

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

27. In the Appendix of the ‘EMEP/UNECE Review Guidelines 2018⁴’ it is stated that if the ERT considers that when emissions are significantly under- or overestimated, then during the review, the Party is 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 the Revised Estimates, then the ERT may calculate a “Technical Correction” in the absence of an updated emission estimate being provided by the Party itself. The threshold for significance for a technical correction for the in-depth review in 2022 was set at 2% of the national total, i.e. findings identified which result in an over- or under-estimate of emissions of more than 2% of the national total can result in a Technical Correction. The methods for calculating the Technical Corrections are set up in the “Review Guidelines 2018” and use the EMEP/EEA Emission “Inventory Guidebook” as a reference for methods and emission factors.

28. Greece did not provide any revised estimates and the ERT did not calculate technical corrections for Greece.

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. Greece IIR 2022 submission
2. Annex_I_GR_2022_submission_[1990-2020]_v1_0.xlsxsubmission

LIST OF ADDITIONAL MATERIALS PROVIDED BY THE COUNTRY DURING THE REVIEW

3. Responses to questions raised by the ERT during this review