UNITED NATIONS

Distr.
GENERAL

CEIP/S3.RR/2022/
28/09/2022

ENGLISH ONLY

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

STAGE 3 REVIEW REPORT

CYPRUS

CONTENT

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 fraction[2]. The inclusion of the condensable component of $PM_{2.5}$ emissions can have a big impact on the emission estimate for certain sources[3].

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 Cyprus 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.

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

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[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

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 Cyprus, 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 Cyprus was received on 14 February 2022 and thus by the deadline of 15 February. The Informative Inventory Report was received on 15 March 2022 and thus by the deadline of 15 March. Cyprus provided a resubmission of the emission inventory on 15 March 2022.

RECOMMENDATIONS FOR IMPROVEMENTS TO THE PARTY

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

9. Cyprus uses a mix of Tier 1 and Tier 2 methodology for calculating $PM_{2.5}$ emissions from '1A4bi – Residential: stationary'. According to the IIR a Tier 1 methodology is used, but elsewhere it is mentioned that for some pollutants a Tier 2 methodology was recently implemented based on a recommendation made as part of the NECD inventory review process. From the additional materials received during this review, the ERT understands that a Tier 2 is used for biomass and coal fuels, but this is not fully clear as the description in the IIR is not sufficiently transparent. The ERT recommends Cyprus to improve the methodology description, by providing an exact description where Tier 2 is used (which fuels, which pollutants), including the respective emission factors.

10. The activity data is based on fuel consumption data of Cyprus energy balance.

11. From the IIR and the explanations from Cyprus, the ERT concluded that collected wood, i.e. wood directly harvested from the forest outside formal market activity, is not included in the fuel use for the residential sector. Cyprus explained that cutting wood in the forest without permission is illegal, and that Cyprus is not able to quantify the amount of wood that could possibly be illegally harvested. The ERT recommends Cyprus to clearly explain this in the next IIR submission.

12. Cyprus has stratified the total fuel consumption for each fuel type into different appliance types e.g. boilers, stoves, etc. by applying the suggested appliance type split factors from the EMEP/EEA Guidebook Tier 2 methodology, complemented by expert judgement. This is however not sufficiently documented in the IIR, the ERT recommends to improve the documentation for the next submission.

13. Cyprus uses the EMEP/EEA Guidebook 2019 version for the compilation of its emissions from this category.

14. 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)

15. The ERT notes that the time series is consistent and commends Cyprus for improving the time series consistency following an earlier review recommendation.

16. The $PM_{2.5}$ emissions from small combustion are spatially distributed with a support of a project titled "Development of an emission inventory including formation of a database for atmospheric pollutant emissions and software for simulation and forecast of air quality in Cyprus" in 2010. The ERT recommends Cyprus to provide a clear explanation of the methodology including the proxy data used for the spatial distribution in the next submission of gridded data.

17. Cyprus does not have any planned improvements listed in the IIR for residential combustion sector in their 2022 IIR. The ERT recommends Cyprus to take note of the recommendations from this review and to include them in the list of planned improvements.

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

18. Cyprus 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.

19. The activity data is taken from the Statistical Service of Cyprus and the Road Transport Department.

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

21. The ERT notes that the method is not documented transparently in the IIR. The source of data and methodology to provide vehicle fleet and activity data is not documented transparently in the IIR. Furthermore, the methodology to allocate activity between urban, rural and highway road classes is not documented. The ERT recommends Cyprus to include all of these details in the next IIR submissions to improve transparency.

22. The time series is consistent.

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

24. The ERT recommends implementing the following improvements:

- In response to a question raised during the review Cyprus provided the traffic speed assumptions for highway, urban and rural roads used in road transport emissions modelling. The ERT recommends that Cyprus provides this information and the data source in the IIR in its next submission.

- In response to a question raised during the review Cyprus explained that small inconsistencies in PM emission trends between 2000 and 2005 relate to fluctuations in passenger car activity during this period. The ERT recommends that Cyprus provides an explanation for any inconsistencies in the time series in the IIR in future submissions.

- The ERT recommends that Cyprus includes a statement in the road transport chapter of the IIR confirming whether the condensable component of $PM_{2.5}$ is included in emissions estimates or not.

And the ERT encourages to implement the following:

- The ERT encourages Cyprus 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

25. In the Appendix of the 'EMEP/UNECE Review Guidelines 2018[4]' 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.

26. Cyprus did not provide any revised estimates and the ERT did not calculate technical corrections for Cyprus.

[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. Cyprus IIR 2022
2. Cyprus Annex 1: National sector emissions: Main pollutants, particulate matter, heavy metals and persistent organic pollutants, emissions1990-2020_v.2.xlsx

LIST OF ADDITIONAL MATERIALS PROVIDED BY THE COUNTRY DURING THE REVIEW

3. Response to preliminary question raised within the review
4. CY-1A4bi-Main.xlsx