

**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

HUNGARY

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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 Hungary 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 Hungary, 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 Hungary was received on 15 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. Hungary provided a resubmission of the emission inventory on 15 March 2022.

RECOMMENDATIONS FOR IMPROVEMENTS TO THE PARTY

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

10. Hungary uses a Tier 2 for calculating PM emissions from '1A4bi – Residential: stationary' in line with Reporting Guidelines.

11. Hungary explains in the IIR that joint IEA/Eurostat annual questionnaires serve as activity data consistently for the whole time series. The Party provided additional information that the category "fuelwood, wood residues and by-products" in the IEA/Eurostat dataset is used for the residential sector. This category includes also pellets (0.2 PJ out of 73 PJ in 2020) however these are used in other source categories (e.g., commercial, agriculture, food), for the residential sector no pellet use is estimated (yet) in the IEA statistics.

12. The activity data for Hungary include collected wood, i.e. wood directly harvested from the forest outside formal market activity. In response to a question from the ERT, Hungary explained that this was introduced in 2017 when the energy statistics provider made a significant re-evaluation of biomass consumption which doubled the values previously allocated to the residential sector.

13. The ERT noted that the inventory is sufficiently detailed to calculate emissions from different appliance types. During the review Hungary has provided the share of different combustion appliances in a separate Excel file for the period 2000-2020. The Party explained that also GAINS data (from Clean Air Outlook 2) were considered in the preparation of this split. The share of technology type for biomass combustion for 2020 is presented in Table 1.

Table 1: Technology type for biomass combustion

Technology type for biomass combustion	Share (2020)
Fireplace	0.5%
Conventional stoves	31.7%
High efficiency stoves	12.0%
Advanced / ecolabelled stoves and boilers	3.4%
Conventional boilers	51.5%
Pellet stoves and boilers	1.0%

As presented the mostly use appliance in Hungary are conventional boilers contributing with 51.5%.

The Party proved additional information that for coal, the share in residential consumption decreased to 1% in 2020 (from 36% in 1990). In 2020, 35% of the coal is used in conventional stoves and 65% in boilers. In response to a question during the review, Hungary explained it does not have specific information on the age of the combustion equipment. The Party based their assumptions on technology shares partly on some articles written by the secretary of the Hungarian Industry Association of Masonry Stoves, Fireplace Builders and Manufacturers around 2018-2019 which state that the majority of solid fuel heating equipment appliances are several decades old, and only a small percentage meets current or future regulations. Even for newly sold units, only a small proportion of them meet limit values. The ERT welcomes the

explanations provided by Hungary and recommends Hungary to include this information in the next submission.

14. Hungary uses the EMEP/EEA Guidebook, Tier 2 methodology for compilation of its emissions from this category. Hungary stated in the IIR that according to the EMEP/EEA Guidebook, condensables are included for biomass but for other fuels it is unclear (Table 2).

Table 2: Inclusion of condensables per fuel type

Fuel Type	Includes the condensable component of PM_{2.5} emissions
Biomass	Yes
Coal	Unknown
Gaseous	Unknown
Liquid	Unknown

15. The ERT notes that the time series is consistent and consistent methods have been used for calculation of the time series. The ERT did not identify any unexplained jumps and dips in the PM_{2.5} emission trends for residential combustion.

16. The PM_{2.5} emissions from small combustion are spatially distributed using proxy data, taking into account the heating mode (e.g. individual or central) and the different fuel types. The number of inhabitants in each grid cell was also divided according to the above parameters, and the calculations were performed by fuel, weighted by the population.

17. Hungary did not define any planned improvements for residential combustion in the IIR. However, in response to a question from the ERT Hungary include in the list of improvements the organisation or surveys to investigate sales of new appliances which meet the latest EU regulations 2015/1185 for solid fuel local space heaters and 2015/1189 for solid fuel boilers. The ERT commends Hungary for this improvement plan and recommends to include this in the improvement plan with clear steps and schedule and to report on progress of the work in the next submissions.

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

18. Hungarian PM transport sector emissions are calculated using COPERT version 5.5.1. 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 official statistics provided by the Ministry of Interior (BM), Vehicle Inspection Database, national energy statistics provided by the Hungarian Energy and Public Utility Regulatory Authority (MEKH), the Hungarian Meteorological Service (OSMZ) research studies carried out by the Institute of Transport Sciences (KTI), the Ministry of Economy and Transport, and data purchased from Emisia, the developers of COPERT, for use when no national data was available.

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

21. The ERT notes that the method is documented transparently in the IIR.
22. The time series is consistent.
23. Hungary lists no specific planned improvements in their 2022 IIR for PM emissions from sectors 1A3bi-iv.
24. The ERT recommends implementing the following:
 - In response to a question raised during the review, Hungary provided details on previous research studies performed by KTI that are used for the inventory compilation. In future submissions of the IIR the ERT recommends that Hungary include an assessment on the applicability of previous research studies to the whole time series of the inventory.
25. And the ERT encourages to implement the following:
 - In response to a question raised during the review, Hungary confirmed that there are no potential improvement plans yet to investigate the impact of transit transport on Hungary's road transport emissions, to reduce the uncertainty of estimates. The ERT encourages Hungary to consider including this point in future improvement plans.
 - In response to a question raised during the review, Hungary explained how multiple data sources for road transport are used and merged across the time series. The ERT encourages Hungary to include a summary description of how the multiple data sources are combined and adjusted to ensure time series consistency in the next submission of the IIR.

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

26. 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.

27. Hungary did not provide any revised estimates and the ERT did not calculate technical corrections for Hungary.

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. Hungary IIR 2022
2. HU_NFR16_1990_2020_v2.xlsx

LIST OF ADDITIONAL MATERIALS PROVIDED BY THE COUNTRY DURING THE REVIEW

3. Responses to questions raised by the ERT during this review
4. Activity data for the road transport emission calculations (stock2020.xlsx, stock8599.xlsx)