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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

THE NETHERLANDS

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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 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 the Netherlands 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.

Ad hoc review - condensables

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

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 and Jeroen Kuenen 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 the Netherlands 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 the Netherlands was received on 15 February 2022 and thus by the deadline of 15 February, with a resubmission on 15 March 2022. The Informative Inventory Report was received on 15 March 2022 and thus by the deadline of 15 March with a resubmission on 28 March 2022.

RECOMMENDATIONS FOR IMPROVEMENTS TO THE PARTY

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

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

10. The activity data is based on fuel consumption data, taken from Statistics Netherlands. The Party describes in its IIR (p70ff.) that the fuel mostly used in this category is natural gas; the use of wood in stoves and fireplaces for heating is almost negligible compared with the amount of natural gas used. The ERT notes that the activity data is not described transparently enough in the Informative Inventory Report and recommends the Party to provide more detailed information on activity data used to calculate emissions from 1A4bi in the next IIR submission.

11. The activity data for the Netherlands includes collected wood, i.e. wood directly harvested from the forest outside formal market activity.

12. The Netherlands have stratified the total fuel consumption for each fuel type into different appliance types e.g. boilers and stoves, in a consistent and complete manner. This is, however, not sufficiently documented in the IIR and the ERT recommend that a clear documentation of the issue be included in the next IIR submission.

13. The Netherlands use the EMEP/EEA Guidebook 2019 as well as a country specific methodology for the compilation of emissions from this category. The country specific method used in the calculation of emissions is based on a survey regarding stove types and age, and is performed every six years⁴. Chapter 3.1 of the IIR describes the number, type and age of wood stoves. For each type of stoves the frequency of the use of the stove was used to split wood use between different appliances. The outcomes of the surveys are used as input in a wood combustion model, in which the penetration of changed technology is also taken into account. This model is tweaked in such a way that the number of stoves per type is equal to the results of the survey and calculates emissions of the years between surveys.

14. The Party uses national measurements based on dilution tunnel sampling/measurements that cover the whole combustion cycle including the ignition and shut down phases. The Netherlands, however, did not provide detailed information on the sampling and measurements. The ERT recommends the Netherlands to include in the next IIR submission information on the measurement standards and equipment used.

15. The emission factors used in the inventory are derived from the above mentioned measurements, and thus include also the start phase (ignition) and end (ember) phase emission levels.

16. The Party takes to some extent into account the so-called user impact in their inventory. To the question on the issue, the Netherlands responded that the partial inclusion of the user impact is reflected by the fact that compared to type-approval measurements based on standard fuel quality and nominal load only, the Dutch emission factors are considerably higher, or in reasonable agreement. However, the emission factors do not include use of wet/treated wood or inefficient combustion conditions. The ERT found the information included in the IIR not to be sufficient and recommends the Party to provide more information in the

⁴ https://www.cbs.nl/-/media/pdf/2019/41/cbs_2019_rapport_houtverbruik_huishoudens_woon-onderzoek_2018.pdf (in Dutch)

next IIR submission on what kind of non-optimal combustion conditions are included and to collect more data on national circumstances to incorporate the information in the inventory for the next submissions.

The emission factors do 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
Coal	unknown
Natural gas (heating)	No
Natural gas (cooking)	No
Diesel	unclear
LPG	No
Petroleum	unclear
Wood Combustion - Fireplace	Yes
Wood Combustion - Conventional Stove	Yes
Wood Combustion - Improved Stove	Yes
Wood Combustion - Ecolabelled stove	Yes
Wood Combustion - Ecodesign stove	Yes
Wood Combustion - Pellet	Yes
Wood Combustion - Barbecues (charcoal)	Yes

17. The ERT notes that the time series is consistent.

18. PM_{2.5} emissions from small combustion are spatially distributed using proxy data such as population and housing density.

19. The Netherlands list the following planned improvements for future submissions in their 2022 IIR

- Error correction for some of the EFs

The ERT commends the Netherlands for their improvement plan and recommends implementing it as soon as possible.

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

20. The Netherlands' transport sector emissions are calculated using and the VERSIT+ model. The IIR provides details of the main features of the model and the documentation of the calculation of transport sector emissions is transparent in the IIR.

21. The activity data is taken from official statistics.

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

23. The emissions time series is consistent.

24. The Netherlands list the following planned improvements for future submissions in their 2022 IIR

- The integration of new insights into the road type distribution of passenger cars, light-duty trucks, heavy-duty trucks and buses

The ERT commends the Netherlands for their improvement plans and recommend the Party to implement them as soon as possible.

25. In addition, the ERT recommends implementing the following:

- Include the link or the reference to the activity data along with the year of publication of the activity data.

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

26. In the Appendix of the 'EMEP/UNECE Review Guidelines 2018'⁵ 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. The Netherlands did not provide any revised estimates and the ERT did not calculate any technical corrections.

⁵ https://www.ceip.at/fileadmin/inhalte/ceip/3_review/advance_version_ece_eb.air_142_add.1.pdf

LIST OF MATERIAL PROVIDED TO ERT

1. Netherlands' Stage 2 S&A report
2. Netherlands' Stage 1 report 2022
3. Netherlands' IIR 2022
4. NFR tables submitted in 2022

LIST OF ADDITIONAL MATERIALS PROVIDED BY THE COUNTRY DURING THE REVIEW

5. Responses to preliminary question raised prior to the review
6. Responses to questions raised during the review
7. Geilenkirchen et al (2022) Methods for calculating emissions from transport sector.xlsx