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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**

**ESTONIA**

# CONTENT

|                                                                                        |          |
|----------------------------------------------------------------------------------------|----------|
| <b>INTRODUCTION</b>                                                                    | <b>3</b> |
| <b>RECOMMENDATIONS FOR IMPROVEMENTS TO THE PARTY</b>                                   | <b>5</b> |
| <b>REVISED ESTIMATES AND TECHNICAL CORRECTIONS CONSIDERED AND/OR CALCULATED BY ERT</b> | <b>8</b> |
| <b>LIST OF MATERIAL PROVIDED TO ERT</b>                                                | <b>9</b> |
| <b>LIST OF ADDITIONAL MATERIAL PROVIDED BY THE COUNTRY DURING THE REVIEW</b>           | <b>9</b> |

# 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*'<sup>(1)</sup> – 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<sub>2.5</sub> 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<sub>2.5</sub> size fraction<sup>2</sup>. The inclusion of the condensable component of PM<sub>2.5</sub> emissions can have a big impact on the emission estimate for certain sources<sup>3</sup>.

4. This ad-hoc review has assessed PM<sub>2.5</sub> 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 Estonia 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.

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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  
[https://unece.org/fileadmin/DAM/env/documents/2018/Air/EB/ECE\\_EB.AIR\\_142\\_Add.1-1902937E.pdf](https://unece.org/fileadmin/DAM/env/documents/2018/Air/EB/ECE_EB.AIR_142_Add.1-1902937E.pdf)

<sup>2</sup> [Condensable Particulate Matter Definition | Law Insider](#)

<sup>3</sup> 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](https://emep.int/publ/reports/2020/emep_mscw_technical_report_4_2020.pdf)

### **Ad hoc review - condensables**

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

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

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

7. The emission inventory of Estonia was received on 11 February 2022 and the resubmission on 15 March 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.

## RECOMMENDATIONS FOR IMPROVEMENTS TO THE PARTY

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

8. Estonia uses a Tier 2 methodology for calculating PM<sub>2.5</sub> emissions from '1A4bi – Residential: stationary', which is a Key Category for Estonia.

9. The activity data is based on non-regular surveys organized by Statistics Estonia over a few years. In the years when the survey does not take place, data are estimated based on the data structure of the previous survey, the data of enterprises selling fuel and the data from the Household Budget Survey. The last survey on household energy consumption took place in 2011. Different wood fuel types as wood, pellet, wood chips were covered in the survey.

10. The activity data for Estonia include collected wood, i.e. wood directly harvested from the forest outside formal market activity.

11. The total fuel consumption for each fuel type is stratified into different appliance types, such as boilers and stoves, in a consistent and complete manner. This is not sufficiently documented in the IIR and the ERT recommends the Party to include in the next IIR submission information regarding the mix of fuels considered in estimates of residential combustion: how biomass consumption is disaggregated by type of fuel and inclusion of "collected wood" in biomass consumption.

12. During the review the Party informed that data on the shares of types of appliance and also change in new and old technology come from the study "Energy consumption, pollutant emissions and tendencies of local heating in the Tallinn area and Tartu in 1990–2020". For the distribution to old and new technologies in households the expert opinion of various licensed potters was taken into account. As this is not sufficiently documented in the IIR, the ERT recommends Estonia to include in the next IIR submission information regarding the mix of appliances considered in estimates of residential combustion: how the mix of appliances were defined; distribution of biomass consumption by appliance; and changes in appliances fleet through the time series

13. Estonia uses a country specific methodology for wood combustion and the EMEP/EEA Guidebook 2019 methodology for liquid, solid and gaseous fuels for the compilation of emission estimates from category 1A4bi.

14. The country specific method used in the calculation of emissions is based on measurement of emissions gases performed at the Estonian Environmental Research Center. A study was developed to acquire emission factors for PCDD/Fs, HCBs, PAHs, PM<sub>x</sub> and for several gaseous pollutants from the residential combustion, where wood is burned with municipal solid waste. Measurements were conducted for the most common heating appliances in Estonia. Emission factors were derived from the complete combustion cycle, including ignition and the end phase of the burning.

15. During the review Estonia shared with the ERT an article detailing the national sampling method and the emission measurements for wood combustion. The ERT recommends Estonia to include in the next IIR submission information on the measurement standards and/or equipment used. In case different measurements/equipments are used for different types of equipment it is recommended that these are also documented in the IIR.

16. The measurements exclude the condensable component of particulate matter (CPM). During the review Estonia stated that new emission measurements are ongoing, with the main purpose to estimate the condensable part in gases and that the project is scheduled to be completed in the first half of 2023.

17. The inventory takes into account user induced impacts that affect emission levels (the so-called user impact). The ERT found the information included in the IIR not to be transparent and sufficient. The ERT recommends Estonia to include in the next IIR submission information regarding factors that influence combustion conditions and that are taken into account in the emission estimation methodology such as share of wet/treated wood, share of combustion of waste, user management of air circulation in the appliance during the combustion cycle.

18. The emission factors do not include the condensable component of PM<sub>2.5</sub> emissions (Table 1).

**Table 1: Inclusion of condensables per fuel type**

| <b>Fuel Type</b> | <b>Includes the condensable component of PM<sub>2.5</sub> emissions</b> |
|------------------|-------------------------------------------------------------------------|
| Biomass          | No                                                                      |
| Coal             | No / Unclear (Guidebook 2019 – Tier 2)                                  |
| Liquid           | No / Unclear (Guidebook 2019 – Tier 2)                                  |
| Gaseous          | No / Unclear (Guidebook 2019 – Tier 2)                                  |

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

20. PM<sub>2.5</sub> emissions from small combustion are spatially distributed using proxy data, for example distributions of point sources, buildings locations and type data from buildings registry, distribution of population, fuel consumptions.

21. Estonia lists the following planned improvements for future submissions in their 2022 IIR

- Review of activity data for waste incineration in the domestic sector.
- During the review, Estonia informed on other improvement plans that depend on an ongoing project that will produce new measurements for domestic combustion equipment. Completion of the project is scheduled for the first half of 2023.

The ERT commends Estonia for their improvement plans and recommends implementing them as soon as possible.

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

22. Estonia calculates particle emissions from the transport sector 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.

23. The activity data is taken from official statistics from Statistics Estonia and Estonian Road Administration, but no link or the reference to these are provided in the IIR. The ERT recommends Estonia to include the link or the reference to the activity data along with the year of publication of the activity data.

24. The ERT recommends Estonia to include in the IIR the relevant links or references to all data sources.

25. PM<sub>2.5</sub> emissions from road transport exhaust include the condensable component of PM<sub>2.5</sub> emissions through the use of the COPERT model. The ERT recommends Estonia to include a statement in the road transport chapter of the IIR confirming whether the condensable component of PM<sub>2.5</sub> is included in emissions estimates or not.

26. The ERT notes that the calculation method is not documented transparently in the IIR and recommends Estonia to include further information on the age distribution of the vehicle fleet and more information about the traffic conditions (average speed per road class and mileage share per road class) in the next IIR submission.

27. The COPERT model which the Party uses calculates all road transport emission. For the years before 1999 Estonia reports NR for PM<sub>2.5</sub> emissions. The ERT encourages Estonia to recalculate the time series since 1990 with consistent methods to the next submission and to submit the whole time series calculated by the COPERT model.

28. Estonia lists the following planned improvement for future submissions in their 2022 IIR.

- to include more detailed vehicle subsectors in emission calculations: light duty vehicles, heavy duty vehicles, mopeds, hybrid and LPG/CNG vehicles and to estimate the share of two-stroke and four-stroke engines out of the total number of mopeds and motorcycles on the road.

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

29. In the Appendix of the 'EMEP/UNECE Review Guidelines 2018'<sup>4</sup> it is stated that if the ERT consider 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.

30. Estonia did not provide any revised estimates and the ERT did not calculate any technical corrections.

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<sup>4</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 MATERIAL PROVIDED TO ERT**

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

## **LIST OF ADDITIONAL MATERIAL 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. Maasikmets et al 2016\_MSW.pdf