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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

POLAND

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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 Poland 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

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 Poland, 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 Poland was received on 9 February 2022 and thus by the deadline of 15 February. The Informative Inventory Report was received on 14 March 2022 and thus by the deadline of 15 March.

RECOMMENDATIONS FOR IMPROVEMENTS TO THE PARTY

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

9. Poland uses a Tier 2 methodology for calculating PM_{2.5} emissions for solid fuels (hard coal and hard coal briquettes, brown coal and brown coal briquettes, wood and waste wood and coal) from '1A4bi – Residential: stationary'. A smaller fraction of the emissions is calculated using a Tier 1 methodology for gaseous (natural gas and other gases) and liquid fuels (fuel oils) from '1A4bi – Residential: stationary'. Although '1A4bi – Residential: stationary' is a key category and it would be recommended to use at least a Tier 2 method for calculating emissions from '1A4bi – Residential: stationary' in line with Reporting Guidelines' paragraph 21⁴, it should however be noted that Poland is already accounting for the majority of the emissions from 1A4bi through a Tier 2 approach.

10. The activity data is taken from the official statistics of Poland. The largest fuel consumption for 1A4bi has been recorded for hard coal, consisting 42% of the total activity in 2020. This is then followed by natural gas and fuel wood and wood waste. The key application of the fuels has been described to be for heating and provision of hot water in the residential sector.

11. The activity data does include collected wood, i.e. wood directly harvested from the forest outside formal market activity.

12. Poland has stratified the total fuel consumption for each solid fuel type into different appliance types e.g. boilers, stoves, in a consistent and complete manner. The basis for this split over appliance types is referenced in the IIR. The details of the split are however not sufficiently documented in the IIR, this could include information such as timeseries representing the composition of the appliance types over the years. The ERT recommends documenting this well in the IIR.

13. Poland uses both the EMEP/EEA Guidebook 2019 and a country specific methodology for the compilation of its emissions from this category. The Guidebook methodology has been applied to fuel oils, natural gas and other gases (industrial, biogas and LPG), whereas the country specific emission factors are applied for hard coal and hard coal briquettes, brown coal and brown coal briquettes, wood and waste wood as well as coke.

14. The Party informed the ERT that the country specific methods for solid fuels (hard coal, brown coal, coke and semi-coke, wood and waste wood) have been developed for individual years accounting for parameters such as:

- (a) percentage of households using particular types of appliances for the production of heat and hot water;
- (b) average installed thermal powers of these devices;
- (c) power overestimation degree of heating devices;
- (d) power utilization factors characteristic for individual groups of devices;

⁴ Reporting Guidelines paragraph 21: "For sources that are determined to be key categories in accordance with the EMEP/EEA Guidebook methodologies, Parties should make every effort to use a Tier 2 or higher (detailed) methodology, including country-specific information."

- (e) average working time of devices during the year in each group,
- (f) efficiency of devices in each group; and
- (g) dynamics of the air temperature and other parameters influencing the heat demand during the heating season.

The information is currently provided in a separate paper⁵, and not in the IIR. The ERT recommends that Poland include a summary of this information (including for instance the breakdown of share of different types of appliances) in the IIR for the next submission.

15. The Party uses national measurements based on EN 13284-1:2017. The ERT recommends including information on the measurement standards and equipment used in the IIR for the next submission.

16. The measurements include the condensable component of particulate matter (CPM).

17. The measurements used to derive the emission factors for the solid fuels also cover the start phase (ignition) and the end (ember) phase of the combustion cycle. Also the emission factors used in the inventory derived from these measurements include the start phase (ignition) and end (ember) phase. The ERT found that the information is not included in the IIR, and would therefore recommend including the information on conditions of the tests, considering the start and end phases to be included in the IIR.

18. The Party takes into account user induced impacts that affect emission levels from those during “normal combustion” (the so called user impact, which covers e.g. the use of wet/unclean wood or poor management of air circulation in the appliance.) The ERT found the information is not included in the IIR, and would therefore recommend including the information on conditions of the tests, considering the user impacts on combustion such as use of wet/unclean wood or poor management of air circulation in the appliance, to be included in the IIR.

19. The emission factors partially include the condensable component of PM_{2.5} emissions (Table 1). While for solid fossil fuels and biomass the condensable component is included, for liquid and gaseous fuels the inclusion of this component is unknown. This is because the respective emission factors are taken from the 2019 EMEP/EEA Guidebook which states that the inclusion of the condensable component in the emission factor is unknown.

Table 1: Inclusion of condensables per fuel type

Fuel Type	Includes the condensable component of PM emissions
Hard coal and hard coal briquettes	Yes
Brown coal and brown coal briquettes	Yes
Wood and wood waste	Yes
Coke	Yes
Fuel oils	Unclear*
Natural gas	Unclear*
Other gases (industrial, biogas, LPG)	Unclear*

*: The emission factors for these fuels are taken from the EMEP/EEA Guidebook 2019.

⁵ IChPW (2020): Report on emission factors for combustion of solid fuels in sectors 1A4ai, 1A4bi and 1A4ci. Zabrze, 2020 (expert study in Polish).

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

21. The PM_{2.5} emissions from small combustion are spatially distributed using proxy data from buildings (area, number of stores and number of heating degree days) and the relevant fuel mixes (coal, wood, gas, fuel oil) at local administrative units (municipalities).

22. Poland list the following planned improvement for future submissions in their 2022 IIR

- The emission factors that are used to calculate emissions from the residential sector were developed in 2020. The initial plan is to update EFs every five years, however, this schedule may be revised in subsequent years.

The ERT commends Poland for their improvement plan and recommends implementing this as scheduled.

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

23. Poland's PM transport sector emissions are calculated using COPERT 5.4. 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.

24. The activity data is taken from official statistics and research. The number of vehicles per vehicle category, size and technology is taken from official statistics from Polish Central Vehicle and Driver Register system and Statistic Poland. Annual mileage, vehicle speed and the share in different travel conditions comes from literature and research⁶.

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

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

27. The time series is not consistent. The time series shows a small inconsistency in road transport exhaust emissions of PM_{2.5} between 2004 and 2005. In response to a question raised during the review process Poland explained that this results from a change in the source of data on the number of vehicles. Prior to 2005 the number of vehicles was derived from the Statistics of Poland in an aggregated form. From 2005 onwards, the number of vehicles was derived from the Central Register of Vehicles directly in the categories required for the COPERT model. The ERT recommends Poland to improve the consistency between the different data sets in future submissions, for example by aligning the data from Statistics of Poland with data from Central Register of Vehicles based on trends in vehicle population rather than absolute numbers.

28. Poland lists the following planned improvements for future submissions in their 2022 IIR

- Calculation of emissions using the real mileage of vehicles registered in Poland

⁶ Chlopek, Z., and Bekkiewicz, K., Maintenance and Reliability 2017, 19(4), 501-507, <http://www.ein.org.pl/sites/default/files/2017-04-02.pdf>

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

29. The ERT has no further recommendations for PM emissions from the transport sector within the remit of this review.

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

30. In the Appendix of the 'EMEP/UNECE Review Guidelines 2018'⁷ 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.

31. Poland did not provide any revised estimates and the ERT did not calculate technical corrections for Poland.

⁷ 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. Poland IIR 2022
2. Annex 1: National sector emissions: Main pollutants, particulate matter, heavy metals and persistent organic pollutants, Annex_1_1990-2020_PL.xlsx
3. Appendix 8: Uncertainty analysis of emissions of selected air pollutants, Appendix_8.xlsx

LIST OF ADDITIONAL MATERIALS PROVIDED BY THE COUNTRY DURING THE REVIEW

4. Response to questions raised by the ERT during the review
5. Structure of heating devices 1990-2050.docx