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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

PORTUGAL

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 Portugal 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

1A4bi Residential: stationary: Aleksandra Nestorovska-Krsteska, André Amaro, Benjamin Cuniasse, Canan Esin Köksal, Damian Zasina, Laureta Dibra, Marion Pinterits, Sam Gorji and Wolfgang Schieder

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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

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 Portugal, 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 Portugal 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. Portugal provided resubmissions of the emission inventory by 15 March, and of the IIR by 7 April 2022.

RECOMMENDATIONS FOR IMPROVEMENTS TO THE PARTY

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

9. Portugal uses a Tier 2 methodology for calculating the majority of the PM emissions from '1A4bi – Residential: stationary'. A relatively small fraction of the emissions is calculated through a Tier 1 method that is used for fuel oil, gasoline and other kerosene. Emissions from combustion of other fuels including liquified petroleum gases, natural gas and gas works gas, gas oil, wood and wood waste are calculated based on a Tier 2 method. 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 21[4], it should however be noted that Portugal is already accounting for the majority of the emissions, i.e. more than 99% of $PM_{2.5}$ emissions in 2020, from 1A4bi through a Tier 2 approach.

10. The activity data are taken from official statistics of Energy Balances from General Directorate of Energy (DGEG). Wood and wood waste formed more than 50% of the total energy balance for 1A4bi category in 2020. The majority of this fuel was estimated to be combusted in conventional stoves.

11. The activity data for Portugal do not include collected wood, i.e. wood directly harvested from the forest outside formal market activity. Therefore, the ERT recommends Portugal to develop a methodology to account for this additional amount of biomass consumption for future submissions.

12. Portugal has stratified the total fuel consumption for all fuel types, excluding fuel oil, gasoline and other kerosene, into different appliance types e.g. boilers, stoves, in a consistent and complete manner. The split of appliances is based on the GAINS model as documented in EMEP/EEA Guidebook 2019. The basis for this split over appliance types is documented in the IIR.

13. Portugal uses the emission factors from EMEP/EEA Guidebook 2019. The country specific data, for the split of technologies for burning wood, used in the analysis are taken from the GAINS model provided in the 2019 EMEP/EEA Guidebook.

14. The emission factors partially include the condensable component of PM2.5 emissions (Table 1).

[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."

Table 1: Inclusion of condensables per fuel type

Fuel Type	Includes the condensable component of PM emissions
Liquefied Petroleum Gases	Unclear/No
Natural Gas & Gas Work Gas	Unclear/No
Gas oil	No
Wood and wood waste	Yes
Fuel oil	Unclear
Gasoline	Unclear
Other Kerosene	Unclear

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

16. The $PM_{2.5}$ emissions from small combustion are spatially distributed using population by municipality as proxy data.

17. Portugal lists the following planned improvements for future submissions in their 2022 IIR and the subsequent communications

- Improvements to the underlying information for distribution of the energy consumptions by the thermal uses and combustion equipment. The current distribution is based on the GAINS model values reported in 2019 EMEP/EEA Guidebook that may not accurately reflect the composition of the appliances. Portugal has indicated its aim to use the data from a survey carried out by DGEG in 2020 to capture the technology split in domestic combustion.

The ERT commends Portugal for their improvement plans and recommends implementing them as scheduled.

18. In addition, the ERT recommends to implement the following:

- As part of the review process, a misallocation of PM emissions between categories 1A4ai and 1A4bi came to light, whereby the emissions from manual and automatic boilers (<1MW) were accounted for in 1A4bi category. The $PM_{2.5}$ emissions from these sources are not expected to be significant, representing 0.12% of the total $PM_{2.5}$ emissions of 1A4bi. The ERT recommends Portgual to resolve this issue in the next submission.

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

19. Portugal PM road 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**.**

20. The activity data is taken from official statistics and literature. The activity data for Passenger Cars, Light Commercial Vehicles, Heavy Duty Trucks and buses is calculated using a model based on data from vehicle inspection centres. For Mopeds and Motorcycles the average distance travelled was obtained by the TRACCS project. The distance travelled on highways was derived from Instituto da Mobilidade e dos Transportes (IMT), the technical regulator for mobility and transport. The remaining vehicle kilometres are allocated to urban and rural driving according to the population living in each area.

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

22. The ERT notes that the method is not documented transparently in the IIR. The methodology for obtaining the vehicle fleet from national vehicle inspection, vehicle sales and insurance data is not transparently described. In a question raised during the review process Portugal provided a description of the data sources and the methodology to calculate the fleet. The ERT recommends Portugal to include a description of the data sources and methodology for calculating fleet data in the next IIR submissions.

23. The time series is consistent.

24. Portugal lists the following planned improvements for future submissions in their 2022 IIR

- Update to the latest version of COPERT

The ERT commends Portugal for this point of improvement and recommends implementing it as soon as possible.

25. The ERT has no further recommendations within the remit of this review.

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

[5] 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. Portugal IIR 2022
2. Annex I: NFR_PT_subm2022_YYYY_total_V2_Tablea.xlsx (YYYY = 1990 to 2020)

LIST OF ADDITIONAL MATERIALS PROVIDED BY THE COUNTRY DURING THE REVIEW

3. Annex_PT_Q1.xlsx