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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

IRELAND

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 Ireland 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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[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 Ireland, 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 Ireland 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. Ireland provided a resubmission of the inventory on 15 March 2022, and a resubmission of the IIR on 26 April 2022.

RECOMMENDATIONS FOR IMPROVEMENTS TO THE PARTY

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

9. The ERT commends the party on using higher Tier 2 methodology for solid fuels in the 2022 submission in this sector, for calculating PM emissions from '1A4bi – Residential: stationary' in line with Reporting Guidelines.

10. The ERT noted that the activity data on biomass (chips, wood briquettes, pellets) are provided from the National Energy Balance by the Sustainable Energy Authority of Ireland (SEAI).

11. Ireland provided additional information that residential non-traded wood is included. According to SEAI the existing estimate of non-traded wood included in the national energy balance assumes that the trend in residential wood consumption follows the same trend as residential coal and peat consumption as most used fuels in open fireplaces, which is assumed to be a reasonable assumption as most open fires use a mix of coal and/or peat and wood logs. The methodology builds on an expert estimate for 1990 which is assumed to be representative and used as the basis for the entire time series. A particular advantage of this methodology is that a consistent time series of firewood consumption is available from 1990. This methodology is applied for the whole time series. The ERT welcomes the provided information and recommends Ireland to explain the methodology used to estimate "non-traded wood" in the next submission of the IIR.

12. The ERT noted that the split of fuel consumption over different combustion appliances is based on expert opinion and data provided by the Central Statistics Office (CSO). In particular, the ERT noted that in the current approach only a split between fireplaces and stoves is estimated for the years for 1990 and 2020, whereas all years in between are based on linear interpolation. In response to a question the Party confirmed that there is no more frequent data available, and data was found for two years using a ratio derived from Quarterly National Household survey (QNHS). Additionally the Party provided reference on the Environment module from 2014 which contains information on the most popular additional home heating source. The ERT welcomes the information provided by the Party and recommends Ireland to include this information in the next IIR submission. The ERT commends Ireland for including appliance type and technology shares for wood for the period 1990-2020 in Annex C of the IIR. The share for technology type for solid fuels combustion use for 2020 amounts up to 45% in fireplaces and 55% in stoves.

13. Ireland uses the EMEP/EEA Guidebook 2019 Tier 2 methodology for the compilation of its emissions from this category. The ERT welcomes the improvements Ireland made moving to the Tier 2 approach for solid fuels.

14. The ERT did not find clear information of whether particle emissions include or exclude the condensable component. However, in the response to a question Ireland explained that it was not clear to them if EFs from the Guidebook are filterable only or whether they include the condensable component. According to Party understanding is that they include both. The ERT recommends Ireland to check the emission factors used and to include this information in the next submission where it is available.

Table 1: Inclusion of condensables per fuel typ

Fuel Type	Includes the condensable component of $PM_{2.5}$ emissions
Biomass	Yes
Coal	Unknown (EMEP/EEA Guidebook 2019)
Liquid	Unknown (EMEP/EEA Guidebook 2019)
Gaseous	Unknown (EMEP/EEA Guidebook 2019)

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 ERT noted that in Ireland the $PM_{2.5}$ emissions from small combustion are spatially distributed using proxy data from the 2011 census on primary fuel types in households combined with an estimated unit consumption calibrated with the estimated national residential fuel consumption and the emission factors used in the emission inventory.

17. The ERT noted that Ireland did not define any planned improvements for this category in its IIR. In response to a question, the Party responded that there are no immediate plans for further disaggregation of share of technology type use for solid combustion, however, there are ongoing research projects on this area. The ERT commends Ireland for the ongoing research work and recommends that Ireland include this in the improvement plan with clear steps and schedule to report on progress of the work in the next submissions.

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

18. Irelands 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 bulletins of vehicle and driver statistics and the National Roads Authority, with odometer records taken from the National Car Testing and the Commercial Roadworthiness Test Service. In 2020, disruptions due to the covid-19 pandemic meant vehicle tests for cars were only partially complete. Car mileage in 2020 was estimated using an iterative method based on expert judgement and the balance of activity to fuel consumption. The reduction in bus mileage in 2020 was taken from Bus Eireann Annual Report.

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

The ERT notes that the method is not documented transparently in the IIR. The vehicle speeds assigned to urban, rural and motorway road classes and source of speed data are not documented in the IIR. Further, the source of data on number of vehicles in the fleet is not transparently documented in the IIR. The ERT recommends that Ireland document vehicle speed assignments and provide a valid reference to the source of fleet data in its next IIR submissions. The ERT further recommends that a summary of

the fleet data be provided in the IIR in its next submission, including as a minimum the vehicle kilometers driven by vehicle type and fuel type. If possible, trends in fleet-weighted emission factors or emissions by vehicle and fuel type could also be shown.

21. The time series is consistent.

22. Ireland lists the following planned improvements for future submissions in their 2022 IIR

- Review of emission factors against the latest EMEP/EEA Guidebook.

The ERT commends Ireland for this point of improvement and recommends it is implemented as soon as possible.

23. In addition the ERT recommends implementing the following:

- The ERT recommends that Ireland include a statement in the road transport chapter of the IIR confirming that the condensable component of $PM_{2.5}$ is included in emissions estimates.

The ERT encourages implementing of the following:

- The ERT encourages Ireland to follow the recommended structure of the IIR detailed in Annex II of the 2014 Guidelines for Estimating and Reporting Emission Data, which includes an appendix with a table summarising the use of PM emission factors that include/exclude the condensable component, where available.

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

24. In the Appendix of the 'EMEP/UNECE Review Guidelines 2018[4]' 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.

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

[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. Ireland IIR 2022
2. Annex_I_Ireland_1990-2020v1_CLRTAP.xlsx

LIST OF ADDITIONAL MATERIALS PROVIDED BY THE COUNTRY DURING THE REVIEW

3. Responses to questions raised by the ERT during this review
4. Spreadsheet summarising traffic speed data used in the transport emissions model provided in response to a question by the ERT, 'Transport_speed data.xlsx'