

Distr.
GENERAL

CEIP/S3.RR/2023/
Kazakhstan
04/10/2023

ENGLISH ONLY

**Report for the Stage 3 *ad-hoc* review of emission
inventories submitted under the UNECE LRTAP
Convention:**

2023

Kazakhstan

FINAL REPORT

CONTENT

INTRODUCTION	3
PART A: GENERAL RECOMMENDATIONS FOR THE CHAPTER AGRICULTURE.....	5
PART B: SPECIFIC RECOMMENDATIONS FOR THE SECTOR AGRICULTURE.....	5
PART C: SPECIFIC RECOMMENDATIONS FOR THE GRIDDED EMISSION DATA FOR THE SECTOR AGRICULTURE.....	15
REVISED ESTIMATES AND TECHNICAL CORRECTIONS CONSIDERED AND/OR CALCULATED BY ERT	16
LIST OF MATERIALS PROVIDED TO ERT.....	17
LIST OF ADDITIONAL MATERIALS PROVIDED BY THE COUNTRY DURING THE REVIEW	17
ANNEX I TECHNICAL CORRECTIONS AND REVISED ESTIMATES	18
ABBREVIATIONS.....	19
LIST OF REFERENCES AND SUPPORTING DOCUMENTS.....	21

INTRODUCTION

1. 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'.

2. 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.

3. At its eighth joint session in September 2022, the Steering Body and the Working Group on Effects approved the plan that the in-depth review in 2023 focuses on emissions from agriculture with a special emphasis on ammonia, NMVOC and NO_x emissions including gridded data. While the focus was set on NH₃, NMVOC and NO_x emissions, also all other pollutants covered by LRTAP Convention and its protocols (i.e. SO₂, NO_x, NMVOC, NH₃, plus PM₁₀ PM_{2.5}, BC, priority HMs and POP_s) have been checked for the time series years 1990 – 2021 to the extent possible. For these other pollutants especially completeness of reporting was assessed.

4. This report covers the results of the Stage 3 Review (ad hoc review) 2023 of Kazakhstan's air emission inventory submitted under the UNECE LRTAP Convention. The review was coordinated by the EMEP Centre on Emission Inventories and Projections (CEIP) acting as Review Secretariat. The review took place between April and June 2023 and was performed as a desk review between 31 March to 5 May 2023 and an in-person meeting between 22 of May 2023 and 26 May 2023 (centralized review). The following team of nominated experts from the Roster of Experts performed the review.

Agriculture experts:

Ms. Armine ARTENYAN (Republic of Armenia)

Ms. Ajla BASOVIC (Montenegro)

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
http://www.unece.org/fileadmin/DAM/env/documents/2002/eb/air/EB%20Decisions/Decision_2018_1.pdf

Ms. Aleksandra NESTOROVSKA-KRSTESKA (North Macedonia)

Mr. Lasha AKHALAIA (Georgia)

Mr. Hakam AL-HANBALI (Sweden)

Ms. Susana LOPEZ-APARICIO (EU/ETC(EEA))

Ms. Simone MAYER (Austria)

Ms. Andjelka RADOSAVLJEVIC (Serbia)

Ms. Kristina Tonhauzer (Slovakia)

Mr. Tim VAN DER ZEE (Netherlands)

Experts for gridded emission data:

Ms. Christine BRENDLE (Austria)

Mr. Christopher EVANGELIDES

Mr. Christian MIELKE (Germany)

5. Mr. Ben RICHMOND (United Kingdom), Ms. Rikke ALBREKTSEN (Denmark), Mr. Etienne MATHIAS (France), Ms. Kristina SAARINEN (Finland) were the lead reviewers. The review was coordinated by Ms. Sabine Schindlbacher and Mr. Bernhard Ullrich (EMEP Centre on Emission Inventories and Projections - CEIP).

6. The review was performed on the basis of CLRTAP emission data officially reported by Kazakhstan, due by 15 February 2023. The Informative Inventory Reports (IIR), reported due by 15 March 2023 under the CLRTAP, informed the review.

7. The EMEP/EEA Guidebook 2019² was used as a base for the review.

8. The emission inventory of Kazakhstan was received on 22 October 2022 and thus by the deadline of 15 February 2023. The Informative Inventory Report was received on 11 November 2022 and thus by the deadline of 15 March 2023. Kazakhstan provided resubmissions of both the emission inventory and the IIR, on 29 March 2023 and 29 March 2023, respectively. These resubmissions have been considered for the review.]

² EMEP/EEA: EMEP/EEA air pollutant emission inventory guidebook 2019, EEA Report No. 13/2019 European Environment Agency, Copenhagen. Available at: <https://www.eea.europa.eu/publications/emep-eea-guidebook-2019> EU 2019

PART A: GENERAL RECOMMENDATIONS FOR THE CHAPTER AGRICULTURE

9. The ERT recognises the level of effort undertaken by Kazakhstan in providing an inventory including a significant level of detail.

The IIR does not describe the methods used for the sector agriculture transparently enough. The ERT considers the agriculture part of the inventory submission to be of adequate quality in terms of completeness and in need of further development in terms of accuracy, comparability and consistency.

To improve the overall quality of the agriculture air emission inventory the ERT recommends Kazakhstan to

- provide a detailed description of applied methodologies, data sources, choice of emission factors and activity data for all categories in the IIR.
- apply a Tier 2 or higher method to all key categories.
- use the latest available version of the EMEP/EEA air pollutant emission inventory guidebook 2019.
- ensure that the agriculture emission inventory is complete
- provide gridded data.
- provide transparent information on recalculations.
- ensure that the time series are consistent
- ensure that activity data is included in the NFR tables
- increase the capacities of the air pollution inventory team in order to manage transparent, complete, comparable, consistent and accurate inventory within deadlines set up in the UNECE reporting Guidelines.
- provide detailed information on its QA/QC plan for its air emission inventory in future submissions.

PART B: SPECIFIC RECOMMENDATIONS FOR THE SECTOR AGRICULTURE

10. Table 1 provides the findings from the 2023 CLRTAP Stage 3 Review including those not implemented from previous CLTRAP Stage 3 Reviews. While the focus was set on NH₃, NMVOC and NO_x emissions, also all other pollutants covered by the LRTAP Convention and its protocols (i.e. SO₂, NO_x, NMVOC, NH₃, plus PM₁₀ PM_{2.5}, BC, priority HMs and POP_S) have been checked for the years 1990 – 2021 to the extent possible, especially regarding the completeness of reporting. The implementation of the recommendations will be followed up in a future CLRTAP inventory review.

11. As no answer was received on the questions from the ERT during the review the following recommendations have been prepared to the extent possible based on the information from the NFR tables and Kazakhstan's IIR.

Table 1: Findings from the CLRTAP Stage 3 Review 2023 for the Sector Agriculture³

ID	Pollutants	NFR category	Key Category	Tier level	Type	TAC ₁ C ₂ C ₃
KZ-2023-3-1	KCA	3	Yes/No	T1	R	AC ₃
<p>Observation The ERT noted that there is a discrepancy in the national key category analysis provided in the IIR and the key category analysis provided in the stage 2 report for NH₃ of NFR category 3Da3.</p> <p>Recommendation The ERT recommends Kazakhstan to check its Key Category Analysis and, if not applied by now, to use the method described in the latest version of EMEP/EEA Guidebook to determine the key categories for the next submission.</p>						
ID	Pollutants	NFR category	Key Category	Tier level	Type	TAC ₁ C ₂ C ₃
KZ-2023-3-2	Notation keys	3	-	-	R	C ₂
<p>Observation The ERT noted that the usage of notation keys in the NFR tables is not fully in line with the CLRTAP reporting guidelines. As an example NFR 3B4a Buffalo: in the IIR it is reported that buffalos are not bred in Kazakhstan, in the NFR table the notation key not estimated (NE) has been used, which should be changed to a “not occurring” (NO) according to the reporting guidelines.</p>						

³ Note: There are four possible types of findings: R: Recommendation, TC: Technical Correction, PTC: Potential Technical Correction; RE : Revised Estimate

The findings have been assigned to one or more of the following criteria: TACCC T (Transparency), A (Accuracy), C₁ (Completeness), C₂ (Comparability), C₃ (Consistency) for definitions of these criteria see EMEP/EEA Guidebook 2019

Recommendation

The ERT recommends Kazakhstan to check the notation keys used in the NFR tables to be in line with the CLRTAP Reporting Guidelines (Para 12). https://www.ceip.at/fileadmin/inhalte/ceip/00_pdf_other/2022/emissions_reporting_guidelines_2023_final.pdf

ID	Pollutants	NFR category	Key Category	Tier level	Type	TAC ₁ C ₂ C ₃
KZ-2023-3-3	NH ₃ , NMVOC	3B1a, 3B1b, 3Da2a	Yes	T1	R	AC ₂

Observation

The ERT noted with reference to the IIR, page 98, that no Tier 2 methods were used, neither for key categories. Using a Tier 1 method is not best practice and could result in an over and/or underestimate of emissions.

Recommendation

The ERT recommends to use a Tier 2 or higher method for the calculations of at least the key categories, namely for NFR categories 3B1a (NH₃, NMVOC), 3B1b (NH₃, NMVOC) and 3Da2a (NH₃). Changing to a Tier 2 method can be facilitated by the use of the N-flow tool available at <https://www.eea.europa.eu/publications/emep-eea-guidebook-2019/part-b-sectoral-guidance-chapters/4-agriculture/manure-management-n-flow-tool/view>

ID	Pollutants	NFR category	Key Category	Tier level	Type	TAC ₁ C ₂ C ₃
KZ-2023-3B-1	NO _x	3B	No	T1	R	AC ₃

Observation

The ERT noted time series inconsistencies for several livestock categories in 3B for NO_x and 1990-2021. It seems that the EFs of the EMEP/EEA GB 2019 (table 3.3) have been only applied for 2021, but not for the years 1990-2020. Furthermore, for 3B2 Sheep, it is not clear which emission factor has been taken.

Recommendation

The ERT recommends Kazakhstan to recalculate NO_x emissions for the different livestock categories within NFR 3B Manure management for the entire time series and report consistent numbers in the next submission.

ID	Pollutants	NFR category	Key Category	Tier level	Type	TAC ₁ C ₂ C ₃
KZ-2023-3B-2	Activity data	3B1a, 3B1b	Yes (NH ₃ , NMVOC)	T1	R	A

Observation

The ERT noted with reference to the 2021 stage 3 inventory review report that the recommendation concerning 3B1a and 3B1b Manure management of cattle was not implemented. In 2021, the ERT recommended Kazakhstan to obtain statistical information of the mix of slurry/solid systems in the country and to recalculate the emissions taking into account the possible changes of the manure management systems in the time series.

Recommendation

The ERT reiterates its recommendation for Kazakhstan to obtain statistical information of the mix of slurry/solid systems in the country and to recalculate the emissions taking into account the possible changes of the manure management systems in the time series.

ID	Pollutants	NFR category	Key Category	Tier level	Type	TAC ₁ C ₂ C ₃
KZ-2023-3B-3	Activity data	3B3	No	T1	R	AC ₁

Observation

The ERT noted with reference to the 2021 stage 3 inventory review report that the recommendation concerning 3B3 Manure management – Swine was not implemented. It was recommended to provide detailed information on the breakdown of the numbers of the different sub-categories included in the category swine and to recalculate emissions using the correct EFs for each sub-category. The ERT did not find any plans to implement this recommendation in the IIR.

Recommendation

The ERT reiterates its recommendation for Kazakhstan to provide detailed information on the breakdown of the numbers of the different sub-categories included in the NFR category 3B3 Manure management – Swine and to recalculate emissions using the correct EFs for each sub-category consistently across the complete time series.

ID	Pollutants	NFR category	Key Category	Tier level	Type	TAC ₁ C ₂ C ₃
KZ-2023-3B-4	Activity data	3B4d	No	T1	R	AC ₂

Observation

The ERT noted that livestock numbers of goats are reported as IE from 1990-2008 as they are included under NFR category 3B2 Sheep based on Kazakhstan's answer during the 2021 CLRTAP review. From 2009 onwards there are numbers available.

Recommendation

The ERT recommends Kazakhstan to check if sheep and goat numbers can be divided for 1990-2008 and to report the emissions disaggregated by NFR category. Please consider that there are goat numbers available in FAO statistics which might be used.

ID	Pollutants	NFR category	Key Category	Tier level	Type	TAC ₁ C ₂ C ₃
KZ-2023-3B-5	Activity data	3B4g	No	T1	R	AC ₁

Observation

The ERT noted with reference to the 2021 stage 3 inventory review report that the recommendation concerning 3B4g Manure management – Poultry was only partially implemented. The ERT strongly recommended Kazakhstan to disaggregate the national statistics into the poultry subcategories required by the Guidebook methodology. The ERT noted that in the IIR it is described that for 3B4giii Manure Management - Turkeys no industry or governmental reporting is available and so no emissions can be reported. However, the FAO statistics provide numbers for turkeys from 1992 onwards. The ERT also noted that emissions of 3B4giv are only reported for 2021, but not for previous years (IE). In the IIR it is explained that the total number of all bird species for which statistics are available was counted in this category, minus the total number of laying hens.

Recommendation

The ERT acknowledges the efforts of Kazakhstan undertaken by now. The ERT reiterates its recommendation for Kazakhstan for 3B4g Manure management – Poultry to investigate activity data to further disaggregate the national statistics into the poultry subcategories required by the Guidebook methodology consistently across the time series. The livestock data available from FAOSTAT (e.g. for turkeys) might be an option to be considered.

ID	Pollutants	NFR category	Key Category	Tier level	Type	TAC ₁ C ₂ C ₃
KZ-2023-3B-6	NH ₃	3B4gi	No	T1	R	C ₃

Observation

The ERT noted that livestock numbers of laying hens significantly dropped between 2020 and 2021. The ERT assumes, that this is because of dividing the poultry numbers in laying hens and other poultry. Furthermore, the ERT determined IEFs of 0.16 kg NH₃ for 1990-2020 and 0.32 kg for 2021. Referring to Table 3.2 of the EMEP/EEA GB 2019 the T1 EF for layers solid is 0.16 kg and for slurry is 0.32 kg.

Recommendation

The ERT recommends Kazakhstan to improve activity data of poultry (see KZ-2023-3B-5) and to check the methodology used for NFR category 3B4gi. The ERT also recommends to recalculate the NH₃ emissions and provide a consistent time series for the next submission.

ID	Pollutants	NFR category	Key Category	Tier level	Type	TAC ₁ C ₂ C ₃
KZ-2023-3B-7	NO _x	3B4h	No	T1	R	AC ₃

Observation

The ERT noted, that NO_x emissions from 3B4h significantly increased between 2020 und 2021, which is also mentioned in the IIR. It is also reported that in contrast to the data in 2020, in category 3B4h in the 2021 inventory the number of rabbits was counted along with camels.

Recommendation

The ERT recommends Kazakhstan to reevaluate the calculations of NFR category 3B4h for all pollutants for the complete time series. Although camels and rabbits are both reported under this category, the calculations should be done per livestock category and then summed up. Furthermore activity data of rabbits has to be evaluated as there is a need for generating a time series of rabbit numbers, if not done by now. The ERT also recommends to include detailed information on activity data and methodology used in the IIR.

ID	Pollutants	NFR category	Key Category	Tier level	Type	TAC ₁ C ₂ C ₃
KZ-2023-3D-1	NO _x , NH ₃	3Da1	No	T1	R	C ₃

Observation

The ERT noted that there are inconsistencies in the time series of NO_x and NH₃ emissions from 3Da1 Inorganic fertilizers. It seems as the T1 methodology of the EMEP/EEA GB 2019 GB has only been applied for 2021, but not consistently across the time series.

Recommendation

The ERT recommends Kazakhstan to recalculate NH₃ and NO_x emissions from NFR 3Da1 Inorganic fertilizers and report a consistent time series in the next submission.

ID	Pollutants	NFR category	Key Category	Tier level	Type	TAC ₁ C ₂ C ₃
KZ-2023-3D-2	NO _x , NH ₃	3Da2a	Yes (NH ₃)	T1	R	AC ₁ C ₃

Observation

The ERT noted that NO_x emissions from 3Da2a are about 30 times higher in 1990 compared to 1991. For NH₃ the years 1991-1994 are reported as IE, for all other years emissions are reported, which seems as an inconsistency in time series.

Recommendation

The ERT recommends Kazakhstan to check the significant rise in NO_x emissions between 1990 and 1991 for NFR category 3Da2a. The ERT also recommends to check and recalculate NH₃ emissions from this category and include emission values between 1991 and 1994 (reported as IE) in order to provide a consistent and complete time series for the next submission.

ID	Pollutants	NFR category	Key Category	Tier level	Type	TAC ₁ C ₂ C ₃
KZ-2023-3D-3	NO _x , NH ₃	3Da3	Yes (NH ₃)	T1	R	TC ₁

Observation

The ERT noted that NO_x emissions from 3Da3 are not reported for 2021 (NE), but for all other years. Regarding NH₃, the ERT welcomes the reporting of emissions from this source, however the IIR contains only little information on the methodology (Tier 1 methodology is used).

Recommendation

The ERT recommends Kazakhstan to provide NO_x emissions from NFR category 3Da3 consistently across the time series in the next submission. The ERT also recommends to include further information in the IIR on the activity data and methodologies used in order to increase transparency.

ID	Pollutants	NFR category	Key Category	Tier level	Type	TAC ₁ C ₂ C ₃
KZ-2023-3D-3	NO _x , NH ₃	3Da3	Yes (NH ₃)	T1	R	TC ₁

Observation

The ERT noted that NO_x emissions from 3Da3 are not reported for 2021 (NE), but for all other years. Regarding NH₃, the ERT welcomes the reporting of emissions from this source, however the IIR contains only little information on the methodology (Tier 1 methodology is used).

Recommendation

The ERT recommends Kazakhstan to provide NO_x emissions from NFR category 3Da3 consistently across the time series in the next submission. The ERT also recommends to include further information in the IIR on the activity data and methodologies used in order to increase transparency.

ID	Pollutants	NFR category	Key Category	Tier level	Type	TAC ₁ C ₂ C ₃
KZ-2023-3D-4	Activity data	3Dc, 3De	No	T1	R	T

Observation

The ERT noted with reference to the 2021 stage 3 inventory review report that the recommendation concerning 3Da1, 3Dc and 3De was only partially implemented as there is still missing information on units for activity data reported in the NFR tables for 2021 (3Dc and 3De).

Recommendation

The ERT highly appreciated the efforts undertaken in order to improve the NFR tables by including units, which has been done almost completely. For 3Dc and 3De there is still missing information of the units in the NFR, so the ERT recommends again to implement QA/QC procedures with checks of time series consistency for both emissions and activity data and include units for activity data in the NFR Annex I template or IIR.

ID	Pollutants	NFR category	Key Category	Tier level	Type	TAC ₁ C ₂ C ₃
KZ-2023-3D-5	NO _x , NH ₃	3Da2b	No	T1	R	C ₁ C ₃

Observation

The ERT noted with reference to the 2021 stage 3 inventory review report that the recommendation concerning 3Da2b sewage sludge was only implemented partially. It was recommended to include emissions from this source. The ERT welcomes, that Kazakhstan reported NH₃ and NO_x emissions for 2021, but the years 1990-2020 are still missing. This cannot be considered to be a consistent time series.

Recommendation

The ERT welcomes the efforts undertaken by Kazakhstan to report NH₃ and NO_x emissions from NFR 3Da2b for 2021. The ERT recommends to report these emissions consistently across the whole time series in the next submission and to include detailed descriptions of the activity data and methodology used in the IIR.

ID	Pollutants	NFR category	Key Category	Tier level	Type	TAC ₁ C ₂ C ₃
KZ-2023-3D-6	HCB	3Df	No	T1	R	C ₁ C ₃

Observation

The ERT noted, that HCB emissions from 3Df are only reported for the years 2015-2020. According to the IIR the input data needed to use the Tier 1 and Tier 2 methodology are not available as they are not included in the available sectoral and national reporting. However, the FAO statistics provide data of pesticide use in Kazakhstan since 1992.

Recommendation

The ERT is aware of the challenging situation on data gaps, however recommends Kazakhstan to further investigate options to obtain activity data from the use of pesticides in order to report HCB emissions from NFR category 3Df consistently across the complete time series for future submissions.

PART C: SPECIFIC RECOMMENDATIONS FOR THE GRIDDED EMISSION DATA FOR THE SECTOR AGRICULTURE

No gridded emission data was reported.

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

12. In the Appendix of the 'EMEP/UNECE Review Guidelines 2018'⁴ it is stated that if the ERT considers that emissions are significantly under- or overestimated, the Party is during the review 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 a Revised Estimate i.e. the ERT does not accept a Revised Estimate provided by the Party, the ERT may calculate a 'Technical Correction'. The threshold for significance for a Technical Correction for the in-depth review in 2023 was set at 2% of the national total, i.e. a finding that has been identified to result in an over- or under-estimate of emissions of more than 2% of the national total. The methods for calculating Technical Corrections are set up in the 'EMEP/UNECE Review Guidelines 2018' and use the EMEP/EEA Emission 'Inventory Guidebook' as a reference for methods and emission factors.

13. The ERT did not calculate any Technical Corrections and Kazakhstan did not provide any Revised Estimates.

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. Kazakhstan Annex I reporting template
2. Kazakhstan Stage 2 S&A report
3. Kazakhstan Stage 1 report 2023
4. Kazakhstan IIR 2023
5. Repdab-Report
6. Extended checks

LIST OF ADDITIONAL MATERIALS PROVIDED BY THE COUNTRY DURING THE REVIEW

1. Responses to the question raised by ERT during the review
2. Material received from the Party during the Review
 - No additional information was provided by the Party either before or during the review.

ANNEX I TECHNICAL CORRECTIONS AND REVISED ESTIMATES

14. The ERT did not calculate any Technical Corrections and Kazakhstan did not provide any Revised Estimates.

ABBREVIATIONS

This list includes abbreviations commonly used in the Review Reports

AD	Activity data
BaP	Benzo[a]pyrene
BC	Black Carbon
C	Confidential
Cd	Cadmium
CEIP	Centre on Emission Inventories and Projections
CLRTAP	Convention on Long-range Transboundary Air Pollution – ‘the Air Convention’
CO	Carbon Monoxide
E-PRTR	European Pollutant Release and Transfer Register
EEA	European Environment Agency
EF	Emission factor
EMEP	The co-operative programme for monitoring and evaluation of the long-range transmission of air pollutants in Europe (unofficially ‘European Monitoring and Evaluation Programme’ = EMEP)
ERC	Emission Reduction Commitment
ERT	Expert Review Team
GHG	Greenhouse gas
GIS	Geo Information System
GNFR	NFR Aggregation for Gridding and LPS
HCB	Hexachlorobenzene
Hg	Mercury
HM	Heavy metals
IEF	Implied emission factor
kt	Kilotonnes
LPS	Large Point Sources
NA	Not applicable
NE	Not Estimated
NECD	National Emission reduction Commitments Directive
NFR	Nomenclature for reporting
NH ₃	Ammonia
NMVOG	Non-methane volatile organic compounds
NO	Not Occuring
NO _x	Nitrogen oxides
NR	Not relevant/Not Reported
PAHs	Polycyclic aromatic hydrocarbons
Pb	Lead
PCB	Polychlorinated biphenyls
PCDD/F	Polychlorinated dibenzo-p-dioxins and dibenzofurans
PM ₁₀	Fine particulate matter: particles with an aerodynamic diameter equal to or less than 10 micrometres (µm)

PM _{2.5}	Fine particulate matter: particles with an aerodynamic diameter equal to or less than 2.5 micrometres (µm)
POPs	Persistent organic pollutants
PTC	Potential technical correction
RE	Revised estimate
SO ₂	Sulphur dioxide
SO _x	Sulphur oxides
TC	Technical correction
TSP	Total suspended particulates

LIST OF REFERENCES AND SUPPORTING DOCUMENTS

1. Annex I emission reporting template. Available at <https://www.ceip.at/reporting-instructions>
2. ECE/EB.AIR/111/Add.1: Decision 2012/3: Adjustments under the Gothenburg Protocol to emission reduction commitments or to inventories for the purposes of comparing total national emissions with them
https://unece.org/DAM/env/documents/2013/air/ECE_EB.AIR_111_Add.1_ENG_DECISION_3.pdf
3. ECE/EB.AIR/113/Add.1: Decision 2012/12: Guidance for adjustments under the 1999 Protocol to Abate Acidification, Eutrophication and Ground-level Ozone to emission reduction commitments or to inventories for the purposes of comparing total national emissions with them
https://unece.org/DAM/env/documents/2012/EB/Decision_2012_12.pdf
4. ECE/EB.AIR/125: 2014 Reporting Guidelines for Estimating and Reporting Emission Data under CLRTAP
https://unece.org/fileadmin/DAM/env/documents/2013/air/eb/ece.eb.air.125_E_ODS.pdf
5. ECE/EB.AIR/127/Add.1: Decision 2014/1: Improving the guidance for adjustments under the 1999 Protocol to Abate Acidification, Eutrophication and Ground-level Ozone to emission reduction commitments or to inventories for the purposes of comparing total national emissions with them
https://unece.org/DAM/env/documents/2014/AIR/EB/Decision_2014_1.pdf
6. ECE/EB.AIR/130: Technical Guidance for Parties Making Adjustment Applications and for the Expert Review of Adjustment Applications, 14 April 2015
https://unece.org/DAM/env/documents/2014/AIR/EB/ECE_EB_AIR_130_ENG.pdf
7. [ECE/EB.AIR/142/Add.1: Decision 2018/1: Updated methods and procedures for the technical reviews of air pollutant emission inventories reported under the Convention](https://www.ceip.at/fileadmin/inhalte/ceip/00_pdf_other/2019/decision_2018_1_advance_version_ece_eb.air_142_add.1.pdf)
https://www.ceip.at/fileadmin/inhalte/ceip/00_pdf_other/2019/decision_2018_1_advance_version_ece_eb.air_142_add.1.pdf
8. EMEP/EEA: EMEP/EEA air pollutant emission inventory guidebook 2016, EEA Report No. 21/2016 European Environment Agency, Copenhagen. Available at: <http://www.eea.europa.eu/publications/emep-eea-guidebook-2016>
9. EMEP/EEA: EMEP/EEA air pollutant emission inventory guidebook 2019, EEA Report No. 13/2019 European Environment Agency, Copenhagen. Available at: <https://www.eea.europa.eu/publications/emep-eea-guidebook-2019>
10. TFEIP (2022): "Inventory adjustments in the context of emission reduction commitments (ERC)" available at: https://www.ceip.at/fileadmin/inhalte/ceip/00_pdf_other/2022/technical_guidance_for_erc_adjustments_issue1.1.pdf