Convention on Long-range Transboundary Air Pollution

emep

Co-operative programme for monitoring and evaluation of the long-range transmission of air pollutants in Europe

TECHNICAL REPORT CEIP
02/2022

Inventory Review 2022

Review of emission data reported under the LRTAP Convention

Stage 1 and 2 review

Status of gridded and LPS data

Bernhard Ullrich
Robert Wankmüller
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CEIP

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[1] EMEP – Co-operative Programme for Monitoring and Evaluation of the Long-range Transmissions of Air Pollutants in Europe

CONTENTS

List of tables

List of figures

EXECUTIVE SUMMARY

The main objective of the *technical review*[2] *of national inventories* is to check and assess Parties' data, with a view to improve the quality of emission data and associated information reported to the Convention.

This report summarizes the main findings of the annual technical review[3] (stage 1 and stage 2) of emission data, and status of reporting under the LRTAP Convention as of 1st June 2022.

Table 1 presents an overview on the submission status of 51 Parties to the Convention. Most of the Parties to the LRTAP Convention submitted emission data and IIRs, but particularly some countries of the EMEP East area did not provide any information. The last reporting year for gridded data and LPS data was 2021 and for projections 2019. Several of these datasets are still missing, especially from the EMEP East area (see Table 1). More detailed information can be found in the Appendix.

The assessment in Table 1 refers to:

- Article 8 of the 1979 Convention on Long-range Transboundary Air Pollution, Executive Body Decision 2013/04 (ECE/EB.AIR/122/Add.1) Annex I,
- Executive Body Decision 2013/03 (ECE/EB.AIR/122/Add.1),
- Guidelines for Reporting Emissions and Projections Data under the CLRTAP (ECE/EB.AIR/125)

[2] UNECE, 2019: EB Decision 2018/01 Updated methods and procedures for the technical reviews of air pollutant emission inventories reported under the Convention (ECE/EB.AIR/142/Add.1)

[3] Review process: detailed information see at https://www.ceip.at/review-of-emission-inventories/review-process

Table 1: Overview on CLRTAP submission status by 1st June 2022

Country	Timeliness	Completeness	IIR	Projections**	LPS**	Gridded data**
AL	☺	☺	☹	☹	☹	☹
AM	😐	😐	😐	☹	☹	☹
AT	☺	☺	☺	☺	☺	☺
AZ	☹	☹	☹	☹	☹	☹
BA	☹	☹	☹	☹	☹	☹
BE	☺	☺	☺	☺	☺	☺
BG	☺	☺	☺	☺	☺	☺
BY	☺	😐	☺	☹	☹	☹
CA*	☺	😐	😐			
CH	☺	☺	☺	☺	☺	☺
CY	☺	☺	☺	☺	☺	☺
CZ	☺	☺	☺	☺	☺	☺
DE	☺	☺	☺	☺	☺	☺
DK	☺	☺	☺	☺	☺	☺
EE	☺	☺	☺	☺	☺	☺
ES	☺	☺	☺	☺	☺	☺
EU***	☺	☺	☺	☺	☺	☺
FI	☺	☺	☺	☺	☺	☺
FR	☺	☺	☺	☺	☺	☺
GB	☺	☺	☺	☺	☺	☺
GE	☺	☺	☺	☺	☺	☹
GR	😐	☺	☺	☺	☺	☺
HR	☺	☺	☺	☺	☺	☺
HU	☺	☺	☺	☺	☺	☺
IE	☺	☺	☺	☺	☺	☺
IS	☺	☺	☺	☹	☺	☺
IT	☺	☺	☺	☺	☺	☺
KG	☹	☹	☹	☹	☺	☺
KZ	☺	☺	☺	☺	☺	☹
LI	😐	😐	☺	☹	☹	☹
LT	☺	☺	☺	☺	☺	☹
LU	☺	☺	☺	☺	☺	☺
LV	☺	☺	☺	☺	☺	☺
MC	☺	☺	☺	☺	☺	☺
MD	☹	☹	☹	☹	☹	☹
ME	☺	☺	☺	☹	☹	☹
MK	☺	☺	☺	☹	☺	☺
MT	☺	☺	☺	☺	☺	☺
NL	☺	☺	☺	☺	☺	☺
NO	☺	☺	☺	☺	☺	☺
PL	☺	☺	☺	☺	☺	☺
PT	☺	☺	☺	☹	☺	☺
RO	☺	☺	☺	☺	☹	☹
RS	☺	☺	☺	☹	☺	☺
RU	☺	☹	☺	☹	☺	☺
SE	☺	☺	☺	☺	☺	☺
SI	☺	☺	☺	☺	☺	☺
SK	☺	☺	☺	☺	☺	☺
TR	☺	☹	☺	☹	☹	☹
UA	☺	😐	☺	☹	☹	☹
US*	☺	😐	☺			

Legend to Table 1:

Timeliness: ***green*** *– submission within deadline,* ***yellow*** *– submission after deadline,* ***red*** *– no submission*
Completeness (CLRTAP): ***green*** *– full priority + activity data all years;*
yellow *– up to ca. 80% priority (i.e. 10 of 13) (or all priority but not all years and/or no activity data);*
red *– below 80% priority*

IIR: ***green*** *– IIR submitted, structure and content correlate to the template;*
yellow *– IIR submitted, structure and content differ from the template;* ***red*** *– no IIR submitted*

Projections**: ***green*** *– min. 2020, 2025, 2030 reported;* ***yellow*** *– min. one year reported or submission after deadline;*
red *– no projections submitted*

Gridded and LPS data (submitted in or after the last reporting year)**: ***green*** *– new gridded data for at least the years 2000, 2005, 2010 and 2015 submitted;* ***blue*** *– new gridded data for at least one year submitted,* ***red*** *– no gridded data at all submitted, empty – no obligations*

** Canada and the USA have different reporting obligations. They are not included in the EMEP LRT models so the reporting of LPS and gridded data is not required.*

*** 2022 was not a reporting year for Projections,gridded data and LPS. All submitted Projections since 2019 are taken into account. All LPS and gridded datasets since 2021 are taken into account.*

**** The EU has different reporting deadlines. EU may deliver emission and projections report by 30 April, its IIR by 30 May and its gridded data and LPS by 15 June.*

1 INTRODUCTION

This report has been prepared by the Centre on Emission Inventories and Projections (CEIP). CEIP is a data centre under the European Monitoring and Evaluation Programme (EMEP). The report reflects the progress achieved in emission reporting under the LRTAP Convention during the 2022 reporting round.

Box 1. Reporting obligations and guidelines

The EMEP Executive Body Decision 2013/03 (ECE/EB.AIR/122/Add.1) adopted the *„Guidelines for reporting emissions and projections data under the Convention on Long-range Transboundary Air Pollution"* – latest version ECE/EB.AIR/128. Detailed information on reporting obligations under the CLRTAP convention can be found on the CEIP website https://www.ceip.at/reporting-instructions.

Table 2: Reporting obligations and deadlines under CLRTAP

Deadlines	CLRTAP	
Emission data	15. February	annually
IIR	15. March	annually
Projections	15. March	every four years (starting year 2015)
Gridded Data	1. May	every four years (starting year 2017)
LPS information	1. May	every four years (starting year 2017)

This report summarises the main findings of the annual technical review of emission data, focusing on future challenges for improving the quality of this data reported under the Convention.

The review assesses the transparency, consistency, comparability, completeness and accuracy of reported data[4]. Details on the review can be found in *the Methodology Report – Review of emission data reported under the LRTAP Convention.*[5] (https://www.ceip.at/review-of-emission-inventories/review-process).

All Parties to the LRTAP Convention which submitted data[6] in the *standard format* before 01st June 2022 were included in the review. This review report is structured as follows:

- In chapter 2, the results of the initial review (the stage 1) are presented, covering timeliness, completeness, format and transparency of the submission.
- Chapter 3 provides a summary of findings of the extended review (stage 2). Within that stage, differences in emissions due to recalculations, the share of sectors and the consistency

[4] UNECE, 2014: See Reporting guidelines 2014, section III, para 5 (a) to (e) for definitions.

[5] CEIP, 2022 c: https://www.ceip.at/ceip-reports

[6] See details at https://www.ceip.at/status-of-reporting-and-review-results/2022-submission

of the time series were analysed. Additional checks were made which included the key categories emissions per capita, and gross national income. In addition, completeness of gridded emission data and of large point sources (LPS) data are discussed in chapter 4.

- A table with detailed information per country on reporting in 2022 is provided in the Appendix.

The stage 1 and stage 2 review is annually complemented with an in-depth review (S3). S3 review findings are published in individual country reports at https://www.ceip.at/status-of-reporting-and-review-results/2022-submission.

Findings of the stage 1 (S1) and stage 2 (S2) on country level for the CLRTAP inventories can be found in the stage 1 and stage 2 review review reports available at https://www.ceip.at/status-of-reporting-and-review-results/2022-submission and summary information, detailed comparison of Parties and additional checks are presented interactively in the dataviewers on CEIP's homepage at https://www.ceip.at/review-of-emission-inventories/technical-review-reports.

Table 3: Overview of dataviewers 2022 with detailed information on country level

	Dataviewers 2022
1	Completeness
2	Recalculations
3	KCA
4	Share of sectors
5	Emissions per capita and per GDP

2 INITIAL (STAGE 1) REVIEW

Key messages

Over the last 14 years, timeliness and completeness of reporting has improved:

Timeliness: *Until 1st of June 2022, 47 Parties reported CLRTAP data, which is an increase of 24% compared to the number of Parties submitting in 2008 – 38 Parties submitted data in the same timeframe in the first year, in which the annual inventory review took place. Three Parties provided their submissions after the due date of 15 February 2022 (30 April for EU). No data were provided (by 1st June) by four Parties with mandatory reporting obligations –* ***Azerbaijan, Bosnia and Herzegovina, Kyrgyzstan and the Republic of Moldova****.*

Completeness - pollutants: *Main pollutants (CLRTAP) were reported by 47 Parties in 2022 compared to 38 in 2008. Cadmium, Mercury and Lead emissions were reported by 45 Parties, additional HMs by 39, PMs by 47 and priority POPs by 44 Parties. Activity data for the year 2020 were reported by 40 Parties (see Appendix, Table 9). Black Carbon (BC) was voluntarily reported for the first time in 2015 by 28 countries. In the 2022 submission 41 Parties submitted data on BC emissions at least for the year 2020. All but one of the Parties, that submitted data, also provided an Informative Inventory Report (IIR) with their CLRTAP submission in 2022.*

Projections: *2022 was not a reporting year for projections. Seven Parties submitted emission projections in 2022 (17 in 2008, 27 in 2019 (reporting year), 27 in 2021).*

Gridded data and LPS: *2022 was not a reporting year for gridded data and LPS data. Four Parties reported gridded data until the 1st of June 2022 (35 in 2021 (reporting year)). LPS were reported by three Parties (36 in 2021 (reporting year)).*

Albania, Armenia, Azerbaijan, Bosnia and Herzegovina, Kyrgyzstan, Republic of Moldova *are in particular encouraged to make efforts to improve the regularity, completeness and transparency of their reporting.*

Although the quality of the data submitted by the Parties to the LRTAP Convention has improved over the years in terms of completeness, consistency and timeliness not all Parties provide a complete time series for emission inventory data. Hence, further improvement of submissions in the above-mentioned aspects of data quality is strongly recommended: ***Azerbaijan, Bosnia and Herzegovina, Kyrgyzstan and the Republic of Moldova*** *did not report any data to EMEP in 2022.* ***Armenia, Belarus, Ukraine and the United States*** *only provided data for the current reporting year. The* ***Russian Federation (2010 to 2020)*** *– provided data for several years only.*

Format of data: *For CEIP the use of the standardised reporting format is inevitable for efficient processing of data. All Parties submitted their inventories using the revised NFR 2019-1 templates*[7]*.*

Transparency and Informative Inventory Reports: *Transparency means that Parties provide clear documentation (IIR) and references, and that they report emissions and activity data at a level of disaggregation, which provides sufficient understanding of how the inventory was compiled, thereby ensuring that it meets good practice requirements. Parties are strongly encouraged to submit the IIR*[8]*. In recent years, the*

[7] Reporting templates can be downloaded from the CEIP website at https://www.ceip.at/reporting-instructions/annexes-to-the-2014-reporting-guidelines

[8] UNECE, 2014: See Reporting Guidelines 2014, para 43 (ECE/EB.AIR/125)

number of Parties that provided an IIR along with their inventory increased. In 2022 only one Party that submitted an air emission inventory did not provide an IIR.

Data viewer

Additional information is presented in the *Dataviewer* on the *CEIP webpage*.
Link: https://www.ceip.at/review-of-emission-inventories/technical-review-reports/rr2022

An current overview of the data submitted by Parties during the 2022 reporting round is available at https://www.ceip.at/status-of-reporting-and-review-results/2022-submission.
In addition, officially reported emission data can be accessed online at www.ceip.at/webdab-emission-database/reported-emissiondata.

3 EXTENDED (STAGE 2) REVIEW

Key messages:

***Recalculations** of 2005, 2010 and 2015 emissions: 13 Parties reported recalculations **higher than 30%** on national total level for the years 2005, 2010 and 2015. High recalculations occured most frequently for BC, followed by PM_{10}. Common reasons for recalculations were changes in **activity data, methodology and emission factors**.*

***Key category analysis:** A number of emission categories have been identified as key categories for both the 'EMEP East' and 'EMEP West' area country groups. Combustion of fossil fuels in the sector energy and transport is the most important contributor to emissions of NO_X, SO_X, PM and CO. For HMs and POPs most of the key sources are found in the sectors energy and industry. NH_3 occurs mainly in the agricultural sector (the agricultural sector is responsible for more than 80% of NH_3 emissions in some countries). A significant difference for some pollutants (e.g. POPs, PMs) in the number of key categories was observed between 'EMEP East' - and 'EMEP West' areas. This might be partly due to real differences in emissions but might also indicate that inventories are often not complete and/or Parties allocate emissions to NFR categories not always in line with the EMEP/EEA Inventory guidebook[9].*

***Emissions per capita** for at least one pollutant, in some cases for several pollutants, rose in 18 countries between 1990 and 2020 (2000 and 2020 for PMs) whereas **emissions per gross domestic product based on purchasing power parity (GDP/PPP) for at least one pollutant** rose for 5 Parties over the same time period. Changes were only analysed if the country reported values for 1990 (2000 for PMS) as well as for the current year.*

Data viewer

Additional information is presented in the *Dataviewer* on the *CEIP webpage*.
Link: https://www.ceip.at/review-of-emission-inventories/technical-review-reports/rr2022

3.1 Consistency between PM_{10}-, $PM_{2.5}$- and BC emissions (1990-2020)

The focus on checks on time series consistency presented in this report is on the consistency between reported PM_{10}-, $PM_{2.5}$- and BC emissions.

Checks addressing time series consistency of reported data at sector level are provided at the CEIP website and can be accessed via the interactive data viewer http://www.ceip.at/data-viewer.

As $PM_{2.5}$ emissions are assumed to be a subset of PM_{10} emissions, it was checked whether the former are lower than the latter in all years for all countries.

Another basic comparison was performed to check whether reported BC emissions are lower than reported $PM_{2.5}$ emissions.

[9] EMEP/EEA 2019: EMEP/EEA air pollutant emission inventory guidebook 2019, see https://www.eea.europa.eu/publications/emep-eea-guidebook-2019

A comparison of the share of the national total of $PM_{2.5}$ in the national total of PM_{10} was made to identify differences between the submitting Parties (Figure 1). Always the latest submission was used for this check. For countries that did not report data in 2022 data from a previous submission was used for the analysis.
Armenia reported the same number of PM_{10} as for $PM_{2.5}$ for 2014 as national total.

The analysis also shows dips and jumps for some countries, which might indicate time series inconsistencies in either $PM_{2.5}$ or PM_{10} submissions. Further, countries like *Armenia, Azerbaijan, Canada, Kazakhstan, Malta, Turkey, Ukraine and the US* report data with a relatively low **$PM_{2.5}$** share between **0.5%** and **26%** for some years. On the upper end, countries like *Albania, Georgia, Luxembourg, Montenegro and Ukraine* show a share above **90%** for some years. Albania reported high values for $PM_{2.5}$ from 2009 onwards, which could indicate potential erroneous reporting. The majority of the submitting Parties have a share around the 67% range.

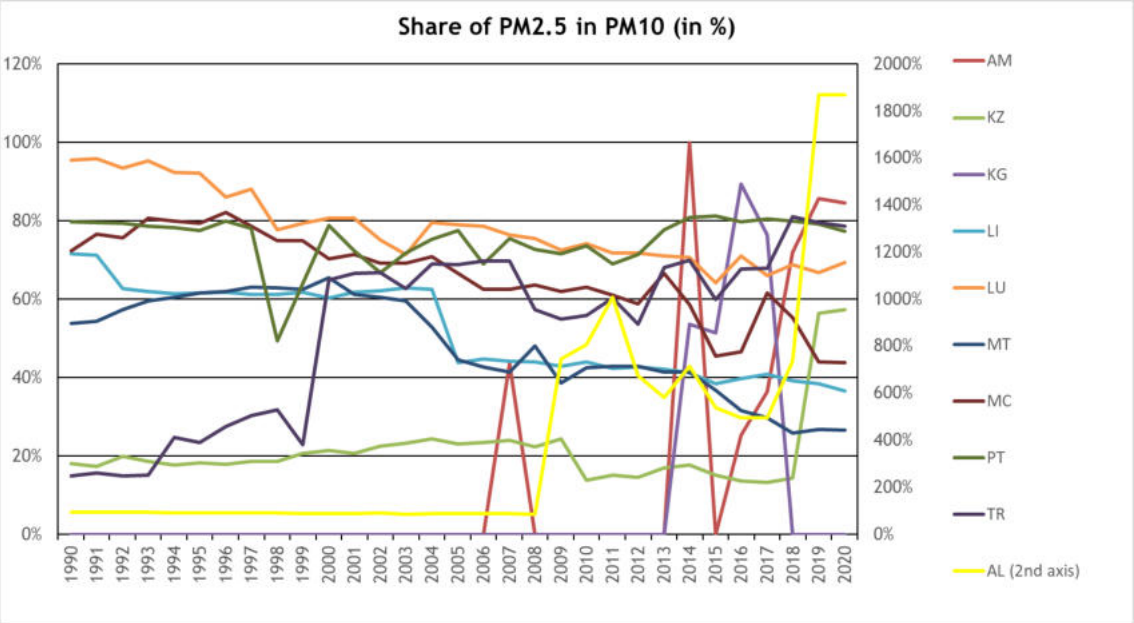


Figure 1: Share in percent of $PM_{2.5}$ national total emissions in PM_{10} national total emissions 2000-2020. Only parties shown where differences greater than 25% occurred (difference between minimum and maximum share)

3.2 Key category analysis (KCA)

A KCA helps to identify significant air pollution sources in the EMEP area and in individual countries. Key categories are those categories that cumulatively contribute 80% of the total emissions of a specific pollutant. The Dataviewer shows the share of the key categories in the total emissions for the two groups of Parties: on the one hand for the group of 'EMEP West'[10] area and

[10] Please note that for the 'EMEP West' area Bosnia and Herzegovina is not included as no data was reported.

on the other hand for the 'EMEP East' area[11]. Results of KCA for individual Parties can be downloaded from www.ceip.at/status-of-reporting-and-review-results/2022-submission.

Most of the reporting 'EMEP West' Parties submitted emission data for BC, except Austria, Liechtenstein and Luxembourg. Most of the reporting 'EMEP East Parties submitted emission data for this pollutant at least for one year, except Russia and Turkey.

3.3 Share of aggregated sectors (GNFR[12])

The share of aggregated NFR14 sectors for each pollutant and each party was assessed to check consistency of reporting between the countries and also potentially identify outliers in reporting.

Figures with comparisons are provided in Dataviewer.

3.4 Comparability – emissions per capita, emissions per GDP

Population and GDP/PPP (gross domestic product/purchasing power parity) have been selected as indicators for the comparison with national total emissions available in standardised format for all Parties. The aim is to further elaborate the check with additional parameters that are relevant for selected key categories/pollutants.

National total emissions reported for 1990 or 2000 (for PM) and 2020 were divided by the number of inhabitants and by the total value of the GDP/PPP. Values for each Party are presented in the Dataviewer. It should be noted that not all Parties submitted 1990 and 2020 data for all analyzed pollutants, and that therefore these statistics cannot fully reflect the developments in the whole EMEP domain.

The Dataviewer shows that for all assessed pollutants the highest and lowest per capita emissions per GDP/PPP emissions differ significantly from the average values (sometimes by a few orders of magnitude). A more detailed analysis of these indicators is outside the scope of this report, but the information is regularly provided to the reviewers during the checking of national inventories under the stage 3 review. Outliers might indicate differences in national economies but also errors in calculations. Low per capita and per GDP/PPP emissions in some Parties also seem to indicate incomplete national inventories, particularly with respect to PM and POPs data. More detailed information on country level is provided in the Dataviewer on the CEIP webpage (www.ceip.at/status-of-reporting-and-review-results/2022-submission).

[11] Please note that for the 'EMEP East' area Azerbaijan, Kyrgyzstan and the Republic of Moldova are not included as no data was reported.

[12] The allocation of NFR14 sector codes to GNFR codes is provided in the conversion table on the CEIP homepage

4 INITIAL CHECKS OF GRIDDED EMISSIONS AND LARGE POINT SOURCES

Key messages:

*In total 37 Parties provided gridded sectoral emissions in 0.1° x 0.1° (long/lat) resolution until June 2022 in this or a previous submission. This covers **80% of the area** of all reporting Parties.*

Until June 2022, only four Parties reported sectoral data in the new EMEP grid resolution of 0.1° x 0.1° (long/lat) for the year 2020, but 34 Parties reported gridded sectoral data for 2019.

For about 59% of the grid cells from 48[13] Parties, data on spatially distributed emissions had to be partly or completely estimated or adjusted by CEIP.

44 out of 48 Parties submitted Large Point Source (LPS) data (in this or a previous submission). Five parties (Armenia, Belarus, Bosnia and Herzegovina, Liechtenstein and Montenegro) did not report any LPS until June 2022.

4.1 Reporting of gridded emissions in 2021

Completeness:

Gridded data is part of the four-year reporting obligation and was not due in 2022.

Until June 2022, **37** of the 48 countries, which are considered part of the EMEP area, reported sectoral gridded emissions in the grid resolution of 0.1°x0.1° (long/lat).

The majority of gridded sectoral emissions in 0.1°x0.1° (long/lat) resolution have been reported for the year 2015 (33 countries). For 2020, gridded sectoral emissions have been reported by four countries, for 2019 by 34 countries, for 2016 and 2017 by 5 countries and for 2018 by four countries (see Figure 2).

Fifteen countries reported gridded emissions additionally for previous years (one country for the whole time series from 1980 to 2020; one country for the time series from 1990 to 2019; seven countries for the years 1990, 1995, 2000, 2005 and 2010; one country for the years 1990, 2000, 2005 and 2010; one country for the years 2000, 2005 and 2010; one country for the year 2005; one country for the year 2010; and two countries for the year 2014).

No gridded sectoral data so far, neither in 0.1° x 0.1° (long/lat) nor in 50 x 50 km² PS resolution, was submitted by Albania, Armenia, Azerbaijan, Bosnia and Herzegovina, Kazakhstan, Liechtenstein, Montenegro, Moldova and Turkey.

From Belarus and Ukraine reported gridded sectoral data is available only in the old 50 x 50 km² PS resolution.

[13] Without Canada, the United States of America and the EU as Party (only the individual EU Member States are considered)

Completeness pollutants:

Until June 2022 37 Parties reported **sectoral gridded emissions for at least one year in 0.1° x 0.1° resolution** for main pollutants, particulate matter, heavy metals and persistent organic pollutants in this or a previous submission.

Reported gridded sectoral data in 0.1° x 0.1° (long/lat) resolution covers 80% of the grid cells of all reporting Parties (see Figure 3).

More information on gridded data is available via the CEIP website at https://www.ceip.at/the-emep-grid.

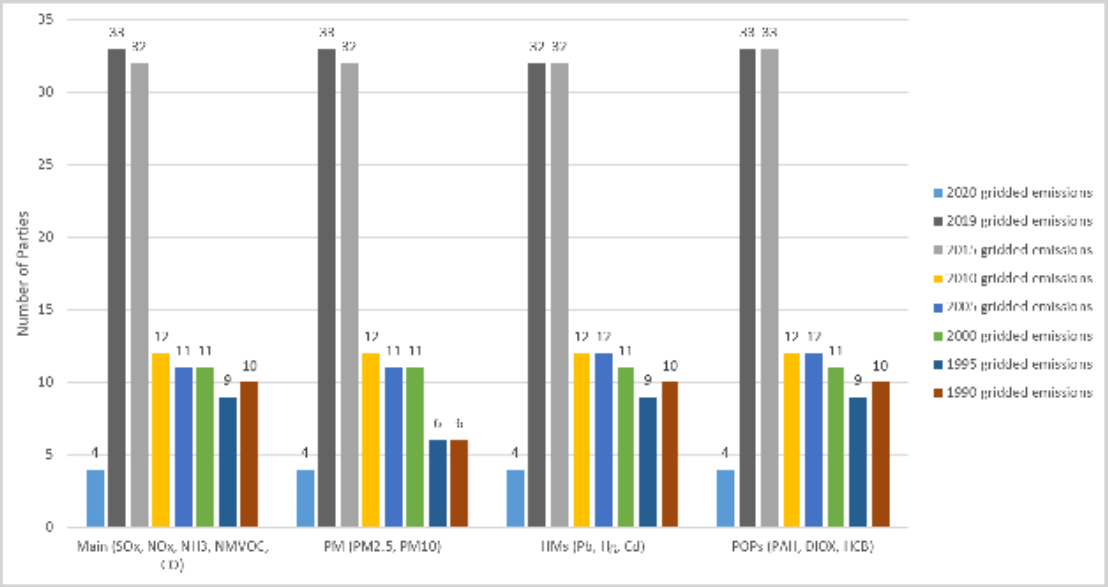


Figure 2: Total number of Parties reporting gridded sectoral data in 0.1° x 0.1° (long/lat) resolution for the years 1990, 1995, 2000, 2005, 2010, 2015, 2019 and 2020, reported to EMEP by 2022

Main pollutants (NO_X, NMVOC, SO_X, NH_3, CO) and PM ($PM_{2.5}$, PM_{10})

Priority heavy metals (Pb, Cd, Hg) and POPs (PCDD/PCDF, PAH and HCB)

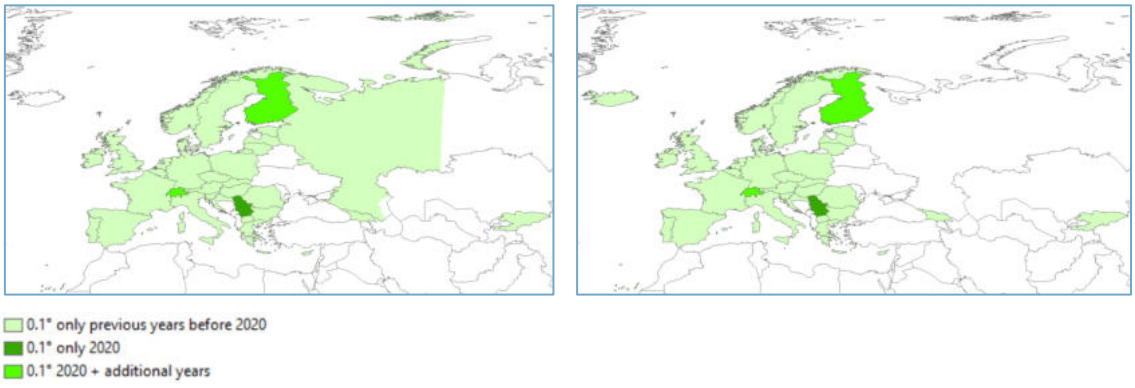


Figure 3: Visualisation of reported gridded emissions in 0.1° x 0.1° (long/lat) resolution in the EMEP area.

For *Portugal* and *Spain* the spatial disaggregation of sector 'F – Road Transport' was replaced by CAMS proxies. Reported gridded data from *Italy* was replaced by CAMS and EDGAR proxies. The submission of gridded emissions for the year 2020 from *Serbia* was too late to be considered for the preparation of gridded data in 2022.

For about 59% of the grid cells from 49 reporting Parties to the LRTAP Convention[14] data on spatially distributed emissions had to be partly or completely estimated or adjusted by air pollutant emission experts in 2022. This is, either because this information was missing or because the reported data could not be used (areas with no reporting at all, like the sea areas, North Africa and areas in the extended EMEP domain are not considered here).

More detailed information on the gap-filling and gridding for emission data used in EMEP models can be found in the „EMEP Status Report 1/2022[15] and in the „Methodologies applied to the CEIP GNFR gap-filling 2022" reports.[16]

4.2 Large point sources (LPS)

„Large point sources" (LPS) are defined as facilities whose combined emissions, within the limited identifiable area of the site premises, exceed certain pollutant emission thresholds[17]. LPS reporting is encouraged to include information on stack heights according to the stack height class categories as defined in the emission reporting guidelines[18]. Submitted LPS information should be consistent with the information reported for European Pollutant Release and Transfer Register (E-PRTR) facilities[19]

Forty-three out of 48 parties submitted LPS data in this or a previous submission. Until June 2022 three Parties submitted LPS data for 2020 and thirty-five Parties submitted LPS data for 2019; Two Parties for 2015 and 2019; One Party for 2010, 2015 and 2019; One Party for 2017, 2018 and 2019; Three Parties for 1990, 1995, 2000, 2005, 2010, 2015 and 2019; One Party for 1990, 1995, 2000, 2005, 2010 and 2015 to 2020; One Party for the time series from 2014 to 2020; One Party for the time series from 2007 to 2020 and one Party for the whole time series from 1990 to 2019. Five parties (Armenia, Belarus, Bosnia and Herzegovina, Liechtenstein and Montenegro) did not report any LPS data yet.

Figure 4 presents maps for main pollutants, PMs, priority heavy metals and POPs with Large Point sources reported until 2022.

[14] Without Canada, the United States of America and the EU as Party (only the individual EU Member States are considered)

[15] EMEP, 2022: http://www.emep.int/mscw/mscw_publications.html

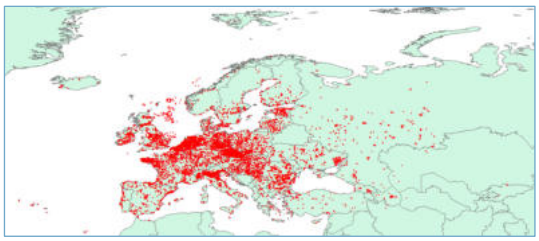
[16] CEIP, 2022 a and CEIP, 2022 b: https://www.ceip.at/ceip-reports

[17] These thresholds have been extracted from the full list of pollutants in Regulation (EC) No. 166/2006 of the European Parliament and of the Council of 18 January 2006 concerning the establishment of a European Pollutant Release and Transfer Register and amending Council Directives 91/689/EEC and 96/61/EC (E-PRTR Regulation) and its annex II 6. See Table 1 in Guidelines for Reporting Emissions and Projections Data under the Convention on Long-range Transboundary Air Pollution – ECE/EB.AIR/125 (www.unece.org/fileadmin/DAM/env/documents/2013/air/eb/ece.eb.air.125_E_ODS.pdf)

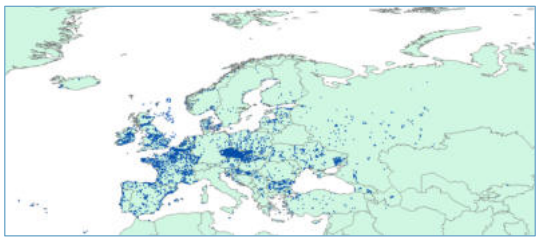
[18] UNECE, 2014. See Table 2 in Guidelines for Reporting Emissions and Projections Data under the Convention on Long-range Transboundary Air Pollution – ECE/EB.AIR/125 (www.unece.org/fileadmin/DAM/env/documents/2013/air/eb/ece.eb.air.125_E_ODS.pdf)

[19] https://ec.europa.eu/environment/industry/stationary/e-prtr/legislation.htm

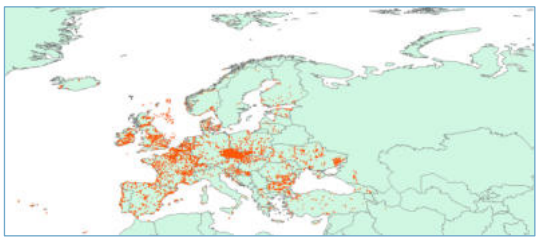
Main pollutants (NO_X, NMVOC, SO_X, NH_3, CO)



Particulate matter ($PM_{2.5}$, PM_{10})



Priority heavy metals (Pb, Cd, Hg)



POPs (PCDD/PCDF, PAH and HCB)

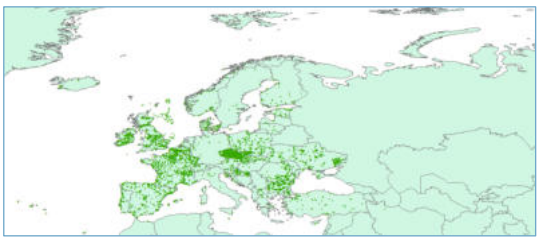


Figure 4: Maps with Large Point Sources reported until 2022

5 UNITS AND ABBREVIATIONS

5.1 Units

kg ..... 1 kilogram = 10^3 g (gram)
t ..... 1 tonne (metric) = 1 megagram (Mg) = 10^6 g
kt ..... 1,000 tonnes …
Mg ..... 1 megagram = 10^6 g = 1 tonne (t)
Gg ..... 1 gigagram = 10^9 g = 1 kilotonne (kt)
Tg ..... 1 teragram = 10^{12} g = 1 megatonne (Mt)
TJ ..... 1 terajoule

5.2 Abbreviations

As ..... Arsenic
BC ..... Black carbon – carbonaceous particulate matter that absorbs light
Cd ..... Cadmium
CDR ..... Central data repository of EEA's Eionet Reportnet
CEIP ..... EMEP Centre on Emission Inventories and Projections
CH_4 ..... Methane
CLRTAP ..... LRTAP Convention
CO ..... Carbon monoxide
CO_2 ..... Carbon dioxide
COPERT ..... Computer Programme to calculate Emissions from Road Transport
Cr ..... Chromium
CRF ..... Common reporting format (UNFCCC for greenhouse gases)
Cu ..... Copper
EEA ..... European Environment Agency
Eionet ..... European environmental information and observation network
EMEP ..... Co-operative Programme for Monitoring and Evaluation of the Long-range Transmissions of Air Pollutants in Europe
E-PRTR ..... European Pollutant Release and Transfer Register
ETC/ATNI ..... European Topic Centre on Air pollution, Transport, Noise and Industrial pollution
EU ..... European Union
GDP, PPP ..... Gross domestic product converted to international dollars using purchasing power parity rates
HCB ..... Hexachlorobenzene – Chemical Abstracts Service (CAS) Registry Number 118-74-1
Hg ..... Mercury
HMs ..... Heavy metals
IIR ..... Informative inventory report
IEF ..... Implied emission factor
KCA ..... Key category analysis

LRTAP Convention	UNECE Convention on Long-range Transboundary Air Pollution
LRT	Long Range Transport
LPS	Large point source
Main pollutants	NO_X, NMVOC, SO_X, NH_3 and CO
Main HMs	Cd, Hg and Pb
NECD	National Emission Reduction Commitments Directive (Directive 2016/2284)
NFR	UNECE Nomenclature For Reporting (of air pollutants)
NH_3	Ammonia
Ni	Nickel
NMVOCs	Non-methane volatile organic compounds – all organic compounds of an anthropogenic nature, other than methane, that are capable of producing photochemical oxidants by reaction with nitrogen oxides in the presence of sunlight
NO_2	Nitrogen dioxide
NO_X	Nitrogen oxides – means nitric oxide and nitrogen dioxide, expressed as nitrogen dioxide (NO_2);
PAHs	Polycyclic aromatic hydrocarbons – for the purposes of emission inventories, the following four indicator compounds shall be used: benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, and indeno(1,2,3_cd)pyrene;
Pb	Lead
PCBs	Polychlorinated biphenyls – aromatic compounds formed in such a manner that the hydrogen atoms on the biphenyl molecule (two benzene rings bonded together by a single carbon-carbon bond) may be replaced by up to 10 chlorine atoms;
PCDD/PCDF	Dioxins and furans – polychlorinated dibenzo-p-dioxins (PCDD) and polychlorinated dibenzofurans (PCDF), tricyclic, aromatic compounds formed by two benzene rings, connected by two oxygen atoms in PCDD and by one oxygen atom in PCDF, and the hydrogen atoms of which may be replaced by up to eight chlorine atoms;
PM	Particulate matter – air pollutant consisting of a mixture of particles suspended in the air. These particles differ in their physical properties (such as size and shape) and chemical composition.
PM_{10}	Particulate matter, or particles with an aerodynamic diameter equal to or less than 10 (μm);
$PM_{2.5}$	Particulate matter, or particles with an aerodynamic diameter equal to or less than 2.5 micrometres (μm);
POPs	Persistent organic pollutants
Se	Selenium
SO_2	Sulphur dioxide
SO_X	Sulphur oxides – means all sulphur compounds expressed as sulphur dioxide (SO_2) (including sulphur trioxide (SO_3), sulphuric acid (H_2SO_4), and reduced sulphur compounds, such as hydrogen sulphide (H_2S), mercaptans and dimethyl sulphides, etc.);
TSP	Total suspended particles
UNECE	United Nations Economic Commission for Europe
UNFCCC	United Nations Framework Convention on Climate Change
VOCs	Volatile organic compounds
Zn	Zinc

5.3 ISO Country codes

AL .....Albania
AM .....Armenia
AT .....Austria
AZ .....Azerbaijan
BA .....Bosnia and Herzegovina
BE.....Belgium
BG .....Bulgaria
BY .....Belarus
CA .....Canada
CH .....Switzerland
CY .....Cyprus
CZ.....Czechia
DE .....Germany
DK.....Denmark
EE.....Estonia
ES .....Spain
EU .....European Union
FI .....Finland
FR.....France
GB .....United Kingdom
GE .....Georgia
GR .....Greece
HR .....Croatia
HU .....Hungary
IE .....Ireland
IS .....Iceland
IT ..... Italy
KG ..... Kyrgyzstan
KZ..... Kazakhstan
LI ..... Liechtenstein
LT ..... Lithuania
LU..... Luxembourg
LV..... Latvia
MC..... Monaco
MD..... Republic of Moldova
ME ..... Montenegro
MK..... North Macedonia
MT ..... Malta
NL..... Netherlands
NO ..... Norway
PL ..... Poland
PT ..... Portugal
RO..... Romania
RS ..... Serbia
RU..... Russian Federation
SE ..... Sweden
SI..... Slovenia
SK ..... Slovakia
TR ..... Turkey
UA ..... Ukraine
US ..... United States of America

'**EMEP West'** comprises Albania, Austria, Belgium, Bosnia & Herzegovina, Bulgaria, Croatia, Cyprus, Czechia, Germany, Denmark, Estonia, European Union, Finland, France, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, North Macedonia, Malta, Monaco, Montenegro, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

'EMEP East' comprises Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Republic of Moldova, Russian Federation, Turkey and Ukraine.

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APPENDIX

Status of 2022 reporting

Table 4: Status of reporting under the LRTAP Convention as of 1st June 2022.

PARTY	Submission Date EMEP	Latest re-sub-mission	NFR template (version)	Gridded Data	LPS Data	2022 Proj.	IIR 2022
Albania	15.02.2022		2019-1				
Armenia	23.02.2022		2019-1				x
Austria	15.02.2022	15.03.2022	2019-1				x
Azerbaijan							
Belarus	15.02.2022		2019-1				x
Belgium	15.02.2022	15.03.2022	2019-1				x
Bosnia & Herzegovina							
Bulgaria	15.02.2022	15.03.2022	2019-1				x
Canada	15.02.2022		2019-1			x	x
Croatia	14.02.2022		2019-1				x
Cyprus	14.02.2022	15.03.2022	2019-1				x
Czechia	15.02.2022	15.03.2022	2019-1				x
Denmark	15.02.2022		2019-1				x
Estonia	11.02.2022	16.03.2022	2019-1				x
European Union	28.04.2022	31.05.2022	2019-1				x
Finland	14.02.2022	15.03.2022	2019-1	x	x	x	x
France	11.02.2022		2019-1				x
Georgia	10.02.2022	05.05.2022	2019-1				x
Germany	08.02.2022		2019-1				x
Greece	18.02.2022		2019-1				x
Hungary	15.02.2022	15.03.2022	2019-1				x
Iceland	14.02.2022		2019-1				x
Ireland	15.02.2022	15.03.2022	2019-1			x	x
Italy	15.02.2022	15.03.2022	2019-1				x
Kazakhstan	10.02.2022	30.03.2022	2019-1			x	x
Kyrgyzstan							
Latvia	15.02.2022	13.04.2022	2019-1				x
Liechtenstein	30.03.2022		2019-1				x
Lithuania	15.02.2022		2019-1				x
Luxembourg	11.02.2022	15.03.2022	2019-1				x
Malta	14.02.2022	29.03.2022	2019-1				x
Monaco	15.02.2022		2019-1	x	x	x	x
Montenegro	15.02.2022	15.03.2022	2019-1				x
Netherlands	15.02.2022	27.05.2022	2019-1				x
North Macedonia	14.02.2022	07.03.2022	2019-1				x
Norway	11.02.2022	08.03.2022	2019-1			x	x

PARTY	Submission Date EMEP	Latest re-sub-mission	NFR template (version)	Gridded Data	LPS Data	2022 Proj.	IIR 2022
Poland	09.02.2022		2019-1				x
Portugal	15.02.2022	15.03.2022	2019-1				x
Republic of Moldova							
Romania	15.02.2022	15.03.2022	2019-1				x
Russian Federation	15.02.2022		2019-1				x
Serbia	14.02.2022	13.04.2022	2019-1	x			x
Slovakia	15.02.2022	15.03.2022	2019-1				x
Slovenia	05.02.2022		2019-1				x
Spain	15.02.2022	14.03.2022	2019-1				x
Sweden	14.02.2022		2019-1				x
Switzerland	10.02.2022		2019-1	x	x	x	x
Turkey	14.02.2022	14.03.2022	2019-1				x
Ukraine	14.02.2022	14.03.2022	2019-1				x
United Kingdom	14.02.2022		2019-1				x
USA	15.02.2022	22.03.2022	2019-1				x

Table 5: Completeness of CLRTAP submissions as of 1st June 2022.

PARTY	SO_2, No_X, CO, NH_3, NMVOC	Cd,Hg, Pb	additional HMs	$PM_{2.5}$, PM_{10}	TSP	BC	POPs (PAH PCDD/PCDF, HCB, PCBs)	Activity Data
Albania	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020
Armenia	2020	2020	2020	2020	2020	2020	2020	
Austria	1990 - 2020	1990 - 2020		1990 - 2020	1990 - 2020		1990 - 2020	1990 - 2020
Azerbaijan								
Belarus	2020	2020	2020	2020	2020	2020	2020	2020
Belgium	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020
Bosnia & Herzegovina								
Bulgaria	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020
Canada	1990 - 2020	1990 - 2020		1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	
Croatia	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020
Cyprus	1990 - 2020	1990 - 2020	1990 - 2020	2000 - 2020	2000 - 2020	2000 - 2020	1990 - 2020	1990 - 2020
Czechia	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020
Denmark	1980 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1980 - 2020
Estonia	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020
EU	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	
Finland	19801 - 2020	1990 - 2020	1990 - 20202	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020
France	1980 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020
Georgia	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020
Germany	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020
Greece	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020
Hungary	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020

PARTY	SO_2, No_X, CO, NH_3, NMVOC	Cd,Hg, Pb	additional HMs	$PM_{2.5}$, PM_{10}	TSP	BC	POPs (PAH PCDD/PCDF, HCB, PCBs)	Activity Data
Iceland	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020
Ireland	1987, 1990-2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020
Italy	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020
Kazakhstan	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020
Kyrgyzstan								
Latvia	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020
Liechtenstein	1990 - 2020	1990 - 2020		1990 - 2020	1990 - 2020		1990 - 2020	
Lithuania	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020
Luxembourg	1990 - 2020	1990 - 2020		1990 - 2020	1990 - 2020		1990 - 2020	1990 - 2020
Malta	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020
Monaco	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020
Montenegro	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020
Netherlands	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020
North Macedonia	1980, 1987, 1988, 1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1980, 1987, 1988, 1990 - 2020
Norway	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020
Poland	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020
Portugal	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020
Republic of Moldova								
Romania	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020
Russian Federation	2010-2020			2010-2020	2010-2020			2010-2020
Serbia	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020
Slovakia	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020
Slovenia	1980 - 20201	1990 - 2020	1990 - 2020	2000 - 2020	2000 - 2020	2000 - 2020	1990 - 2020	1990 - 2020
Spain	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020
Sweden	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020
Switzerland	1980 - 2020	1980 - 2020		1980 - 2020	1980 - 2020	1980 - 2020	1980 - 2020	1980 - 2020
Turkey	1990 - 2020	1990 - 2020		1990 - 2020				
Ukraine	2020	2020	2020	2020	2020	2020	2020	
United Kingdom	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020	1990 - 2020
USA	2020			2020				

Table 6: Completeness of CLRTAP submissions as of 1st June 2022 (since 2015 reporting of Projections mandatory every 4 years, since 2017 reporting of Gridded data and LPS data mandatory every 4 years).

PARTY	Template version 2014-1 or 2014-2				Gridded	LPS Emissions
	Projections WM	Projections WaM	Activity data WM	Activity data WaM	0.1° x 0.1°	
Canada	2025, 2030		2025, 2030			
Finland	2025, 2030, 2040, 2050		2025, 2030, 2040, 2050		1990, 1995, 2000, 2005, 2010, 2015, 2020	1990, 1995, 2000, 2005, 2010, 2015 to 2020
Ireland	2025, 2030, 2040	2025, 2030, 2040	2025, 2030	2025, 2030		
Kazakhstan	2025, 2030, 2040, 2050	2025, 2030, 2040, 2050	2025, 2030, 2040, 2050	2025, 2030, 2040, 2050		
Monaco	2025, 2030	2025, 2030	2025, 2030	2025, 2030	2014 - 2020	2014 - 2020
Norway	2025, 2030		2025, 2030			
Serbia					2020	
Switzerland	2025, 2030, 2040, 2050				1980-2020	2007-2020

DATAVIEWER

The dataviewer containing five different subcategories is available on CEIP's homepage at: www.ceip.at/review-of-emission-inventories/technical-review-reports

Table 7: Overview of dataviewer content to the Inventory Report 2022

Dataviewer 2022	
1	Completeness
2	Recalculations
3	KCA
4	Share of sectors
5	Emissions per capita and per GDP

emep

CEIP
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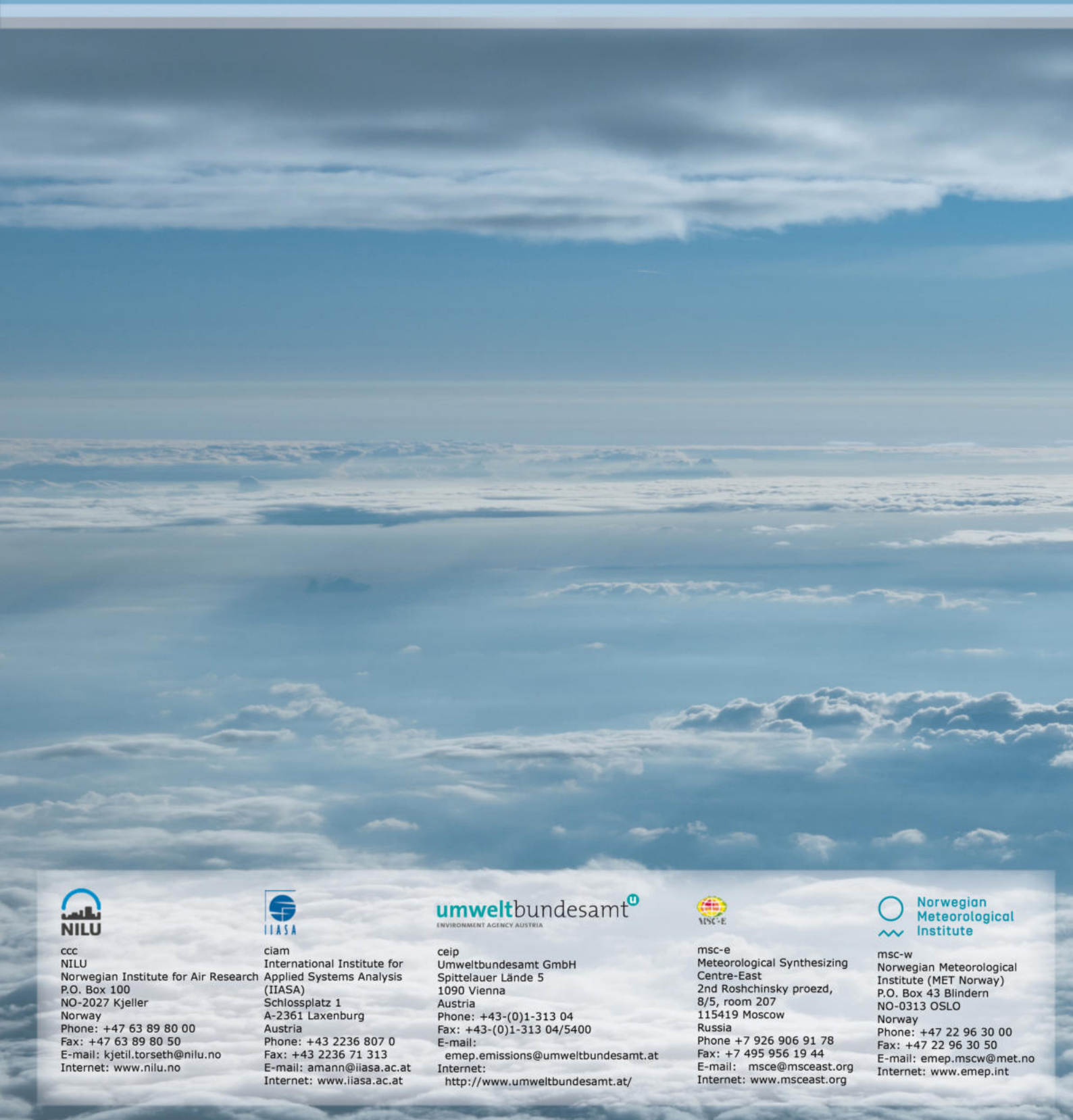

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