



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

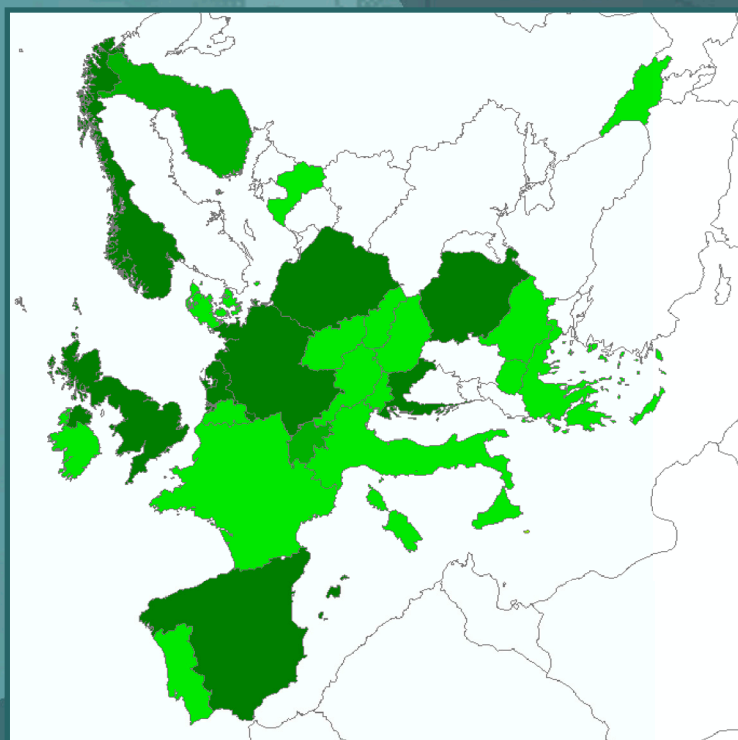
Inventory Review 2018

Review of emission data reported
under the LRTAP Convention
and NEC Directive

Stage 1 and 2 review

Status of gridded
and LPS data

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Umweltbundesamt GmbH, Austria

Katarina Mareckova, Marion Pinterits, Bernhard Ullrich,
Johannes Burgstaller (ETC-ACM)

Robert Wankmueller, Melanie Tista (CEIP/ETC-ACM),

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Project management

Katarina Mareckova

Authors

Katarina Mareckova (CEIP/ETC/ACM)

Marion Pinterits (ETC/ACM)

Bernhard Ullrich (ETC/ACM)

Robert Wankmueller (CEIP/ETC/ACM)

Johannes Burgstaller (ETC/ACM)

Melanie Tista (CEIP/ETC/ACM)

Layout and typesetting

Manuela Kaitna

Cover

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

CONTENTS

	EXECUTIVE SUMMARY	7
1	INTRODUCTION	10
2	INITIAL (STAGE 1) REVIEW	12
2.1	Timeliness	13
2.1.1	CLRTAP.....	13
2.1.2	NECD.....	13
2.2	Completeness	15
2.2.1	CLRTAP.....	15
2.2.2	NECD.....	18
2.3	Format of data	18
2.4	Transparency and Informative Inventory Reports	18
3	EXTENDED (STAGE 2) REVIEW	20
3.1	Recalculations	20
3.1.1	CLRTAP.....	21
3.1.2	NECD.....	23
3.2	Time series consistency (1990-2016)	24
3.2.1	Consistency between reported PM ₁₀ , PM _{2.5} , and BC emissions.....	24
3.3	Key category analysis (KCA)	25
3.4	Inventory comparisons	29
3.4.1	Share of aggregated sectors (GNFR).....	29
3.4.2	CLRTAP/NECD comparisons.....	32
3.4.3	CLRTAP/UNFCCC comparisons.....	32
3.5	Comparability – emissions per capita, emissions per GDP	33
3.5.1	Emissions per capita.....	33
3.5.2	Emissions per GDP.....	33
4	INITIAL CHECKS OF GRIDDED EMISSIONS AND LARGE POINT SOURCES	36
4.1	Reporting of gridded emissions in 2018	36
4.2	Large point sources (LPS)	38
5	UNITS AND ABBREVIATIONS	40
5.1	Units	40
5.2	Abbreviations	40
5.3	ISO Country codes	42
6	REFERENCES	43
	APPENDIX	44
	Status of 2018 reporting under the LRTAP Convention	44
	Status of 2018 reporting under the NECD	49
	ANNEXES	51

List of tables

Table 1: Overview on submission status	7
Table 2: Comparison of reporting obligations and deadlines under CLRTAP and the new NECD	10
Table 3: Overview of annexes to the Inventory Report 2018	11
Table 4: Recalculations above 30% of NO _x , NMVOC, SO _x , NH ₃ , PM _{2.5} , PM ₁₀ and CO emissions for the reported years 2005, 2010 and 2015.	22
Table 5: Total number of categories identified as key categories in the 2016 inventories for individual pollutants in the countries of the EMEP West and EMEP East area.	25
Table 6: Status of reporting under the LRTAP Convention as of 07 th June 2018.....	44
Table 7: Completeness of CLRTAP submissions as of 07 th June 2018.....	45
Table 8: Completeness of CLRTAP submissions as of 07 th June 2018.....	47
Table 9: Status of reporting under the NECD as of 07 th June 2018.....	49
Table 10: Completeness of NECD submissions as of 07 th June 2018.	50
Table 11: Overview of annexes to the Inventory Report 2018	51

List of figures

Figure 1: Status of official submissions to the CLRTAP in 2018 (the deadline for the EU to submit its inventory is 30 th April)	14
Figure 2: Date of NECD inventory submission to the CDR or the European Commission in 2018.....	15
Figure 3: Number of Parties reporting various groups of pollutants, 2010 to 2018 reporting rounds.....	16
Figure 4: Completeness of submitted pollutants per country for the year 2016.....	17
Figure 5: Completeness of CLRTAP submissions for two country groups based on information provided in individual cells of the reporting tables.....	17
Figure 6: Difference of SO _x (for the year 2005), PM _{2.5} (for the year 2005) and BC (for the year 2010) national total emissions as reported for the period 2007–2018 and 2015–2018, respectively.....	21
Figure 7: Share in per cent of PM _{2.5} national total emissions in PM ₁₀ national total emissions 2000–2016 for the upper and lower 10%	24
Figure 8: Overview of key categories for the EMEP East and EMEP West area	27
Figure 9: Comparison of key categories for each pollutant for the EMEP East and EMEP West region	28
Figure 10: Share of GNFR sectors on NMVOC emissions for individual Parties in 2016. Only countries that submitted emission data for this pollutant are presented in the figure.	30
Figure 11: Share of GNFR sectors on BC emissions for individual Parties in 2016. Only countries that submitted emission data for this pollutant are presented in the figure.	31
Figure 12: Minimum and maximum value and middle 50%-range of per capita emissions for each pollutant in 2016.....	34
Figure 13: Minimum and maximum value and middle 50%-range of emissions per GDP/PPP for each pollutant in 2016.....	35
Figure 14: 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 and 2016, reported to EMEP by 2018.	37
Figure 15: Visualisation of reported gridded emissions in 0.1° x 0.1° (long/lat) resolution in the EMEP area.....	37
Figure 16: Maps with Large Point Sources reported until 2018	39

EXECUTIVE SUMMARY

The main objective of technical review 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. The review of data reported under CLRTAP is performed jointly with those reported under the revised National Emissions Ceilings Directive (2016/2284/EU).

This report summarizes the main findings of the annual technical review² (stage 1 and stage 2) of emission data, submitted under the LRTAP Convention and the new NEC Directive before 07th of June 2018.

Table 1 presents an overview on the submission status of 51 Parties to the Convention from which 28 are EU Member States. Under the LRTAP Convention reporting of emission data and IIRs was in the most cases sufficient, but particularly some countries of the EMEP East area did not provide any information. 2018 was no reporting year for projections, gridded data and LPS data. Projections, gridded data in new resolution and LPS data for reference years are still missing from a number of countries, especially from the EMEP East area. The submission under the new NEC Directive was sufficient.

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), and Directive (EU) 2016/2284 of the European Parliament and of the Council of 14 December 2016 on the reduction of national emissions of certain atmospheric pollutants, amending Directive 2003/35/EC and repealing Directive 2001/81/EC

Table 1: Overview on submission status

Country	NECD						CLRTAP					
	Timeliness	Completeness	IIR	Projections**	LPS**	Gridded data**	Timeliness	Completeness	IIR	Projections**	LPS**	Gridded data**
AL							😊	😐	😞	😞	😊	😞
AM							😐	😐	😞	😞	😞	😞
AT	😊	😊	😊	😊	😐	😐	😊	😊	😊	😞	😊	😐
AZ							😐	😐	😐	😞	😊	😞
BA							😞	😞	😞	😞	😞	😞
BE	😊	😊	😊	😊	😊	😊	😊	😊	😊	😊	😊	😐
BG	😊	😊	😊	😐	😊	😊	😊	😊	😊	😐	😊	😐
BY							😐	😐	😞	😞	😞	😞

² Review process: detailed information see at http://www.ceip.at/review_process/review_process_general/

Country	NECD						CLRTAP					
	Timeliness	Completeness	IIR	Projections**	LPS**	Gridded data**	Timeliness	Completeness	IIR	Projections**	LPS**	Gridded data**
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							😞	😞	😞	😞	😞	😞

Country	NECD						CLRTAP					
	Timeliness	Completeness	IIR	Projections**	LPS**	Gridded data**	Timeliness	Completeness	IIR	Projections**	LPS**	Gridded data**
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; empty – no obligations towards NECD

Completeness (NECD): green – reported all 4 pollutants; empty – no obligations towards NECD

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 not like the template; red – no IIR submitted

Projections: green – min. 2020, 2025, 2030 reported; yellow – min. one year reported;

red – no projections submitted

Gridded and LPS data: 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, yellow – last year's 50x50 gridded data submitted,

orange – 50x50 gridded data since 2012 submitted, red – no gridded data at all submitted

* 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 needed.

** 2018 was no reporting year for Projections, gridded data and LPS. All submitted Projections since 2015 and LPS and gridded data since 2017 are taken into account.

1 INTRODUCTION

This report has been prepared by the European Monitoring and Evaluation Programme (EMEP) Centre on Emission Inventories and Projections (CEIP) in cooperation with the European Environment Agency (EEA). It reflects the progress achieved in emission reporting under the LRTAP Convention and in emission reporting under the new NECD during the 2018 reporting round.

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 www.ceip.at/reporting_instructions.

For information about the reporting obligation under the new NECD the following website can be consulted http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2016.344.01.0001.01.ENG.

The new National Emissions Ceilings (NEC) Directive (2016/2284/EU) entered into force on 31 December 2016. Replacing earlier legislation, (Directive 2001/81/EC), the new NEC Directive sets 2020 and 2030 emission reduction commitments for five main air pollutants.

The new directive introduces a number of new reporting requirements for Member States. These are defined in Annex I of the directive and include annual information on emissions of a number of pollutants. For more information please consider the technical report „Methodologies applied to the technical review of emission data” available on CEIP’s website: http://www.ceip.at/fileadmin/inhalte/emep/pdf/2018/Methodology_Report_2018.pdf.

Table 2: Comparison of reporting obligations and deadlines under CLRTAP and the new NECD

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

Note: orange labels indicate differences in the reporting obligations

The report summarises the main findings of the annual technical review of emission data, focusing on future challenges for improving the quality of emission data reported under the Convention and the NECD. To present the progress of the reporting status the actual year is compared with the status in 2008, when the review process was performed for the first time.

The review assesses the transparency, consistency, comparability, completeness and accuracy of reported data³. Details on the review methods can be found in the Methodology Report – Review of emission data reported under the LRTAP Convention and NEC Directive (www.ceip.at/review_proces_intro/review_process).

³ See Reporting guidelines 2014, section III, para 5 (a) to (e) for definitions.

All Parties which submitted data⁴ in the *standard format* before 07th June 2018 (Figure 1) 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, differences between NECD, UNFCCC and CLRTAP submissions, the share of sectors and the consistency of the time series were analysed. Further checks were made which included the key categories emissions per capita, and gross national income.

In addition completeness of gridded data and of large point sources (LPS) are discussed in chapter 4. A table with detailed per country information on reporting in 2018 is provided in the Appendix.

The stage 1 and stage 2 review is annually complemented with an in-depth review of selected countries (in 2018: Armenia, Azerbaijan, Belarus, Finland, Moldova and Ukraine). Review findings are published in country reports at

http://www.ceip.at/review_process/review_process_general/.

Eight annexes with detailed results can be found on CEIP's homepage at:

http://www.ceip.at/ms/ceip_home1/ceip_home/review_results/review_reports.

Table 3: Overview of annexes to the Inventory Report 2018

Annexes 2018 - available on CEIP's homepage	
A	Recalculations of CLRTAP and NECD emission data in 2018
B	Inventory Comparisons between CLRTAP, UNFCCC and NECD data for 1990 and 2016
C	LPS reporting under CLRTAP from 2017-2018
D	Emissions per capita and per GDP comparison of 1990 and 2016 (2000 and 2016 for PM _{2.5} and PM ₁₀)
E	Completeness of reported data
F	KCA: Comparison EMEP West with EMEP East area
G	Analysis of recalculations performed by countries
H	Comparison of share of sectors between countries for reported pollutants

⁴ See details at http://www.ceip.at/ceip_home/status_reporting/2018_submissions/

2 INITIAL (STAGE 1) REVIEW

Key messages

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

In 2018, 45 Parties reported CLRTAP data, which is an increase of 50% compared to the number of submitting Parties in 2008 - only 30 Parties submitted data in the first year, in which the annual inventory took place.

*37 Parties provided their submissions by due date of 15 February 2018. No data were provided by three Parties with mandatory reporting obligations - **Liechtenstein, Monaco and the Republic of Moldova.***

In 2018, 86% of the EU Member States provided NECD data by the required reporting deadline but finally all EU Member States submitted data. In 2008, the percentage within deadline was 70%.

Similar to 2017, major pollutants (CLRTAP) were reported by 45 Parties in 2018 compared to 40 in 2008.

76% of the Parties submitted an Informative Inventory Report (IIR) with their CLRTAP submission in 2018 comparing to 66% in 2008. It should be noted that the provision of an IIR is essential for a complete centralised stage 3 review.

Black Carbon (BC) was voluntarily reported for the first time in 2015 by 28 countries, the number of reporting parties raised to 34 in 2016 and to 36 countries in 2017. In 2018 39 countries reported BC emissions.

Armenia, Belarus, Bosnia and Herzegovina, Kazakhstan, Kyrgyzstan, Montenegro, Republic of Moldova, Ukraine and Turkey are in particular encouraged to make efforts to improve the regularity, completeness and transparency of their reporting.

*Although in the submitted data quality in terms of completeness, consistency and timeliness by the Parties to the LRTAP Convention has improved through the years, not all Parties provide a complete time series for emission inventory data, therefore the viability of time series assessment for these countries is limited. Hence, further improvement of submissions in the above-mentioned aspects of data quality is strongly recommended: **Bosnia and Herzegovina** did not report any data to EMEP, **Montenegro** did not report data since 2013, **Armenia and Ukraine** only provided data for the current reporting year. Other countries, namely **Belarus, Georgia and Russia** - provided data for a few years only (less than 10 years).*

2.1 Timeliness

Inventory data reported under LRTAP Convention serve as input for gridded data, which are used by diverse EMEP models for annual environmental analyses. If data are not reported according to the agreed deadline, expert estimates must be used instead. As a result, late reporting has a negative impact on the accuracy of the EMEP (modeling) assessment.

2.1.1 CLRTAP

45 Parties (out of 51) to the Convention submitted inventories by 07th June 2018 (see Figure 1). 37 Parties reported emission data by the due date⁵ of 15th February 2018, two less than during the 2017 reporting round. 19 Parties resubmitted NFR tables and/or an IIR. Liechtenstein, Monaco and the Republic of Moldova were the only countries with mandatory reporting obligations that did not submit any data. More details are provided in the Appendix (Table 6).

2.1.2 NECD

Since the end of December 2016 the new NECD is in place. Similar to the emissions reporting obligations under CLRTAP a number of pollutants, that weren't a priority to report with the old NECD, have to be reported now under the new NECD. In the 2018 NEC Directive reporting round⁶, 24 of the 28 Member States submitted their national inventories of the five main pollutants (NO_x, NMVOCs, SO₂, NH₃ and CO), particulate matter (PM_{2.5}, PM₁₀, and, if available BC and TSP), heavy metals (Cd, Pb, Hg), if available additional heavy metals (As, Cr, Ni, Se, Zn) and persistent organic pollutants (PAHs, Dioxins, PCBs and HCB) emissions to the Commission by the appropriate reporting deadline. Croatia and Italy delivered their inventories by the end of February 2018 (see Figure 2). 16 Member States provided additional or revised data until 09 May 2018 – date of the latest emission data submission received for 2018. Malta and Greece submitted their initial data relatively late; by 17 April 2018 and 03 May 2018, respectively.

An overview of the status of reporting under the NECD is given in Table 9 and Table 10.

⁵ The reporting deadline for the EU-28 inventory is 30th April. For the IIR it is 30th May (UNECE, 2014).

⁶ Pursuant to Annex 1 of the NECD Member States are required to report their emission inventories by 15 February each year, deadline for the IIR is March 15 (Directive (EU) 2016/2284)..

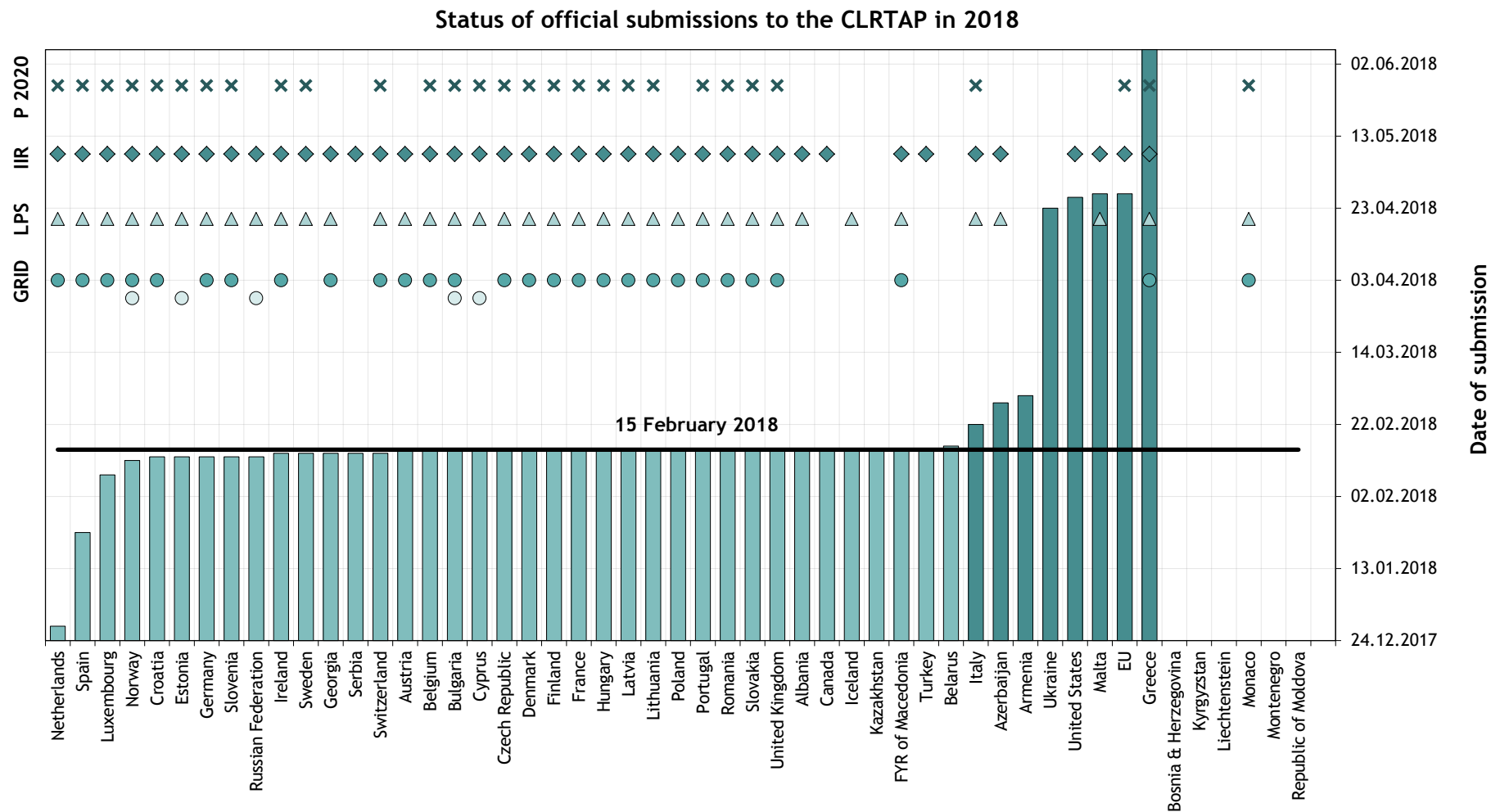


Figure 1: Status of official submissions to the CLRTAP in 2018 (the deadline for the EU to submit its inventory is 30th April)

Note: Bars indicate the submission of NFR tables. Symbols indicate the submission of Informative Inventory Reports (IIR), Gridded data (GRID) in the 50x50 grid (light green circles), the new grid (dark green circles) and Large Point Sources (LPS) in 2017 and 2018. 2020 projections (P2020) in 2015, 2016, 2017 and 2018. For detailed information see Table 7 in the Appendix.

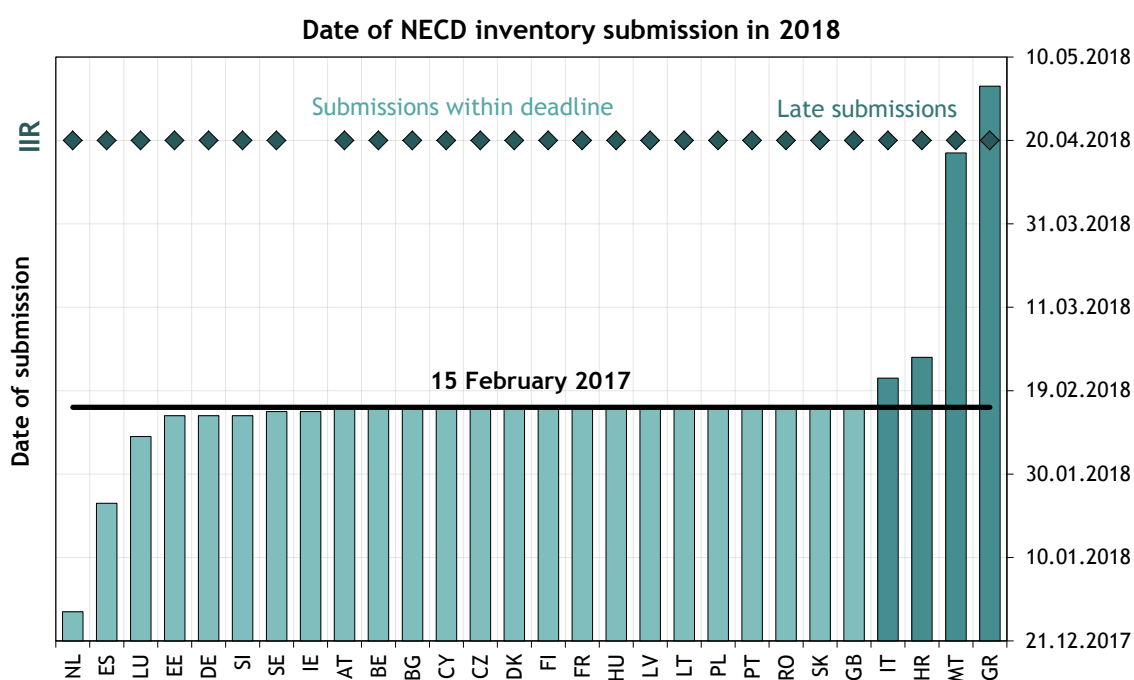


Figure 2: Date of NECD inventory submission to the CDR or the European Commission in 2018

2.2 Completeness

2.2.1 CLRTAP

Completeness – pollutants: 45 Parties to the Convention submitted inventories but not all inventories were complete. All submitting Parties reported their 2016 emissions of the *main pollutants*. Cadmium, Mercury and Lead emissions were reported by 42 Parties, additional HMs by 37, PMs by all 45 and priority POPs by 42 Parties. Activity data were reported by 38 Parties (see Appendix, Table 7). It is noticeable that reporting remained stable for the main pollutants, additional HMs, PMs and POPs; a slight decrease in the number of reporting parties can be noticed for the HMs and activity data in 2018 (Figure 3). For the fourth time Black Carbon (BC) was reported, where 39 Parties submitted data (37 Parties in 2017; 35 Parties in 2016).

Completeness of time series: A number of Parties to the Convention who submitted data during the 2018 reporting round did not provide complete time series in the standard format as specified by the current reporting requirements: complete time series of the *main pollutants* in NFR format for 1990–2016 were reported by 36 Parties. 34 Parties provided complete time series (1990–2016) of the *priority heavy metals*. 37 Parties provided the requested time series of *particulate matter* (2000–2016). 34 Parties provided full time series (at least 1990–2016) of POPs, 20 Parties submitted a full time series (1990–2016) of BC. Armenia, Kyrgyzstan and Ukraine provide only emissions of the current year but not the whole time series that would also reflect improvements and recalculations (see Appendix, Table 7).

Projections: In 2018, four Parties (17 in 2008) submitted emission projections, and all of them (12 in 2008) submitted data for 2020, 2025 and 2030 projections (see Appendix, Table 8). Up to now, 26 Parties have provided 2020 projections (submitted either in 2012, 2013, 2014, 2015, 2016, 2017 or in 2018; see Figure 1).



Figure 3: Number of Parties reporting various groups of pollutants, 2010 to 2018 reporting rounds

An up-to-date overview of the data as submitted by Parties during the 2018 reporting round is available at www.ceip.at/status_reporting/2018_submissions.

In addition, officially reported emission data can be accessed online at www.ceip.at/webdab_emepdatabase/reported_emissiondata.

A number of Parties do not submit information regularly during the annual reporting rounds under the LRTAP Convention. *Bosnia and Herzegovina, Kyrgyzstan, Liechtenstein, Monaco, Montenegro and the Republic of Moldova* did not submit any data in 2018.

Figure 4 shows the split of the submitted data into priority and non-priority pollutants for the 2016 data. 45 parties submitted data. 38 Parties submitted data for all priority pollutants, and only 31 Parties submitted data for all 25 pollutants listed in paragraph 7 and 8 of the [Guidelines of Reporting Emissions and Projections Data under the Convention on Long-range Transboundary Air Pollution](#) (Azerbaijan, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, European Union, Finland, France, Georgia, Germany, Greece, Hungary, Iceland, Ireland, Italy, Kazakhstan, Latvia, Lithuania, Malta, Norway, Portugal, FYROM, Romania, Serbia, Slovakia, Spain, Sweden and the United Kingdom). Activity data was reported only by 38 Parties from 45 Parties submitting NFR tables..

Figure 5 shows a simple compilation indicating completeness of reporting for the CLRTAP inventories (years 2005, 2010 and 2016) for two country groups, based on the NFR templates originally submitted. The number of the notation keys or values used for source categories in the NFR templates and the amount of missing data are compiled across all countries within each country group and expressed as percentage values. In Figure 5 the main pollutants **NO_x**, **NMVOCs**, **SO_x**, **NH₃** and **CO** are shown. Analyses for all other pollutants are given in Annex E (see [Annexes](#)).

Within the area ‘*EMEP West*’ reporting completeness is high, with higher data quality for more recent years. In the country group ‘*EMEP East*’ a very high amount of data is still missing (20-30%), but the reporting situation has considerably improved within this group of countries over the years. The frequent use of the notation key ‘NA’ can be explained with the fact that some air pollutants are only relevant for specific emission sources (e.g. NH₃ mainly for agriculture). The notation key ‘NE’ has been used frequently in the country group ‘*EMEP West*’ in 2016 (8-14%), and in the geographical area ‘*EMEP East*’ empty cells are often used (up to 10%) – on top of the high amount of missing inventories (see Annex F – KCA: Comparison *EMEP West* with *EMEP East* area – [Annexes](#))

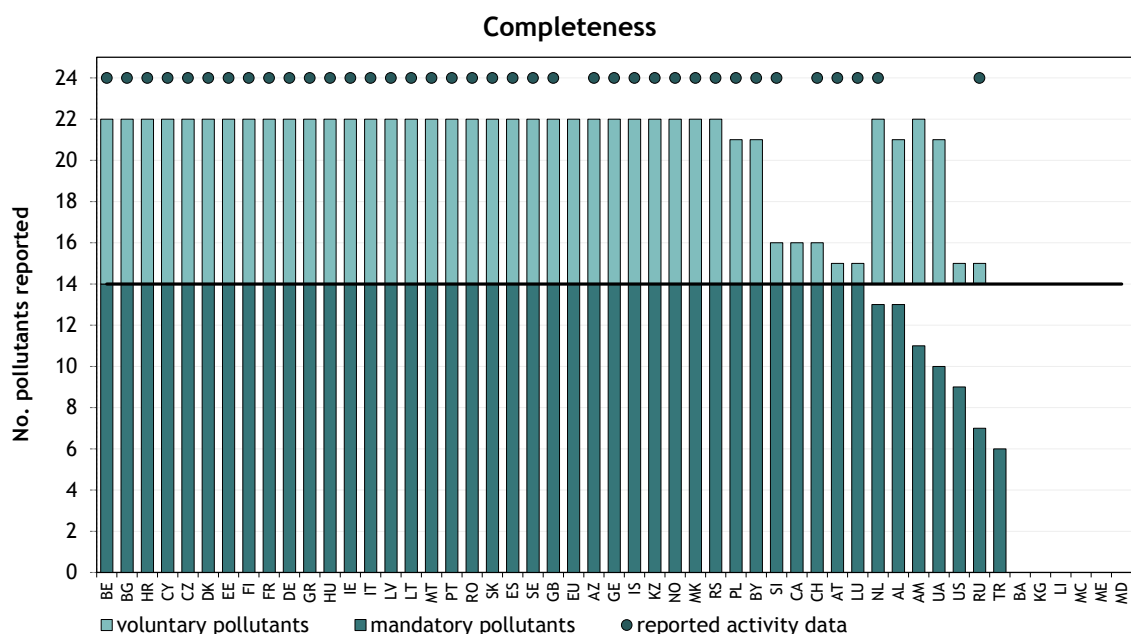


Figure 4: Completeness of submitted pollutants per country for the year 2016

Note: priority pollutants: NO_x , SO_x , NH_3 , NMVOC, CO_2 , Cd, Hg, Pb, $PM_{2.5}$, PM_{10} , PAH, DIOX, HCB, PCB
 voluntary pollutants: BC, TSP, As, Cr, Cu, Ni, Se, Zn

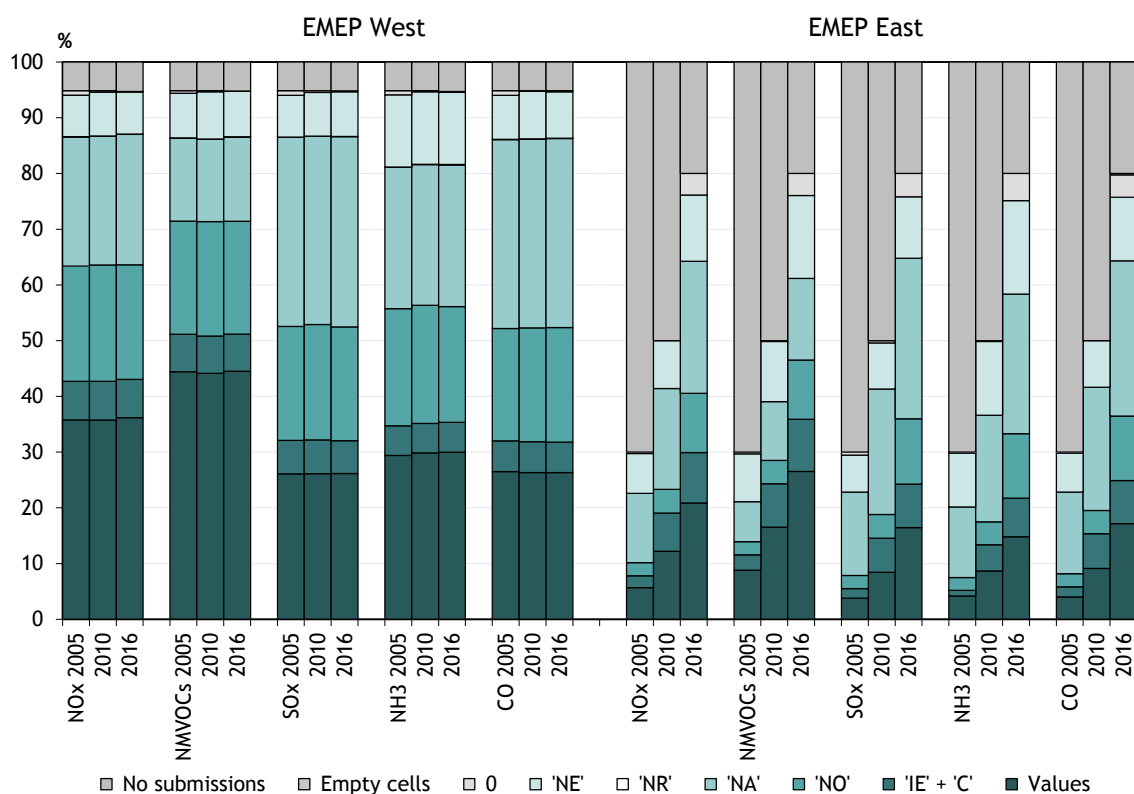


Figure 5: Completeness of CLRTAP submissions for two country groups⁷ based on information provided in individual cells of the reporting tables.

(‘NE’ – not estimated, ‘NR’ – not relevant, ‘NA’ – not applicable, ‘NO’ – not occurring, ‘IE’ – included elsewhere, ‘C’ – confidential)

⁷ For more detailed information see [Units and abbreviations](#)

2.2.2 NECD

The second reporting round under the new NECD in 2018⁸, was completed by four late submissions received after the reporting deadline of February 15th. Two submissions were received soon after the reporting deadline (*Italy, Croatia*). The submissions for *Malta and Greece* were received on the 17 of April and the 03 of May, respectively. All Member States provided emission data for main pollutants in 2016. In addition, three EU Member states submitted projections for 2020, 2025 and 2030. The last reporting year for gridded data and LPS emissions under the new NECD was 2017. Gridded data was reported by six countries with all countries submitting data before the official reporting deadline of May 1st. One country provided LPS emission data in 2018 within the reporting deadline of May 1st. An overview of NECD emission inventory data (status as of 07th of June 2018) is provided in Table 9 and Table 10.

2.3 Format of data

The use of the standardised reporting format is inevitable for efficient processing of data for CEIP like reviews, comparisons across countries and the import of data into the CEIP database „WebDab“. Parties have to use the latest version of tables provided in Annexes to Reporting guidelines. (see http://www.ceip.at/reporting_instructions/annexes_to_guidelines).

CLRTAP

With the exception of Albania, all Parties submitted their inventories using the revised NFR14 templates⁹. Albania submitted emission data in the old NFR09 format.

NECD

The consistency of the reporting formats submitted under the new NECD is similar to the previous reporting round. All 28 Member States submitted data in standard formats (NFR14 templates).

2.4 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.

In 2018, the number of Informative Inventory Reports (IIRs) submitted by Parties under the CLRTAP decreased by one to 40 (all of those submitting inventories), compared to the previous year.

⁸ The reporting deadline for the actual NECD reporting cycle was 15 Feb 2018.

⁹ Reporting templates can be downloaded from the CEIP website at www.ceip.at/reporting_instructions/annexes_to_guidelines

The quality of submitted national IIRs has improved within the last years. Comprehensive reports were submitted by *Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, FYR of Macedonia, the Netherlands, Norway, Poland, Portugal, Slovenia, Spain, Sweden, Slovenia, Switzerland and the United Kingdom*. The IIRs of *Azerbaijan, Romania and Serbia* show significant improvements within the last years but still lack in completeness or transparency. Other countries do not submit IIRs regularly (i.e. *Albania, Armenia, Belarus, Bosnia and Herzegovina, Czech Republic, Georgia, Ireland, Kazakhstan, Kyrgyzstan, Luxembourg, Malta, Monaco, Montenegro, Republic of Moldova and Ukraine*).

Not all protocols are ratified by Armenia, Azerbaijan, Bosnia and Herzegovina, Georgia, Kazakhstan and Kyrgyzstan. From these countries, only *Azerbaijan and Georgia*, submitted an IIR to CEIP in 2018. It should be noted that a complete in-depth review (stage 3) is only possible for Parties which submit an IIR.

Under the new NECD, providing inventory reports or explanatory information that describes the methods and sources of reported data is mandatory. All countries except *Ireland* submitted an inventory report together with their NECD inventories in 2018.

The number of submitted IIRs in relation to the total number of Parties (51 Parties to the CLRTAP) increased from 29 submissions in 2008 to 39 submissions in 2018. This trend also applies to IIR submissions under NECD (5 submissions in 2008 to 27 submissions in 2018).

3 EXTENDED (STAGE 2) REVIEW

Key messages:

In 2018, the total number of recalculations increased significantly. The most recalculated emissions are NMVOC, NO_x, CO and SO_x.

Recalculations of 2005, 2010 and 2015 emissions: 15 Parties reported recalculations for over 30% of the emission data for the years 2005, 2010 and 2015. Most recalculations were applied to PM₁₀ (2005 and 2010), CO (2005) and BC (2010). The most frequent reasons for the recalculations were changes in activity data and emission factor.

Key category analysis: A number of emission categories have been identified as key categories for both groups of countries¹⁰. Combustion of fossil fuels in energy industries and transport is the most important contributor to emissions of NO_x, SO_x and PM. They are also dominating sources for emissions of HMs and POPs. NH₃ occurs mainly in the agricultural sector (typically by more than 80%). 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 seem to 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. In comparison with the previous submission, the biggest change of sectoral share occur in EMEP West area for DIOX emissions in category 1A1a (Public electricity and heat production).

Portugal was the only country that submitted different values under NECD and CLRTAP, because of different territorial coverage under NECD and CLRTAP.

The comparison between CLRTAP and UNFCCC emissions shows differences of 2% or below for 86% of the reported values. In eight countries there are differences of more than 10% for at least one pollutant (up to -260.8% in SO_x emissions reported by Bulgaria) which seems to indicate inconsistent reporting across different reporting obligations.

Emissions per capita rose between 1990 and 2016 (2000 and 2016 for PMs) in 24 countries whereas emissions per GDP/PPP rose over the same time period for 12 Parties.

3.1 Recalculations

All emission estimates within a time series should be calculated consistently, i.e. the time series should be calculated using the same method and data sources for all years. It is important and necessary to document inventory recalculations and to understand their origin in order to correctly evaluate the officially reported emission data. This is especially the case when emission ceiling targets are expressed in absolute terms (as in the Gothenburg Protocol and the old NECD) and not as percentage reduction targets (as in the Kyoto Protocol for greenhouse gases and the reduction commitments mentioned in the new NECD). The magnitude of the recalculations can also provide an indication of the general uncertainty in emissions estimates.

¹⁰ for 'EMEP East' and 'EMEP West' areas

3.1.1 CLRTAP

A first test to check the recalculations is to calculate *differences between the national total emissions* for the full time series as reported by Parties to the CLRTAP in 2018 and 2017. Then the variances larger than $\pm 10\%$ are flagged¹¹ (see Annex A, *Annexes*). Of 45 reporting Parties, 38 provided recalculated data for at least some pollutants. Among main reasons for recalculation were:

- updates of activity data,
- changes in inventory calculation methodologies
- updates of emission factors mainly due to the revision of the *EMEP/EEA guidebook* and
- corrections of errors

The total number of recalculations for individual components does not differ significantly and varies between 685 and 923, with **NMVO**C being the pollutant most often recalculated, followed by **NO_x**, **CO** and **SO_x**. Compared to last year, the total number of recalculations has increased by 72% (from 7 454 to 12806). This increase also includes the recalculations of Black Carbon (685 recalculations), which was reported the third time.

In the second test, where the focus is on the number of *recalculations larger than $\pm 10\%$* (highlighted cells in Annex A – Recalculations of CLRTAP and NECD emission data in 2018) it was found that 26%¹² of all recalculations were larger than $\pm 10\%$. Large differences were most frequently observed for **PM₁₀**, **PCB** and **HCB**. Extreme differences were observed for Portugal, for example (PAH in all years), Malta (CO 2005-2015) and Bulgaria (BC in all years).

Next, the recalculations of 2005, 2010 and 2015 emissions as reported in subsequent years were analysed. Figure 6 shows the recalculations for the emissions of **SO_x**, **PM_{2.5}** and **BC** emissions reported in selected countries. For recalculations with a deviation above 30% the IIRs were consulted and if no explanation was found, the member states were contacted.

More information on recalculations and explanations is available in Annex G at the CEIP website under http://www.ceip.at/ms/ceip_home1/ceip_home/review_results/review_reports.

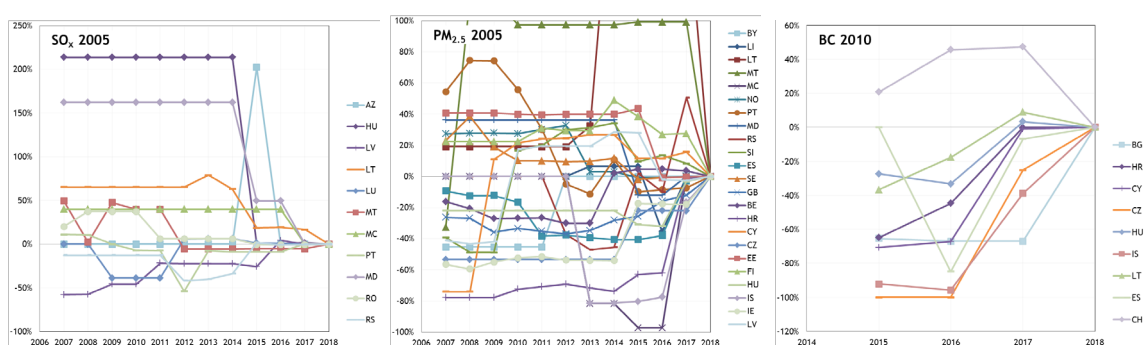


Figure 6: Difference of SO_x (for the year 2005), PM_{2.5} (for the year 2005) and BC (for the year 2010) national total emissions as reported for the period 2007-2018 and 2015-2018, respectively (in %; only countries with recalculations of more than $\pm 30\%$)

¹¹ The formula used to calculate the magnitude of the recalculations is $100 * [(X_{2018} - X_{2017}) / X_{2017}]$, where X_{2018} denotes emissions reported in 2018 and X_{2017} represents emission reported in 2017.

¹² Share of recalculations larger than \pm ten percent: 30% in 2017, 27% in 2016, 31% in 2015, 22% in 2014, 14% in 2013, 11% in 2012, 15% in 2011, 23% in 2010 and 16% in 2009.

Frequent reasons for significant recalculations were **updates of activity data**, e.g. due to new emission estimates (*Cyprus, Czech Republic, Hungary, Luxembourg, Malta, Serbia and Switzerland*). Further, **changes to emission factors** are often the reason for more significant recalculations. In some cases (e.g. *Bulgaria, Cyprus, Czech Republic, Greece, Iceland, Ireland, Lithuania, Luxembourg and Spain*), updates of emission factors were necessary mainly due to a the revision of the [EMEP/EEA guidebook](#) (see [References](#)).

Other frequent reasons for recalculations are changes in inventory calculation methodologies. These changes can be caused by, updates of methodology like a new version of the Computer Programme to calculate Emissions from Road Transport (COPERT) or the implementation of a higher tier method (e.g. Malta).

Further reasons for recalculations are **corrections of errors**. An example is the correction of the reporting of emissions in the wrong category, double counted emissions or errors in activity data (e.g. Bulgaria).

Table 4 shows an overview of the largest recalculations (>30%) for the inventories of NO_x, NMVOCs, SO_x, NH₃, PM_{2.5}, PM₁₀ and CO and for the years 2005, 2010 and 2015 reported for the 2017 to the 2018 reporting round. The table summarizes the main reasons for the recalculation, the sectors concerned and the year when the recalculations were submitted. Large recalculations where no reasons were specified by the country are not included in the table. Detailed information on these recalculations is provided in Annex G (see [Annexes](#)). For detailed information about the largest recalculations in previous years please consult last year's report; the download link is available in the '[References](#)'-section.

Table 4: Recalculations above 30% of NO_x, NMVOC, SO_x, NH₃, PM_{2.5}, PM₁₀ and CO emissions for the reported years 2005, 2010 and 2015.

Party	Pollutant	Emissions in	High recalculation done in	Main reason	Sector
Czech Republic	CO	2005	2018	AD	1A4
Hungary	CO	2005	2018	AD, M	1A3b
Malta	CO	2005	2018	AD	Energy
Slovakia	CO	2005	2018	M	1A3b
Czech Republic	CO	2010	2018	AD	1A4
Czech Republic	CO	2015	2018	AD	1A4
Malta	CO	2015	2018	AD, M	Energy, 1A3b
Malta	NH ₃	2005	2018	EF	3B
Malta	NH ₃	2010	2018	EF	3B
Bulgaria	NH ₃	2015	2018	EF	1A4b, 3B, 3D
Malta	NH ₃	2015	2018	EF	3B
Greece	NMVOC	2005	2018	EF	1A2f, 3B1a, 3B1b, 3B2, 3B4d, 3B4f
Cyprus	NMVOC	2010	2018	AD, EF, M	1A3, 2D3a, 2D3d, 3B2, 3B3
Czech Republic	NMVOC	2010	2018	AD, EF	1A4, 5A
Greece	NMVOC	2010	2018	EF	1A2f, 3B1a, 3B1b, 3B2, 3B4d, 3B4f
Czech Republic	NMVOC	2015	2018	AD, EF	1A4, 5A
Malta	NMVOC	2015	2018	M	1A3b
Ireland	NO _x	2010	2018	M	1A3b
Ireland	NO _x	2015	2018	M	1A3b
Malta	NO _x	2015	2018	AD, M	Energy, 1A3b, 1A3d

Party	Pollutant	Emissions in	High recalculation done in	Main reason	Sector
Ireland	PM ₁₀	2005	2018	EF	3B
Lithuania	PM ₁₀	2005	2018	EF	1A4b
Malta	PM ₁₀	2005	2018	AD, M	Energy, 1A3b
Serbia	PM ₁₀	2005	2018	AD	1A4b, 2B10a
Czech Republic	PM ₁₀	2010	2018	AD	1A4
Ireland	PM ₁₀	2010	2018	EF	3B
Lithuania	PM ₁₀	2010	2018	EF	1A4b
Malta	PM ₁₀	2010	2018	AD, M	Energy, 1A3b
Czech Republic	PM ₁₀	2015	2018	AD	1A4
Lithuania	PM ₁₀	2015	2018	EF	1A4b
Lithuania	PM _{2.5}	2005	2018	EF	1A4b
Malta	PM _{2.5}	2005	2018	AD, M	Energy, 1A3b
Serbia	PM _{2.5}	2005	2018	AD	1A4b, 2B10a
Czech Republic	PM _{2.5}	2010	2018	AD	1A4
Lithuania	PM _{2.5}	2010	2018	EF	1A4b
Malta	PM _{2.5}	2010	2018	AD, M	Energy, 1A3b
Czech Republic	PM _{2.5}	2015	2018	AD	1A4
Lithuania	PM _{2.5}	2015	2018	EF	1A4b
Luxembourg	PM _{2.5}	2015	2018	AD, EF, M	1A3b, 1A4b
Spain	SO _x	2010	2018	EF	1A2, 1A3d
Georgia	SO _x	2015	2018	M	1A2f
Malta	SO _x	2015	2018	AD	Energy
Bulgaria	BC	2005	2018	EF, M, C	1A3b
Iceland	BC	2005	2018	EF	1A2a, 1A2b, 1A2e, 1A2f, 1A2gvii, 1A2gviii, 1A3bvi, 1A3dii, 1A4ai, 1A4bi, 1A4ciii.
Switzerland	BC	2005	2018	AD, EF	1A3b
Bulgaria	BC	2010	2018	EF, M, C	1A3b
Czech Republic	BC	2010	2018	AD	1A4
Iceland	BC	2010	2018	EF	1A2a, 1A2b, 1A2e, 1A2f, 1A2gvii, 1A2gviii, 1A3bvi, 1A3dii, 1A4ai, 1A4bi, 1A4ciii.
Switzerland	BC	2010	2018	AD, EF	1A3b
Bulgaria	BC	2015	2018	EF, M, C	1A3b
Czech Republic	BC	2015	2018	AD	1A4
Malta	BC	2015	2018	AD, M	Energy, 1A3b

Notes: M – change in methodology AD – updated activity data error – error
EF – change of emission factor C – correction

3.1.2 NECD

In this reporting cycle all countries except Portugal (due to different territorial coverage under NECD and CLRTAP) provided identical inventories for their reporting obligations under the CLRTAP and NECD (see chapter 3.4.2). Therefore reasons for recalculations under NECD are identical with those under LRTAP (see chapter 3.1.1)

3.2 Time series consistency (1990-2016)

The focus on checks on time series consistency in this report is on the consistency between reported PM₁₀-, PM_{2.5}- and BC emissions.

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

3.2.1 Consistency between reported PM₁₀, PM_{2.5}, and BC emissions

The consistency between reported emissions of PM₁₀ and PM_{2.5} was assessed. As PM_{2.5} emissions are assumed to be a subset of PM₁₀ emissions, it was checked whether the former are lower than the latter in all years for all countries. Armenia reported the same amount of PM₁₀ as for PM_{2.5} for 2014. It is possible to report the same emissions for PM₁₀ and PM_{2.5}, but that means that PM₁₀ only includes PM_{2.5} emissions and no PM_{coarse}, which is quite unlikely.

Another basic comparison was performed to check whether reported BC emissions are lower than reported PM_{2.5} emissions. The results show that one Party (*Armenia*) reported higher BC emissions than PM_{2.5} emissions what indicates an error in data.

A comparison of the share of PM_{2.5} in PM₁₀ was made to identify differences between the submitting Parties (Figure 7). The analysis shows dips and jumps in some of the countries which might indicate time series inconsistencies in either PM_{2.5} or PM₁₀ submissions. Further, countries like *Azerbaijan, Canada, Kazakhstan or the US* have a relatively low PM_{2.5} share between 20% and 41%. On the upper end, countries as *Georgia, Italy, Luxembourg, Slovakia and Slovenia* show a share above 80%. The majority of the submitting Parties have a share between approximately 53% and 76%; a more in depth check of this outcome is planned for future reviews.

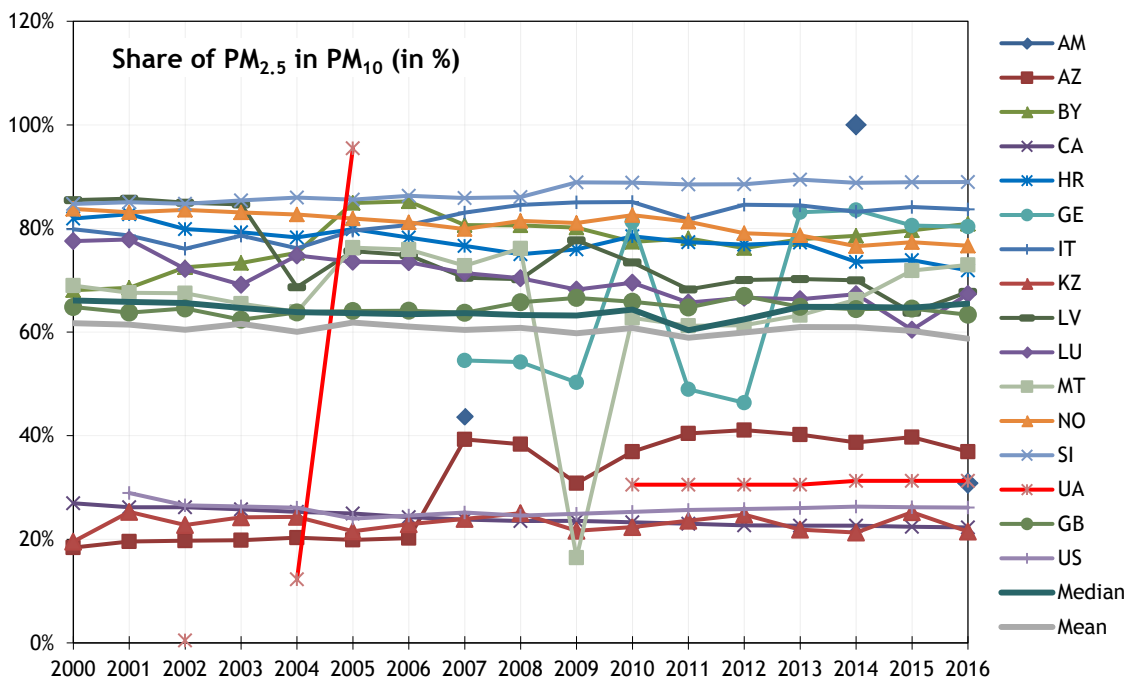


Figure 7: Share in per cent of PM_{2.5} national total emissions in PM₁₀ national total emissions 2000-2016 for the upper and lower 10%

3.3 Key category analysis (KCA)

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. Annex F (see [Annexes](#)) 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’ area and on the other hand for the ‘EMEP East’ area¹³. Results of KCA for individual Parties can be downloaded from www.ceip.at/review_results/review_results_2018.

In the following table (Table 5), the total number of key categories is shown for each of the pollutants as well as the trend in the number of key categories over the last seven years.

The biggest difference between the *EMEP East* and *EMEP West* area in the number of key categories can be seen for reported **PM₁₀** emissions. While the countries of the ‘EMEP West’ area have identified 21 key categories, the group of the ‘EMEP East’ area has identified only twelve categories for **PM₁₀**.

Also the number of key categories of **CO, Pb, Cd, Hg and DIOX** is quite different between *EMEP West* and *EMEP East*.

In countries of the ‘EMEP East’ area, the sector 2B10a (*Chemical Industry – Other*) with a share of 30% is the dominating sector in the KCA because of high **PM₁₀** emissions reported by *Turkey* whereas in the ‘EMEP West’ area sector 1A4bi (*Residential – Stationary plants*) dominates **PM₁₀** emissions (share: 36%).

Table 5: Total number of categories identified as key categories in the 2016 inventories for individual pollutants in the countries of the EMEP West and EMEP East area. The figures below the numbers illustrates the trend in the number of key categories over the last six years. Green: EMEP West, red: EMEP East.

NO _x		NMVOC		SO _x		NH ₃		PM _{2.5}		PM ₁₀		BC		PBC	
West	East	West	East	West	East	West	East	West	East	West	East	West	East	West	East
12	10	17	16	9	6	7	8	16	16	21	12	7	4	3	3
CO		Pb		Cd		Hg		DIOX		PAH		HCB			
West	East	West	East	West	East	West	East	West	East	West	East	West	East		
10	5	9	4	12	5	11	4	7	1	3	4	5	5		

¹³ Please note that for the ‘EMEP East’ area Kyrgyzstan and Republic of Moldova are not included as no data was reported.

Figure 8 gives an overview of all key categories in the EMEP East and EMEP West area. Figure 9 shows a comparison for the share of key categories for each pollutant between the EMEP East and EMEP West region. A darker colour indicates a higher share of the respective category. The comparison shows that:

- *IA4bi Residential – Stationary plants* is the most important source of the pollutants assessed for this report: like in previous years, *IA4bi* is a key source of all pollutants except **NH₃** and ranks among the top three key categories for most pollutants.
- *IA1a Public Electricity and Heat Production* is among the key categories for ten assessed pollutants (except NMVOC, NH₃, BC, CO and PCB). It is the most important key source of **SO_x**, **Hg** and **DIOXin** in the countries of the ‘EMEP West’ area and for **SO_x**, **Hg**, **NO_x** and **PM_{2.5}** in the ‘EMEP East’ area.
- *IA2a Stationary combustion in manufacturing industries and construction: Iron and steel* is key category for nine out of fifteen assessed pollutants (all except NH₃, NMVOC, BC, HCB, PAH, PCB).
- *IA3bi Road Transportation – Passenger cars* is a key source of **NO_x**, **NMVOC**, **PM_{2.5}**, **PM₁₀**, **BC**, **CO** and **Pb emissions**.
- Sectors 3B1a (*Manure management – Dairy cattle*), 3B1b (*Manure management – Non-dairy cattle*) and 3Da1 (*Inorganic N-fertilizers*) are dominating **NH₃** emission sources in both areas.
- The energy sector (*mainly IA4bi – Residential stationary*) is the dominating source of **PM₁₀** emissions in the ‘EMEP West’ area, whereas the industry sector (*particularly 2B10a – Chemical industries – other*) is the main source of **PM₁₀** emissions in the ‘EMEP East’ area.
- In the ‘EMEP West’ area 51% of the **PM_{2.5}** emissions come from *IA4bi – Residential stationary*, while the most important key category for this pollutant in the ‘EMEP East’ area is *IA1a Public Electricity and Heat Production* with a share of 24%.

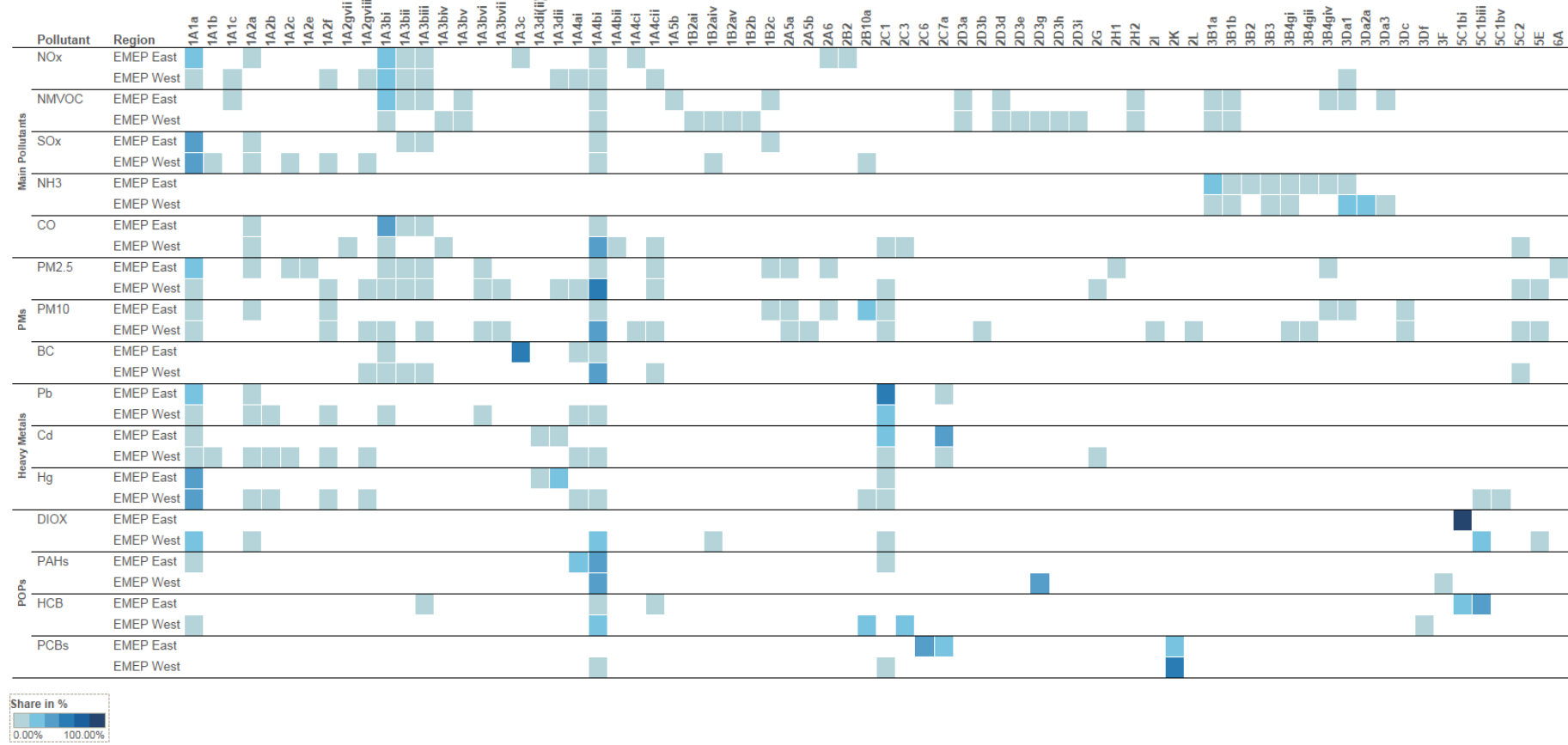


Figure 8: Overview of key categories for the EMEP East and EMEP West area

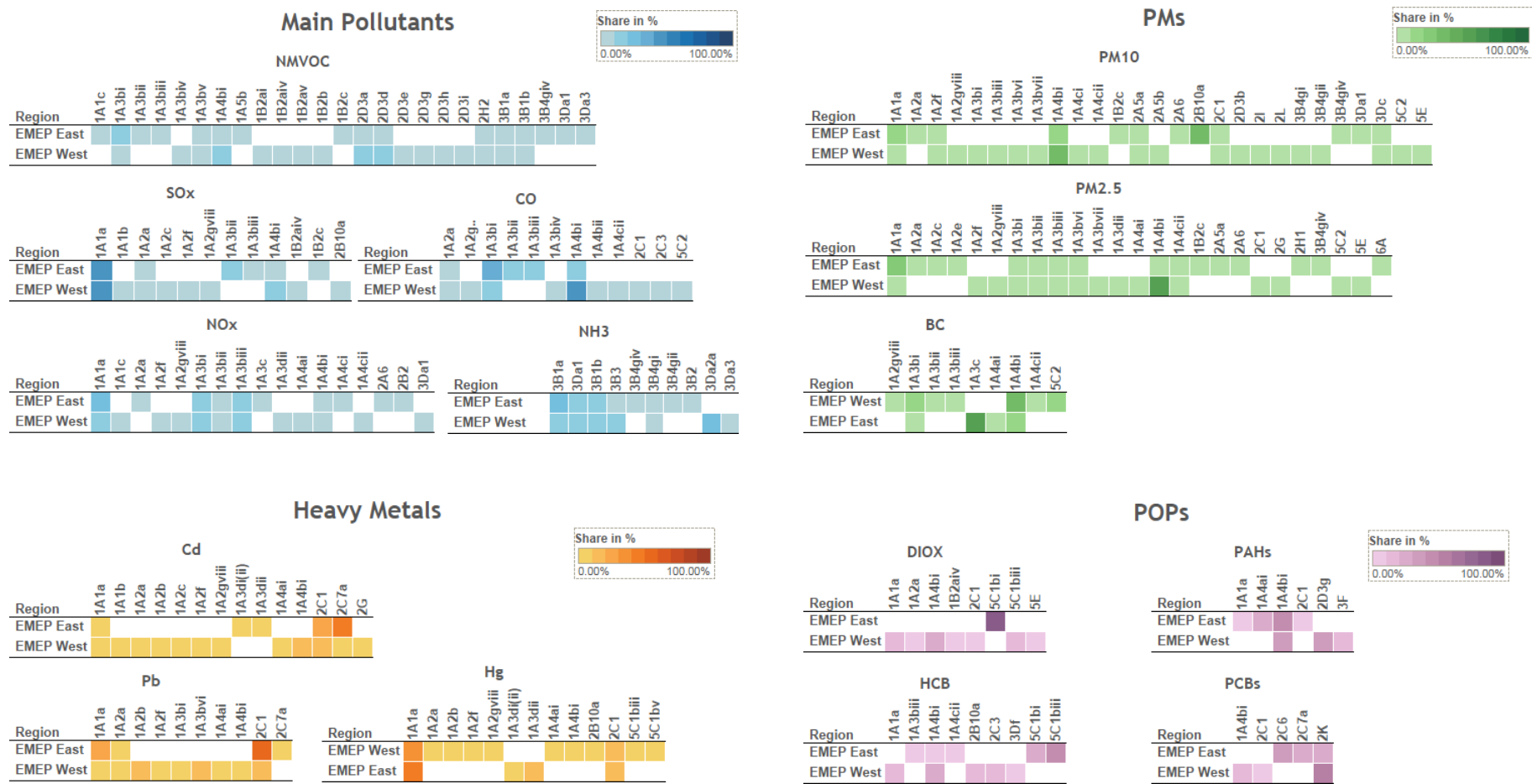


Figure 9: Comparison of key categories for each pollutant for the EMEP East and EMEP West region

2015 was the first year when Black Carbon was reported by Parties and significant differences in the number of key categories for this pollutant were observed between the ‘EMEP East’ (4 KCs) and ‘EMEP West’ (8 KCs) area. In the 2018 reporting round the number of key categories between the two areas is nearly identical (7 KCs in EMEP West and 4 KCs in EMEP East area). In the EMEP West area the dominating key categories for Black Carbon is 1A4bi (*Residential – Stationary plants*) whereas in the EMEP East area 1A3c (*Railways*) and 1A4bi (*Residential – Stationary*) are the main sources of BC.

Most of the reporting ‘EMEP West’ Parties submitted emission data for BC, except Austria, Bosnia and Herzegovina, Liechtenstein, Luxembourg and Montenegro. From the ‘EMEP East’ area only Azerbaijan, Belarus, Georgia and Kazakhstan submitted emission data for this pollutant.

3.4 Inventory comparisons

In the following, the share of sectors for specific pollutants reported under the CLRTAP is presented, as well as a comparison of the inventories reported under different reporting obligation. A summary of the results of the comparison between data reported officially under the new NECD, CLRTAP and UNFCCC for 1990 and the most recent reported year (2016) is provided in Annex B (see [Annexes](#)). Differences are expressed as percentages (%).

3.4.1 Share of aggregated sectors (GNFR¹⁴)

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.

Figure 10 displays the share of GNFR sector for **NMVO**C emissions for each Party in 2016. Since 1990, reported NMVOC emissions in the EMEP area are decreasing; The dominating sector for this pollutant are ‘*Solvents*’, ‘*Agricultural Livestock*’, ‘*Road Transport*’ and ‘*Other Stationary Combustion*’ for almost all Parties. The primary source of NMVOC emissions in Canada, Norway and Serbia is the sector ‘*Fugitive*’. The main sector for Ukraine’s NMVOC emissions is the ‘*Industry*’ sector.

Figure 11 shows the share of sectors for **BC** emissions in each country. It can be seen that most countries report BC emissions mainly in the sectors ‘*Road Transport*’ and/or ‘*Other Stationary Combustion*’ and ‘*Off-road*’. Canada reported most of its BC emissions in sector ‘*Shipping*’, where Azerbaijan, Netherlands and Norway also reported significant emissions for this sector. Spain reported most of its BC emissions in sector ‘*Waste*’. This might indicate that reporting of BC emissions is still rather inconsistent across countries.

Figures with comparisons for the remaining pollutants are provided in Annex H (see [Annexes](#)).

¹⁴ the allocation of NFR14 sector codes to GNFR codes is provided in the [conversion table](#) on the CEIP homepage

Share of Sectors (NMVOC)

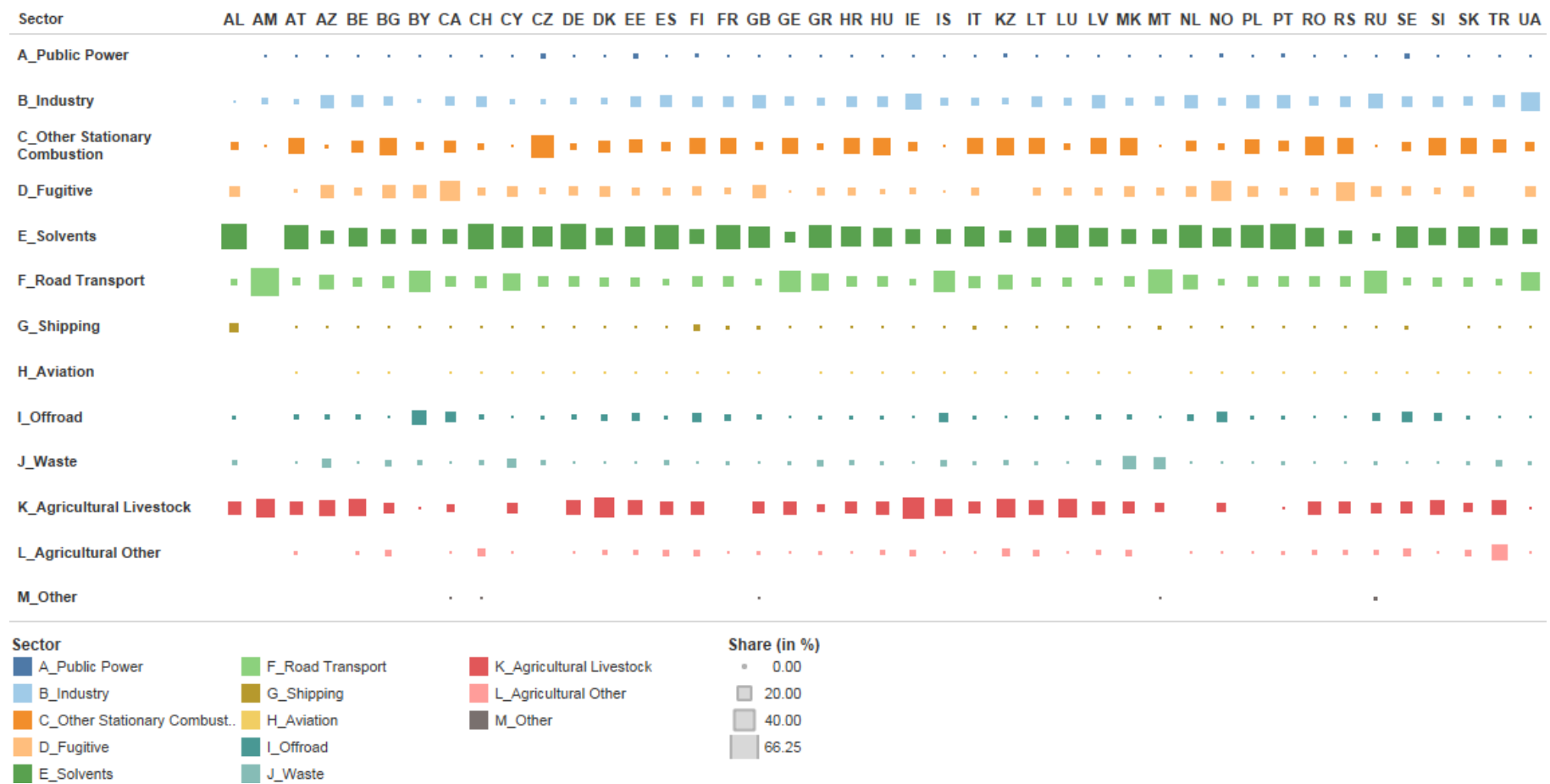


Figure 10: Share of GNFR sectors on NMVOC emissions for individual Parties in 2016. Only countries that submitted emission data for this pollutant are presented in the figure.

Share of Sectors (BC)

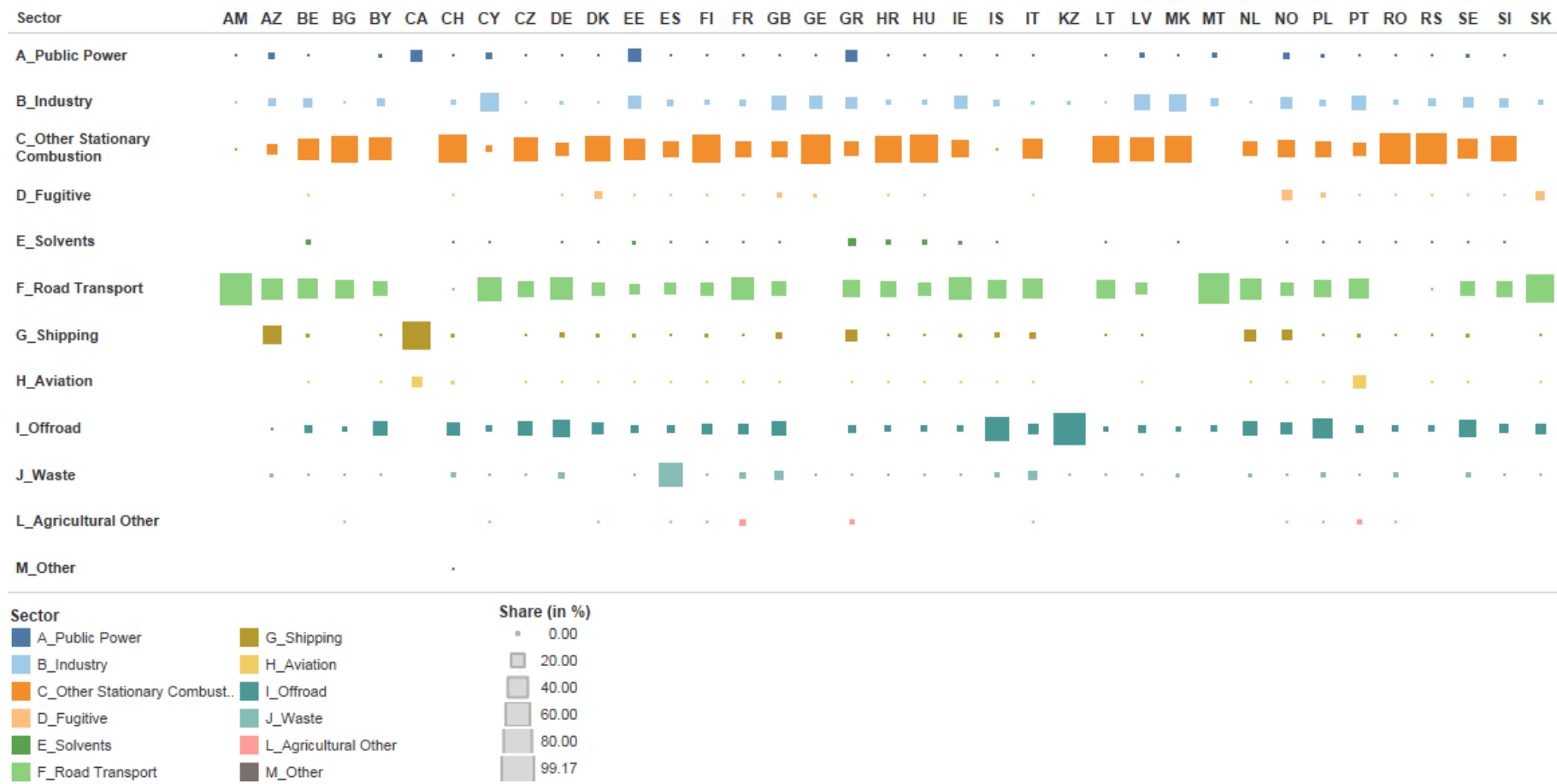


Figure 11: Share of GNFR sectors on BC emissions for individual Parties in 2016.
Only countries that submitted emission data for this pollutant are presented in the figure.

3.4.2 CLRTAP/NECD comparisons¹⁵

Reporting obligations under CLRTAP and the new NECD are now identical for all countries except Portugal due to different territorial coverage. Under the CLRTAP Portugal is obliged to report all emissions occurring in the EMEP-domain including the ones from Madeira and the Azores. Under the NEC Directive Portugal has to report emissions occurring in the geographical scope of the NEC Directive and has to therefore exclude emissions from Madeira and the Azores.

In general, all disparities which indicate that CLRTAP emissions are lower than NECD levels suggest potential errors in one of the data sets.

3.4.3 CLRTAP/UNFCCC comparisons¹⁶

Larger differences between national total emissions reported under CLRTAP and emissions reported under UNFCCC occur more frequently than when comparing CLRTAP and NECD inventories. Not all of these differences can be explained by different reporting obligations and indicate inconsistent reporting across reporting obligations.

Differences of more than 10% in the **NO_x** emission data for 2016 were found in 5 countries (Estonia (24.7%), France (11.2%), Greece (-11.4%), Malta (-36.2%) and the Netherlands (11.9%).

The largest differences in the **SO_x** emissions for 2016 were found in 4 countries (Bulgaria (-260.8%), France (13%), Greece (50.7%) and Malta (-27%).

In 2016, **NMVO**C data with a difference of 10% or more were provided by 5 countries (Bulgaria (-10.1%), Estonia (21%), Finland (17.4%), France (59.5%) and Greece (-27.9%).

Three countries (Bulgaria, Estonia and Romania) showed the largest differences in **CO** emissions in 2016 (-45.1%, -13.7% and -172.6% respectively)

Errors in inventories, which also result in differences between inventories, cannot be identified by automated tests. These errors can only be detected during the stage 3 review. However, such big differences often indicate a lack of communication between institutions responsible for compiling emission inventories at national level, i.e. a use of inconsistent data sets for the two inventories.

¹⁵ Reported NECD data is taken as 100%. A reported difference below 0% means that reported CLRTAP data is below reported NECD data.

¹⁶ Reported UNFCCC data is taken as 100%. A reported difference below 0% means that reported CLRTAP data is less than reported UNFCCC data.

3.5 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 which are 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 2016 were divided by the number of inhabitants and by the total value of the GDP/PPP. Values for each Party are presented in Annex D (see Annexes). It should be noted that not all Parties submitted 1990 and 2016 data for all analyzed pollutants, and that therefore these statistics cannot fully reflect the developments in the whole EMEP domain. Tables with complete time series for these indicators were posted in a separate file on the CEIP webpage (http://www.ceip.at/review_results/review_results_2017).

Figure 12 and Figure 13 show 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 for PM and POPs data. More detailed information on country level is provided in Annex D (see Annexes) on the CEIP webpage (http://www.ceip.at/review_results/review_results_2017).

3.5.1 Emissions per capita

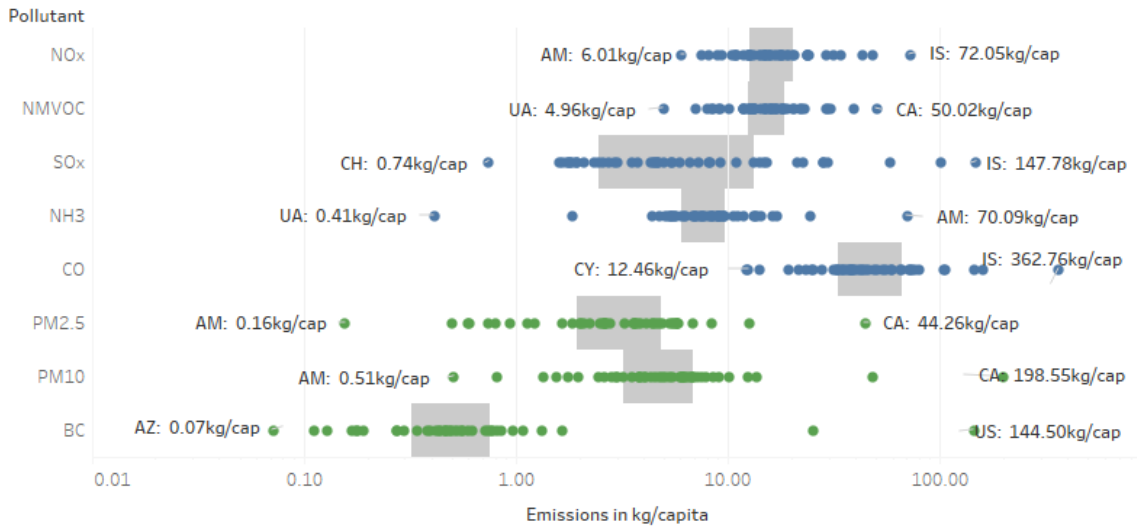
Between 1990 (or 2000 for PM) and 2016 *per capita emissions* rose in 24 Parties.

Significant differences between Parties can be seen for each reported pollutant in per capita emissions; e.g. in 2016 *Switzerland* reports the lowest value with 0.74 kg of SO_x emissions per capita while *Iceland* reports 148 kg SO_x emissions per capita, which is 200 times higher than Switzerland's SO_x emissions and 11 times higher than the average reported emissions per capita (see Figure 12).

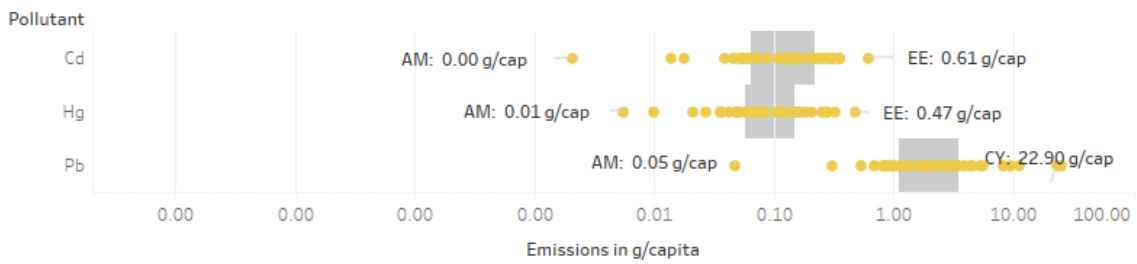
3.5.2 Emissions per GDP

Again, not all Parties reported emissions for both 1990 (or 2000 for PM) and 2016. Emissions per GDP/PPP differ significantly among the Parties. The biggest difference can be seen in DIOX submissions: Kazakhstan is reporting 0.001ng DIOX/GDP PPP while Greece is reporting 4g DIOX/GDP PPP, which is 4,185 times higher. Trends in emissions per GDP/PPP do not follow exactly the same trends as per capita emissions. Between 1990 and 2015 emissions per GDP/PPP rose in 12 Parties (see Figure 13).

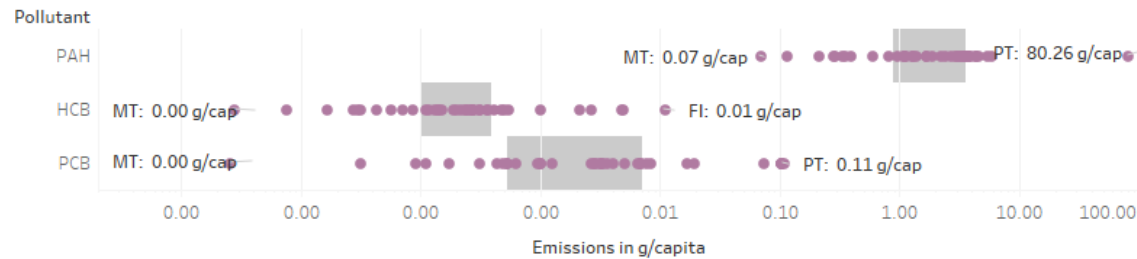
Main Pollutants and PMs



Heavy Metals



POPs



DIOX

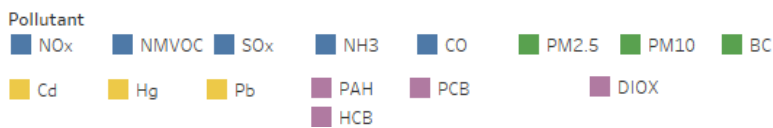
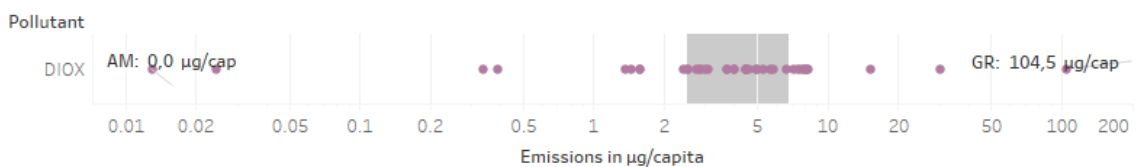
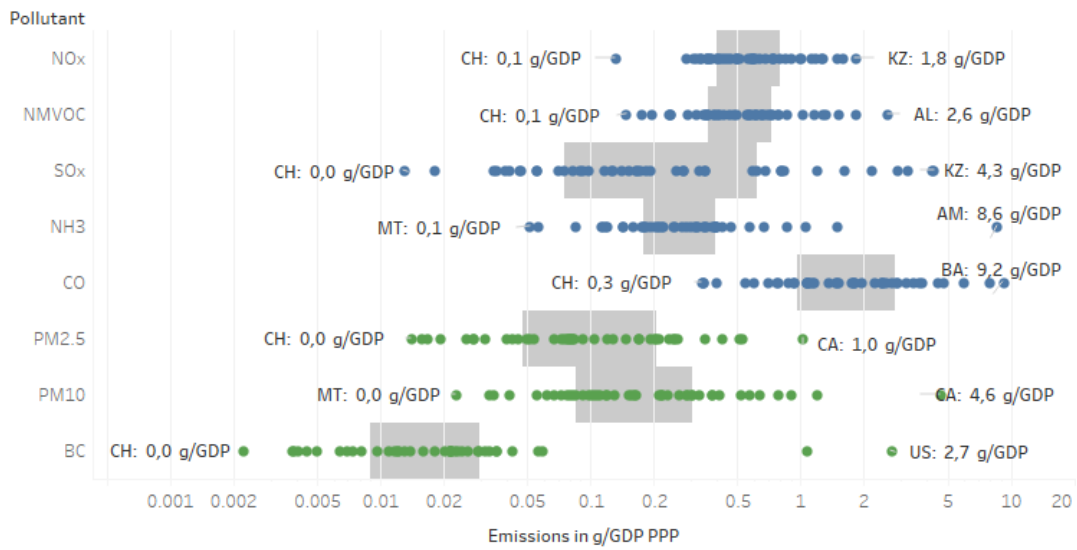


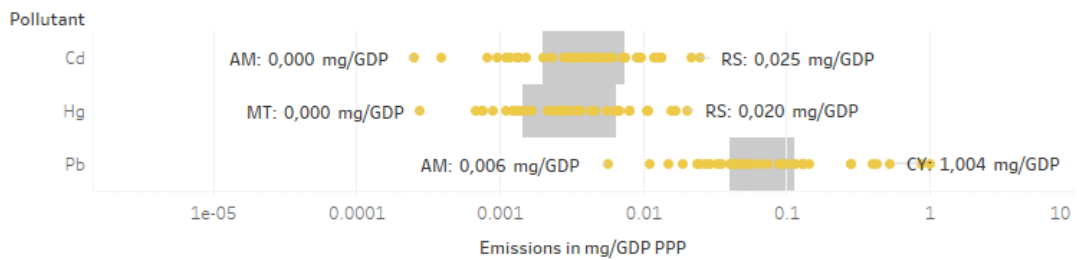
Figure 12: Minimum and maximum value and middle 50%-range of per capita emissions for each pollutant in 2016.

Note: The axes of the graphs are scaled logarithmically for a better readability. Units in each graph are different. Grey sectors mark the 25% to 75% quartile.

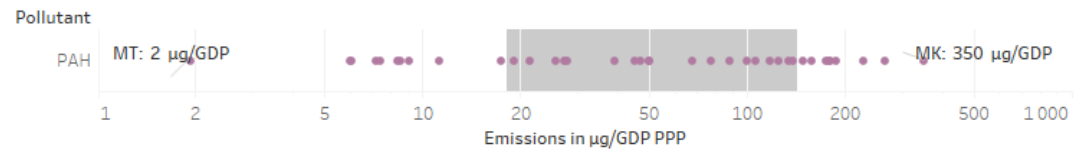
Main Pollutants and PMs



Heavy Metals



PAH



DIOX, HCB and PCB

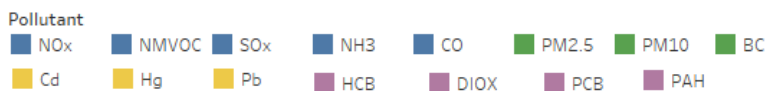
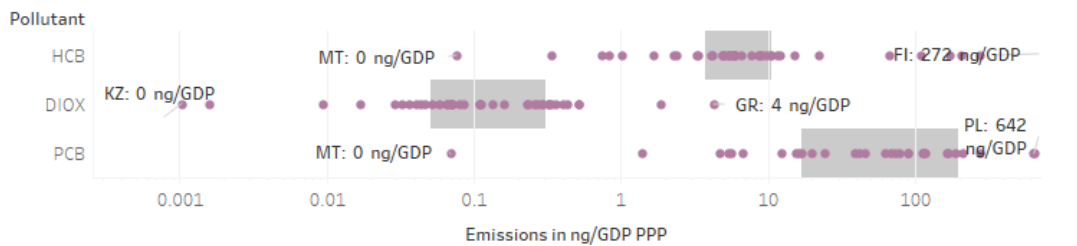


Figure 13: Minimum and maximum value and middle 50%-range of emissions per GDP/PPP for each pollutant in 2016

Note: The axes of the graphs are scaled logarithmically for a better readability. Units in each graph are different. Grey sectors indicate the 25% to 75% quartile.

4 INITIAL CHECKS OF GRIDDED EMISSIONS AND LARGE POINT SOURCES

Key messages:

Overall, 29 Parties provided gridded sectoral emissions in 0.1° x 0.1° (long/lat) resolution until June 2018. This covers only 38% of the area of all reporting Parties.

In 2018, three Parties reported sectoral data in the new EMEP grid resolution of 0.1° x 0.1° (long/lat) for the year 2016.

For about 47% (main pollutants and PM) to 61% (heavy metals and persistent organic pollutants) of the grid cells from 49¹⁷ Parties, data on spatially distributed emissions had to be partly or completely estimated or adjusted by CEIP.

42 out of 49 Parties submit Large Point Source (LPS) data (independent from the reporting year). Seven parties (Armenia, Belarus, Bosnia and Herzegovina, Kazakhstan, Kyrgyzstan, Liechtenstein and Montenegro) did not report any LPS data yet.

4.1 Reporting of gridded emissions in 2018

Completeness: Gridded data is part of the four-year reporting obligation and was not due in 2018. Nevertheless in 2018 eight Parties, which are considered to be part of the extended EMEP area, did report sectoral gridded emissions in the new resolution, but only three countries reported gridded emissions for the year 2016. Four Parties reported gridded emissions for 2015, one country for the years 1990, 1995, 2000, 2005, 2010 and 2015 and one country for the whole time series from 1980 to 2016.

Overall, **29** Parties provided gridded GNFR14 sectoral emissions in 0.1° x 0.1° (long/lat) resolution so far (see Figure 14).

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, Kyrgyzstan, Liechtenstein, Montenegro, Moldova, Serbia and Turkey.

From Belarus, Cyprus, Estonia, Iceland, Norway, the Russian Federation, Sweden and Ukraine reported gridded sectoral data is available only in the old 50 x 50 km² PS resolution.

Completeness pollutants: Overall, 29 Parties reported **sectoral gridded emissions for at least one year in 0.1° x 0.1° resolution** for main pollutants and particulate matter, 28 Parties for priority heavy metals and persistent organic pollutants.

Reported gridded sectoral data in 0.1° x 0.1° (long/lat) resolution covers only 38% of the grid cells of all reporting Parties. (see Figure 15)

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

¹⁷ Without Canada and the United States of America.

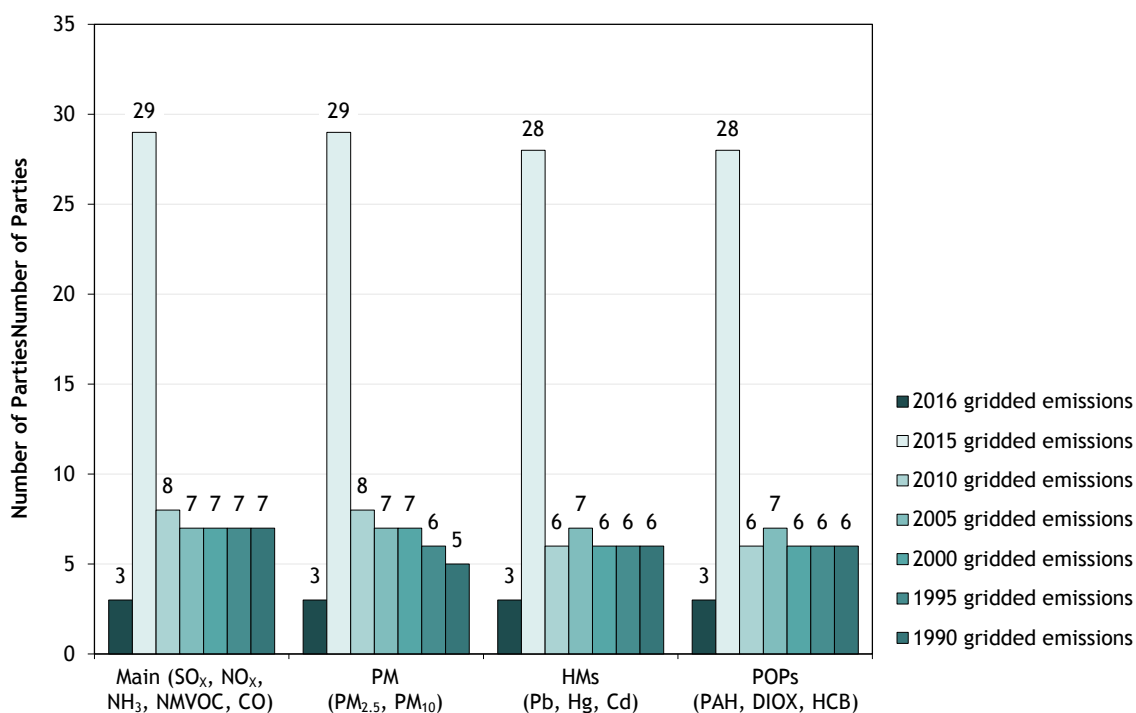


Figure 14: Total number of Parties reporting gridded sectoral data in 0.1° x 0.1° (long/lat) resolution for the years 1990, 1995, 2000, 2005, 2010, 2015 and 2016, reported to EMEP by 2018.

Main pollutants (NO_x, NMVOC, SO_x, NH₃, CO) and PM (PM_{2.5}, PM₁₀)

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

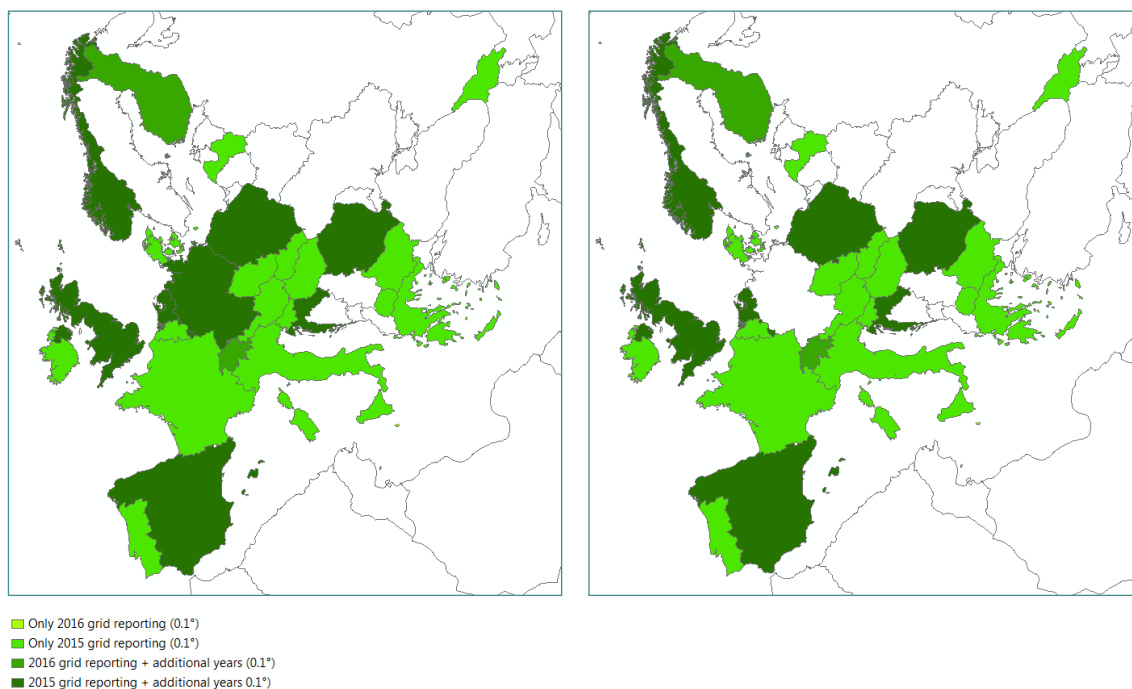


Figure 15: Visualisation of reported gridded emissions in 0.1° x 0.1° (long/lat) resolution in the EMEP area. Brighter green - reported data only for 2015 or 2016 is available; Darker green - additional historical years are available; White - no reporting of gridded emissions in 0.1° x 0.1° (long/lat) resolution

Lithuania reported gridded emissions only on national total level, which could not be used for the gridding, which is done on sectoral level. For *Poland and Portugal* the spatial disaggregation of sector ‘F – Road Transport’ had to be replaced by EDGAR proxies. *Finland and Malta* reported their gridded emissions too late and therefore it could not be used for the preparation of spatial distributed emission data in 2018. Reported gridded data from *Italy* had to be completely replaced by EDGAR proxies.

For about 47% (main pollutants and PM) to 61% (heavy metals and persistent organic pollutants) of the grid cells from 49 reporting Parties to the LRTAP Convention¹⁸ data on spatially distributed emissions had to be partly or completely estimated or adjusted by air pollutant emission experts in 2018, either because it 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 1/2018¹⁹”.

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 thresholds²⁰. LPS reporting is encouraged to include information on stack heights according to the stack height class categories as defined in the emission reporting guidelines²¹. Submitted LPS information should be consistent with the information reported for E-PRTR facilities.

Regardless the reporting year, 42 out of 49 parties submitted LPS data. *Albania, Germany, Greece, Malta and Italy* reported LPS data already in 2017, but too late to be included in the last year’s inventory report. In 2018 *Croatia and Finland* submitted LPS data for 2016, *Romania* updated LPS data for 2015 and *Switzerland* submitted LPS data for the whole time series from 2007 to 2016. Seven parties (*Armenia, Belarus, Bosnia and Herzegovina, Kazakhstan, Kyrgyzstan, Liechtenstein and Montenegro*) did not report any LPS data yet.

Annex C – LPS reporting under CLRTAP until 2018 (see [Annexes](#)) shows in detail which Party submitted LPS data for which years.

Figure 16 presents maps for main pollutants, PMs, priority heavy metals and POPs with Large Point sources reported until 2018.

¹⁸ Without Canada and the United States of America.

¹⁹ http://www.emep.int/mscw/mscw_publications.html

²⁰ 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)

²¹ 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)

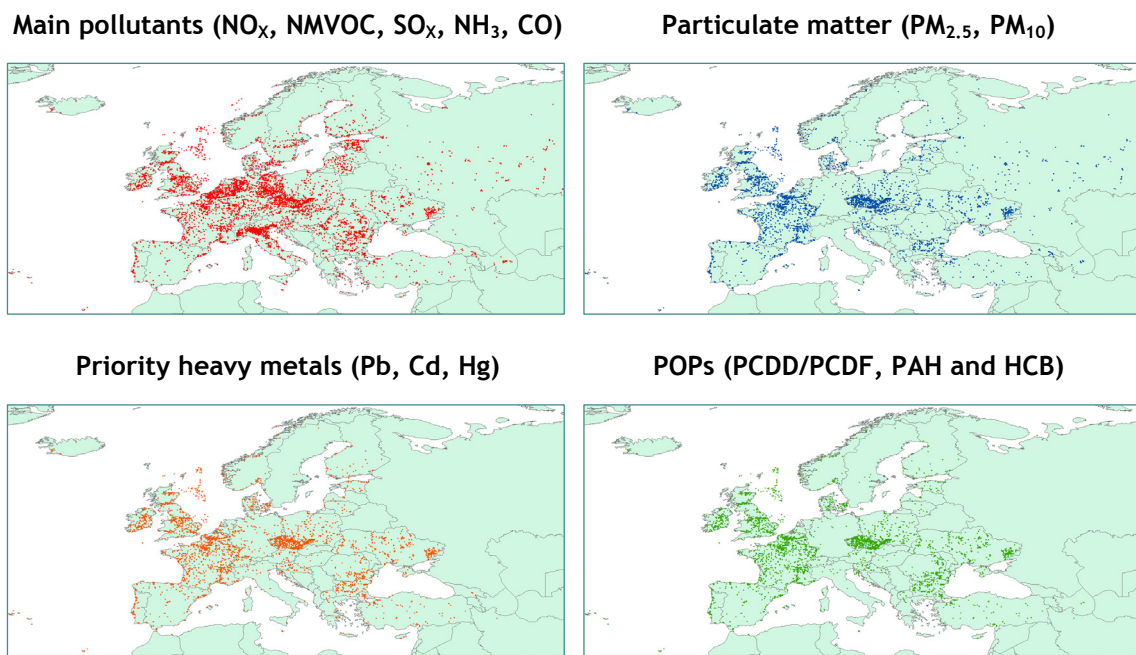


Figure 16: Maps with Large Point Sources reported until 2018

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/ACM.....	European Topic Centre for Air pollution and Climate change Mitigation
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 Ceilings Directive (2001/81/EC)
NEMO	Network Emission Model
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 ₂ SO ₄), and reduced sulphur compounds, such as hydrogen sulphide (H ₂ S), 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	IT	Italy
AM	Armenia	KG	Kyrgyzstan
AT	Austria	KZ	Kazakhstan
AZ	Azerbaijan	LI	Liechtenstein
BA	Bosnia and Herzegovina	LT	Lithuania
BE	Belgium	LU	Luxembourg
BG	Bulgaria	LV	Latvia
BY	Belarus	MC	Monaco
CA	Canada	MD	Republic of Moldova
CH	Switzerland	ME	Montenegro
CY	Cyprus	MK	FYR of Macedonia
CZ	Czech Republic	MT	Malta
DE	Germany	NL	Netherlands
DK	Denmark	NO	Norway
EE	Estonia	PL	Poland
ES	Spain	PT	Portugal
EU	European Union	RO	Romania
FI	Finland	RS	Serbia
FR	France	RU	Russian Federation
GB	United Kingdom	SE	Sweden
GE	Georgia	SI	Slovenia
GR	Greece	SK	Slovakia
HR	Croatia	TR	Turkey
HU	Hungary	UA	Ukraine
IE	Ireland	US	United States of America
IS	Iceland		

‘**EMEP West**’ comprises Albania, Austria, Belgium, Bosnia & Herzegovina, Bulgaria, Croatia, Cyprus, Czech Republic, Germany, Denmark, Estonia, European Union, Finland, France, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, FYR of 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, FYR of Moldova, Russian Federation, Turkey and Ukraine.

6 REFERENCES

- EEA, 2018. NEC Directive reporting status 2018 – The need to reduce air pollution in Europe. European Environment Agency, Copenhagen. Available at: <https://www.eea.europa.eu/themes/air/national-emission-ceilings/nec-directive-reporting-status-2018>
- EMEP, 2018. Transboundary particulate matter, photo-oxidants, acidifying and eutrophying components. Joint MSC-W & CCC & CEIP Report, EMEP Status Report 1/2018. Available at: emep.int/publ/common_publications.html
- EMEP/EEA, 2013. EMEP/EEA air pollutant emission inventory guidebook – 2013. EEA technical report No. 1209/2013. European Environment Agency, Copenhagen. Available at: <http://www.eea.europa.eu/publications/emep-eea-guidebook-2013>
- EMEP/EEA, 2016. EMEP/EEA air pollutant emission inventory guidebook – 2016. EEA Technical report No 21/2016. Available at: <https://www.eea.europa.eu/publications/emep-eea-guidebook-2016>
- CEIP, 2018. Methodologies applied to the CEIP GNFR gap-filling 2018. Part I: Main pollutants and Particulate Matter (NO_x, NMVOCs, SO_x, NH₃, CO, PM_{2.5}, PM₁₀, PM_{coarse}). Technical report CEIP 01/2018. Available at: http://www.ceip.at/fileadmin/inhalte/emep/pdf/2018/MAIN_PM_gap-filling_documentation_2018.pdf
- CEIP, 2018. Methodologies applied to the CEIP GNFR gap-filling 2018. Part II: Heavy Metals (Pb, Cd, Hg). Technical report CEIP 02/2018. Available at: http://www.ceip.at/fileadmin/inhalte/emep/pdf/2018/HM_gap-filling_documentation_2018_v3.pdf
- CEIP, 2018. Methodologies applied to the CEIP GNFR gap-filling 2018. Part III: Persistent organic pollutants (Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Indeno(1,2,3-cd)pyrene, Dioxin and Furan, Hexachlorobenzene, Polychlorinated biphenyls). Technical report CEIP 03/2018. Available at: http://www.ceip.at/fileadmin/inhalte/emep/pdf/2018/POP_gap-filling_documentation_2018_v3.pdf
- IPCC, 2000. Good practice guidance and uncertainty management in national greenhouse gas inventories. Intergovernmental Panel on Climate Change. Available at: www.ipcc-nggip.iges.or.jp/public/gp/english
- CEIP 2017a. Review of emission data reported under the LRTAP Convention and NEC Directive, Stage 1 and 2 review, Status of Gridded and LPS data. Technical Report CEIP 2/2017 (EEA and CEIP technical report), ISBN 978-3-99004-441-4. Available at: www.ceip.at/review_proces_intro/review_reports/
- CEIP 2017b. Methodologies applied to the technical review of emission data 2017. Technical Report CEIP 5/2017 (EEA and CEIP technical report). Available at: www.ceip.at/fileadmin/inhalte/emep/pdf/2017/Methodology_Report_2017.pdf
- UNECE, 2007. Methods and procedures for the technical review of air pollutant emission inventories reported under the Convention and its protocols (EB.AIR/GE.1/2007/16). Available at: www.ceip.at/fileadmin/inhalte/emep/review/RevGuid_ece.eb.air.ge.1.2007.16.e.pdf
- UNECE, 2014. Guidelines for Reporting Emissions and Projections Data under the Convention on Long-range Transboundary Air Pollution (ECE/EB.AIR/125). Available at: www.ceip.at/fileadmin/inhalte/emep/reporting_2009/Rep_Guidelines_ECE_EB_AIR_97_e.pdf

APPENDIX

Status of 2018 reporting under the LRTAP Convention

Table 6: Status of reporting under the LRTAP Convention as of 07th June 2018.

PARTY	Submission Date EMEP	Resubmission Date	NFR template (version)	Gridded Data	LPS Data	2020 Proj.	IIR 2018
Albania	15.02.2018	03.04.2018 14.05.2018	2009-1				x
Armenia	02.03.2018		2014-2				
Austria	15.02.2018	15.03.2018	2014-2				x
Azerbaijan	28.02.2018	27.03.2018	2014-1				x
Belarus	16.02.2018		2014-2				
Belgium	15.02.2018		2014-2				x
Bosnia & Herzegovina							
Bulgaria	15.02.2018	14.03.2018	2014-1	x			x
Canada	15.02.2018		2014-1				x
Croatia	13.02.2018		2014-1	x	x		x
Cyprus	15.02.2018		2014-2				x
Czech Republic	15.02.2018	15.03.2018 16.03.2018	2014-2				x
Denmark	15.02.2018		2014-1				x
Estonia	13.02.2018		2014-2				x
European Union	27.04.2018		2014-2				x
Finland	15.02.2018	15.03.2018 13.04.2018	2014-1	x	x	x	x
France	15.02.2018		2014-2				x
FYR of Macedonia	15.02.2018		2014-2				x
Georgia	14.02.2018	29.03.2018	2014-1				x
Germany	13.02.2018		2014-2				x
Greece	06.06.2018		2014-2				x
Hungary	15.02.2018	15.03.2018	2014-2				x
Iceland	15.02.2018		2014-2				x
Ireland	14.02.2018	15.03.2018	2014-2	x			x
Italy	22.02.2018	15.03.2018	2014-1	x			x
Kazakhstan	15.02.2018		2014-2				
Kyrgyzstan							
Latvia	15.02.2018	15.03.2018	2014-2				x
Liechtenstein							
Lithuania	15.02.2018	23.02.2018 08.03.2018	2014-2				x
Luxembourg	08.02.2018	15.03.2018	2014-2			x	x
Malta	27.04.2018		2014-1	x			x
Monaco							
Montenegro							
Netherlands	28.12.2017	13.04.2018	2014-1				x
Norway	12.02.2018		2014-2				x

PARTY	Submission Date EMEP	Resubmission Date	NFR template (version)	Gridded Data	LPS Data	2020 Proj.	IIR 2018
Poland	15.02.2018		2014-1				x
Portugal	15.02.2018	15.02.2018 15.03.2018	2014-1				x
Republic of Moldova							
Romania	15.02.2018		2014-2	x	x		x
Russian Federation	13.02.2018		2014-2				x
Serbia	14.02.2018		2014-2				x
Slovakia	15.02.2018	15.03.2018	2014-2				x
Slovenia	13.02.2018		2014-2				x
Spain	23.01.2018	07.03.2018	2014-2				x
Sweden	14.02.2018		2014-1				x
Switzerland	14.02.2018		2014-2	x	x	x	x
Turkey	15.02.2018		2014-2				x
Ukraine	23.04.2018		2014-2				
United Kingdom	15.02.2018		2014-2			x	x
United States of America	26.04.2018		2014-2				x

Table 7: Completeness of CLRTAP submissions as of 07th June 2018.

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	1990-2016	1990-2009	1990-2009	1990-2016	2005, 2008, 2009		1990-2009	
Armenia	2016	2016	2016	2016	2016	2016	2016	
Austria	1990-2016	1990-2016		1990, 1995, 2000-2016	1990, 1995, 2000-2016		1990-2016	1990-2016
Azerbaijan	1990-2016	1990-2016	1995-2016	1990-2016	1990-2016	2014-2016	1995-2016	1990-2016
Belarus	2014-2016	2014-2016	2014-2016 ^{a)}	2014-2016	2014-2016	2016	2014-2016	2015-2016
Belgium	1990-2016	1990-2016	1990-2016	2000-2016	2000-2016	2000-2016	1990-2016	1990-2016
Bosnia & Herzegovina								
Bulgaria	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016
Canada	1990-2016	1990-2016		1990-2016	1990-2016	2013-2016	1990-2016	
Croatia	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016
Cyprus	1990-2016	1990-2016	1990-2016	2000-2016	2000-2016	2000-2016	1990-2016	1990-2016
Czech Republic	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016	2000-2016	1990-2016	1990-2016
Denmark	1980-2016	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016	1980-2016
Estonia	1990-2016	1990-2016	1990-2016	2000-2016	1990-2016	2000-2016	1990-2016	1990-2016
EU	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016	
Finland	1980-2016	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016
France	1980-2016	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016	1980-2016
FYR of Macedonia	1980, 1987, 1988, 1990-2016	1990-2016	1990-2016	1990-2016	1990-2016		1990-2016	1990-2016
Georgia	2007-2016	2007-2016	2007-2016	2007-2016	2007-2016	2007-2016	2007-2016	2007-2016

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
Germany	1990-2016	1990-2016	1990-2016	1995-2016	1990-2016	2000-2016	1990-2016	1990-2016
Greece	1990-2016	1990-2016	1990-2016	1995-2016	1990-2016	2000-2016	1990-2016	1990-2016
Hungary	1990-2016	1990-2016	1990-2016	2000-2016	2000-2016	2000-2016	1990-2016	1990-2016
Iceland	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016
Ireland	1987, 1990-2016	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016
Italy	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016
Kazakhstan	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016
Kyrgyzstan								
Latvia	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016
Liechtenstein								
Lithuania	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016
Luxembourg	1990-2016	1990-2016		1990-2016	1990-2016		1990-2016	1990-2016
Malta	2000-2016	2000-2016	2000-2016	2000-2016	2000-2016	2005-2016	2005-2016	2000-2016
Monaco								
Montenegro								
Netherlands	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016
Norway	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016
Poland	1990-2016	1990-2016	1990-2016 ^{a)}	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016
Portugal	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016
Republic of Moldova								
Romania	2000-2016	2000-2016	2000-2016	2000-2016	2000-2016	2000-2016	2000-2016	2000-2016
Russian Federation	2010-2016			2010-2016	2010-2016			2010-2016
Serbia	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016
Slovakia	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016
Slovenia	1980-2016	1990-2016		2000-2016	2000-2016	2000-2016	1990-2016	1990-2016
Spain	1990-2016	1990-2016	1990-2016	2000-2016	2000-2016	2000-2016	1990-2016	1990-2016
Sweden	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016	2000-2016	1990-2016	1990-2016
Switzerland	1980-2016	1980-2016		1980-2016	1980-2016	1980-2016	1980-2016	1980-2016
Turkey	1990-2016			1990-2016				
Ukraine	2016	2016	2016	2016	2016			
United Kingdom	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016
United States of America	2012-2016	2014		2012-2016		2014	2014	

Table 8: Completeness of CLRTAP submissions as of 07th June 2018
(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 new	LPS Emissions
	Projections WM	Projections WaM	Activity data WM	Activity data WaM	Gridded data 50x50		
Albania							2015
Armenia							
Austria						2015	2015
Azerbaijan							2015
Belarus							
Belgium	2020, 2025, 2030					2015	2015
Bosnia & Herzegovina							
Bulgaria	2020, 2025, 2030				2015	2015	2015
Canada							
Croatia	2020, 2025, 2030	2020, 2025, 2030	2020, 2025, 2030	2020, 2025, 2030		1990, 1995, 2000, 2005, 2010, 2015	1990, 1995, 2000, 2005, 2010, 2015, 2016
Cyprus	2020, 2025, 2030		2020, 2025, 2030		2015		2015
Czech Republic	2020, 2025, 2030		2020, 2025, 2030, 2040, 2050	2020, 2025, 2030		2015	2015
Denmark	2020, 2025, 2030					2015	2015
Estonia	2020, 2025, 2030				1990, 1995, 2000, 2005, 2010, 2015		1990, 1995, 2000, 2005, 2010, 2015
Finland	2020, 2025, 2030, 2050		2020, 2030			2015, 2016	2015, 2016
France	2020, 2030	2020, 2030				2015	2015
FYR of Macedonia						2015	2014
Georgia						2015	2015
Germany	2020, 2025, 2030	2020, 2025, 2030				1990, 1995, 2000, 2005, 2010, 2015	2015
Greece	2020, 2025, 2030, 2040	2020, 2025, 2030, 2040				2015	2015
Hungary	2020, 2025, 2030					2015	2015
Iceland							2015
Ireland	2020, 2025, 2030	2020, 2025, 2030	2020, 2025, 2030	2020, 2025, 2030		2015	2015
Italy	2020, 2025, 2030		2020, 2025, 2030			2015	2015
Kazakhstan							
Kyrgyzstan							2016
Latvia	2020, 2025, 2030, 2040, 2050	2020, 2025, 2030	2020, 2025, 2030, 2040, 2050	2020, 2025, 2030, 2040, 2050		2015	2015
Liechtenstein							

PARTY	Template version 2014-1 or 2014-2					Gridded new	LPS Emissions
	Projections WM	Projections WaM	Activity data WM	Activity data WaM	Gridded data 50x50		
Lithuania	2020, 2025, 2030	2020, 2025, 2030	2020, 2025, 2030	2020, 2025, 2030		2015	2015
Luxembourg		2020, 2025, 2030				2015	2015
Malta						2016	2015
Monaco	2020, 2025, 2030					2014, 2015	2014, 2015
Montenegro							
Netherlands	2020, 2025, 2030		2020, 2030			1990, 1995, 2000, 2005, 2010, 2015	1990, 1995, 2000, 2005, 2010, 2015
Norway	2020, 2025, 2030		2020, 2025, 2030, 2040, 2050		1990, 1995, 2000, 2005, 2010	1990, 1995, 2000, 2005, 2010, 2015	2015
Poland						2015	2015
Portugal	2020, 2025, 2030		2020, 2025, 2030			2015	2015
Republic of Moldova							
Romania	2020, 2025, 2030	2020, 2025, 2030	2020, 2025, 2030	2020, 2025, 2030		2005, 2015	2005, 2015
Russian Federation					2015		2015
Serbia							
Slovakia	2020, 2025, 2030, 2040	2020, 2025, 2030, 2040	2020, 2025, 2030, 2040	2020, 2025, 2030, 2040		2015	2015
Slovenia	2020, 2025, 2030	2020, 2025, 2030	2020, 2025, 2030	2020, 2025, 2030		2015	2007, 2010, 2015
Spain	2020, 2025, 2030		2020, 2025, 2030			1990-2015	1990-2015
Sweden	2020, 2025, 2030						2015
Switzerland	2020, 2025, 2030, 2040, 2050	2020, 2025, 2030, 2040, 2050	2020, 2025, 2030, 2040, 2050	2020, 2025, 2030, 2040, 2050		1980-2016	2007-2016
Turkey							
Ukraine							
United Kingdom	2020, 2025, 2030		2020, 2025, 2030			2015	2015
United States of America							

Status of 2018 reporting under the NECD

Table 9: Status of reporting under the NECD as of 07th June 2018.

PARTY	Annual reporting					2-year reporting	4-year reporting		
	Submission date	Date of resubmission	Projection submission Date	Date of additional information	Date of IIR	Format (NFR template)	Projections	Gridded data	LPS emissions
Austria	15.02.2018	15.03.2018		15.02.2018, 15.03.2018	15.03.2018	NFR 2014-2			
Belgium	15.02.2018			15.02.2018	15.03.2018	NFR 2014-2			
Bulgaria	15.02.2018	14.03.2018			14.03.2018	NFR 2014-1		30.03.2018	
Croatia	27.02.2018				14.03.2018	NFR 2014-1			
Cyprus	15.02.2018				14.03.2018	NFR 2014-2			
Czech Republic	15.02.2018	15.03.2018 16.03.2018			15.03.2018	NFR 2014-2			
Denmark	15.02.2018			15.02.2018	15.03.2018	NFR 2014-1			
Estonia	13.02.2018				15.03.2018	NFR 2014-2			
Finland	15.02.2018	15.03.2018 13.04.2018	15.02.2018	15.02.2018, 15.03.2018	15.03.2018 03.05.2018 04.05.2018 06.05.2018 07.05.2018 08.05.2018	NFR 2014-1	2020/2025/2030	11.05.2018	
France	15.02.2018			15.02.2018	15.03.2018	NFR 2014-2			
Germany	13.02.2018			13.02.2018	14.03.2018	NFR 2014-2			
Greece	03.05.2018	09.05.2018			03.05.2018 09.05.2018	NFR 2014-2			
Hungary	15.02.2018	15.03.2018		15.03.2018	15.03.2018	NFR 2014-2			
Ireland	14.02.2018	15.03.2018		14.02.2018, 15.03.2018	np	NFR 2014-2		15.03.2018	
Italy	22.02.2018	15.03.2018			16.03.2018	NFR 2014-1		22.02.2018	
Latvia	15.02.2018	15.03.2018			15.03.2018	NFR 2014-2			
Lithuania	15.02.2018	23.02.2018, 08.03.2018			15.03.2018	NFR 2014-2			
Luxembourg	08.02.2018	15.03.2018	15.03.2018	15.03.2018	15.03.2018	NFR 2014-2	2020/2025/2030		
Malta	17.04.2018				03.05.2018 12.06.2018	NFR 2014-1		05.06.2018	
Netherlands	28.12.2018	28.03.2018			15.03.2018 13.04.2018	NFR 2014-1			
Poland	15.02.2018				15.03.2018	NFR 2014-1			
Portugal	15.02.2018	15.03.2018			15.03.2018	NFR 2014-1			
Romania	15.02.2018				15.03.2018	NFR 2014-2		27.04.2018	27.04.2018
Slovakia	15.02.2018	15.03.2018			15.03.2018 13.04.2018	NFR 2014-2			
Slovenia	13.02.2018				14.03.2018	NFR 2014-2			
Spain	23.01.2018	07.03.2018		23.01.2018	07.03.2018	NFR 2014-2			
Sweden	14.02.2018				13.03.2018	NFR 2014-1			
United Kingdom	15.02.2018		15.03.2018	15.02.2018 15.03.2018	15.03.2018	NFR 2014-2	2020/2025/2030		

Table 10: Completeness of NECD submissions as of 07th June 2018.

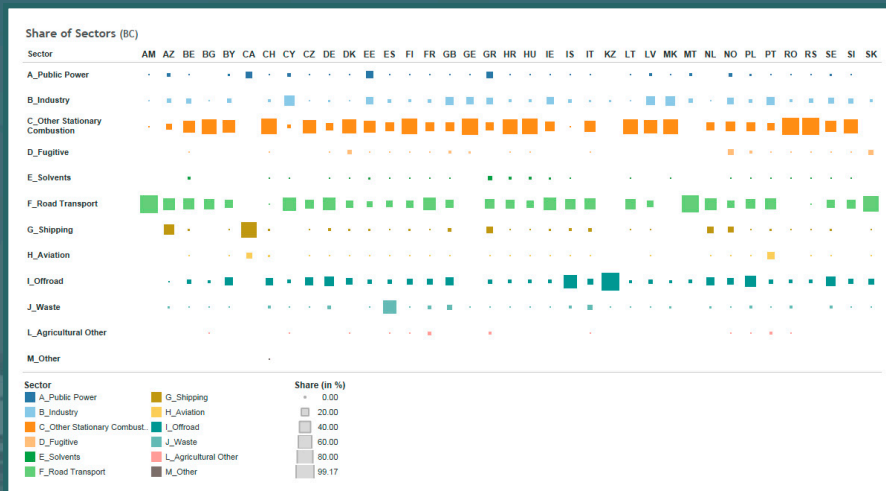
PARTY	Activity data	Reporting details				
		SO ₂ , NO _x , CO, NH ₃ , NMVOC	Cd, Hg, Pb	additional HM	PM _{2.5} , PM ₁₀ , TSP, BC	POPs
Austria	1990-2016	1990-2016	1990-2016	-	1990, 1995, 2000-2016 (PM _{2.5} , PM ₁₀ , TSP)	1990-2016 (Total PAHs)
Belgium	1990-2016	1990-2016	1990-2016	1990-2016	2000-2016	1990-2009 (Total PAHs); 2010-2016
Bulgaria	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016
Croatia	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016
Cyprus	1990-2016	1990-2016	1990-2016	1990-2016	2000-2016	1990-2016
Czech Republic	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016; BC: 2000-2016	1990-2016
Denmark	1980-2016	SO _x : 1980-2016; 1985-2016	1990-2016	1990-2016	1990-2016	1990-2016
Estonia	1990-2016	1990-2016	1990-2016	1990-2016	TSP: 1990-2016; 2000-2016	1990-2016
Finland	1990-2016	1980-2016; NMVOC: 1987-2016; CO: 1990-2016	1990-2016	1990-2016 (As, Cr, Cu, Ni, Zn)	1990-2016	1990-2016 (Total PAHs)
France	1980-2016	1980-2016; NMVOC: 1988-2016	1990-2016	1990-2016	1990-2016	1990-2016
Germany	1990-2016	1990-2016	1990-2016	1990-2016	TSP: 1990-2016; PM _{2.5} , PM ₁₀ : 1995-2016; BC: 2000-2016	1990-2016
Greece	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016
Hungary	1990-2016	1990-2016	1990-2016	1990-2016	2000-2016	1990-2016
Ireland	1990-2016	1987 (Nox, NMVOC, SO _x); 1990-2016	1990-2016	1990-2016	1990-2016	1990-2016
Italy	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016 (Total PAHs)
Latvia	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016
Lithuania	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016
Luxembourg	1990-2016	1990-2016	1990-2016	np	1990-2016 (PM _{2.5} , PM ₁₀ , TSP)	1990-2016
Malta	2000-2016	2000-2016	2000-2016	2000-2016	2000-2015; BC 2005-2016	2005-2016
Netherlands	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016; PCBs 1995-1998, 2002, 2004-2005
Poland	1990-2016	1990-2016	1990-2016	1990-2016 (As, Cr, Cu, Ni, Zn)	1990-2016	1990-2016
Portugal	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016
Romania	2000-2016	2000-2016	2000-2016	2000-2016	2000-2016	2000-2016
Slovakia	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016
Slovenia	1990-2016	1980-2016, NH ₃ : 1986-2016; NMVOC: 1990-2016	1990-2016	np	2000-2016	1990-2016
Spain	1990-2016	1990-2016	1990-2016	1990-2016	2000-2016	1990-2016 (Total PAHs)
Sweden	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016; BC: 2000-2016	1990-2016
United Kingdom	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016	1990-2016

ANNEXES

All eight annexes with detailed results are available on CEIP's homepage at:
http://www.ceip.at/ms/ceip_home1/ceip_home/review_results/review_reports

Table 11: Overview of annexes to the Inventory Report 2018

Annexes 2018
A Recalculations of CLRTAP and NECD emission data in 2018
B Inventory Comparisons between CLRTAP, UNFCCC and NECD data for 1990 and 2016
C LPS reporting under CLRTAP from 2017-2018
D Emissions per capita and per GDP comparison of 1990 and 2016 (2000 and 2016 for PM _{2.5} and PM ₁₀)
E Completeness of reported data
F KCA: Comparison EMEP West with EMEP East area
G Analysis of recalculations performed by countries
H Comparison of share of sectors between countries for reported pollutants



ccc
NILU
Norwegian Institute
for Air Research
P.O. Box 100, NO-2027 Kjeller
Norway
Phone: +47 63 89 80 00
Fax: +47 63 89 80 50
E-mail: kjetil.torseth@nilu.no
Internet: www.nilu.no



ciam
International Institute for
Applied Systems Analysis (IIASA)
Schlossplatz 1
A-2361 Laxenburg
Austria
Phone: +43 2236 807 0
Fax: +43 2236 71 313
E-mail: amann@iiasa.ac.at
Internet: www.iiasa.ac.at



CEIP
Umweltbundesamt GmbH
Spittelauer Lände 5
A-1090 Vienna
Austria
Phone: +43-(0)1-313 04
Fax: +43-(0)1-313 04/5400
E-mail:
emep.emissions@umweltbundesamt.at
Internet: www.umweltbundesamt.at



MSC-E
Meteorological Synthesizing
Centre-East
2nd Roshchinsky proezd, 8/5
115419 Moscow
Russia
Phone +7 926 906 91 78
Fax: +7 495 956 19 44
E-mail: msce@msceast.org
Internet: www.msceast.org



MSC-W
Norwegian Meteorological
Institute (MET Norway)
P.O. Box 43 Blindern
NO-0313 OSLO
Norway
Phone: +47 22 96 30 00
Fax: +47 22 96 30 50
E-mail: emep.mscw@met.no
Internet: www.emep.int