ETC-HE Report 2025/2

Status report of air quality in Europe for year 2023, using validated data

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Contents

1 Summary

The *2023 Status report of air quality in Europe* presents summarized information on the status of air quality in Europe for the protection of health. It is based on 2023 validated monitoring data([1]) officially reported under the Ambient Air Quality Directives in the 2024 September reporting cycle([2]). It provides information on the following pollutants, regulated by the Ambient Air Quality Directives (AAQD) (EU, 2004, 2008, 2024)

- PM_{10}: Particulate matter with a diameter of 10 µm or less
- $PM_{2.5}$: Particulate matter with a diameter of 2.5 µm or less
- O_3: Tropospheric ozone
- NO_2: Nitrogen dioxide
- BaP: Benzo[a]pyrene
- SO_2: Sulphur dioxide
- CO: Carbon monoxide
- C_6H_6: Benzene
- As: Arsenic
- Cd: Cadmium
- Pb: Lead
- Ni: Nickel

It also offers a comparison with the situation in previous years.

Data included in this report was received by 27 January 2025 from the reporting countries. By that date the reporting status of 2023 validated data is summarized in Figure 1, where a green box indicates that the referred pollutant was reported by the referred country and a grey box indicates the contrary (that the referred pollutant was not reported by the referred country). Please see editorial notes at the end of this Chapter on additional information on the data used. The number of stations by country reporting each pollutant, with the minimum data coverage for at least one of the aggregations used in the report, is also included in Figure 1, while Table

[1] Please be aware that some countries also report official data from modelling applications. Those data are available at https://discomap.eea.europa.eu/AirQualityModellingViewer/

[2] https://eeadmz1-cws-wp-air02-dev.azurewebsites.net/aq-ereporting/

3 in the Annex summarizes the number of stations, with the minimum data coverage for at least one of the aggregations used in the report, at different country aggregations. Data from stations that do not fulfil the criteria from Box 1.1 are excluded from this report. Please be aware that the number of stations presented in Figure 1 and Table 3, that corresponds to all reported stations fulfilling the minimum data coverage criteria for at least one of the aggregations used in the report, may be different to the one presented in the corresponding boxplots, as there could be some stations not fulfilling the minimum data coverage criteria for the corresponding aggregation.

Figure 1: Number of stations, for each country and each pollutant, that in 2023 reported data with the minimum data coverage for at least one of the aggregations used in the report, by 27 January 2025

	PM10	PM2.5	O3	NO2	BaP	SO2	CO	C6H6	As	Cd	Pb	Ni
Albania	3	3	2	4		2	2	5				
Andorra	1	1	2	1		1	1					
Austria	124	65	105	140	34	63	26	22	12	13	12	12
Belgium	79	82	39	135	21	22	14	31	30	30	31	30
Bosnia and Herzegovina	23	11	19	24		23	14					
Bulgaria	40	8	20	25	15	28	18	19	7	12	11	7
Croatia	15	16	16	16	7	9	4	3	2	2	2	2
Cyprus	3	4	3	3	1	3	3	1	2	2	2	2
Czechia	146	87	65	92	54	60	20	37	39	39	38	39
Denmark	7	2	8	14	2	4	6	3	3	3	3	3
Estonia	7	7	9	9	5	9	7	4	5	5	5	5
Finland	36	22	17	33	9	14		2	5	5	2	5
France	333	225	301	371	42	82	13	49	46	46	46	47
Germany	387	306	280	603	101	97	78	105	104	104	104	104
Greece	34	18	29	30	5	18	18	7	4	4	4	4
Hungary	22	12	16	19	19	19	18	14	12	15	2	15
Iceland	8	6		8		12	1					
Ireland	58	53	17	32	4	11	5	2	4	4	3	4
Italy	562	321	341	616	143	202	186	235	116	116	108	109
Kosovo	7	7	3	1		1						
Latvia	8	5	6	6	7	1	3	7	5	5	5	5
Liechtenstein												
Lithuania	15	7	13	17	5	14	9	5	5	5	5	5
Luxembourg	7	4	5	124	2	1	2	1	2	2	2	2
Malta	4	5	4	5	2	4	2	2	2	2		2
Montenegro				5		3	2					
Netherlands	71	53	44	74	3	13	6	7	2	2	2	2
North Macedonia	14	10	15	15		12	14					
Norway	56	54	12	45	7	11	1	7	4	4	2	4
Poland	251	135	99	135	172	87	55	67	59	59	59	59
Portugal	51	23	46	61	1	21	15	7	1	1	1	1
Romania	68	30	35	29	3	41	21	5	20	30	30	26
Serbia	11	2	8	15		15	17		2	2	2	2
Slovakia	50	47	23	40	21	20	18	14	8	8	8	7
Slovenia	20	18	11	11	4	3	1	3	5	5	5	5
Spain	470	294	420	508	84	398	207	119	93	93	96	93
Sweden	59	42	45	65	3	42	2	11	4	4	4	4
Switzerland	30	8	30	31		8	9	3	12	13	13	12
Türkiye	276	118	142	180		227	122					

The countries included in this report and that, therefore, appear in Figure 1, are those with the obligation to report data under the AAQD or that have voluntary reported data. These countries are the EU-27 (Austria, Belgium, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta,

the Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain and Sweden); the five other member countries of the EEA (Iceland, Liechtenstein, Norway, Switzerland and Türkiye) that, together with the EU-27 form the EEA-32; the six EEA's cooperating countries from the Western Balkans (Albania, Bosnia and Herzegovina, Kosovo under UN Security Council Resolution 1244/99, Montenegro, North Macedonia and Serbia) that, together with the EEA-32 form the EEA-38; and the voluntary reporting country of Andorra.

The air quality data are stored at the EEA's e-reporting database ([3]). Therefore, this is the source for all maps and figures in the report.

1.1 Particulate matter

For PM_{10}, concentrations above the EU daily limit value (50 µg/m^3) were registered at 11 % of the reporting stations. These stations were in 13 countries in EU-27 and in 5 other reporting countries. For $PM_{2.5}$, concentrations above the EU annual limit value (25 µg/m^3) were registered at 1.2 % of the reporting stations. These stations were in 3 countries in EU-27 and in 3 other reporting countries.

The long-term World Health Organization air quality guideline (WHO AQG) level for PM_{10} (15 µg/m^3) was exceeded at 64 % of the stations in 27 countries of the EU-27 and 10 other reporting countries. The long-term WHO AQG level for $PM_{2.5}$ (5 µg/m^3) was exceeded at 92 % of the stations located in 27 countries of the EU-27 and 9 other reporting countries.

All Member States had met the exposure concentration obligation that was set under the Ambient Air Quality Directive to be attained as of 2015. The exposure concentration obligation reflects exposure of the population to fine particles and required that by 2015 exposure of the general population to $PM_{2.5}$ averaged over the previous 3-year period should not exceed 20 µg/m^3. The national exposure reduction target was met for all reporting countries.

1.2 Ozone

18 % of stations registered concentrations above the EU target value for O_3 (120 µg/m^3) for the protection of human health. These stations were located in 16 countries of the EU-27 and 4 other reporting countries. The long-term EU objective (120 µg/m^3) was met in only 17 % of the stations. The short-term WHO AQG level for O_3 (100 µg/m^3) was exceeded in 92 % of all the reporting stations, and concentrations above the long-term WHO AQG level for O_3 (60 µg/m^3) were registered in 97 % of all reporting stations.

[3] https://discomap.eea.europa.eu/App/AQViewer/index.html?fqn=Airquality_Dissem.b2g.AirQualityStatistics

1.3 Nitrogen dioxide

Around 2 % of all the reporting stations recorded concentrations above the EU annual limit value for NO_2 (40 µg/m^3). These stations were located in 8 countries of the EU-27 and 1 other reporting country. 66 % of concentrations above this limit value were observed at traffic stations.

On the contrary, 70 % of stations, located in 27 countries of the EU-27 and 10 other reporting countries reported concentrations above the WHO AQG level of 10 µg/m^3.

1.4 Benzo[a]pyrene, an indicator for polycyclic aromatic hydrocarbons

18 % of the stations reported annual mean concentrations above 1.0 ng/m^3. They were located in 9 countries in EU-27.

1.5 Sulphur dioxide, carbon monoxide, benzene and toxic metals

For SO_2, regarding the EU daily limit value (125 µg/m^3), concentrations above were registered at 1.3 % of the reporting stations. These stations were in 2 other reporting countries . On the other hand, concerning the daily WHO AQG level (40 µg/m^3), 5 % of all reporting SO_2 stations measured SO_2 concentrations above. These stations were located in 7 countries of the EU-27 and 6 other reporting countries .

The EU limit value for CO (10 mg/m^3), which is the same as the 8-hour WHO AQG level, was exceeded at 0.2 % of the stations. These stations were in 1 country of the EU-27 and 1 other reporting country .

Concentrations above the EU limit value for C_6H_6 (5 µg/m^3) were not observed at any stations.

1.1 % of stations registered concentrations above the EU target value for As (6 ng/m^3). These stations were located in 5 countries of the EU-27. For Cd, concentrations above the EU target value (5 ng/m^3) were not observed at any stations . The EU target value for Ni (20 ng/m^3) was exceeded at 0.3 % of the stations. These stations were located in 2 country of the EU-27. Pb concentrations above the limit value (0.5 µg/m^3) were measured at 0.3 % of the stations located in 1 country of the EU-27.

1.6 Editorial note

Values in Table 4 in Annex 1 are considered outliers and were not taken into account for the analysis presented in this report.

On 20 November 2024, the revised Directive (EU) 2024/2881 (EU, 2024) on ambient air quality and cleaner air for Europe was published and it entered into force on 10 December 2024. It sets new or revised air quality standards to be reached by 1 January 2030. The main analysis in this report is done against the AQ standards defined in the 2004 and 2008 AAQD (EU, 2008, 2024), which are the ones currently applicable. Annex 2 benchmarks the situation in year 2023 with respect to some of the new and/or revised AQ standards, as an analysis of the 'distance to target' from the 2023 status.

2 Introduction

The *2023 Status report of air quality in Europe* presents summarized information on the air quality data reported as measurements data under the 2024 September reporting cycle (validated assessment data for 2023, deadline of submission 30 September 2024). This report aims at informing on the 2023 status of ambient air quality in Europe and on progress towards meeting the air quality standards established for the protection of health in the Ambient Air Quality Directives (EU, 2004, 2008) (Table 1) and the World Health Organization air quality guideline levels (WHO, 2000, 2006, 2021) (Table 2)([4]).

This report builds on the former EEA "Air quality in Europe report" (EEA, 2020) content, figures and maps regarding the status of monitored air quality in Europe. It provides:

- a European overview of the 2023 monitoring stations reported, and of their concentrations in relation to the EU legal standards set in the 2004 and 2008 EU Ambient Air Quality Directives (EU, 2004, 2008) and WHO AQG levels for each pollutant;
- a map with the 2023 concentrations at station level for each pollutant;
- a boxplot graph summarizing for each country the range of concentrations (highlighting the lowest, highest, average and the 25 and 75 percentiles) for PM_{10}, $PM_{2.5}$, NO_2, O_3 and BaP.

Furthermore, it provides:

- maps with the situation at station level for the previous three years. In this way, any significant change in the spatial distribution of the values above the set thresholds in the legends can be observed;
- heatmaps with the evolution of the mean and the maximum measured concentrations at country level since 2000 (or since when available).

[4] Nevertheless, in this report the following standards and guideline levels are not analysed: information and alert thresholds for O_3, alert threshold for NO_2, and alert threshold for SO_2 in Table 1; and hourly air quality guideline level for NO_2, 10 minutes air quality guideline level for SO_2, and hourly air quality guideline level for CO in Table 2.

Table 1: Air quality standards for the protection of health, as given in the EU 2004 and 2008 Ambient Air Quality Directives

Pollutant	Averaging period	Legal nature and concentration	Comments
PM_{10}	1 day	Limit value: 50 µg/m^3	Not to be exceeded on more than 35 days per year
	Calendar year	Limit value: 40 µg/m^3	
$PM_{2.5}$	Calendar year	Limit value: 25 µg/m^3	Stage 1
		Indicative limit value: 20 µg/m^3	Stage 2: indicative limit value to be reviewed by the Commission in 2013. It remained unchanged after that revision
		Exposure concentration obligation: 20 µg/m^3	Average Exposure Indicator (AEI) ([a]) in 2015 (2013-2015 average)
		National Exposure reduction target: 0-20 percentage reduction in exposure	AEI ([a]) in 2020, the percentage reduction depends on the initial AEI
O_3	Maximum daily 8-hour mean	Target value: 120 µg/m^3	Not to be exceeded on more than 25 days/year, averaged over 3 years ([b])
		Long term objective: 120 µg/m^3	
	1 hour	Information threshold: 180 µg/m^3 Alert threshold: 240 µg/m^3	
NO_2	1 hour	Limit value: 200 µg/m^3	Not to be exceeded on more than 18 hours per year
		Alert threshold: 400 µg/m^3	To be measured over 3 consecutive hours over 100 km^2 or an entire zone
	Calendar year	Limit value: 40 µg/m^3	
BaP	Calendar year	Target value: 1 ng/m^3	Measured as content in PM_{10}
SO_2	1 hour	Limit value: 350 µg/m^3	Not to be exceeded on more than 24 hours per year
		Alert threshold: 500 µg/m^3	To be measured over 3 consecutive hours over 100 km^2 or an entire zone
	1 day	Limit value: 125 µg/m^3	Not to be exceeded on more than 3 days per year
CO	Maximum daily 8-hour mean	Limit value: 10 mg/m^3	
C_6H_6	Calendar year	Limit value: 5 µg/m^3	
Pb	Calendar year	Limit value: 0.5 µg/m^3	Measured as content in PM_{10}
As	Calendar year	Target value: 6 ng/m^3	Measured as content in PM_{10}
Cd	Calendar year	Target value: 5 ng/m^3	Measured as content in PM_{10}
Ni	Calendar year	Target value: 20 ng/m^3	Measured as content in PM_{10}

Notes:

[a] AEI: based upon measurements in urban background locations established for this purpose by the Member States, assessed as a 3-year running annual mean.

[b] In the context of this report, only the maximum daily 8-hour means in 2023 are considered, so no average over the period 2021 - 2023 is presented.

Sources:

EU (2004, 2008).

Table 2: WHO air quality guideline (AQG) levels and estimated reference levels (RL) ([a])

Pollutant	Averaging period	AQG	RL	Comments
PM_{10}	1 day	45 µg/m^3		99th percentile (3-4 exceedance days per year). Updated 2021 guideline
	Calendar year	15 µg/m^3		Updated 2021 guideline
$PM_{2.5}$	1 day	15 µg/m^3		99th percentile (3-4 exceedance days per year). Updated 2021 guideline
	Calendar year	5 µg/m^3		Updated 2021 guideline
O_3	Maximum daily 8-hour mean	100 µg/m^3		99th percentile (3-4 exceedance days per year). Updated 2021 guideline
	Peak season ([b])	60 µg/m^3		New 2021 guideline
NO_2	1 hour	200 µg/m^3		
	1 day	25 µg/m^3		99th percentile (3-4 exceedance days per year). New 2021 guideline
	Calendar year	10 µg/m^3		Updated 2021 guideline
BaP	Calendar year		0.12 ng/m^3	
SO_2	10 minutes	500 µg/m^3		
	1 day	40 µg/m^3		99th percentile (3-4 exceedance days per year). Updated 2021 guideline
CO	1 hour	30 mg/m^3		
	Maximum daily 8-hour mean	10 mg/m^3		
	1 day	4 mg/m^3		99th percentile (3-4 exceedance days per year). New 2021 guideline
C_6H_6	Calendar year		1.7 µg/m^3	
Pb	Calendar year	0.5 µg/m^3		
As	Calendar year		6.6 ng/m^3	
Cd	Calendar year	5 ng/m^3 ([c])		
Ni	Calendar year		25 ng/m^3	

Notes:

[a] As WHO has not set an AQG level for BaP, C_6H_6, As and Ni, the RL was estimated assuming an acceptable risk of additional lifetime cancer risk of approximately 1 in 100 000.

[b] Average of daily maximum 8-hour mean concentration in the six consecutive months with the highest six-month running average O_3 concentration.

[c] AQG set to prevent any further increase of Cd in agricultural soil, likely to increase the dietary intake of future generations.

Sources:

WHO (2000, 2006, 2021).

Box 1.1 Classification of monitoring stations and criteria used for the assessment

Fixed sampling points in Europe are situated at different types of stations following rules for macro- and micro-scale siting. Briefly, depending on the predominant emission sources, stations are classified as follows:

- traffic stations: located in close proximity to a single major road;
- industrial stations: located in close proximity to an industrial area or an industrial source;
- background stations: where pollution levels are representative of the average exposure of the general population or vegetation.

Depending on the distribution/density of buildings, the area surrounding the station is classified as follows:

- urban: continuously built-up urban area;
- suburban: largely built-up urban area;
- rural: all other areas.

In general, for the pollutants considered in this report, monitoring stations have to fulfil the criterion of reporting more than 75 % of valid data out of all the possible data in a year to be included in this assessment. The Ambient Air Quality Directive sets, for compliance purposes, the objective of a minimum data capture of 90 % for monitoring stations, but, for assessment purposes, a coverage of 75 % allows more stations to be taken into account without a significant increase in monitoring uncertainties. For benzene, As, Cd, Ni and BaP, the general amount of valid data is 13% (according to the air quality objectives for indicative measurements). The exceptions to the general rule are PM and lead random fixed measurements, for which the required amount of valid data for the analysis is 13 %. Reporting stations not fulfilling the minimum data coverage could be found at the Annual AQ statistics table.

Measurement data are rounded following the general recommendations under (EU, 2011). The number of considered decimals are indicated in the legend of the corresponding maps.

The assessments, in the cases of PM and SO_2, do not account for the fact that the Ambient Air Quality Directive (EU, 2008) provides Member States with the possibility of subtracting contributions to the measured concentrations from natural sources and winter road sanding/salting under specific circumstances.

3 Status of particulate matter ambient air concentrations

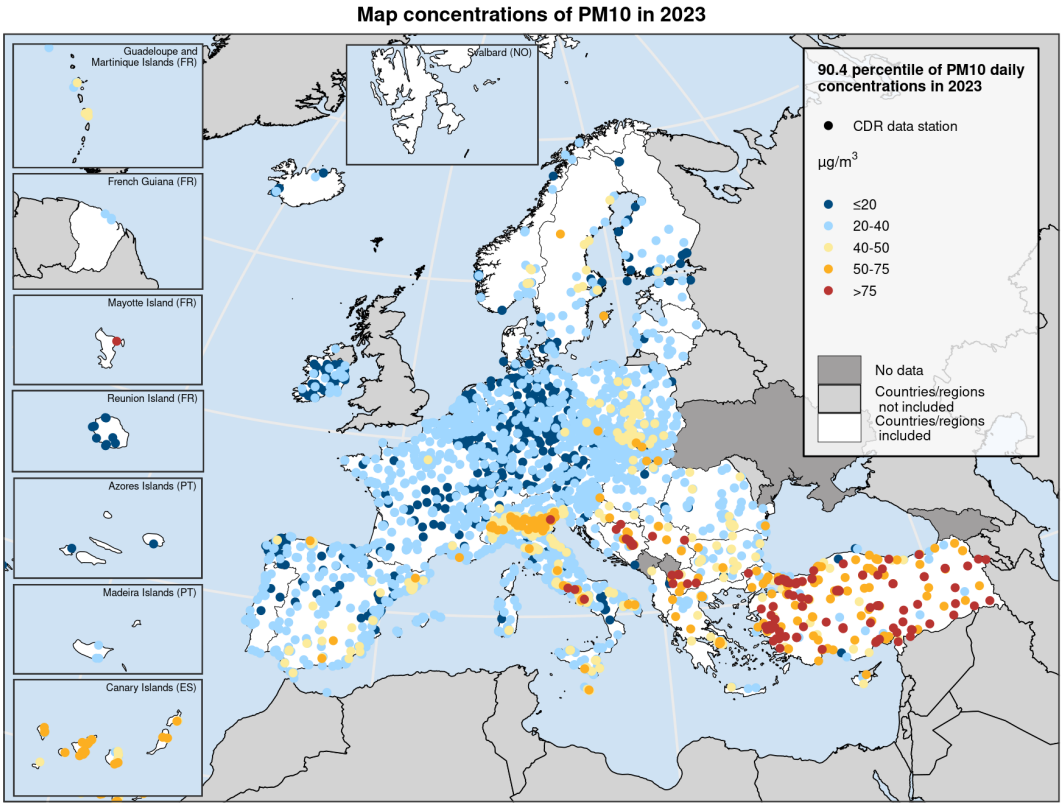
3.1 Status of PM_{10} concentrations

The EEA received PM_{10} data for 2023, with sufficient valid measurements (a general minimum coverage of 75 % and of 13 % for fixed random measurements) from 3354 stations for the calculation of annual mean concentrations and from 3326 stations in relation to the daily limit value. The stations were located in all the reporting countries shown in Figure 1.

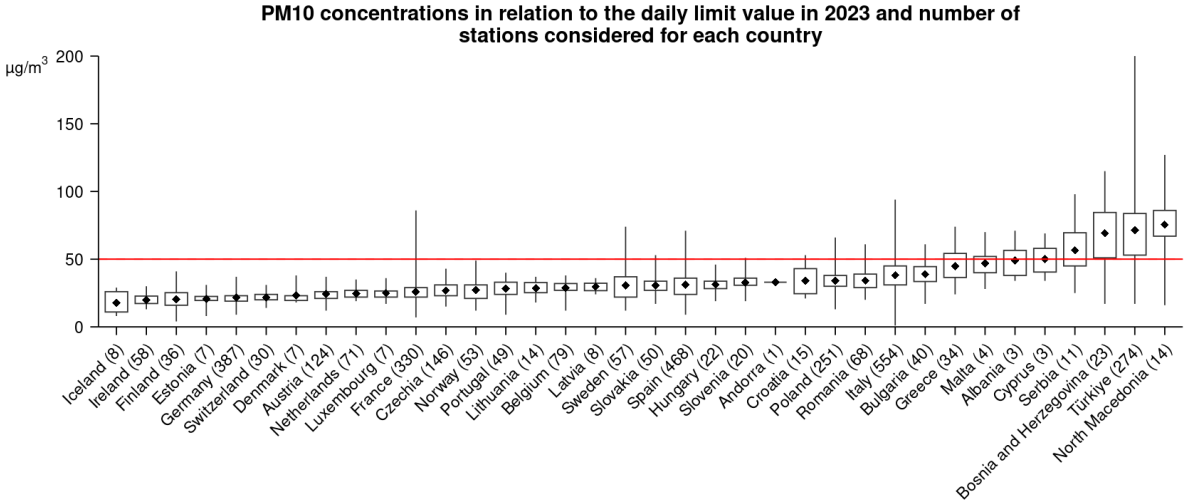
Thirteen countries in EU-27, and five other reporting countries reported PM_{10} concentrations above the EU daily limit value of 50 µg/m^3 (Figure 2). This was the case for 11 % (375) of reporting stations. In total, 96 % of those stations were either urban (86 %) or suburban (10 %). The stricter value of the WHO AQG level for PM_{10} daily mean (45 µg/m^3) was exceeded at 56 % (1872) of the stations in all the reporting countries (Figure 8).

Concentrations above the PM_{10} annual limit value (40 µg/m^3) were monitored in 4.4 % (149 stations) of all the reporting stations, located in 4 countries in EU-27, and 4 other reporting countries. The stricter value of the WHO AQG level for PM_{10} annual mean (15 µg/m^3) was exceeded at 64 % (2136) of the stations in all the reporting countries (Figure 5).

Figure 2: Map and boxplot of PM_{10} concentrations in 2023 - daily limit value



Note: Observed concentrations of PM10 in 2023. The possibility of subtracting contributions to the measured concentrations from natural sources and winter road sanding/salting has not been considered. The map shows the 90.4 percentile of the PM10 daily mean concentrations, representing the 36th highest value in a complete series. It is related to the PM10 daily limit value, allowing 35 exceedances of the 50 µg/m³ threshold over 1 year. The last two colour categories indicate stations with concentrations above this daily limit value. Only stations with more than 75 % of valid data, and more than 13 % in the case of fixed random measurements, have been included in the map.

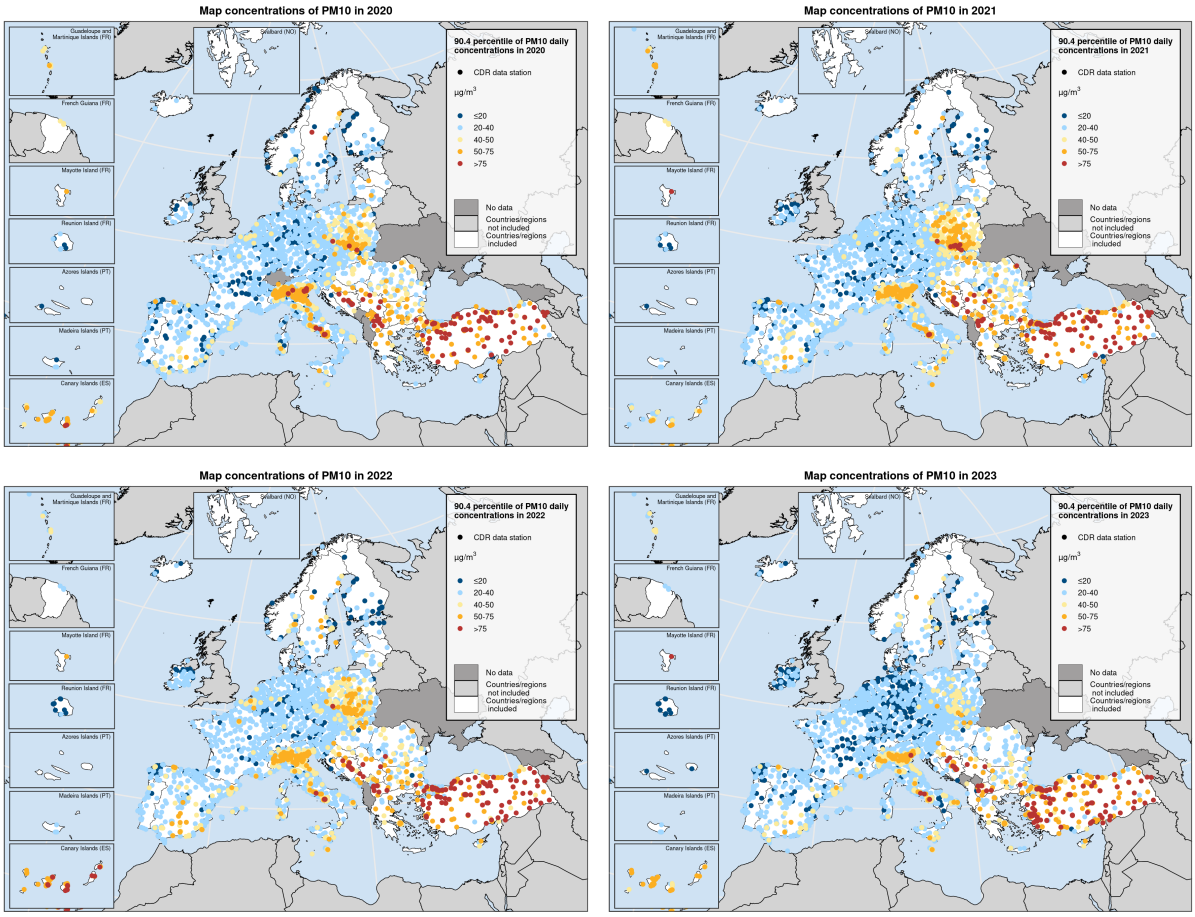


Note: The graph is based, for each country, on the 90.4 percentile of daily mean concentration values corresponding to the 36th highest daily mean in a complete time series. For each country, the number of stations considered for 2023 (in brackets) are given. The boxplot represents the lowest (bottom of the whisker), highest (top of the whisker) and average (black dot) 90.4 percentile values (in µg/m³). The rectangles mark the 25th and 75th percentiles. At 25 % of the stations, levels are below the 25th percentile; at 25 % of the stations, concentrations are above the 75th percentile. The daily limit value set by EU legislation is marked by the horizontal line. The graph should be read in relation to the above map, as a country's situation depends on the number of stations considered.

The highest value in the boxplot, Türkiye (221 µg/m³), has not been included in the graph for representation purposes.

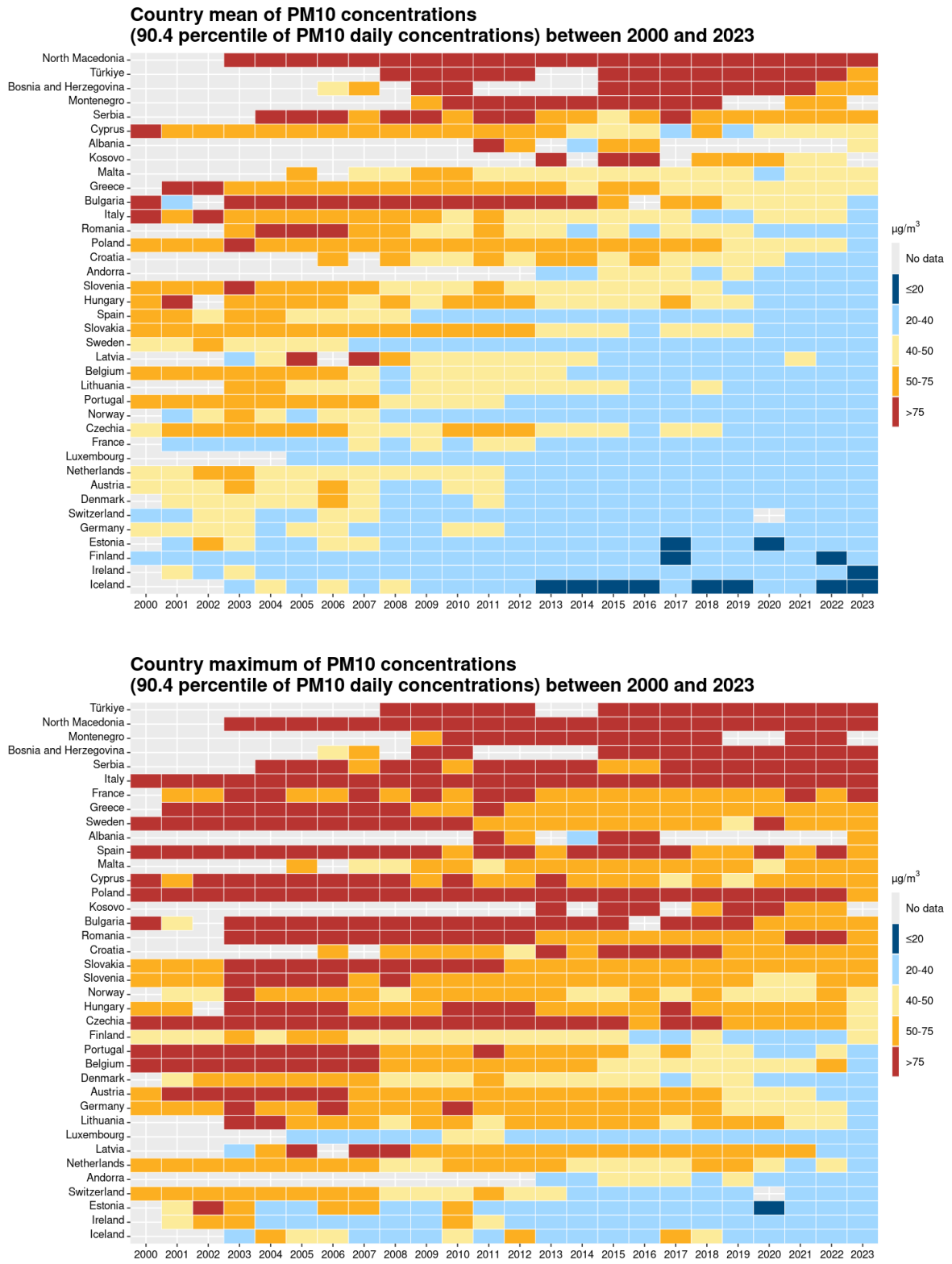
Figure 3 shows the maps of the 90.4 percentile of PM_{10} daily mean concentrations (equivalent to the PM_{10} daily limit value) for four years. In this way, any significant change in the spatial distribution of the values above the set thresholds in the legends can be observed. These maps are based on officially reported validated data on the central data repository (CDR).

Figure 3: Maps of PM_{10} concentrations (daily limit value) for the last 4 years



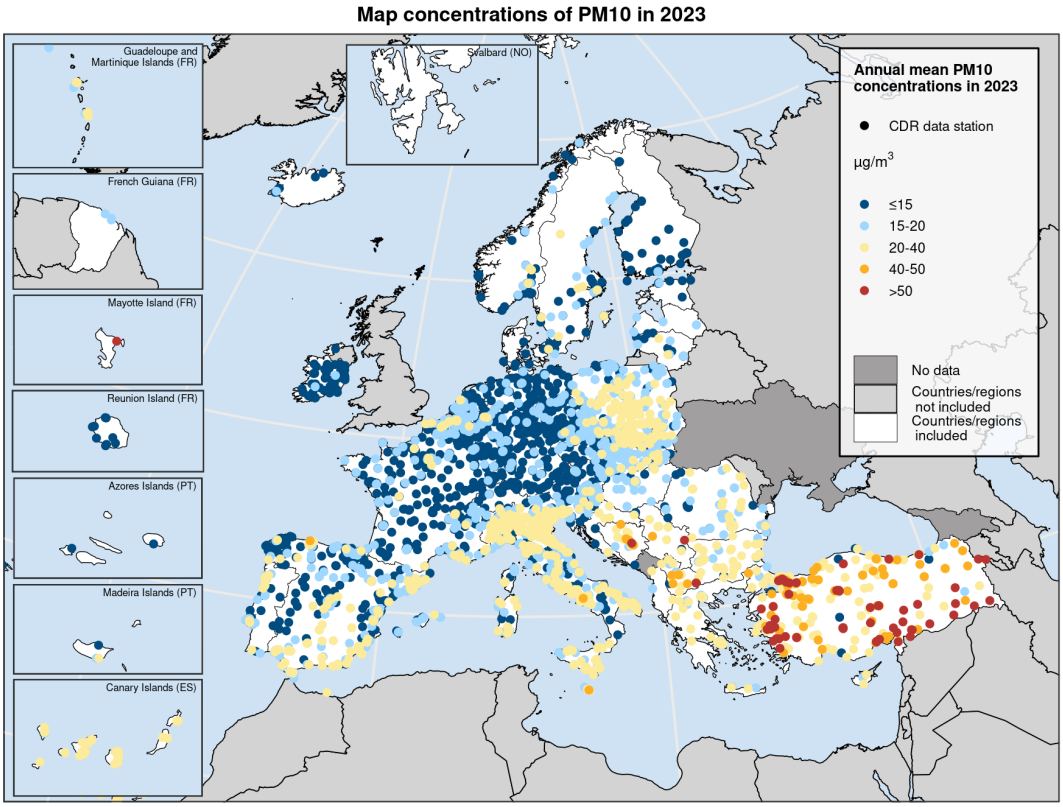
Heatmaps with the evolution from 2000 of the mean (top) and the maximum (bottom) 90.4 percentile of PM_{10} daily mean concentrations at country level are shown in figure 4. In this way, the evolution along years of the average and maximum measured concentration levels can be seen for each country. Note that meteorological variability has a considerable impact on year-to-year changes in ambient air concentrations of air pollutants (EEA, 2020).

Figure 4: Evolution of mean (top) and maximum (bottom) 90.4 percentile of PM_{10} daily mean concentrations (daily limit value) per country from 2000

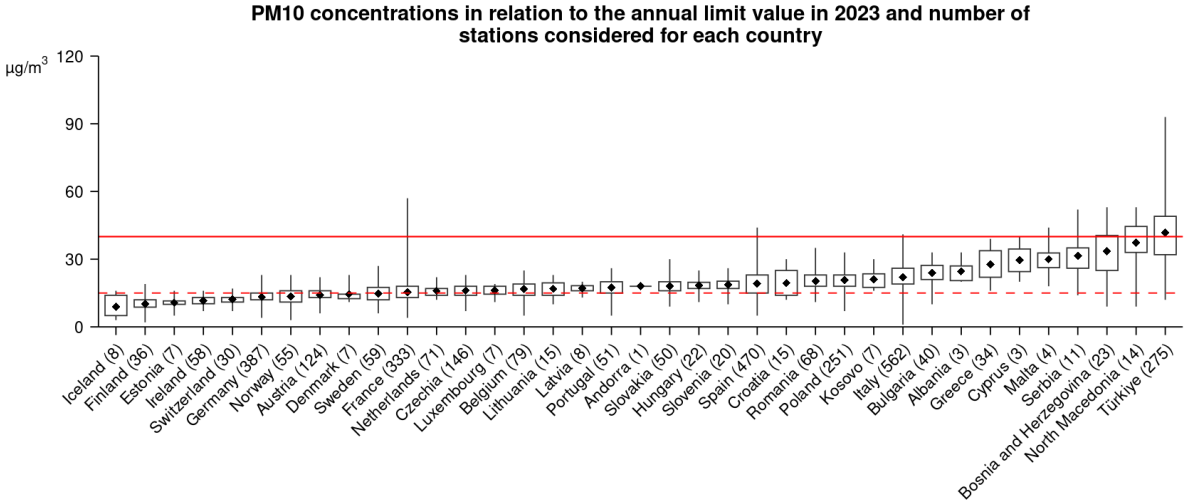


Note: It is important to note that the figure is not based on a consistent set of stations. The number, location and classification of the stations included may vary from year to year.

Figure 5: Map and boxplot of PM_{10} concentrations in 2023 - annual limit value



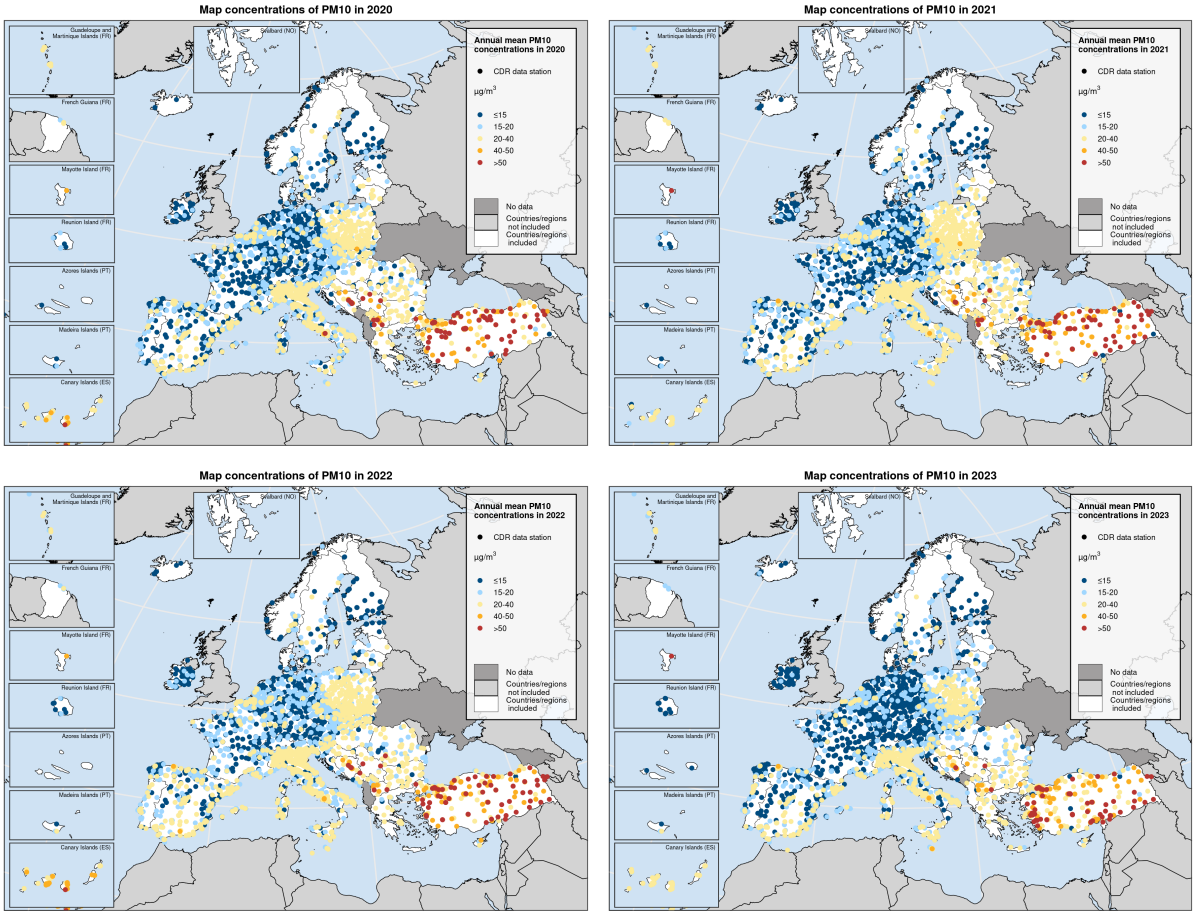
Note: Observed concentrations of PM10 in 2023. The possibility of subtracting contributions to the measured concentrations from natural sources and winter road sanding/salting has not been considered. The last two colour categories indicate stations reporting concentrations above the EU annual limit value (40 µg/m³). The first colour category indicate stations reporting values below the WHO AQG level for PM10 (15 µg/m³). Only stations with more than 75 % of valid data, and more than 13 % in the case of fixed random measurements, have been included in the map.



Note: The graph is based on annual mean concentration values. For each country, the number of stations considered for 2023 (in brackets) are given. The boxplot represents the lowest (bottom of the whisker), highest (top of the whisker) and average (black dot) annual mean values (in µg/m³). The rectangles mark the 25th and 75th percentiles. At 25 % of the stations, levels are below the 25th percentile; at 25 % of the stations, concentrations are above the 75th percentile. The annual limit value set by EU legislation is marked by the upper continuous horizontal line. The WHO AQG level is marked by the lower dashed horizontal line. The graph should be read in relation to the above map, as a country's situation depends on the number of stations considered.

Figure 6 shows the maps of PM_{10} annual mean concentrations at station level for the last four years. In this way, any significant change in the spatial distribution of the values above the set thresholds in the legends can be observed. These maps are based on officially reported validated data (CDR).

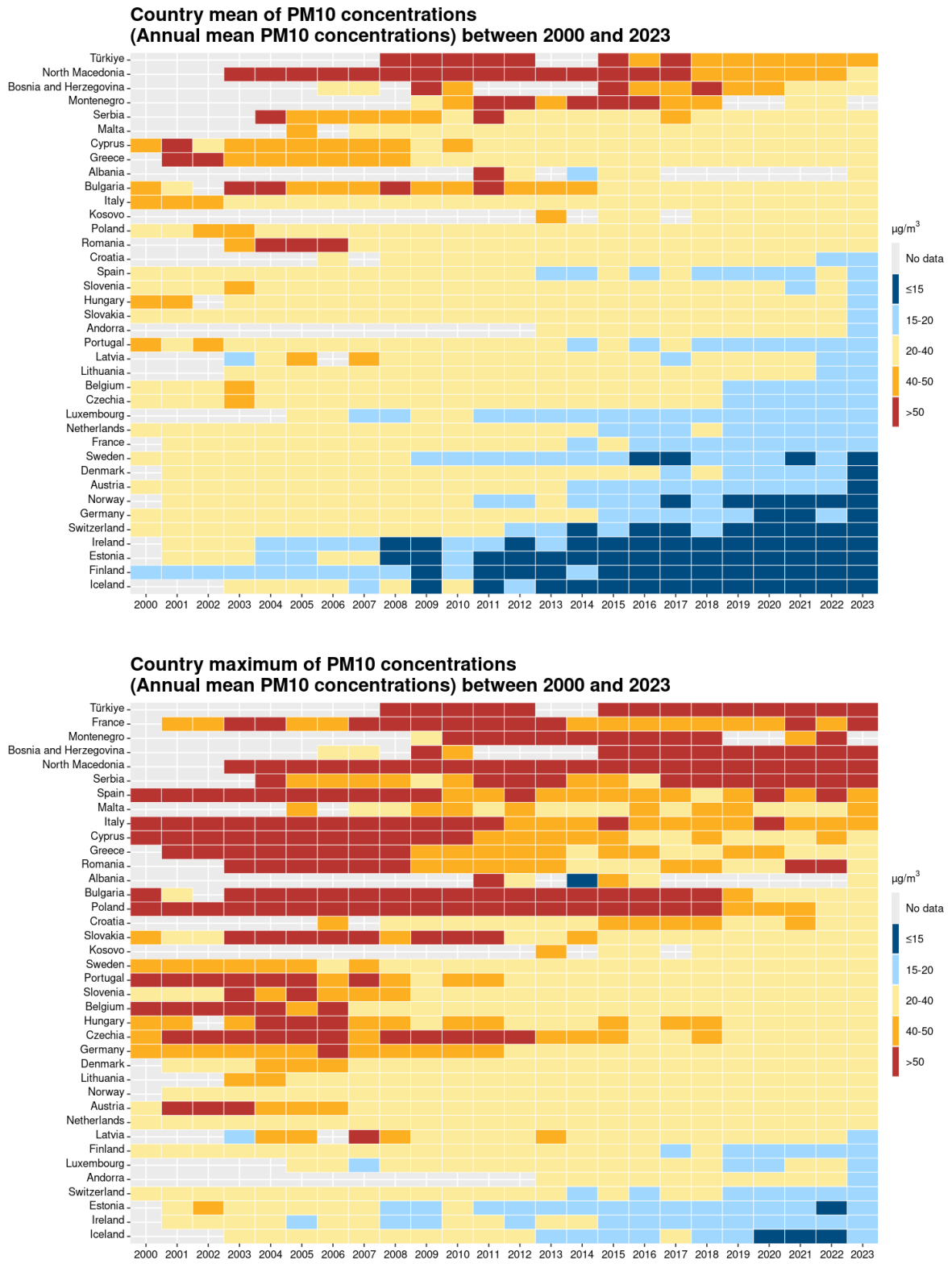
Figure 6: Maps of PM_{10} concentrations (annual limit value) for the last 4 years



Maps for years before 2023 are different to the ones published in previous reports because the bands in the legend have been modified to accommodate the 2030 EU annual limit value (EU, 2024).

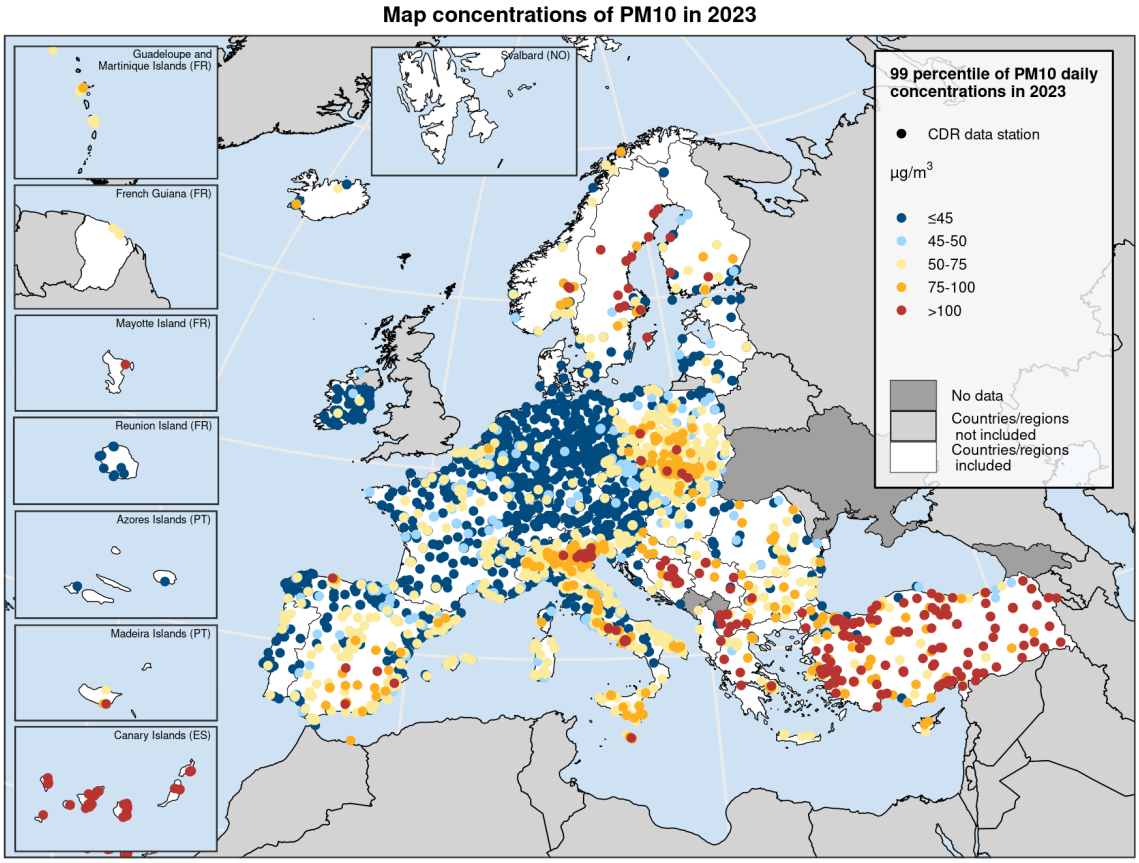
Heatmaps with the evolution from 2000 of the mean (top) and the maximum (bottom) annual mean PM_{10} concentrations at country level are shown in figure 7. In this way, the evolution along years of the average and maximum measured concentration levels can be seen for each country. Note that meteorological variability has a considerable impact on year-to-year changes in ambient air concentrations of air pollutants (EEA, 2020).

Figure 7: Evolution of mean (top) and maximum (bottom) PM_{10} annual mean concentrations (annual limit value) per country from 2000



Note: It is important to note that the figure is not based on a consistent set of stations. The number, location and classification of the stations included may vary from year to year.

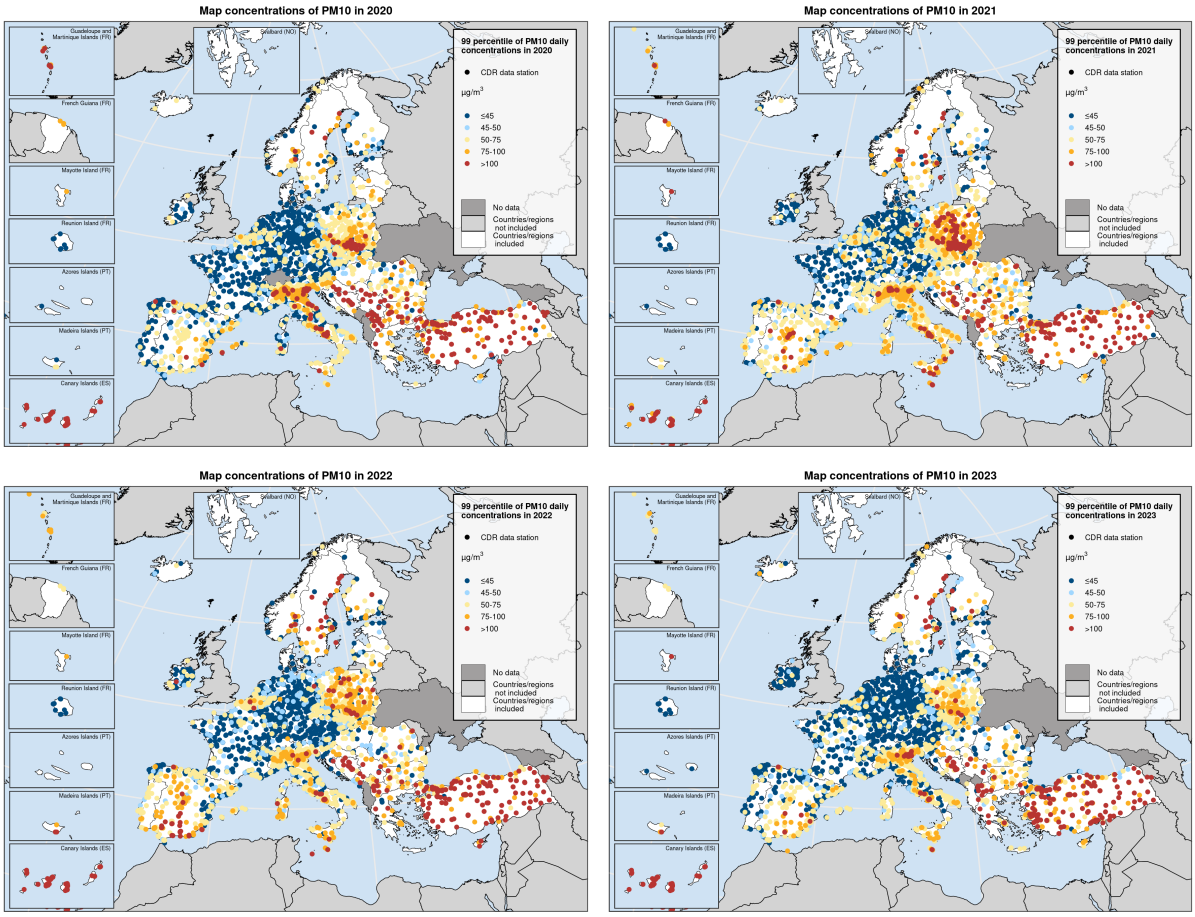
Figure 8: Map of PM_{10} concentrations in 2023 - daily WHO AQG level



Note: Observed concentrations of PM10 in 2023. The map shows the 99 percentile of the PM10 daily mean concentrations, equivalent to 3−4 exceedance days per year, according to the definition of the daily WHO AQG level (45 µg/m³). The first colour category indicates stations with concentrations below this AQG level. Only stations with more than 75 % of valid data, and more than 13 % in the case of fixed random measurements, have been included in the map.

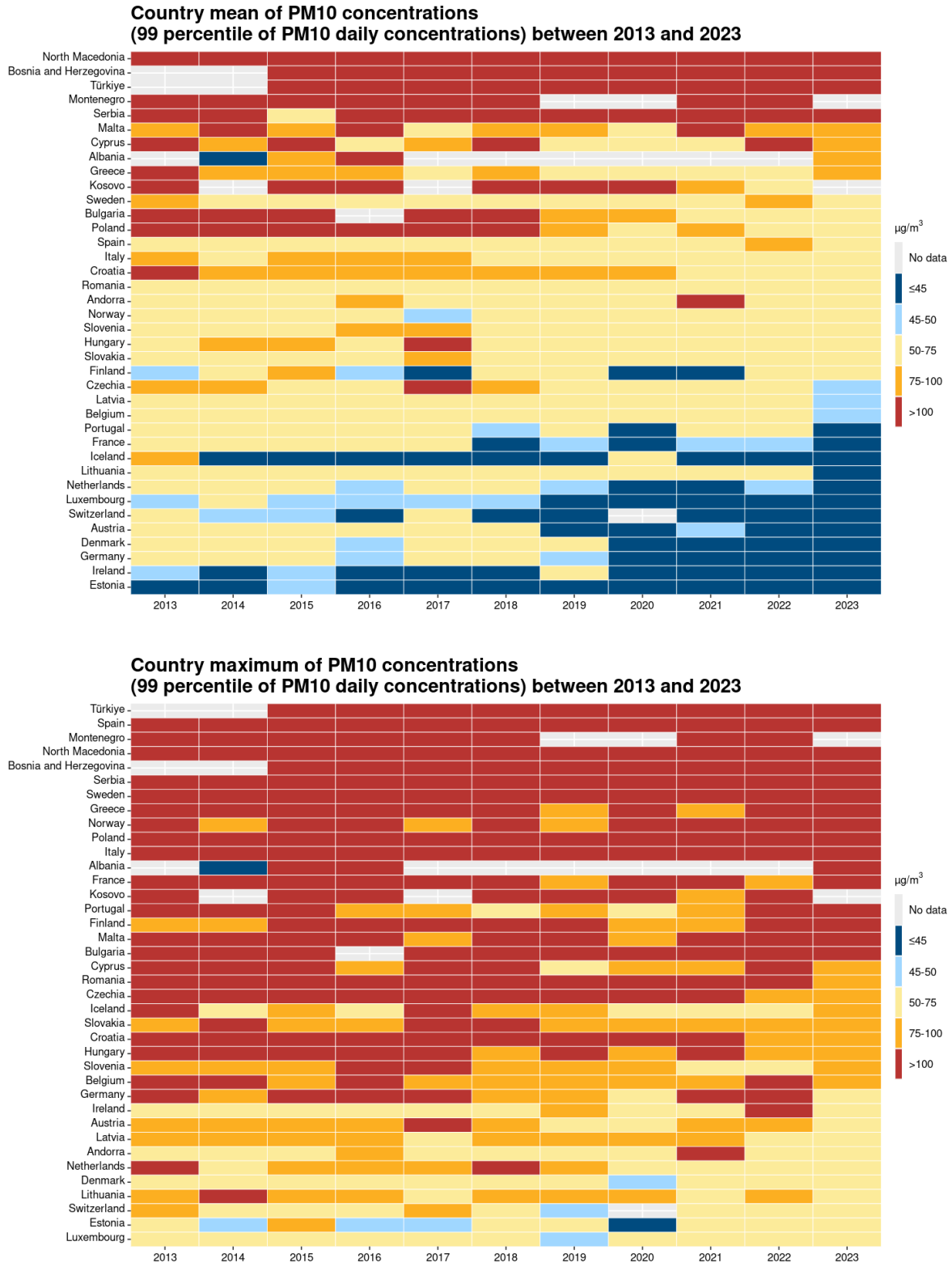
Figure 9 shows the maps of the 99 percentile of PM_{10} daily mean concentrations (equivalent to the WHO AQG level for PM_{10} daily mean level) for the last four years. In this way, any significant change in the spatial distribution of the values above the set thresholds in the legends can be observed. These maps are based on officially reported validated data (CDR).

Figure 9: Maps of PM_{10} concentrations (daily WHO AQG level) for the last 4 years



Heatmaps with the evolution from 2013 of the mean (top) and the maximum (bottom) 99 percentile of PM_{10} daily mean concentrations at country level are shown in figure 10. In this way, the evolution along years of the average and maximum measured concentration levels can be seen for each country. Note that meteorological variability has a considerable impact on year-to-year changes in ambient air concentrations of air pollutants (EEA, 2020).

Figure 10: Evolution of mean (top) and maximum (bottom) 99 percentile of PM_{10} daily mean concentrations (daily WHO AQG level) per country from 2013



Note: It is important to note that the figure is not based on a consistent set of stations. The number, location and classification of the stations included may vary from year to year.

3.2 Status of $PM_{2.5}$ concentrations

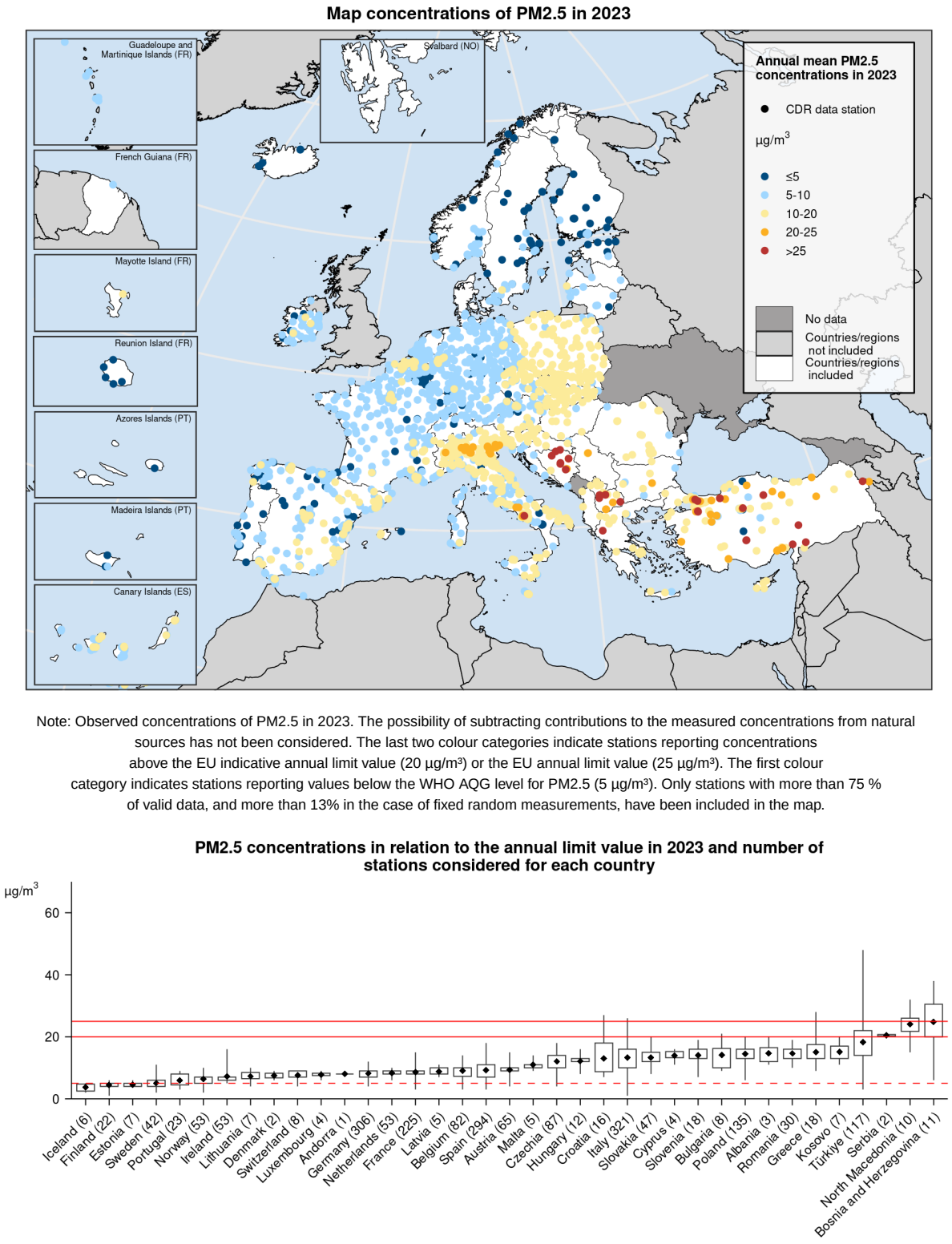
Regarding $PM_{2.5}$, data with a general minimum coverage of 75 %, and of 13 % for fixed random stations, of valid data were received from 2109 stations for the calculation of annual mean concentrations and from 2088 stations in relation to the short-term WHO AQG level. These stations were located in all the reporting countries shown in Figure 1.

The $PM_{2.5}$ concentrations were higher than the EU annual limit value (25 µg/m^3) in three countries in EU-27 and three other reporting countries (Figure 11). These concentrations above the limit value were registered in 1.2 % of all the reporting stations and occurred primarily (97 % of cases) in urban (85 %) or suburban (12 %) areas.

The WHO AQG level for $PM_{2.5}$ annual mean (5 µg/m^3) was exceeded at 92 % of the stations, located in 36 of the 37 countries reporting $PM_{2.5}$ data (Figure 11). Iceland did not report any concentrations above the WHO AQG level for $PM_{2.5}$.

The WHO AQG level for $PM_{2.5}$ daily mean (15 µg/m^3), expresed as percentile 99, it was exceeded at 95 % (1988 stations) of the stations in all the reporting countries (Figure 14).

Figure 11: Map and boxplot of $PM_{2.5}$ concentrations in 2023 - annual limit value

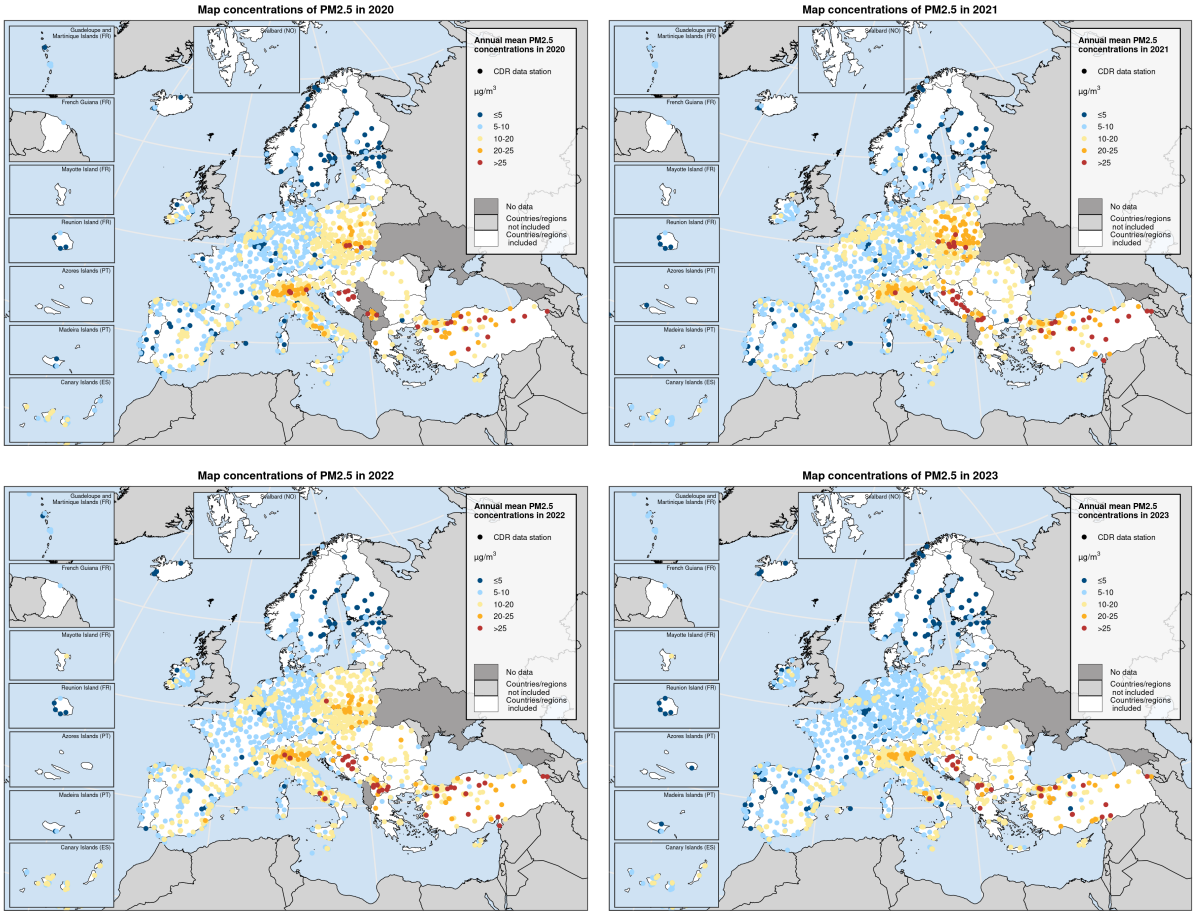


Note: Observed concentrations of PM2.5 in 2023. The possibility of subtracting contributions to the measured concentrations from natural sources has not been considered. The last two colour categories indicate stations reporting concentrations above the EU indicative annual limit value (20 µg/m³) or the EU annual limit value (25 µg/m³). The first colour category indicates stations reporting values below the WHO AQG level for PM2.5 (5 µg/m³). Only stations with more than 75 % of valid data, and more than 13% in the case of fixed random measurements, have been included in the map.

Note: The graph is based on annual mean concentration values. For each country, the number of stations considered for 2023 (in brackets) are given. The boxplot represents the lowest (bottom of the whisker), highest (top of the whisker) and average (black dot) annual mean values (in µg/m³). The rectangles mark the 25th and 75th percentiles. At 25 % of the stations, levels are below the 25th percentile; at 25 % of the stations, concentrations are above the 75th percentile. The annual limit value and the indicative annual limit value set by EU legislation are marked by the upper continuous horizontal lines at 25 and 20, respectively. The WHO AQG level is marked by the lower dashed horizontal line. The graph should be read in relation to the above map, as a country's situation depends on the number of stations considered.

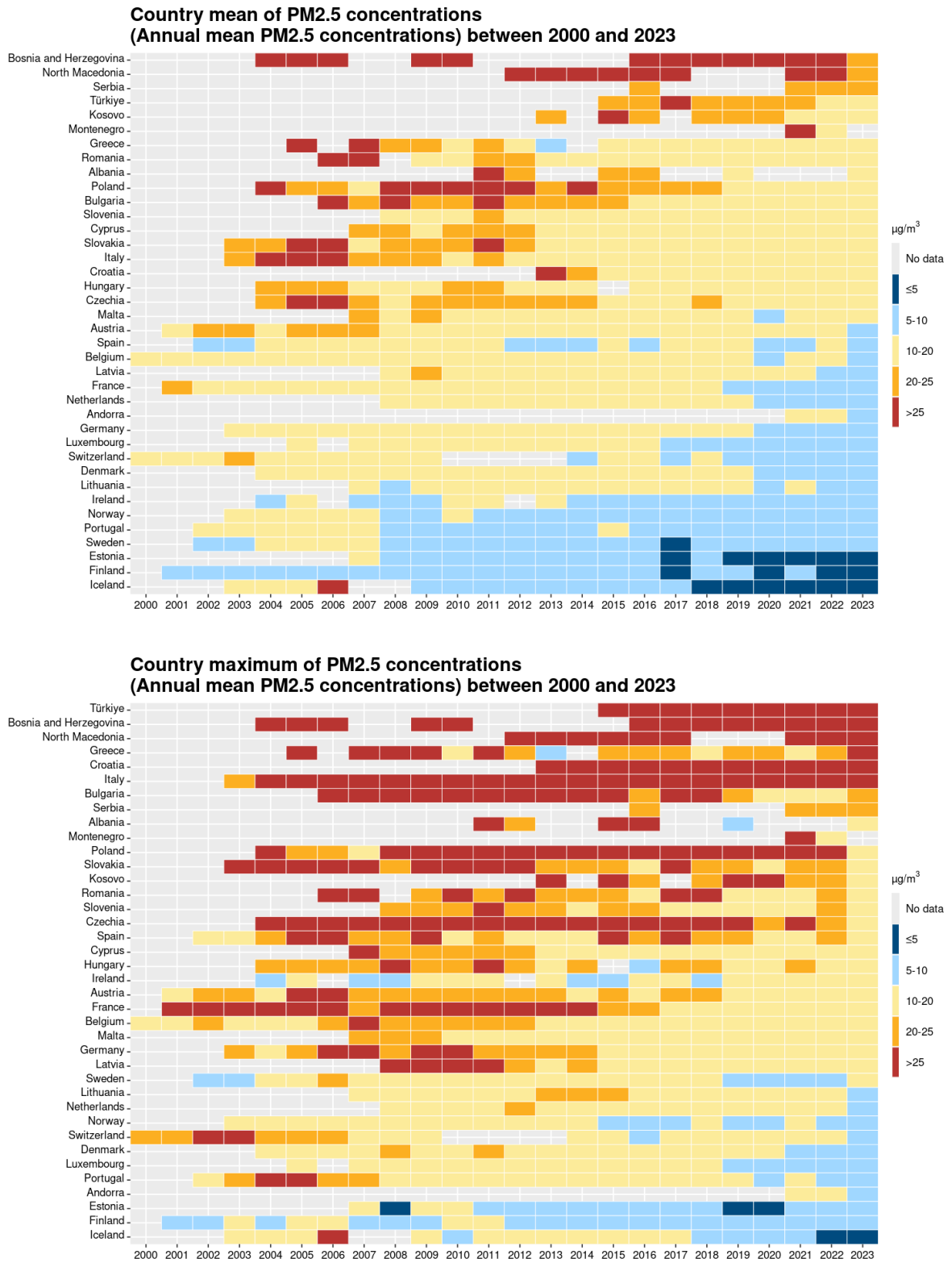
Figure 12 shows the maps of measured $PM_{2.5}$ annual mean concentrations for the last four years. In this way, any significant change in the spatial distribution of the values above the set thresholds in the legends can be observed. These maps are based on officially reported validated data (CDR).

Figure 12: Maps of $PM_{2.5}$ concentrations (annual limit value) for the last 4 years



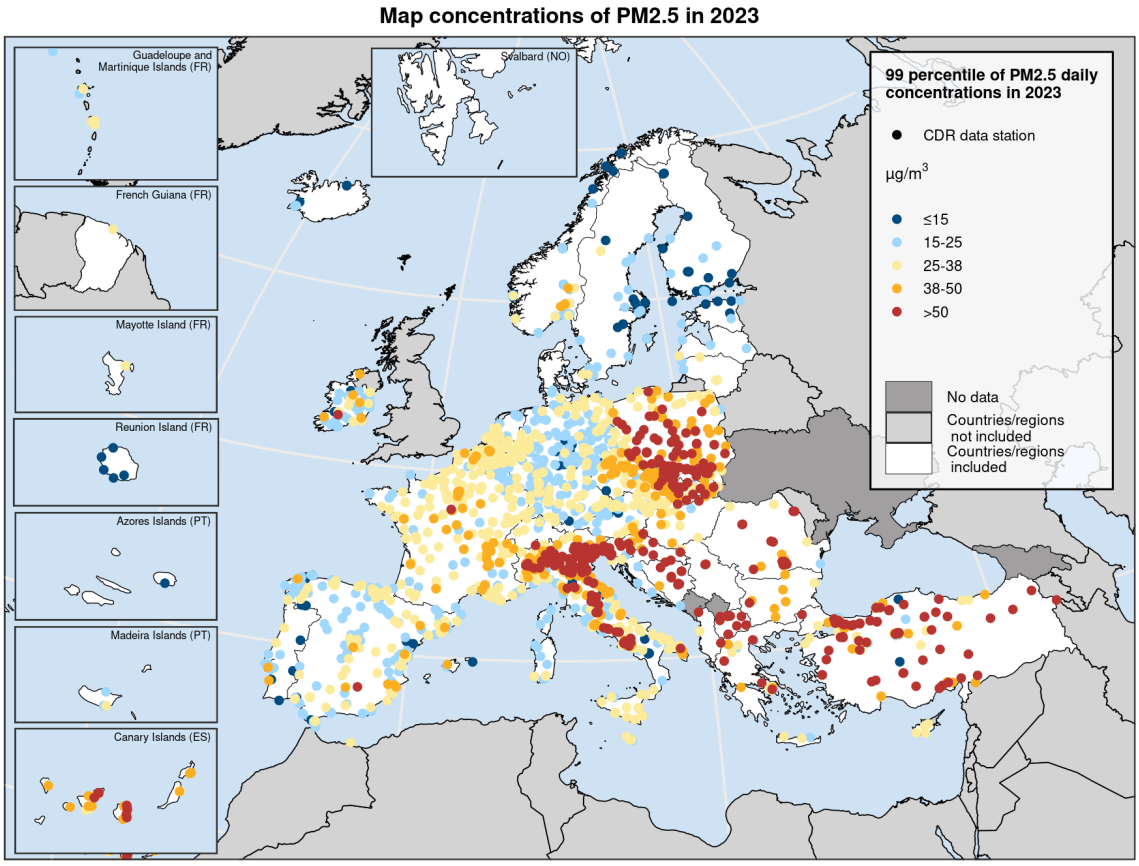
Heatmaps with the evolution from 2000 of the mean (top) and the maximum (bottom) $PM_{2.5}$ annual mean concentrations at country level are shown in figure 13. In this way, the evolution along years of the average and maximum measured concentration levels can be seen for each country. Note that meteorological variability has a considerable impact on year-to-year changes in ambient air concentrations of air pollutants (EEA, 2020).

Figure 13: Evolution of mean (top) and maximum (bottom) $PM_{2.5}$ annual mean concentrations (annual limit value) per country from 2000



Note: It is important to note that the figure is not based on a consistent set of stations. The number, location and classification of the stations included may vary from year to year.

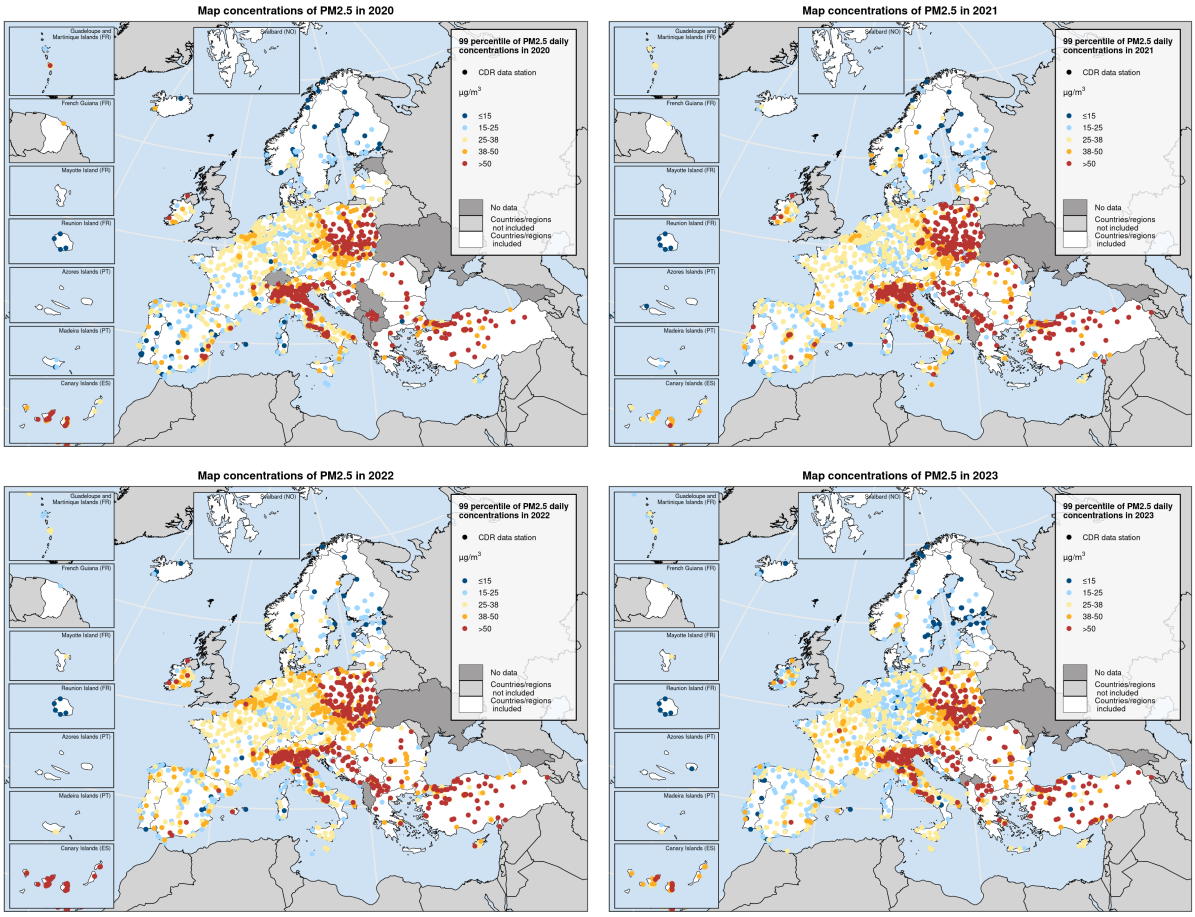
Figure 14: Map of $PM_{2.5}$ concentrations in 2023 - daily WHO AQG level



Note: Observed concentrations of PM2.5 in 2023. The map shows the 99 percentile of the PM2.5 daily mean concentrations, equivalent to 3−4 exceedance days per year, according to the definition of the daily WHO AQG level (15 µg/m³). The first colour category indicates stations with concentrations below this AQG level. Only stations with more than 75 % of valid data, and more than 13 % in the case of fixed random measurements, have been included in the map.

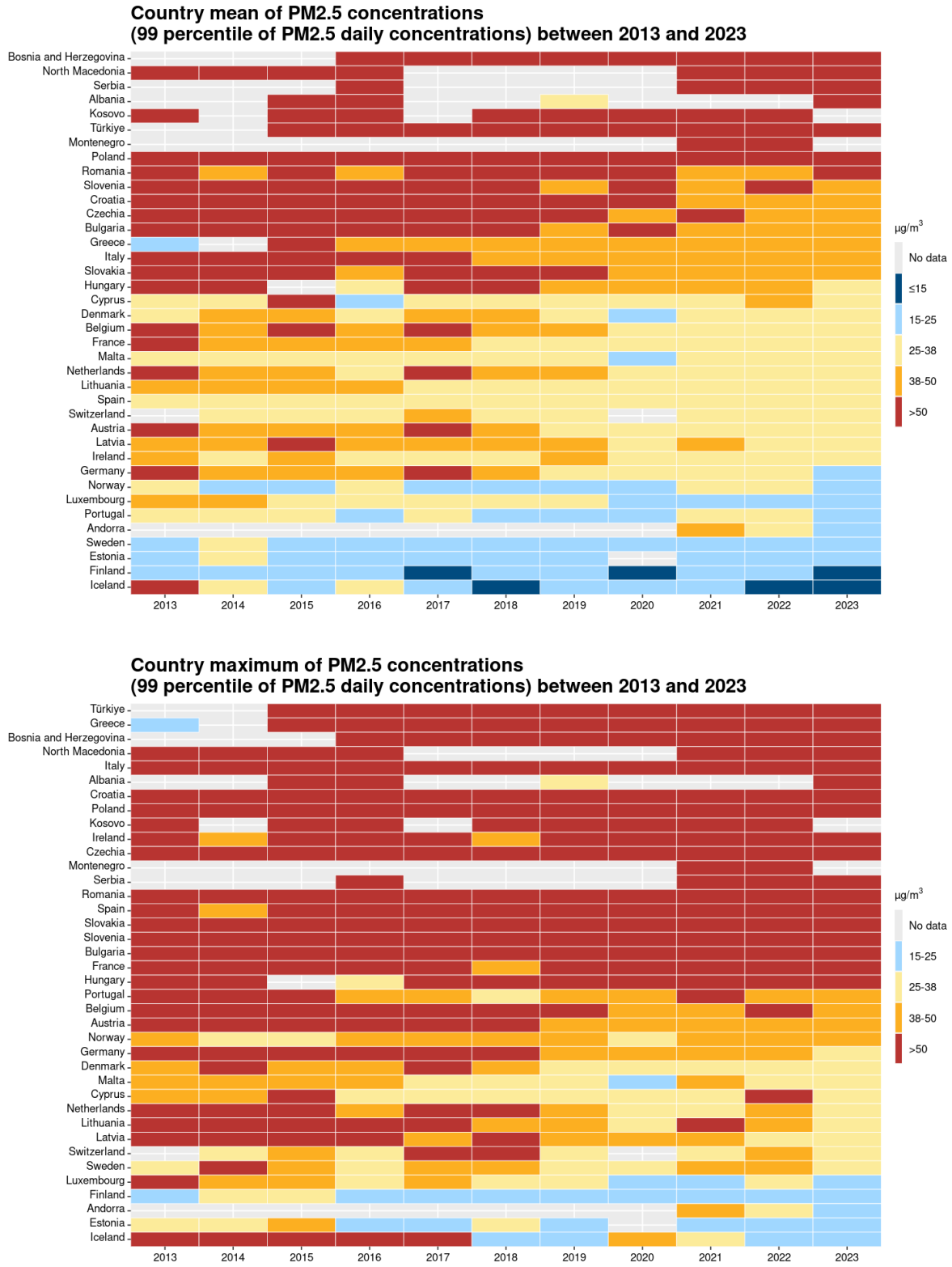
Figure 15 shows the maps of the 99 percentile of $PM_{2.5}$ daily mean concentrations (equivalent to the WHO AQG level for $PM_{2.5}$ daily mean level) for the last four years. In this way, any significant change in the spatial distribution of the values above the set thresholds in the legends can be observed. These maps are based on officially reported validated data (CDR).

Figure 15: Maps of $PM_{2.5}$ concentrations (daily WHO AQG level) for the last 4 years



Heatmaps with the evolution from 2013 of the mean (top) and the maximum (bottom) 99 percentile of $PM_{2.5}$ daily mean concentrations at country level are shown in figure 16. In this way, the evolution along years of the average and maximum measured concentration levels can be seen for each country. Note that meteorological variability has a considerable impact on year-to-year changes in ambient air concentrations of air pollutants (EEA, 2020).

Figure 16: Evolution of mean (top) and maximum (bottom) 99 percentile of $PM_{2.5}$ daily mean concentrations (daily WHO AQG level) per country from 2013



Note: It is important to note that the figure is not based on a consistent set of stations. The number, location and classification of the stations included may vary from year to year.

3.3 $PM_{2.5}$ average exposure indicator

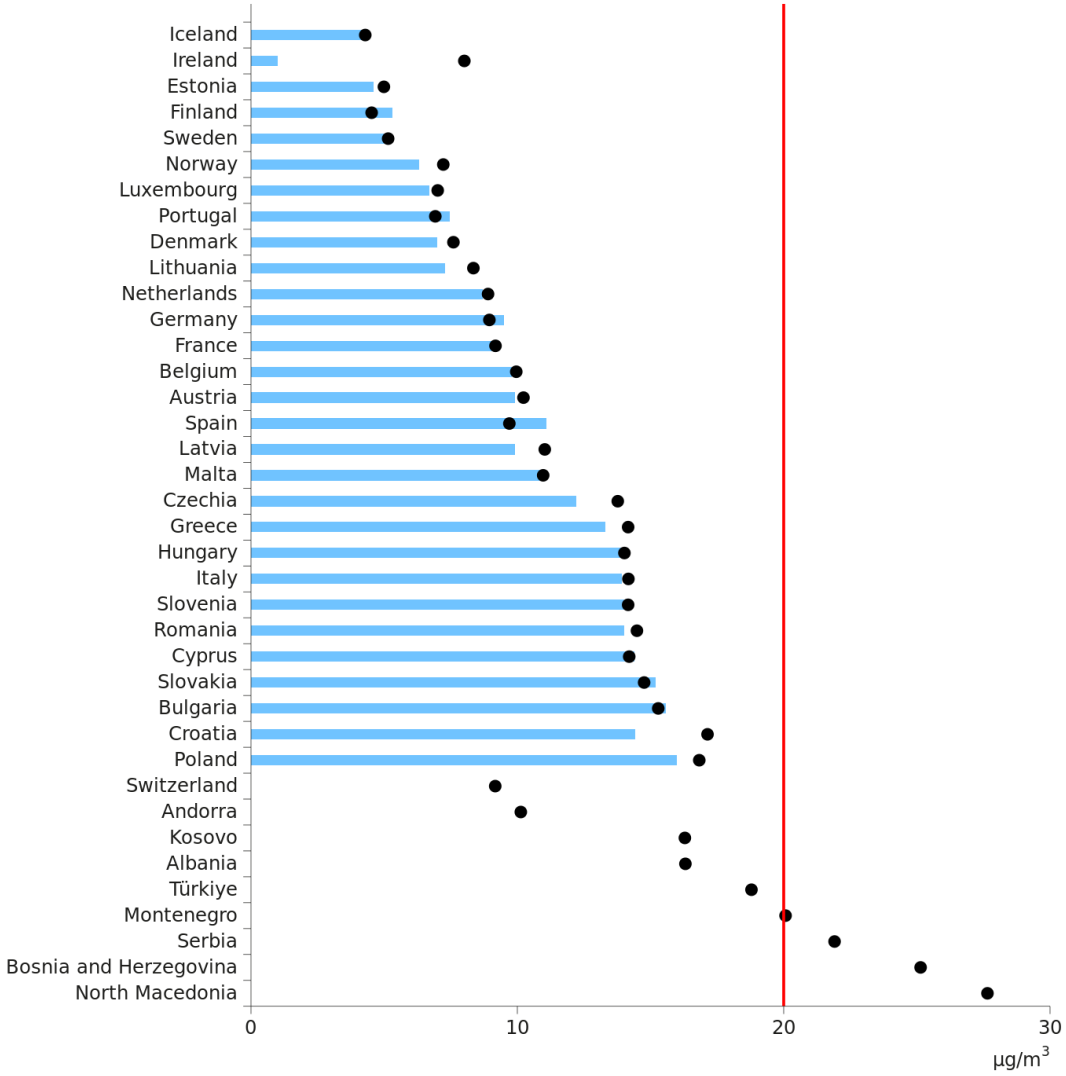
The Ambient Air Quality Directive (EU, 2008) also sets two additional targets for $PM_{2.5}$, the exposure concentration obligation (ECO) and the national exposure reduction target (NERT) (Table 1). Both targets are based on the average exposure indicator (AEI), calculated at national level. The AEI is an average of concentration levels (over a 3-year period) measured at urban background stations (representative of general urban population exposure) selected for this purpose by every national authority. The reference year for the AEI is 2010 (average 2008-2010), but the Ambient Air Quality Directive offered two additional alternatives when data are not available for 2008: (1) an alternative AEI 2010, with a 2-year average (2009 and 2010) instead of the 3-year average; or (2) the AEI 2011 (average 2009-2011). The exception is Croatia for which 2015 is the AEI reference year (average 2013-2015). The data presented here are analysed with reference to the official AEI reported by each country and stored in EEA's vocabulary ([5]) and presented in Table 5 in the Annex.

Figure 17 assesses $PM_{2.5}$ levels against the ECO threshold. It shows the AEI reported for 2023 (average 2021-2023) and the situation in relation to the ECO. The bars show the AEI 2023 as reported by countries under data flow G (Information on the attainment of environmental objectives) according to Article 12 of IPR Decision 2011/850/EU, while the dots show the 3-year (2021-2023) average concentrations from measurements at all urban and suburban background stations with 75 % data coverage. This calculation, covering the urban and suburban background stations, has been used in previous *Air quality in Europe* reports as an approximation of the AEI and is presented here for comparison with the information presented in those reports. The calculation using reported urban and suburban background stations is also made for the rest of the non-EU countries.

In Figure 17, the vertical line represents the ECO threshold, set at 20 µg/m^3. For those countries whose bars are to the right of the vertical line, the AEI is above the ECO (based on reported information in data-flow G). For those countries whose dots are to the right of the vertical line, the 3 year average calculated from reported urban and suburban background stations is above the ECO.

[5] https://dd.eionet.europa.eu/vocabulary/aq/exposurereductiontarget/view.

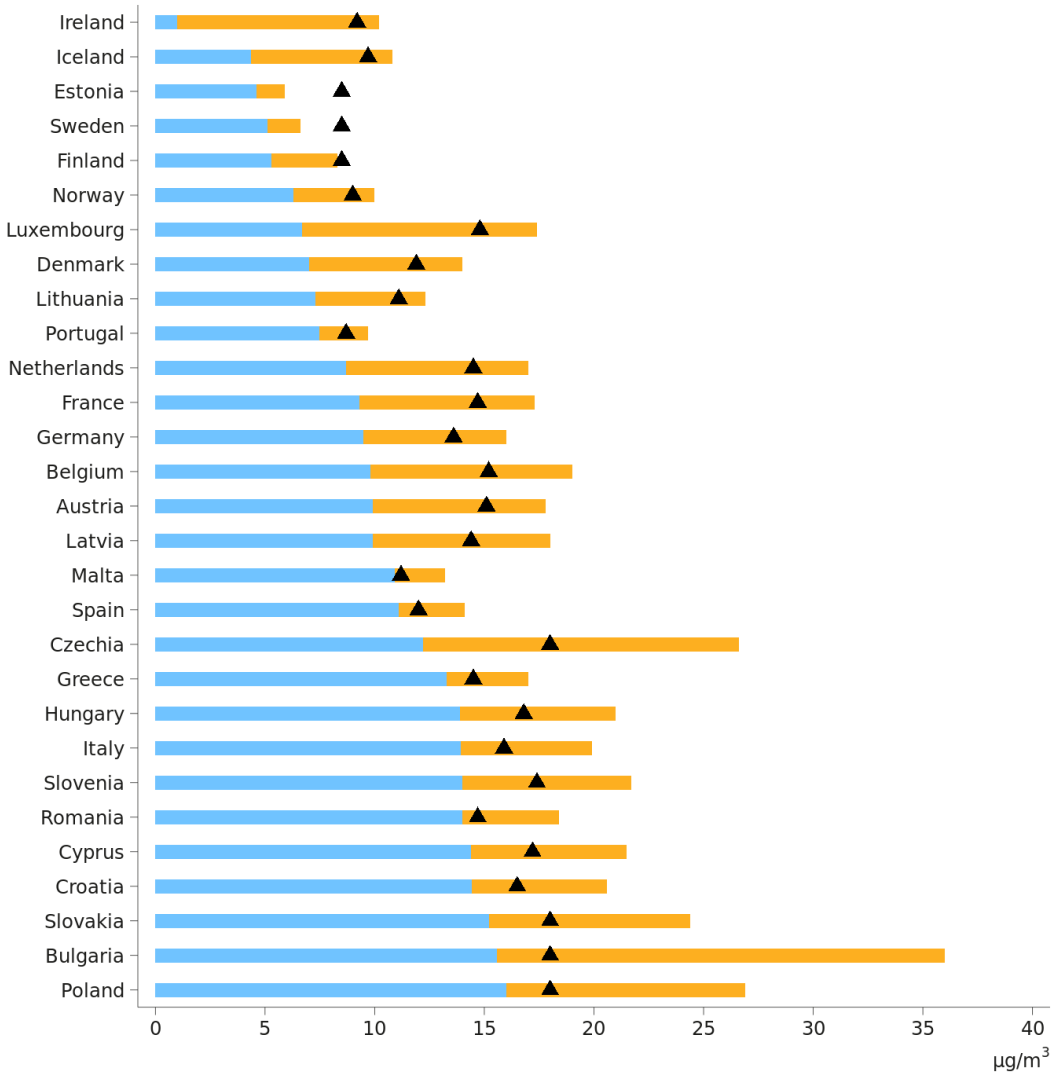
Figure 17: Average exposure indicator in 2023 and exposure concentration obligation



Note: The bars show the average exposure indicator (AEI) calculated in 2023 (averages 2021−2023) as reported by countries under data flow G (Information on the attainment of environmental objectives) according to Article 12 of IPR Decision 2011/850/EU.
The dots show the 3 year (2021−2023) average of all urban and suburban background PM2.5 concentrations (for stations with at least 75 % of data coverage) in all reporting countries, to facilitate comparison with information provided in previous Air quality in Europe reports.
The vertical line represents the exposure concentration obligation (ECO) for the countries in EU−27, set at 20 µg/m³, to be achieved as of 2015.

Figure 18 shows the situation per country in relation to the NERT. The total stacked bar (both blue and orange parts) represents the initial baseline AEI for 2010 or 2011 as reported by each country expressed in µg/m^3 (see Table 5 in Annex). The blue part is the latest reported AEI for 2023, as it can also be seen in figure 17 (if a country has not reported data for the year of analysis, only the orange bar will be shown). The triangles indicate the NERT level to be attained from 2020 onwards. Figure 18 shows those countries that have reduced their AEI below their corresponding NERT, estimated from their initial AEI baseline, (those who have reported data, and threfore have blue part, and whose triangles is over the orange bar) and those that did not (triangles over the blue part of the bar).

Figure 18: Reduction in AEI 2023 in relation to initial AEI (either 2010 or 2011) and distance to the national exposure reduction target



Note: The total stacked bar indicate the initial baseline AEI for 2010 or 2011 (AEI 2015 in the case of Croatia, see the main text).
Triangles indicate the NERT to be met in 2023 applying the percentage reduction to the AEI baseline.
If the triangle is over the orange part of the stack bar, the NERT was achieved in 2023,
if the triangle is over the blue part of the bar, the NERT is not met.

4 Status of ozone ambient air concentrations

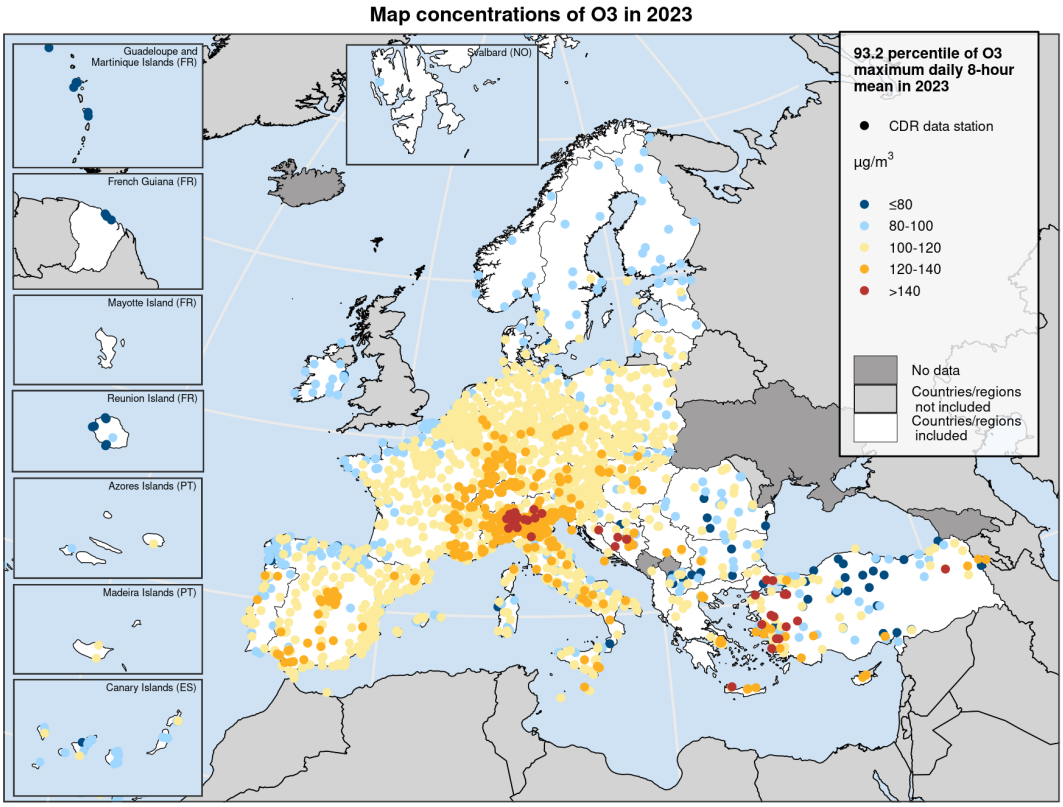
Data for O_3 were reported from 2218 stations for the calculation of EU standards, from 2218 stations in relation to the short-term WHO AQG level, and from 2090 stations for the long-term WHO AQG level. These stations were located in all the reporting countries shown in Figure 1.

16 countries in EU-27 and 4 other reporting countries registered concentrations above the O_3 target value threshold (120 µg/m^3) more than 25 times this year (Figure 19). In total, 18 % of all stations reporting O_3 showed concentrations above the target value threshold for the protection of human health. In addition, only 17 % (375) of all stations fulfilled the long-term objective (120 µg/m^3). 86 % of the stations with values above the long-term objective were background stations.

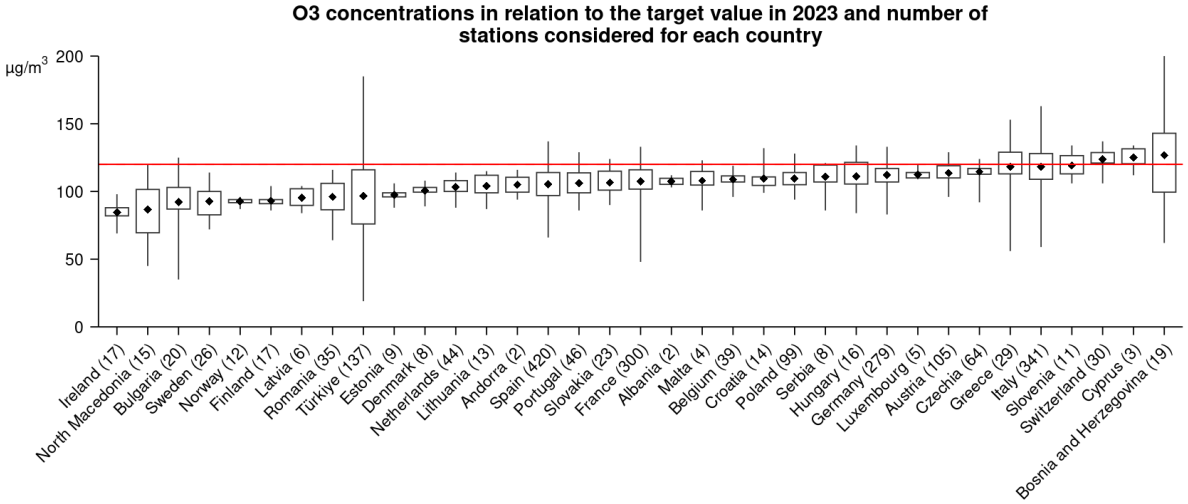
8 % (183) of all stations and only 15 of the 555 reported rural background stations had values below the short-term WHO AQG value for O_3 (100 µg/m^3) (Figure 22), set for the protection of human health. The long-term, peak season([6]), WHO AQG level (60 µg/m^3) was exceeded in 97 % (2024) of all stations located in 27 countries in EU-27 and 8 other reporting countries. Only 4 of the 533 reported rural background stations had values below this AQG level (Figure 25).

[6]The peak season is calculated for each station as the average of daily maximum 8-hour mean O3 concentration in the six consecutive months with the highest six-month running-average O_3 concentration. That means that, for each station, twelve 6-months running averages of the daily 8-h max are calculated (1 August YY-1 to 31 January YY, ..., 1 January YY to 30 June YY, ..., 1 July YY to 31 December YY) and the maximum of those 12 values is selected as the peak season concentration. Please check also Data Dictionary - Vocabulary (https://dd.eionet.europa.eu/vocabularyconcept/aq/aggregationprocess/P1Y-maxP6M-P8H-dmax/view?vocabularyFolder.workingCopy=false&facet=HTML+Representation).

Figure 19: Map and boxplot of O_3 concentrations in 2023



Note: Observed concentrations of O3 in 2023. The map shows the 93.2 percentile of the O3 maximum daily 8−hour mean, representing the 26th highest value in a complete series. It is related to the O3 target value. At sites marked with the last two colour categories, the 26th highest daily O3 concentrations were above the 120 µg/m³ threshold, implying values above the target value threshold. Please note that the legal definition of the target value considers not only 1 year but the average over 3 years. Only stations with more than 75 % of valid data have been included in the map.

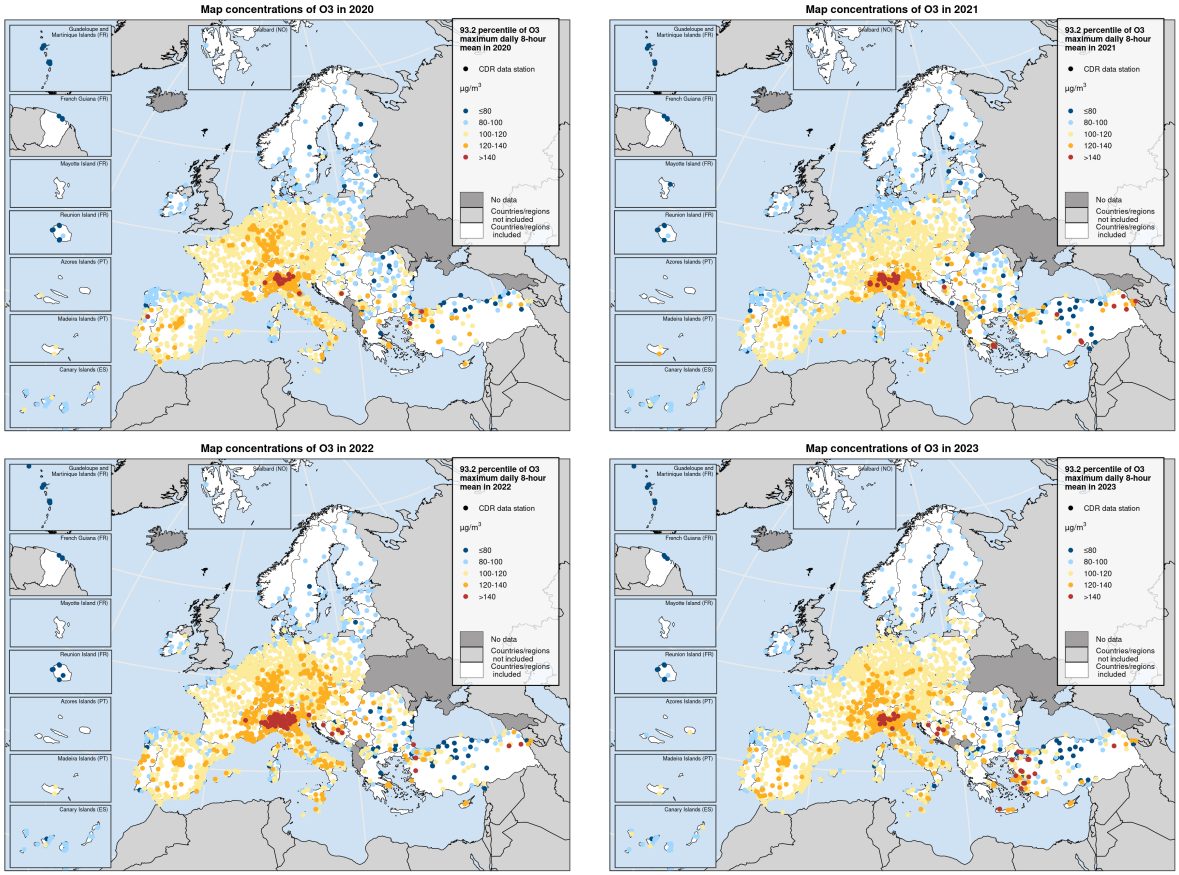


Note: The graph is based, for each country, on the 93.2 percentile of the maximum daily 8−hour mean concentration values, corresponding to the 26th highest daily maximum of the running 8−hour mean in a complete time series. For each country, the number of stations considered for 2023 (in brackets) are given. The boxplot represents the lowest (bottom of the whisker), highest (top of the whisker) and average (black dot) values (in µg/m³). The rectangles mark the 25th and 75th percentiles. At 25 % of the stations, levels are below the 25th percentile; at 25 % of the stations, concentrations are above the 75th percentile. The target value threshold set by the EU legislation is marked by the horizontal line. Please note that the legal definition of the target value considers not only 1 year but the average over 3 years. The graph should be read in relation to the above map, as a country's situation depends on the number of stations considered.

The highest value in the boxplot, Bosnia and Herzegovina (217 µg/m³), has not been included in the graph for representation purposes.

Figure 20 shows the maps of the observed 93.2 percentile of the O_3 maximum daily 8-hour mean concentrations (O_3 target value) for the last four years. In this way, any significant change in the spatial distribution of the values above the set thresholds in the legends can be observed. These maps are based on officially reported validated data (CDR).

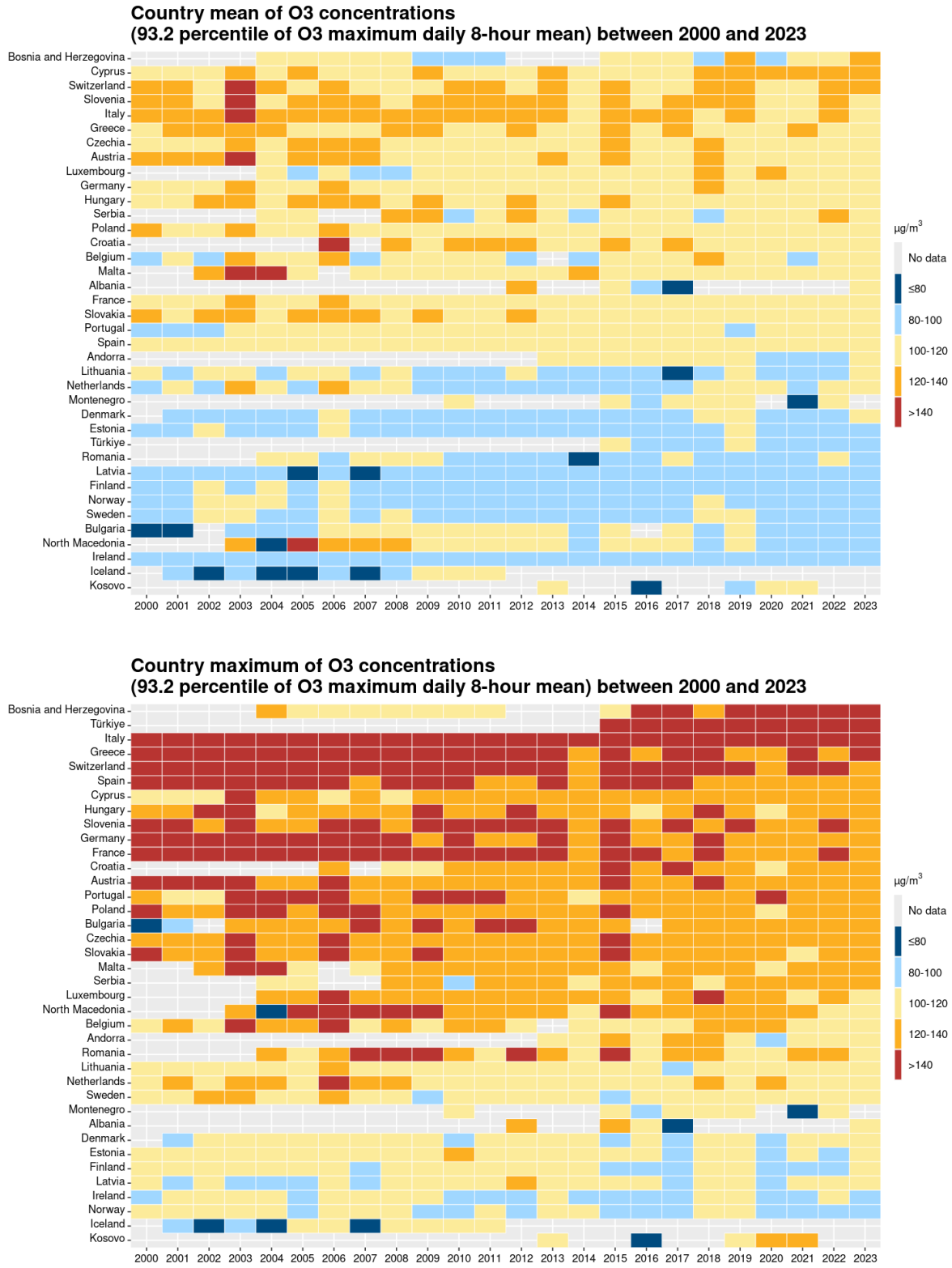
Figure 20: Maps of O_3 concentrations (related to the target value) for the last 4 years



Note: Please be aware that the TV considers the average over 3 years and the maps only show the situation for one specific year.

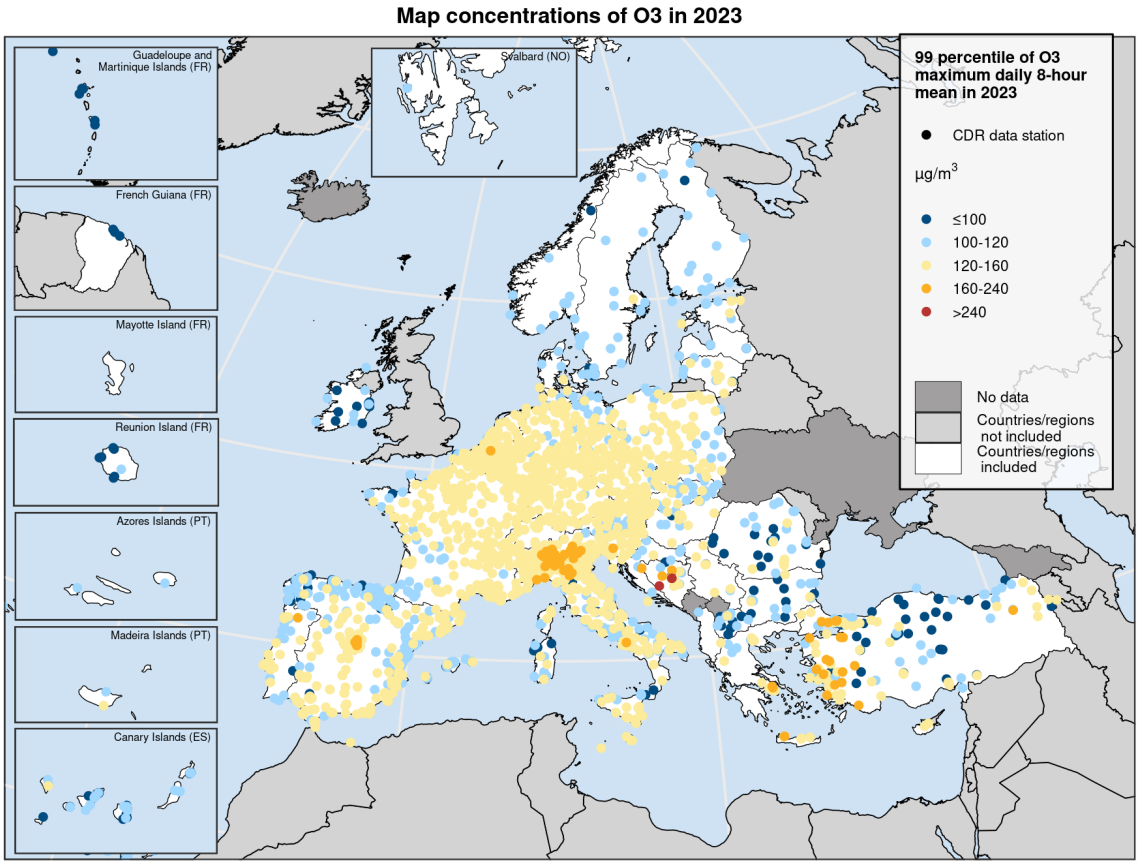
Heatmaps with the evolution from 2000 of the mean (top) and the maximum (bottom) O_3 concentrations (93.2 percentile of the maximum daily 8-hour mean concentration, target value) at country level are shown in figure 21. In this way, the evolution along years of the average and maximum measured concentration levels can be seen for each country. Note that meteorological variability has a considerable impact on year-to-year changes in ambient air concentrations of air pollutants (EEA, 2020), especially for O_3 as higher ambient air temperature leads to enhanced photochemical reactions and O_3 formation.

Figure 21: Evolution of mean (top) and maximum (bottom) O_3 concentrations (93.2 percentile of the maximum daily 8-hour mean concentration, related to the target value) per country from 2000



Note: It is important to note that the figure is not based on a consistent set of stations. The number, location and classification of the stations included may vary from year to year.

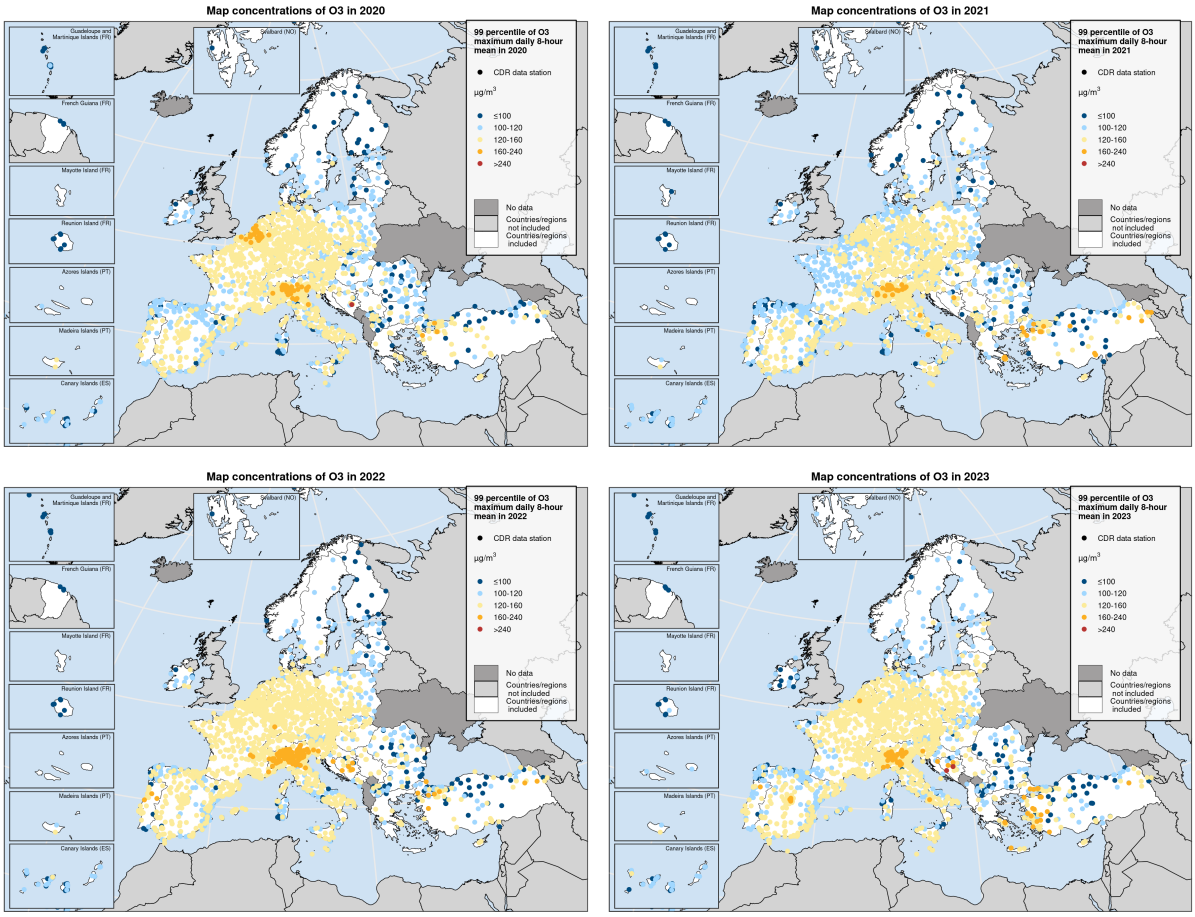
Figure 22: Map of O_3 concentrations in 2023 - short-term WHO AQG level



Note: Observed concentrations of O3 in 2023. The map shows the 99 percentile of the O3 maximum daily 8−hour mean concentrations, equivalent to 3−4 exceedance days per year, according to the definition of the short−term WHO AQG level (100 µg/m³).
The first colour category indicates stations with concentrations below this AQG level.
Only stations with more than 75 % of valid data have been included in the map.

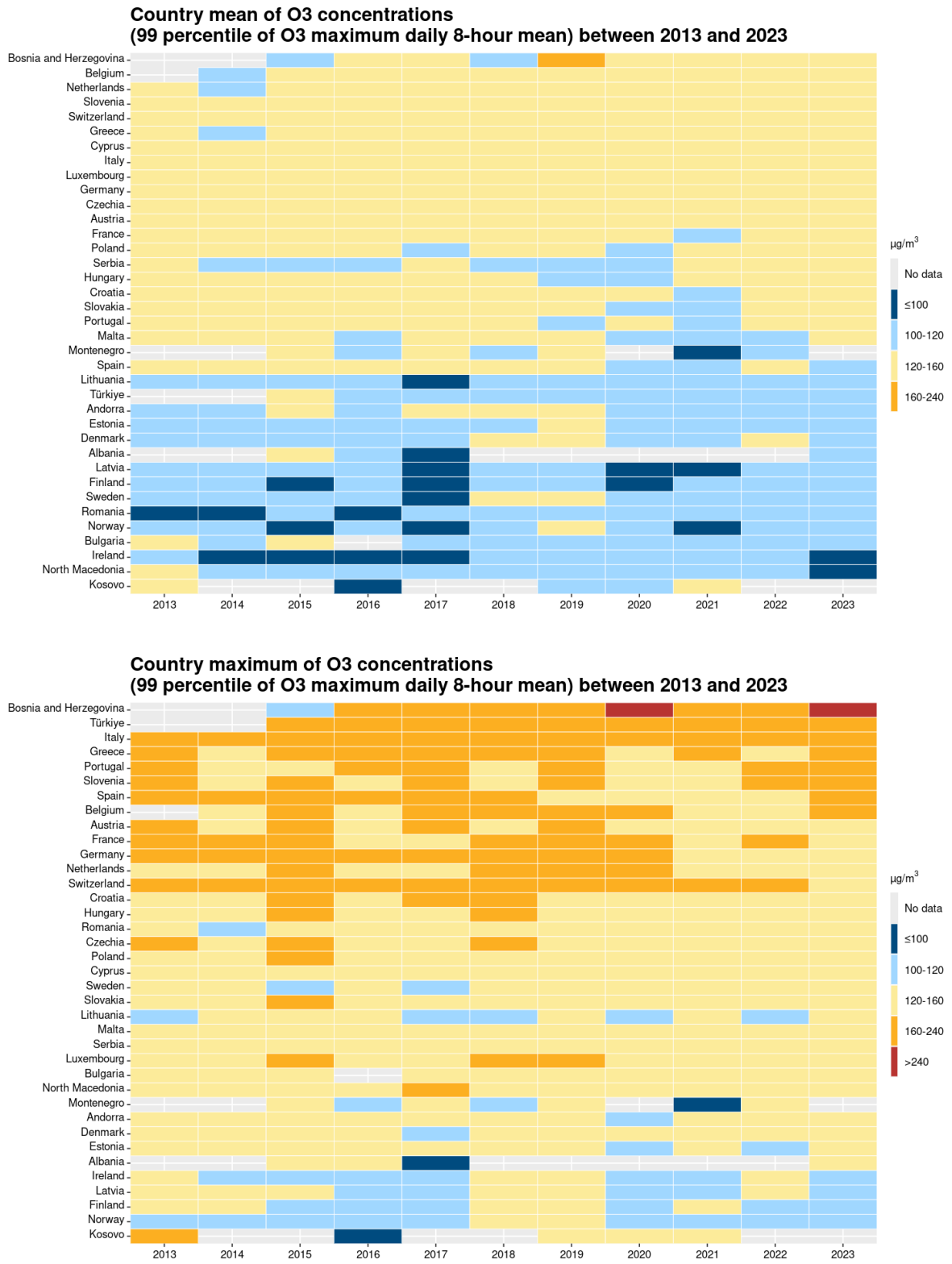
Figure 23 shows the maps of the 99 percentile of the O_3 maximum daily 8-hour mean concentrations (equivalent to the short-term WHO AQG level) for the last four years. In this way, any significant change in the spatial distribution of the values above the set thresholds in the legends can be observed. These maps are based on officially reported validated data (CDR).

Figure 23: Maps of O_3 concentrations (short-term WHO AQG level) for the last 4 years



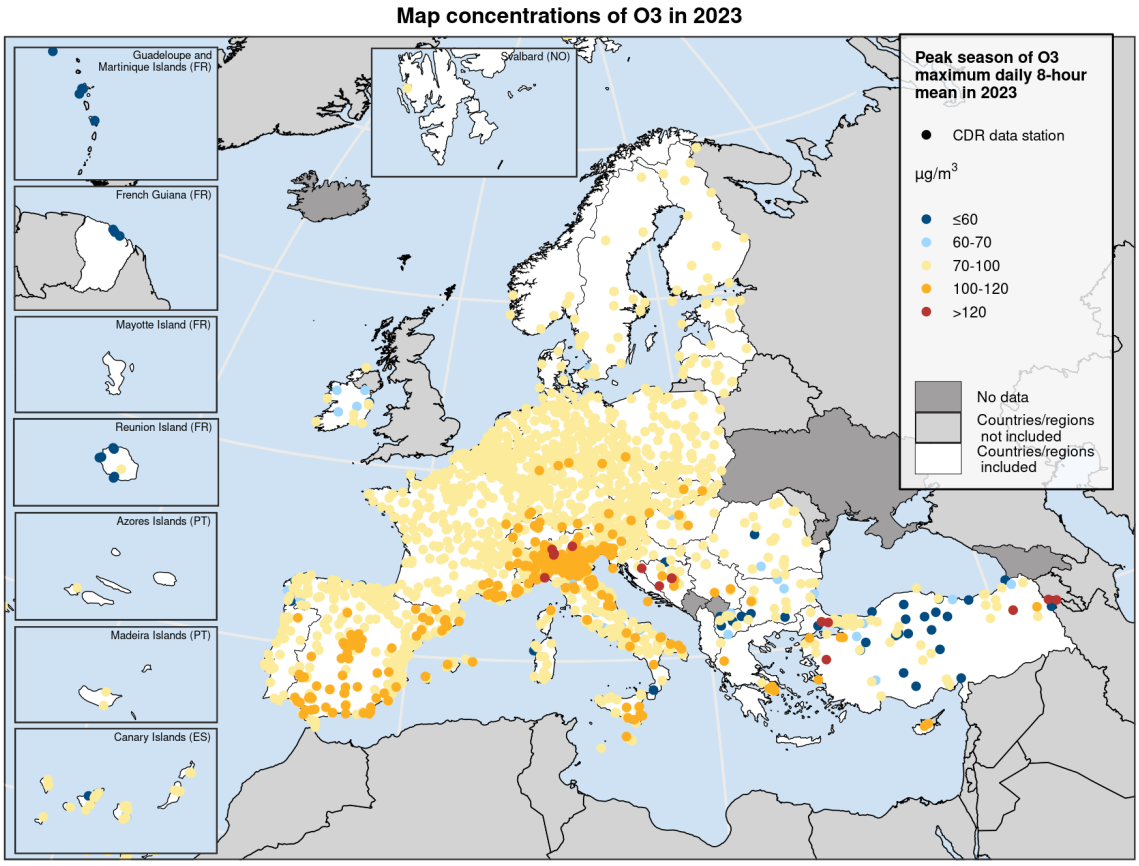
Heatmaps with the evolution from 2013 of the mean (top) and the maximum (bottom) 99 percentile of the O_3 maximum daily 8-hour mean concentrations at country level are shown in figure 24. In this way, the evolution along years of the average and maximum measured concentration levels can be seen for each country. Note that meteorological variability has a considerable impact on year-to-year changes in ambient air concentrations of air pollutants (EEA, 2020).

Figure 24: Evolution of mean (top) and maximum (bottom) 99 percentile of the O_3 maximum daily 8-hour mean concentrations per country from 2013



Note: It is important to note that the figure is not based on a consistent set of stations. The number, location and classification of the stations included may vary from year to year.

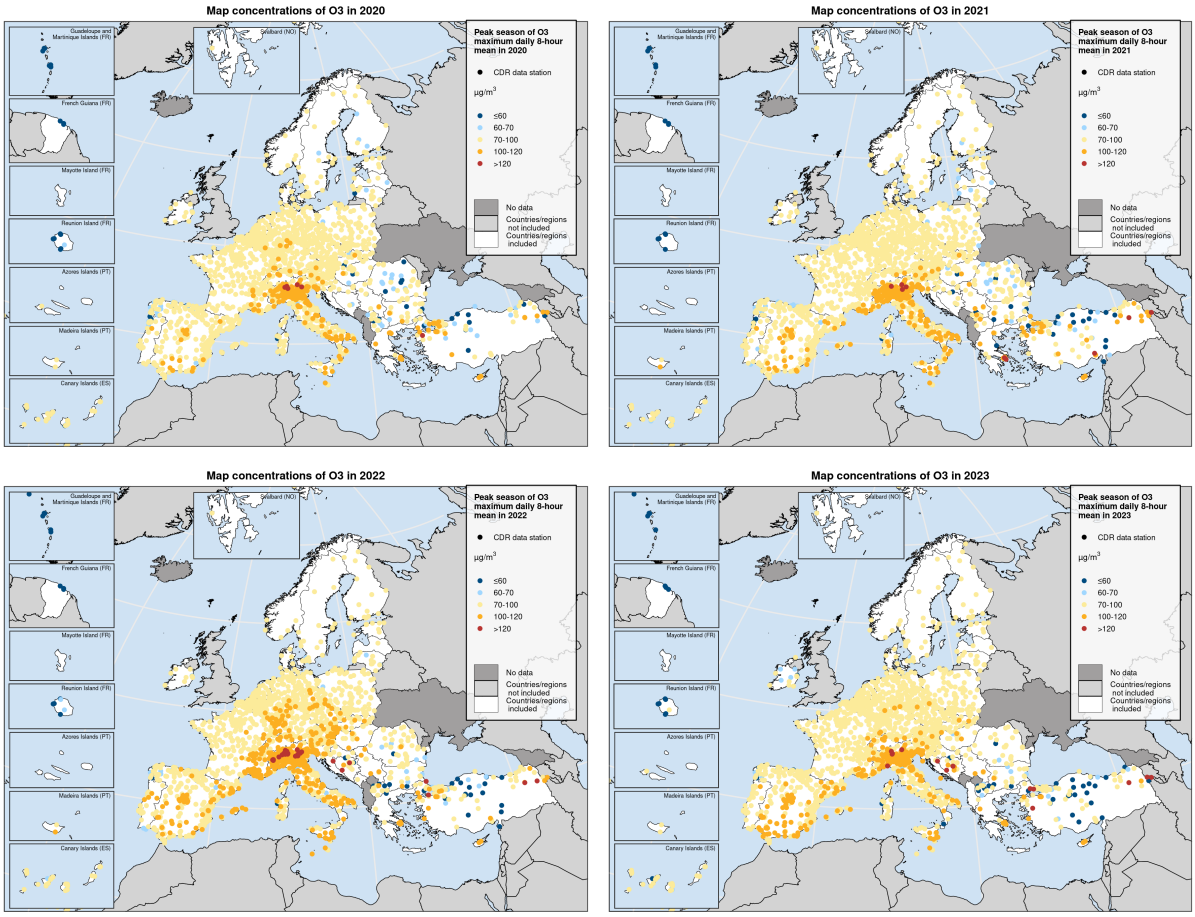
Figure 25: Map of peak season O_3 concentrations in 2023



Note: Observed concentrations of O3 in 2023. The map shows the average of the daily maximum 8−hour mean O3 concentration in the six consecutive months with the highest six−month running−average O3 concentration. The first colour category represents stations fulfilling the peak season O3 AQG level. Only stations with more than 75 % of valid data have been included in the map.

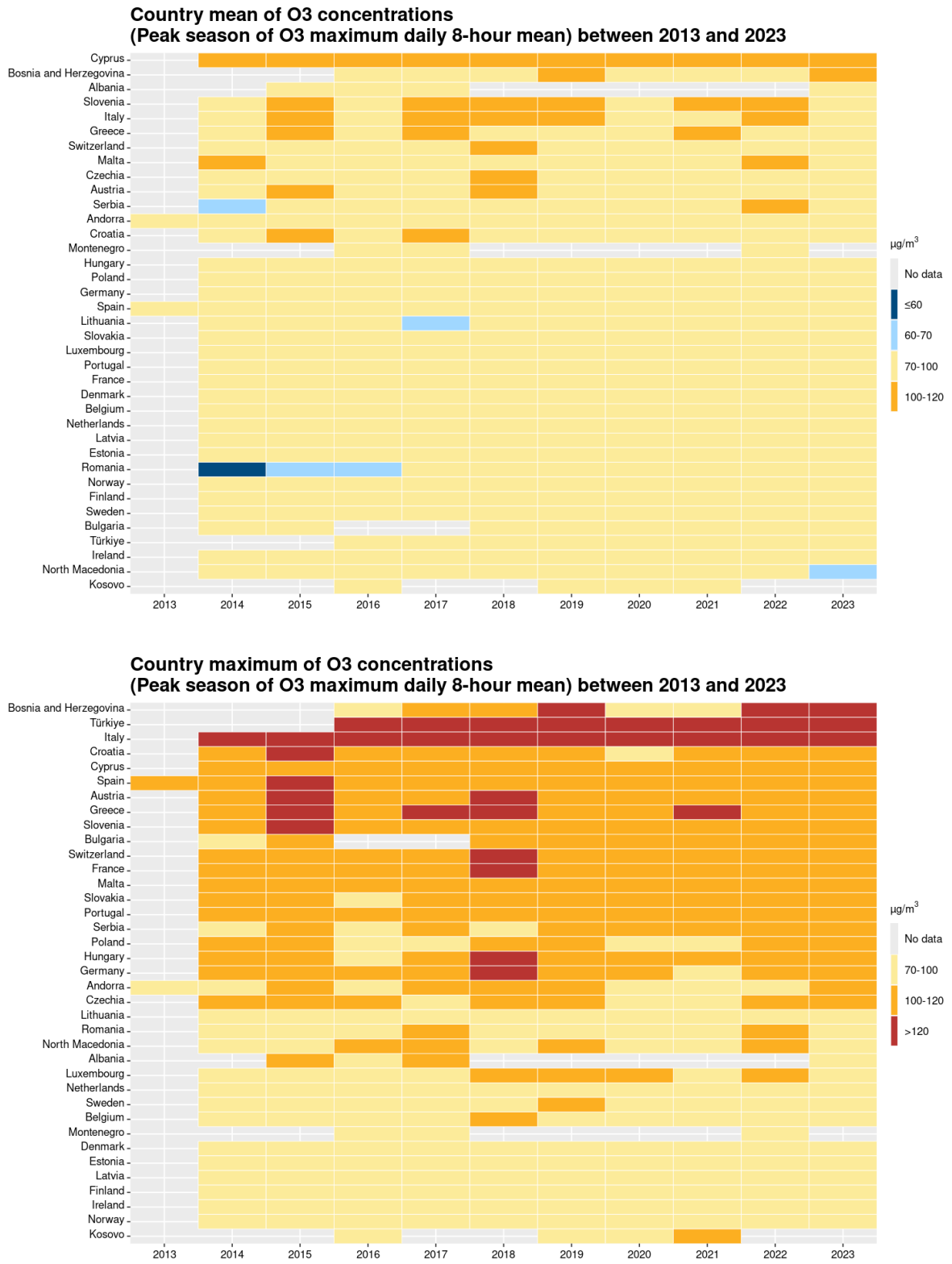
Figure 26 shows the maps of the peak season O_3 concentrations (equivalent to the long-term WHO AQG level) for the last four years. In this way, any significant change in the spatial distribution of the values above the set thresholds in the legends can be observed. These maps are based on officially reported validated data (CDR).

Figure 26: Maps of peak season O_3 concentrations for the last 4 years



Heatmaps with the evolution from 2013 of the mean (top) and the maximum (bottom) peak season O_3 concentrations at country level are shown in figure 27. In this way, the evolution along years of the average and maximum measured concentration levels can be seen for each country. Note that meteorological variability has a considerable impact on year-to-year changes in ambient air concentrations of air pollutants (EEA, 2020).

Figure 27: Evolution of mean (top) and maximum (bottom) peak season O_3 concentrations per country from 2013



Note: It is important to note that the figure is not based on a consistent set of stations. The number, location and classification of the stations included may vary from year to year.

5 Status of nitrogen dioxide ambient air concentrations

The reporting countries shown in Figure 1 submitted NO_2 data from 3540 stations for the annual limit value, 3165 stations for the hourly limit value, and 3167 stations for the daily WHO AQG level.

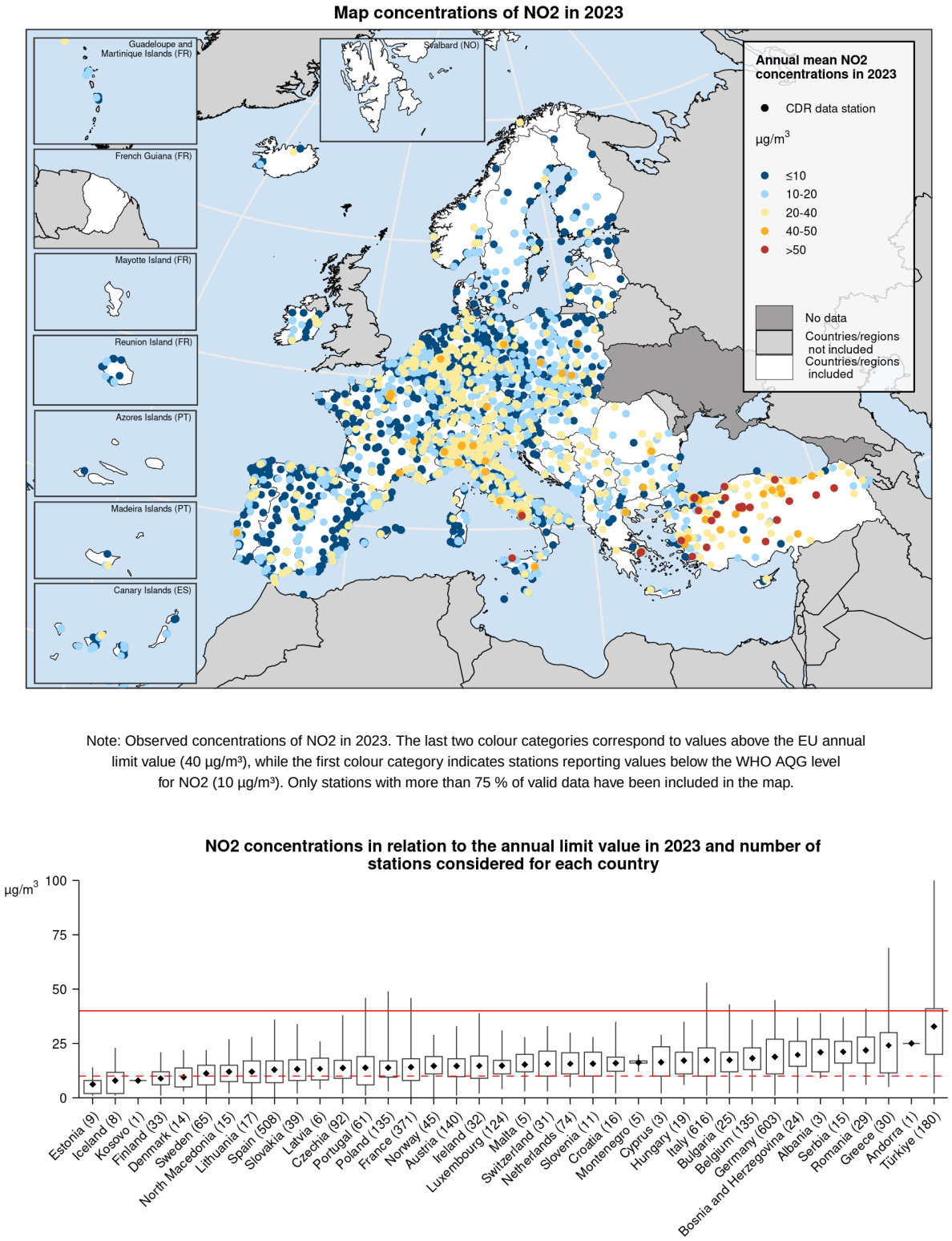
8 of the countries in EU-27 and 1 other reporting countries (Figure 28) recorded concentrations above the annual limit value (40 µg/m^3). This happened in 2 % of all the stations measuring NO_2. On the contrary, 70 % of stations, located in 27 of the countries in EU-27 and 10 other reporting countries reported concentrations above the WHO AQG level of 10 µg/m^3. Figure 28 shows the measured annual mean NO_2 concentrations.

66 % of all values above the annual limit value were observed at traffic stations. Furthermore, 100 % of the stations with concentrations above the annual limit value were located in urban or suburban areas.

Concentrations above the hourly limit value (200 µg/m^3) were observed in 0.88 % (28 stations) of all reporting stations, mostly at urban traffic stations. They were observed in one countries. (Türkiye (twenty-eight)).

Finally, concentrations above the daily NO_2 WHO AQG level (25 µg/m^3) were registered in 74 % (2349 stations) of all the reporting stations in 27 of the countries in EU-27 and 10 other reporting countries (Figure 31).

Figure 28: Map and boxplot of NO_2 concentrations in 2023



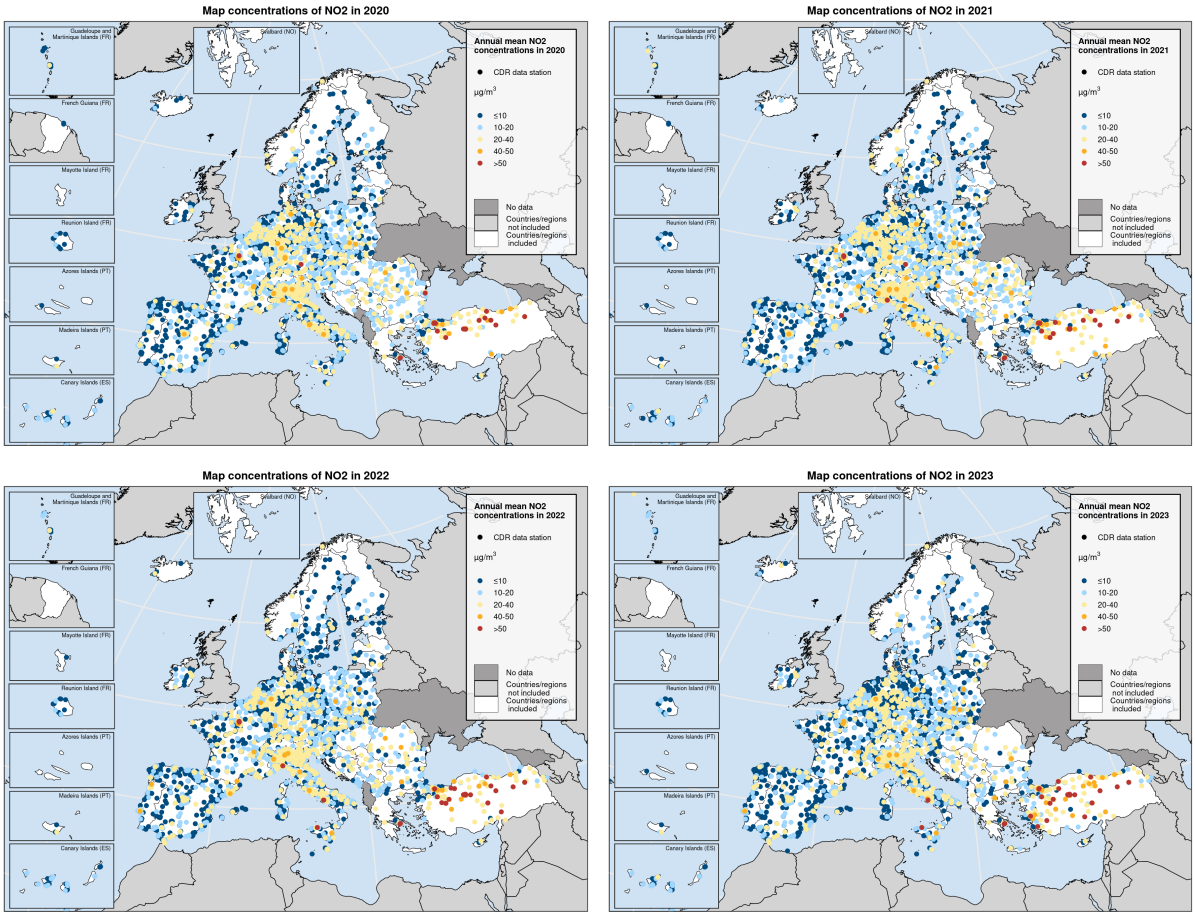
Note: Observed concentrations of NO2 in 2023. The last two colour categories correspond to values above the EU annual limit value (40 µg/m³), while the first colour category indicates stations reporting values below the WHO AQG level for NO2 (10 µg/m³). Only stations with more than 75 % of valid data have been included in the map.

Note: The graph is based on the annual mean concentration values. For each country, the number of stations considered for 2023 (in brackets) are given. The boxplot represents the lowest (bottom of the whisker), highest (top of the whisker) and average (black dot) annual mean values (in µg/m³). The rectangles mark the 25th and 75th percentiles. At 25 % of the stations, levels are below the 25th percentile; at 25 % of the stations, concentrations are above the 75th percentile. The limit value set by EU legislation is marked by the horizontal line. The WHO AQG level is marked by the lower dashed horizontal line. The graph should be read in relation to the above map, as a country's situation depends on the number of stations considered.

The highest value in the boxplot, Türkiye (107 µg/m^3), has not been included in the graph for representation purposes.

Figure 29 shows the maps of the observed NO_2 annual mean concentrations for the last four years. In this way, any significant change in the spatial distribution of the values above the set thresholds in the legends can be observed. These maps are based on officially reported validated data (CDR).

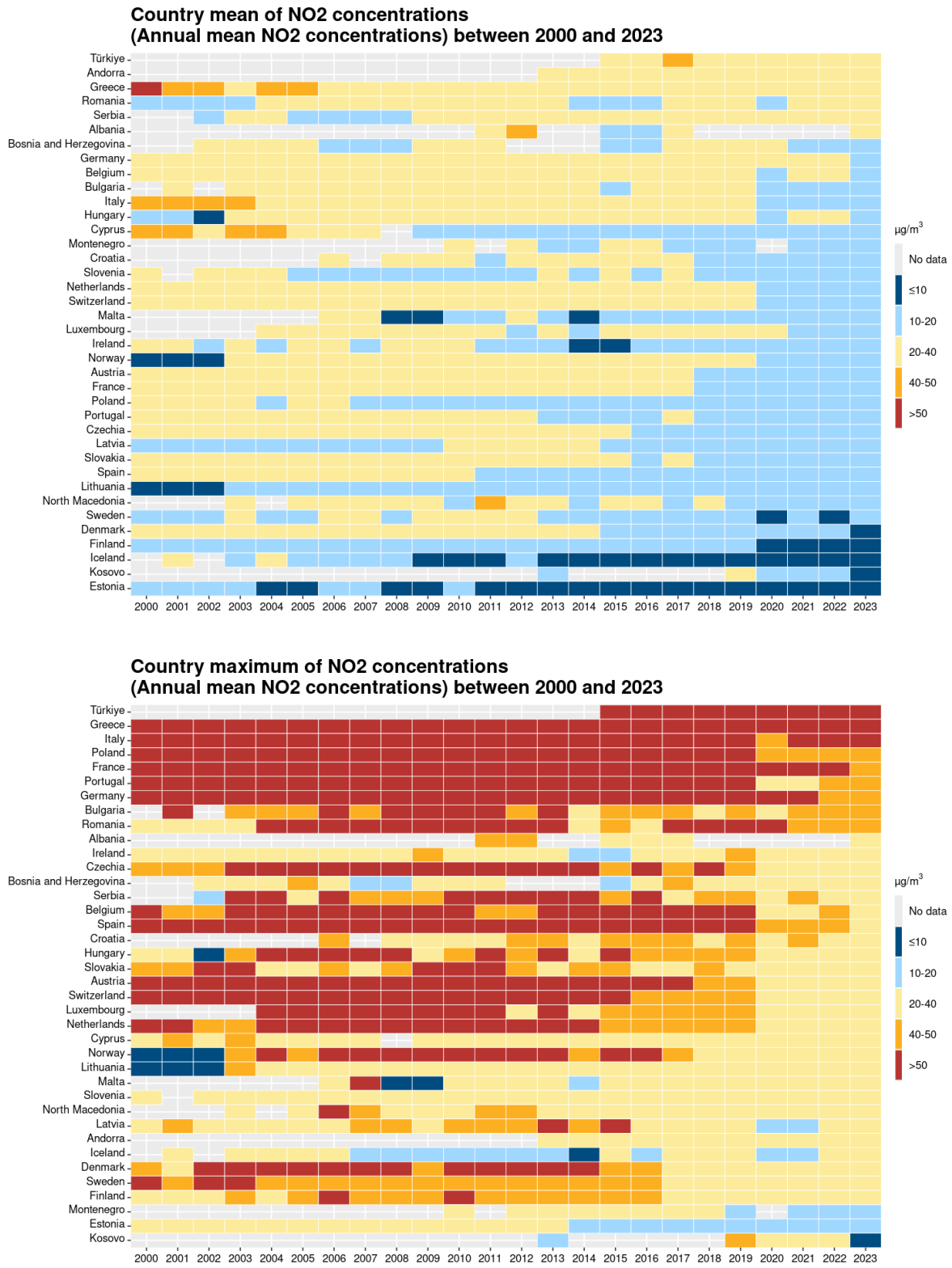
Figure 29: Map of NO_2 concentrations (annual mean) for the last 4 years



Maps for years before 2023 are different to the ones published in previous reports because the bands in the legend have been modified to accommodate the 2030 EU annual limit value (EU, 2024).

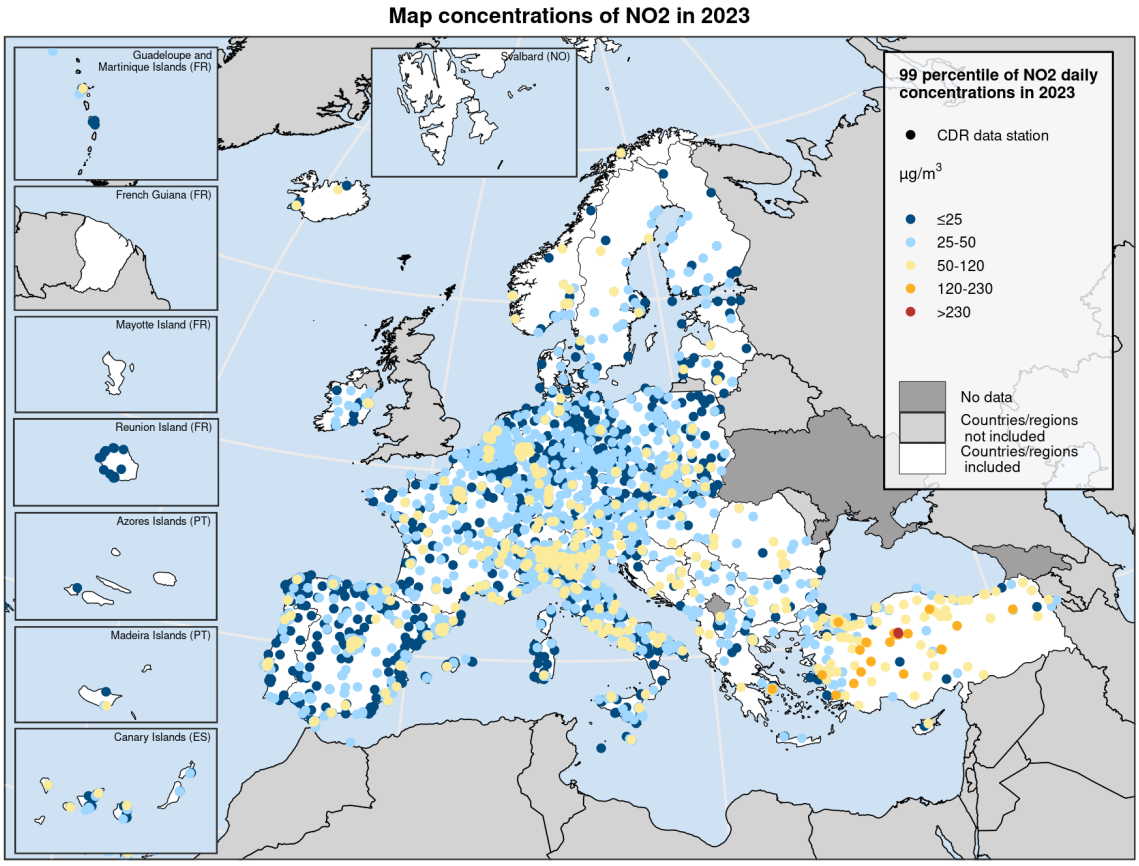
Heatmaps with the evolution from 2000 of the mean (top) and the maximum (bottom) NO_2 annual mean concentrations at country level are shown in figure 30. In this way, the evolution along years of the average and maximum measured concentration levels can be seen for each country. Note that meteorological variability has a considerable impact on year-to-year changes in ambient air concentrations of air pollutants (EEA, 2020).

Figure 30: Evolution of mean (top) and maximum (bottom) NO_2 annual mean concentrations (annual limit value) per country from 2000



Note: It is important to note that the figure is not based on a consistent set of stations. The number, location and classification of the stations included may vary from year to year.

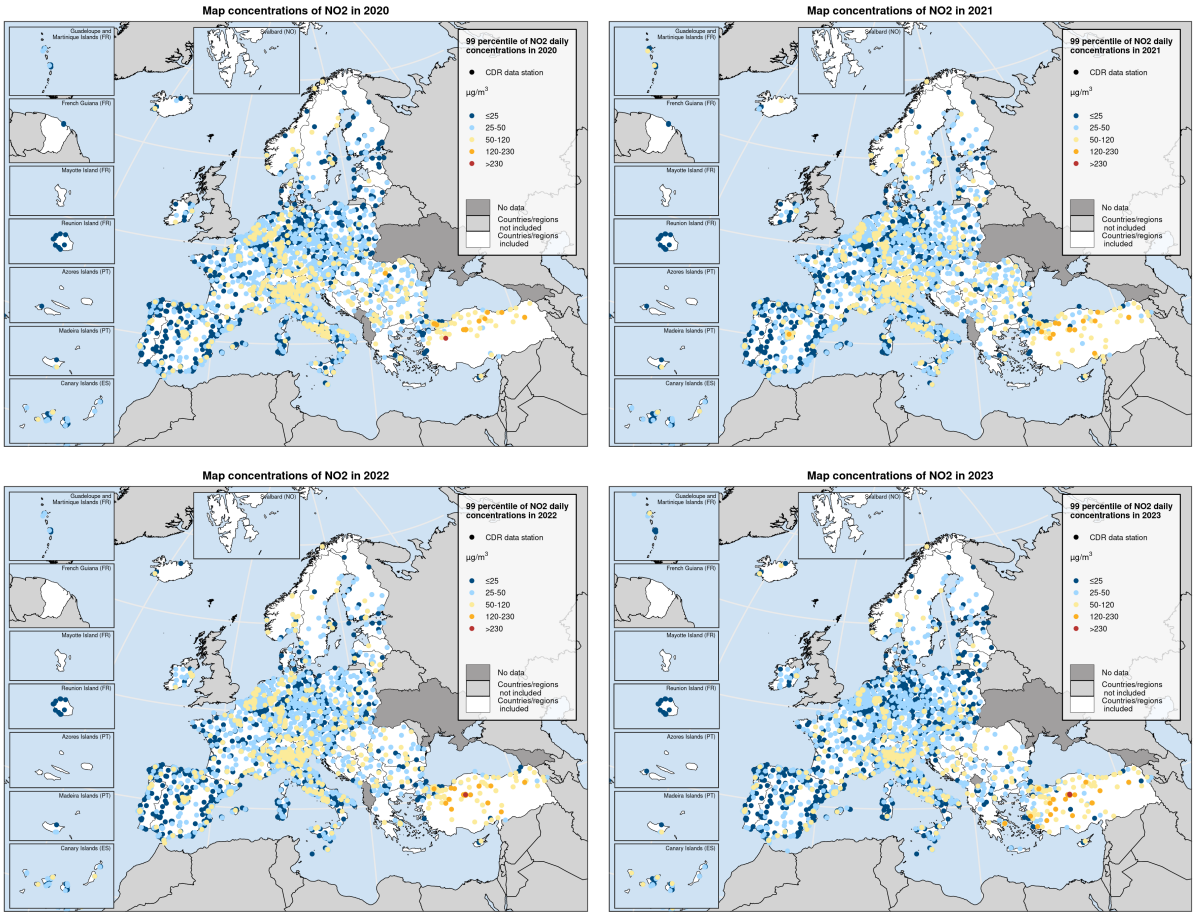
Figure 31: Map of NO_2 concentrations in 2023 - daily WHO AQG level



Note: Observed concentrations of NO2 in 2023. The map shows the 99 percentile of the NO2 daily mean concentrations, equivalent to 3−4 exceedance days per year, according to the definition of the daily WHO AQG level (25 µg/m³). The first colour category indicates stations with concentrations below this AQG level. Only stations with more than 75 % of valid data have been included in the map.

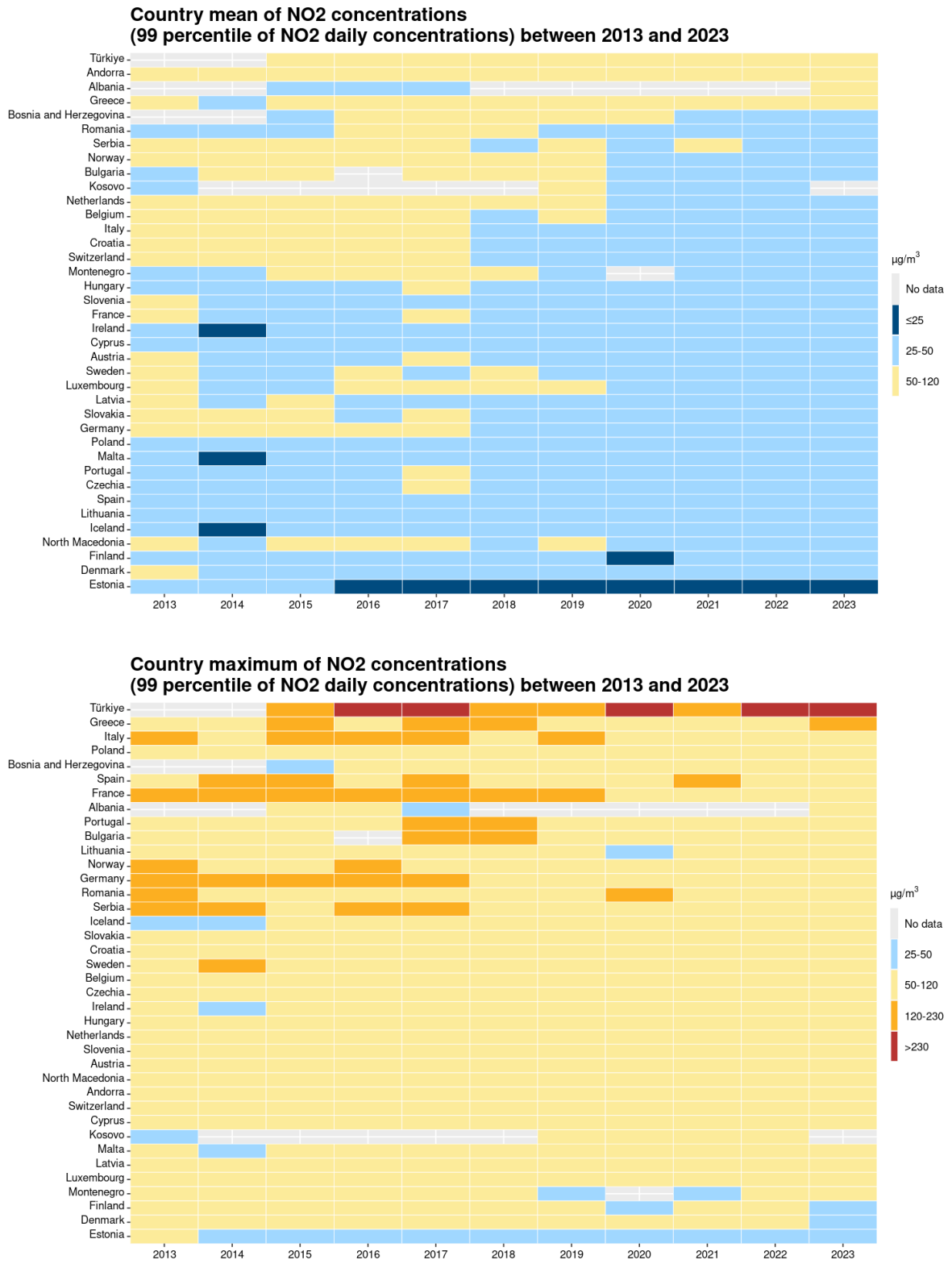
Figure 32 shows the maps of the 99 percentile of NO_2 daily mean concentrations (equivalent to the WHO AQG level for NO_2 daily mean level) for the last four years. In this way, any significant change in the spatial distribution of the values above the set thresholds in the legends can be observed. These maps are based on officially reported validated data (CDR).

Figure 32: Maps of NO_2 concentrations (daily WHO AQG level) for the last 4 years



Heatmaps with the evolution from 2013 of the mean (top) and the maximum (bottom) 99 percentile of NO_2 daily mean concentrations at country level are shown in figure 33. In this way, the evolution along years of the average and maximum measured concentration levels can be seen for each country. Note that meteorological variability has a considerable impact on year-to-year changes in ambient air concentrations of air pollutants (EEA, 2020).

Figure 33: Evolution of mean (top) and maximum (bottom) 99 percentile of NO_2 daily mean concentrations (daily WHO AQG level) per country from 2013



Note: It is important to note that the figure is not based on a consistent set of stations. The number, location and classification of the stations included may vary from year to year.

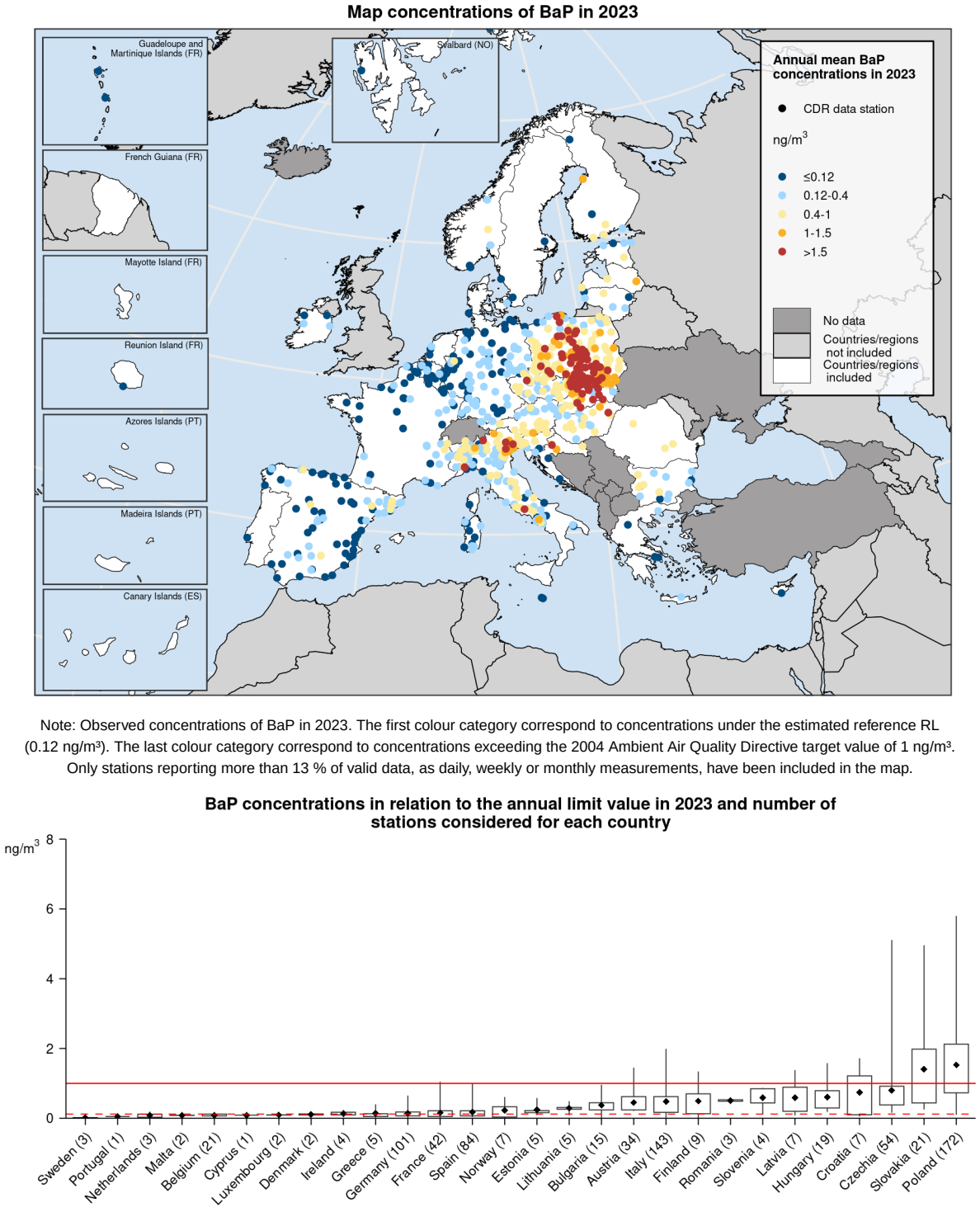
6 Status of benzo[a]pyrene ambient air concentrations

A total of 776 stations in the reporting countries shown in Figure 1 reported BaP data with sufficient data coverage.

9 countries measured concentrations above 1.0 ng/m^3 (Figure 34). These were measured at 18 % of the reported BaP measurement stations (Figure 34), mainly at urban (81 % of all stations with values above 1.0 ng/m^3) and suburban (16 %) stations.

Regarding the reference level, all reporting countries, except for Cyprus, Luxembourg, Malta, Portugal and Sweden have at least one station with concentrations above 0.12 ng/m^3. Only 26 % of the reported stations had annual concentrations below the reference level.

Figure 34: Map and boxplot of BaP concentrations in 2023



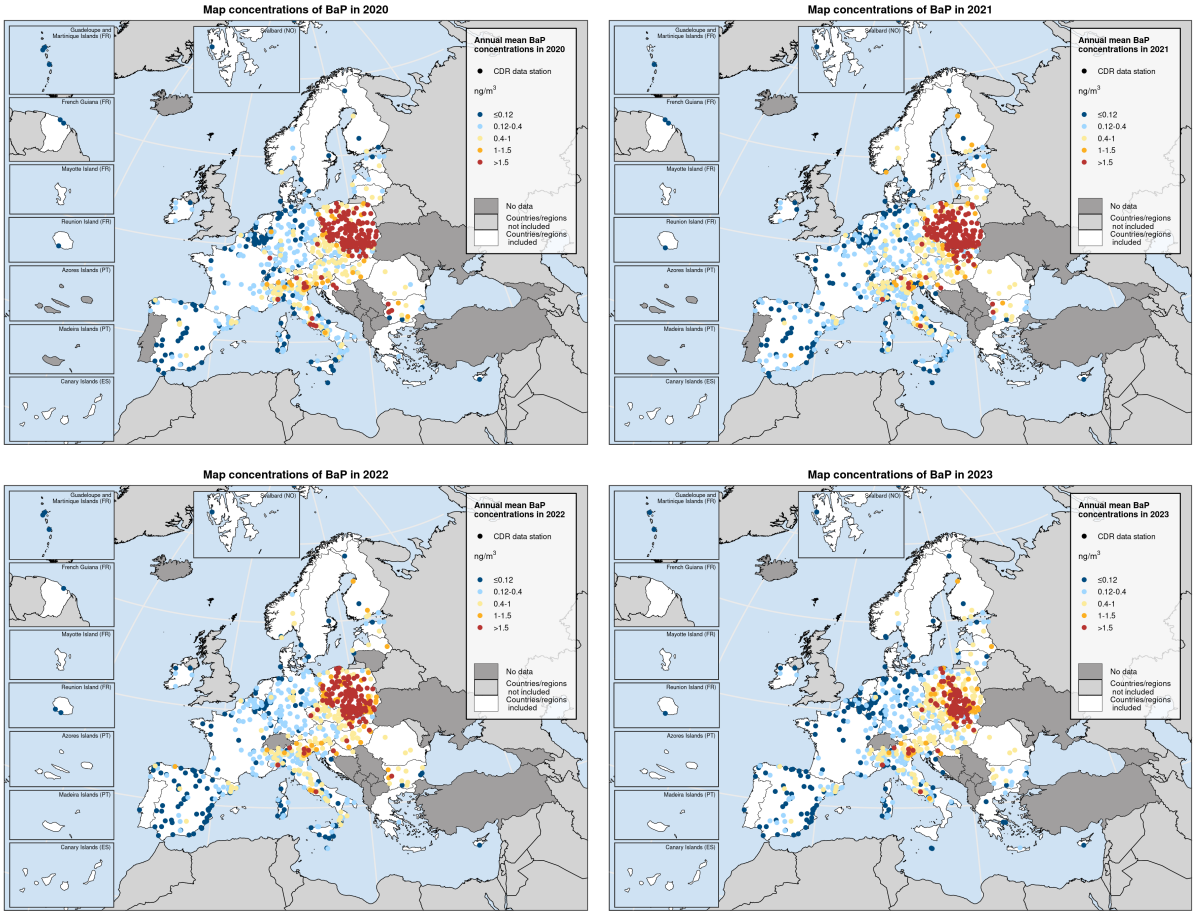
Note: Observed concentrations of BaP in 2023. The first colour category correspond to concentrations under the estimated reference RL (0.12 ng/m³). The last colour category correspond to concentrations exceeding the 2004 Ambient Air Quality Directive target value of 1 ng/m³. Only stations reporting more than 13 % of valid data, as daily, weekly or monthly measurements, have been included in the map.

Note: The graph is based on the annual mean concentration values. For each country, the number of stations considered for 2023 (in brackets) are given. The boxplot represents the lowest (bottom of the whisker), highest (top of the whisker) and average (black dot) annual mean values (in ng/m³). The rectangles mark the 25th and 75th percentiles.At 25 % of the stations, levels are below the 25th percentile; at 25 % of the stations, concentrations are above the 75th percentile. The upper horizontal line marks the concentration of 1.0 ng/m³. The lower horizontal line marks the estimated air quality RL. The graph should be read in relation to the above map, as a country's situation depends on the number of stations considered.

Figure 35 shows the maps of the observed BaP annual mean concentrations for the last four years. In this way, any significant change in the spatial distribution of the values above the

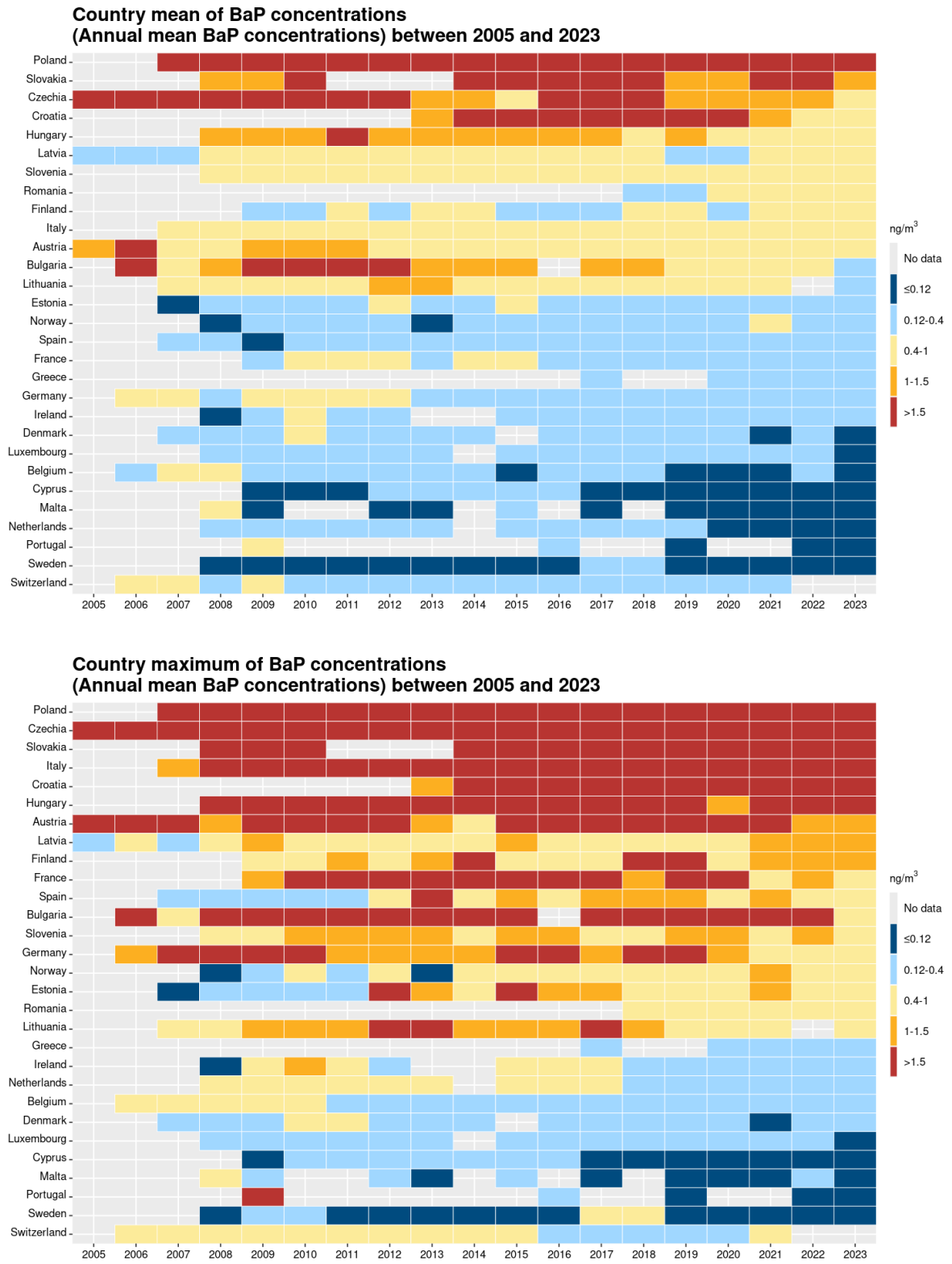
set thresholds in the legends can be observed. These maps are based on officially reported validated data (CDR).

Figure 35: Maps of BaP concentrations (annual mean) for the last 4 years



Heatmaps with the evolution from 2005 of the mean (top) and the maximum (bottom) BaP annual mean concentrations at country level are shown in figure 36. In this way, the evolution along years of the average and maximum measured concentration levels can be seen for each country. Note that meteorological variability has a considerable impact on year-to-year changes in ambient air concentrations of air pollutants (EEA, 2020).

Figure 36: Evolution of mean (top) and maximum (bottom) BaP annual mean concentrations (targe value) per country from 2005



Note: It is important to note that the figure is not based on a consistent set of stations. The number, location and classification of the stations included may vary from year to year.

7 Status of sulphur dioxide, carbon monoxide, benzene and toxic metals ambient air concentrations

7.1 Sulphur dioxide

The reporting countries shown in Figure 1 reported measurements of SO_2 from 1547 stations for the hourly limit value and 1543 stations for the daily limit value.

15 stations ([7]) registered concentrations above the hourly limit value (350 µg/m^3); and 20 stations ([8]) registered concentrations above the daily limit of 125 µg/m^3 for SO_2 (Figure 37).

On the contrary, 81 (5 %) of all the stations reporting SO_2 levels, located in 13 reporting countries ([9]), measured SO_2 concentrations above the WHO AQG level of 40 µg/m^3 for daily mean concentrations ([10]).

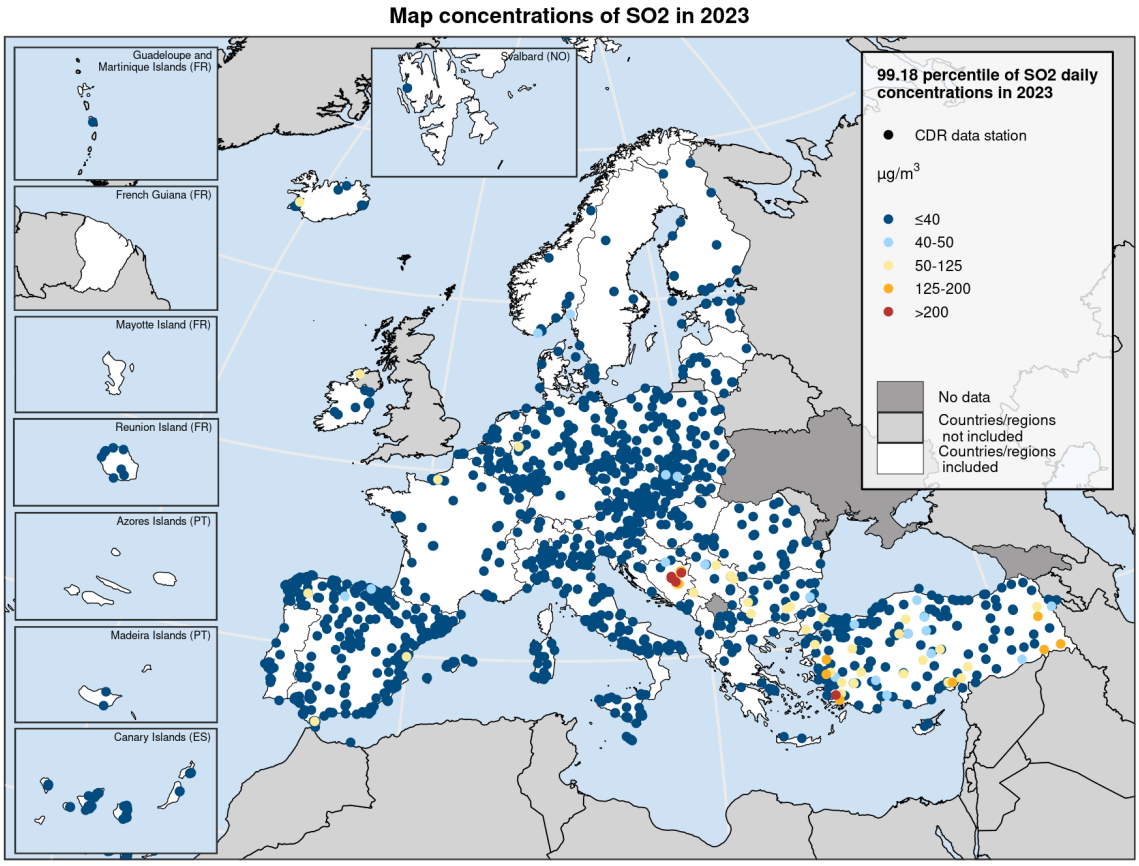
[7] Bosnia and Herzegovina (nine) and Türkiye (six)

[8] Bosnia and Herzegovina (twelve) and Türkiye (eight).

[9] All reporting countries except Albania, Andorra, Austria, Belgium, Croatia, Cyprus, Denmark, Estonia, Finland, Greece, Hungary, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, North Macedonia, Portugal, Romania, Slovakia, Slovenia, Sweden and Switzerland.

[10] Although the WHO AQG level for daily means refers to the percentile 99 (3-4 exceedance days), here we have used the percentile 99.18 (3 exceedance days), so the daily WHO AQG level can be directly compared with the EU daily LV.

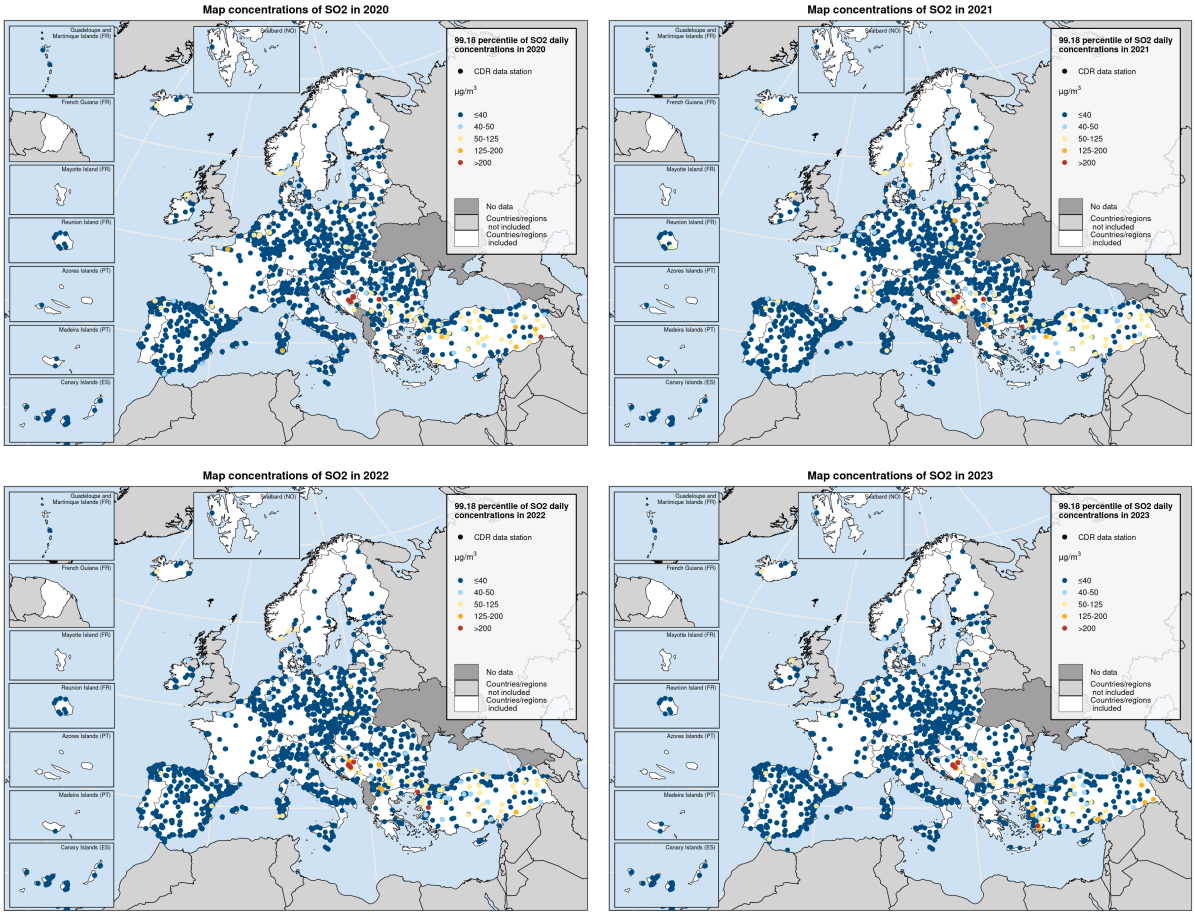
Figure 37: Map of SO_2 daily concentrations in 2023



Note: Observed concentrations of SO2 in 2023. The map shows the percentile 99.18 of SO2 daily means, indicating 3 exceedance days. It relates to the EU daily limit value (125 µg/m³) and to the WHO daily AQG level (40 µg/m³). Only stations with more than 75 % of valid data have been included in the map.

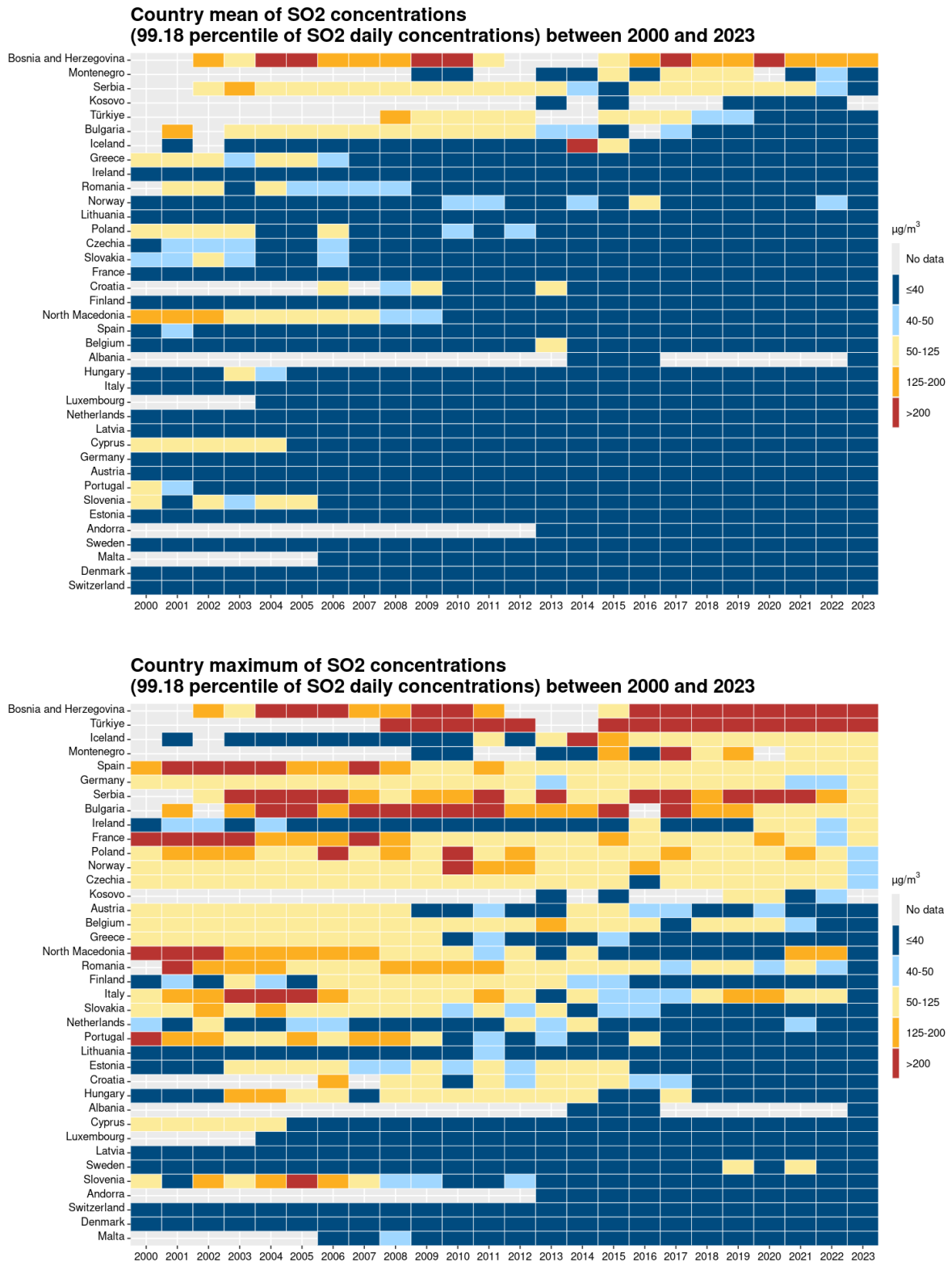
Figure 38 shows the maps of the observed SO_2 daily mean concentrations for the last four years. In this way, any significant change in the spatial distribution of the values above the set thresholds in the legends can be observed. These maps are based on officially reported validated data (CDR).

Figure 38: Maps of SO_2 concentrations (daily mean) for the last 4 years



Heatmaps with the evolution from 2000 of the mean (top) and the maximum (bottom) SO_2 daily mean concentrations at country level are shown in figure 39. In this way, the evolution along years of the average and maximum measured concentration levels can be seen for each country. Note that meteorological variability has a considerable impact on year-to-year changes in ambient air concentrations of air pollutants (EEA, 2020).

Figure 39: Evolution of mean (top) and maximum (bottom) SO_2 99.18 percentile of daily mean concentrations (EU LV (125 µg/m^3) and WHO AQG level (40 µg/m^3)) per country from 2000



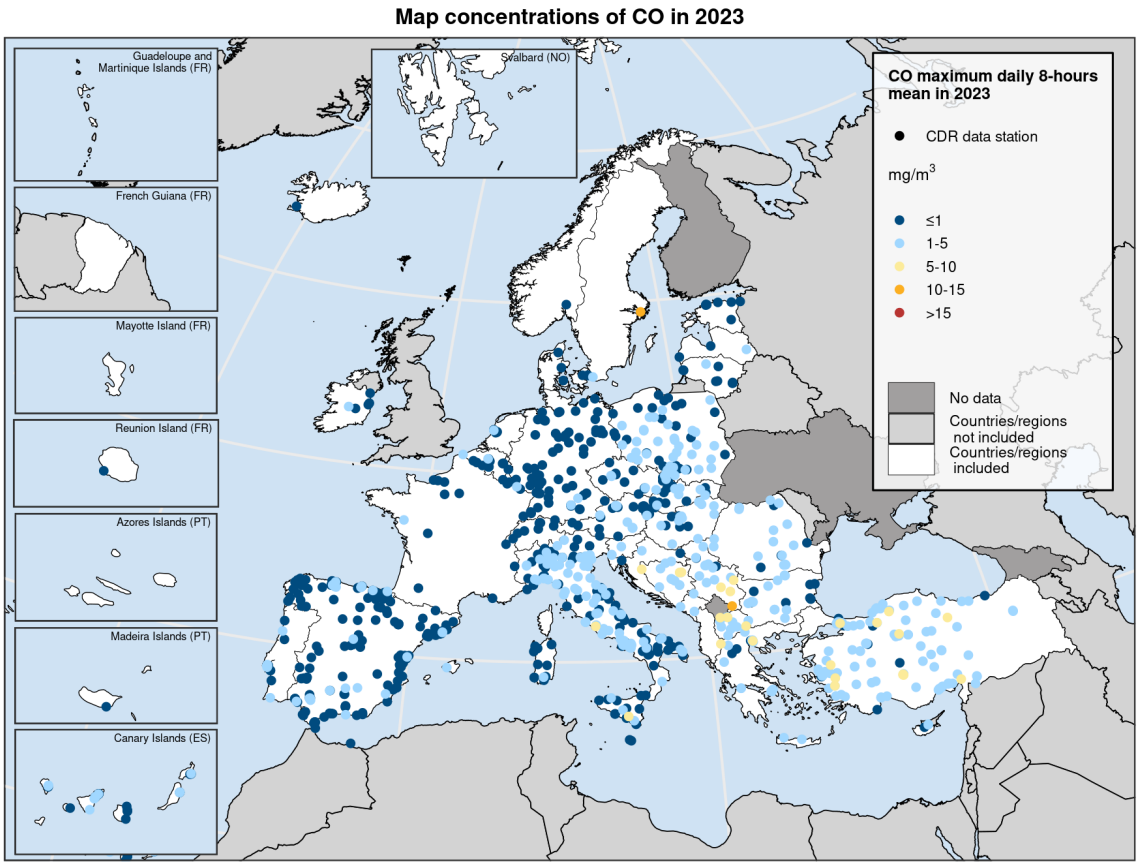
Note: It is important to note that the figure is not based on a consistent set of stations. The number, location and classification of the stations included may vary from year to year.

7.2 Carbon monoxide

All reporting countries shown in Figure 1 measured CO data from 932 operational stations for the daily limit value and from 938 stations for the daily WHO AQG level. Only 2 stations (Figure 40) registered concentrations above the CO limit daily value (10 mg/m^3) and the WHO AQG level for the maximum daily 8-hour mean. These stations were located in Serbia (one) and Sweden (one).

5 stations registered concentrations above the daily WHO AQG level (4 mg/m^3). They were located in Türkiye (three), Bosnia and Herzegovina (one) and Serbia (one) (Figure 42).

Figure 40: Map of CO concentrations in 2023

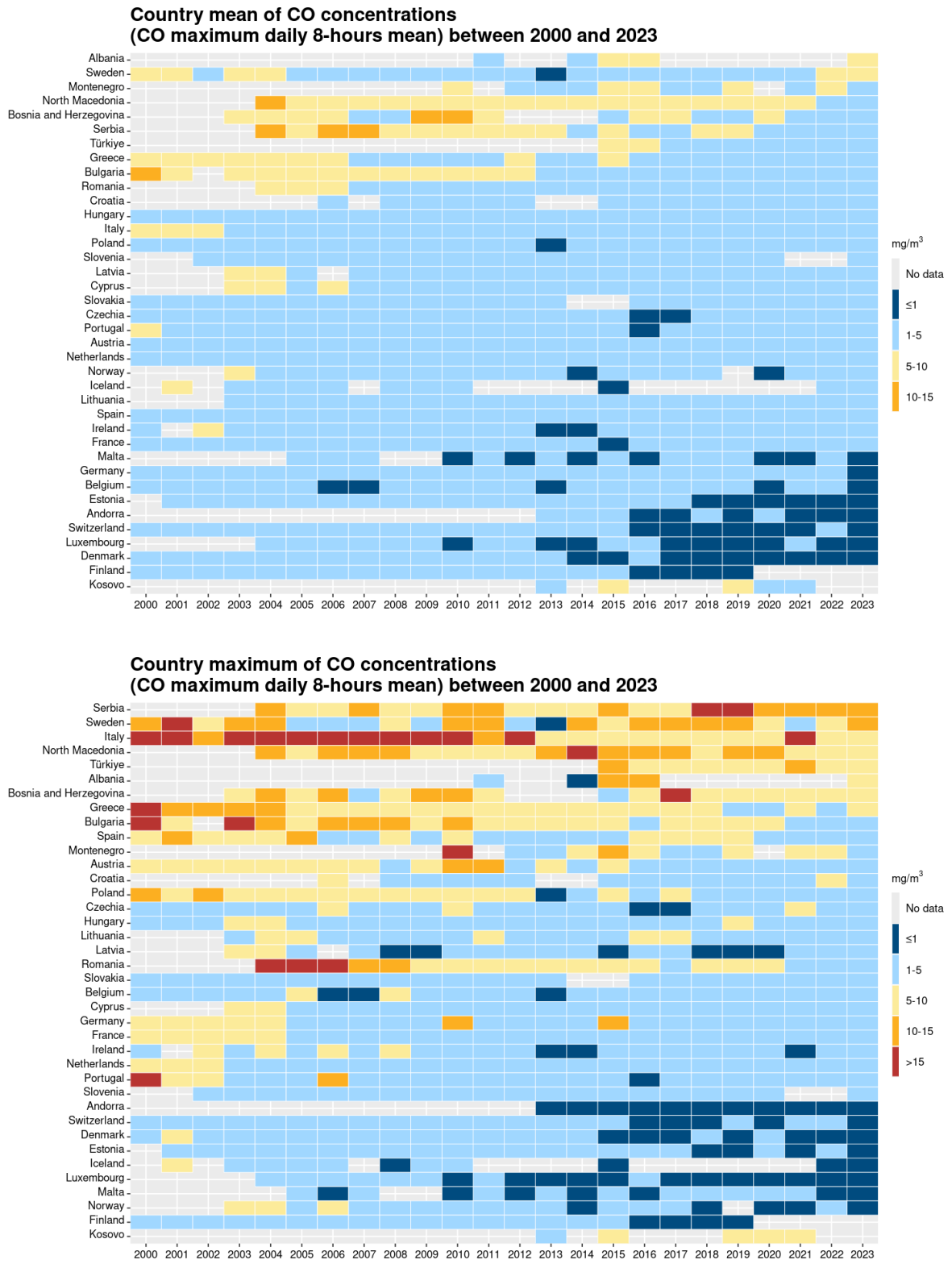


Note: Observed concentrations of CO in 2023. The map shows the CO maximum daily 8−hour mean. The last two colour categories correspond to values above the EU annual limit value and the WHO AQG (10 mg/m³). Only stations with more than 75 % of valid data have been included in the map.

When concentrations are below the 'lower assessment threshold' (LAT), air quality can be assessed by means of only modelling or objective estimates. At 905 stations (97 % of locations), maximum daily 8-hour mean concentrations of CO were below the LAT of 5 mg/m^3 (first two colour categories in Figure 40).

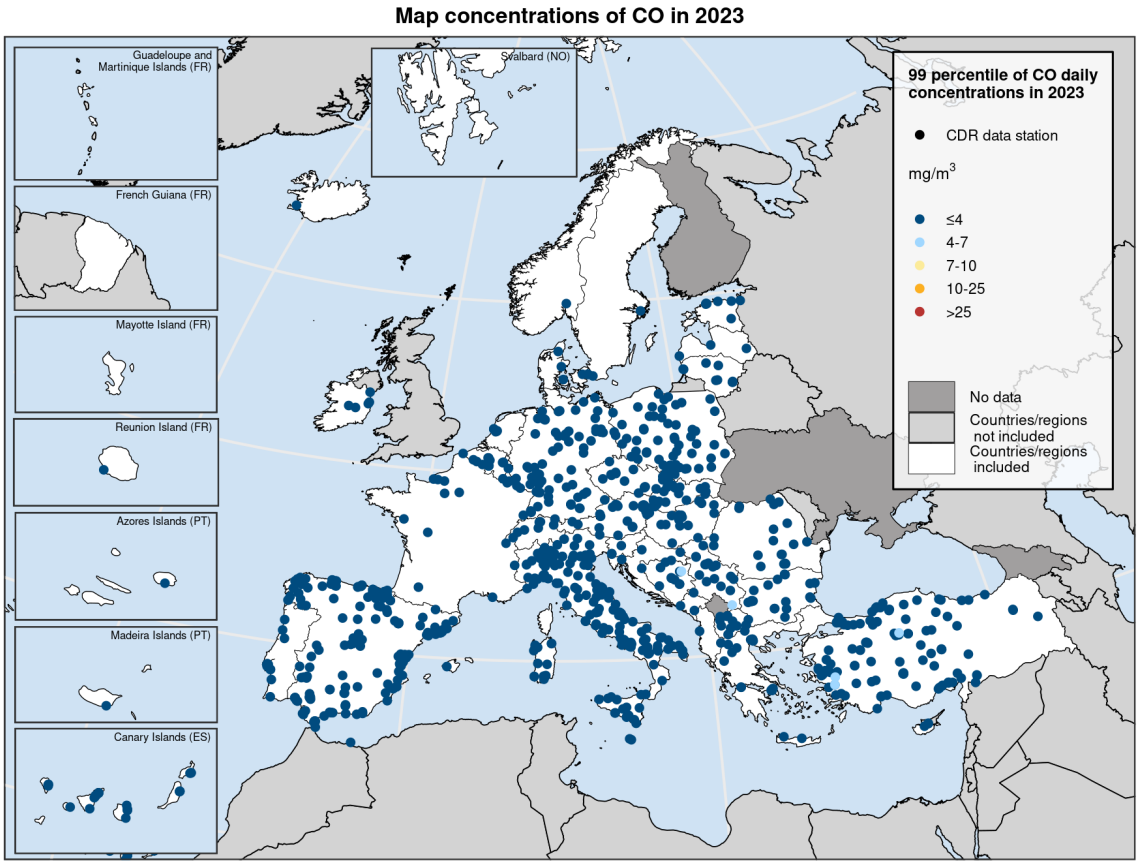
Heatmaps with the evolution from 2000 of the mean (top) and the maximum (bottom) CO maximum daily 8-hour mean concentrations at country level are shown in Figure 41. In this way, the evolution along years of the average and maximum measured concentration levels can be seen for each country. Note that meteorological variability has a considerable impact on year-to-year changes in ambient air concentrations of air pollutants (EEA, 2020).

Figure 41: Evolution of mean (top) and maximum (bottom) CO maximum daily 8-hour mean concentrations (limit value) per country from 2000



Note: It is important to note that the figure is not based on a consistent set of stations. The number, location and classification of the stations included may vary from year to year.

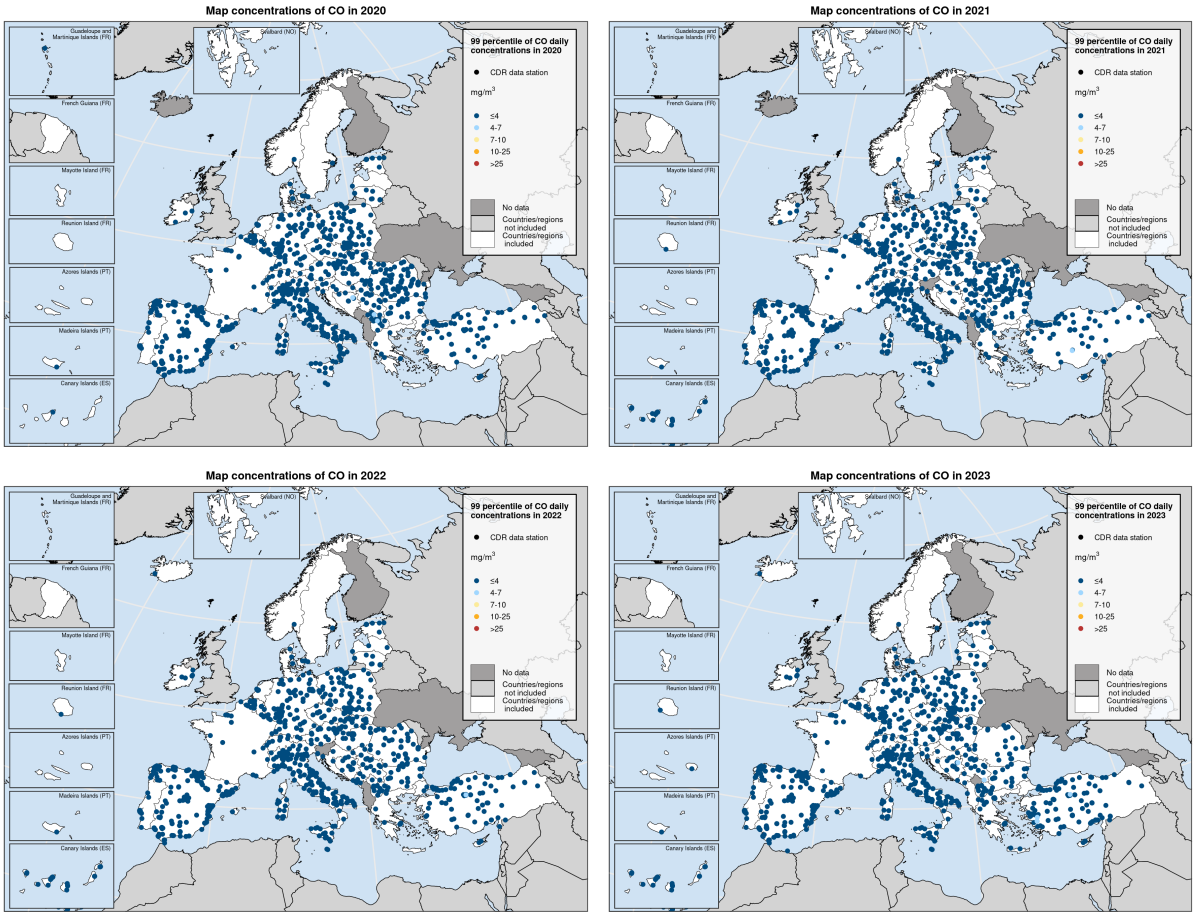
Figure 42: Map of daily CO concentrations in 2023



Note: Observed concentrations of CO in 2023. The map shows the 99 percentile of CO daily concentrations, meaning 3−4 exceedance days. The first colour category corresponds to values below the WHO AQG level (4 mg/m³). Only stations with more than 75 % of valid data have been included in the map.

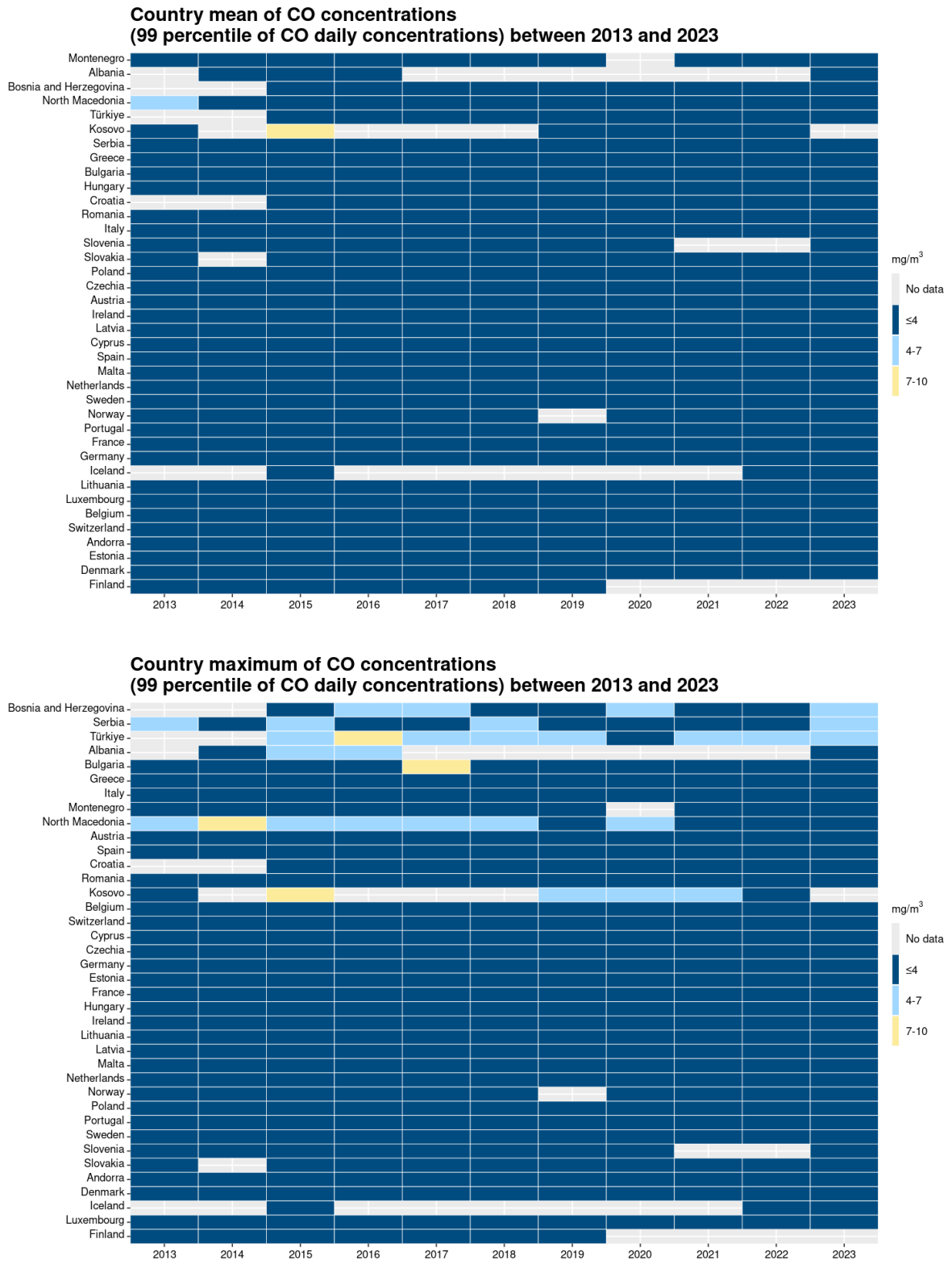
Figure 43 shows the maps of the 99 percentile of CO daily mean concentrations (equivalent to the WHO AQG for CO daily mean level) for the last four years. In this way, any significant change in the spatial distribution of the values above the set thresholds in the legends can be observed. These maps are based on officially reported validated data (CDR).

Figure 43: Maps of CO concentrations (daily WHO AQG level) for the last 4 years



Heatmaps with the evolution from 2013 of the mean (top) and the maximum (bottom) 99 percentile of CO daily mean concentrations at country level are shown in figure 44. In this way, the evolution along years of the average and maximum measured concentration levels can be seen for each country. Note that meteorological variability has a considerable impact on year-to-year changes in ambient air concentrations of air pollutants (EEA, 2020).

Figure 44: Evolution of mean (top) and maximum (bottom) 99 percentile of CO daily mean concentrations (daily WHO AQG level) per country from 2013



Note: It is important to note that the figure is not based on a consistent set of stations. The number, location and classification of the stations included may vary from year to year.

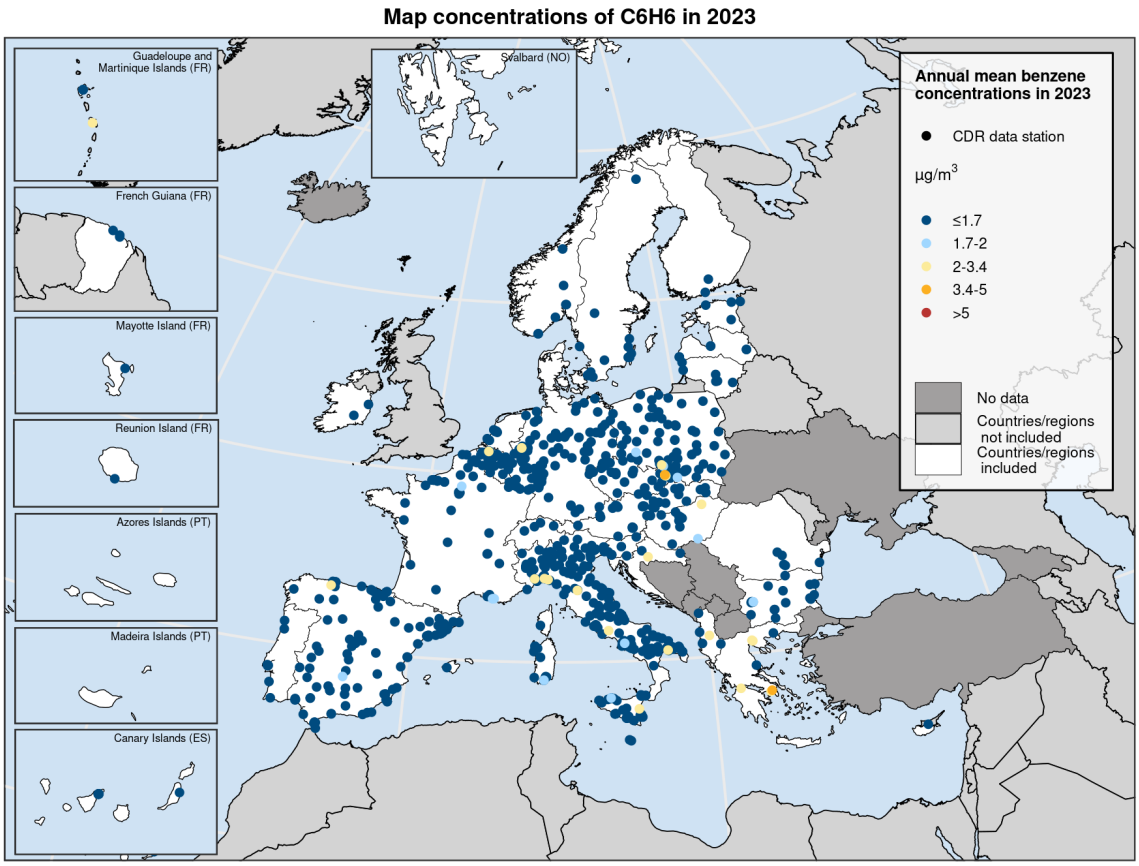
7.3 Benzene

C_6H_6 measurements were reported from a total of 797 stations in the reporting countries shown in Figure 1.

Concentrations above the limit value for C_6H_6 (5 µg/m^3) were not observed at any stations. At 97 % of locations, annual mean concentrations of C_6H_6 were below the LAT of 2 µg/m^3 (first two colour categories in Figure 45).

Regarding the estimated WHO reference level (1.7 µg/m^3), 5 % of all stations reported concentrations above this reference level, distributed across 12 European countries ([11]) (Figure 45).

Figure 45: Map of C_6H_6 concentrations in 2023

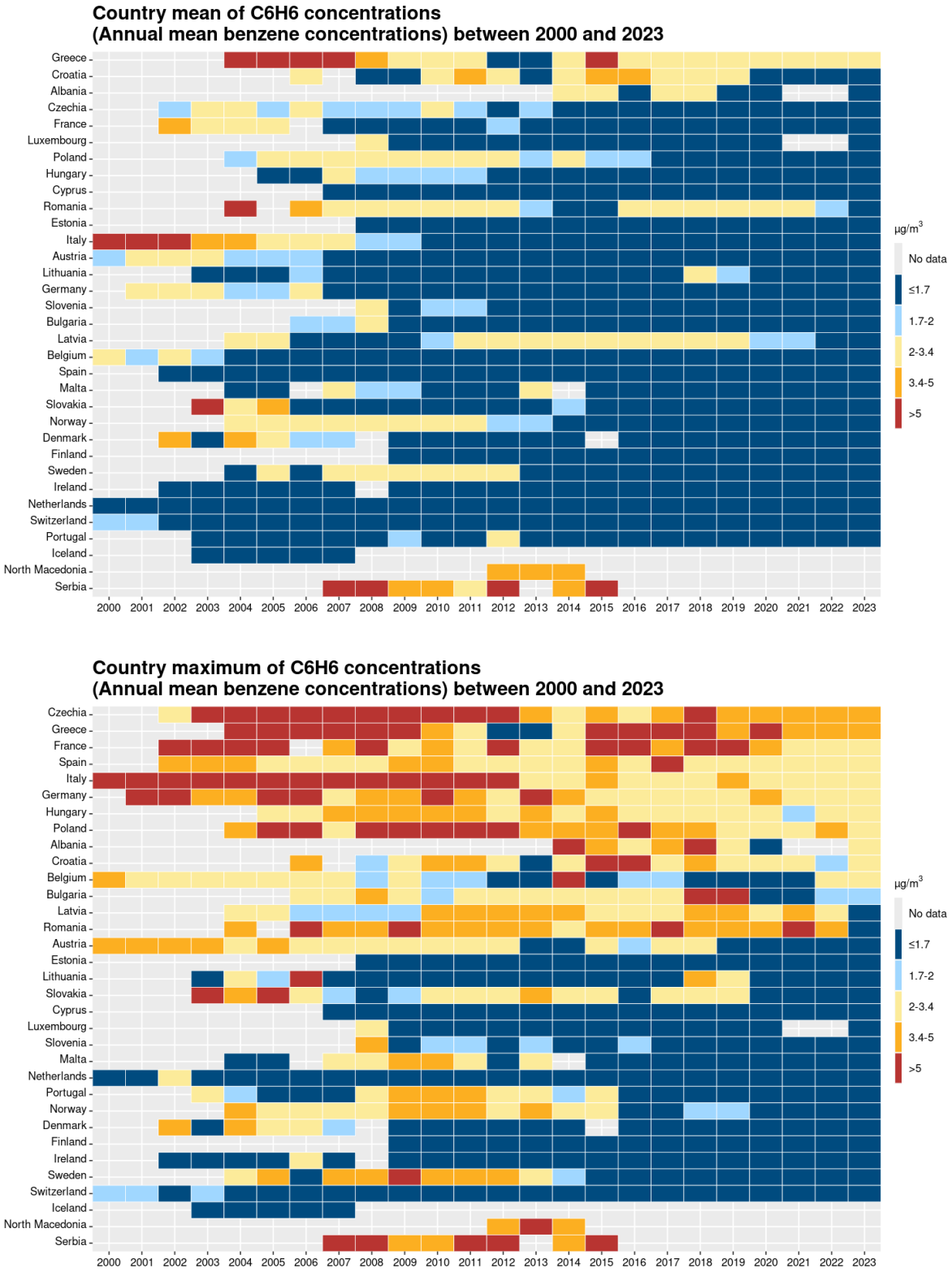


Note: Observed concentrations of C6H6 in 2023. The last colour category correspond to concentrations above the limit value of 5 µg/m³. The first colour category correspond to concentrations under the estimated WHO RL (1.7 µg/m³). Only stations reporting more than 50 % of valid data have been included in the map.

[11] Albania, Belgium, Bulgaria, Croatia, Czechia, France, Germany, Greece, Hungary, Italy, Poland and Spain

Heatmaps with the evolution from 2000 of the mean (top) and the maximum (bottom) C_6H_6 annual mean concentrations at country level are shown in Figure 46. In this way, the evolution along years of the average and maximum measured concentration levels can be seen for each country. Note that meteorological variability has a considerable impact on year-to-year changes in ambient air concentrations of air pollutants (EEA, 2020).

Figure 46: Evolution of mean (top) and maximum (bottom) C_6H_6 annual mean concentrations (limit value) per country from 2000

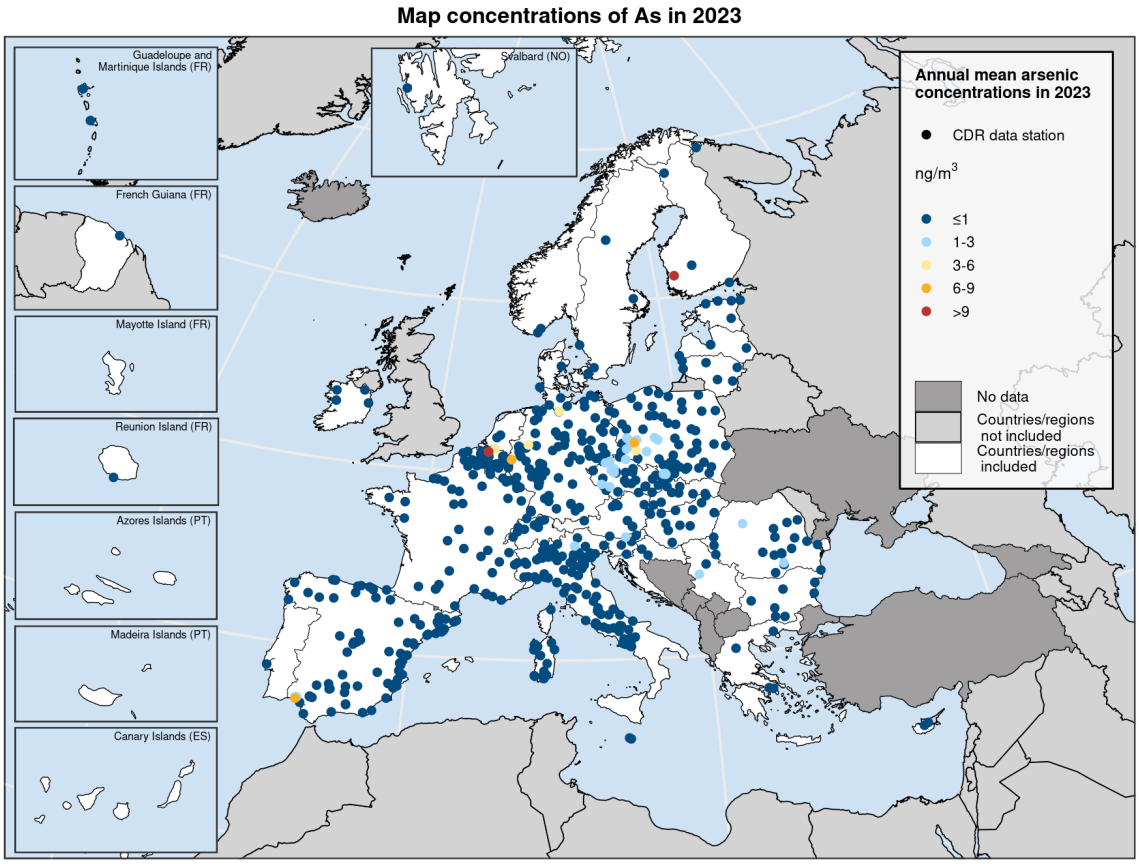


Note: It is important to note that the figure is not based on a consistent set of stations. The number, location and classification of the stations included may vary from year to year.

7.4 Toxic metals

Data for **Arsenic** (As) were reported from 615 stations in the reporting countries shown in Figure 1. 7 stations measured concentrations above the target value (6 ng/m^3), located in: Belgium (two), Finland (two), Germany (one), Poland (one) and Spain (one), and 5 of these were industrial. Concentrations of As below the LAT (2.4 ng/m^3) were reported at 96 % of the stations (Figure 47).

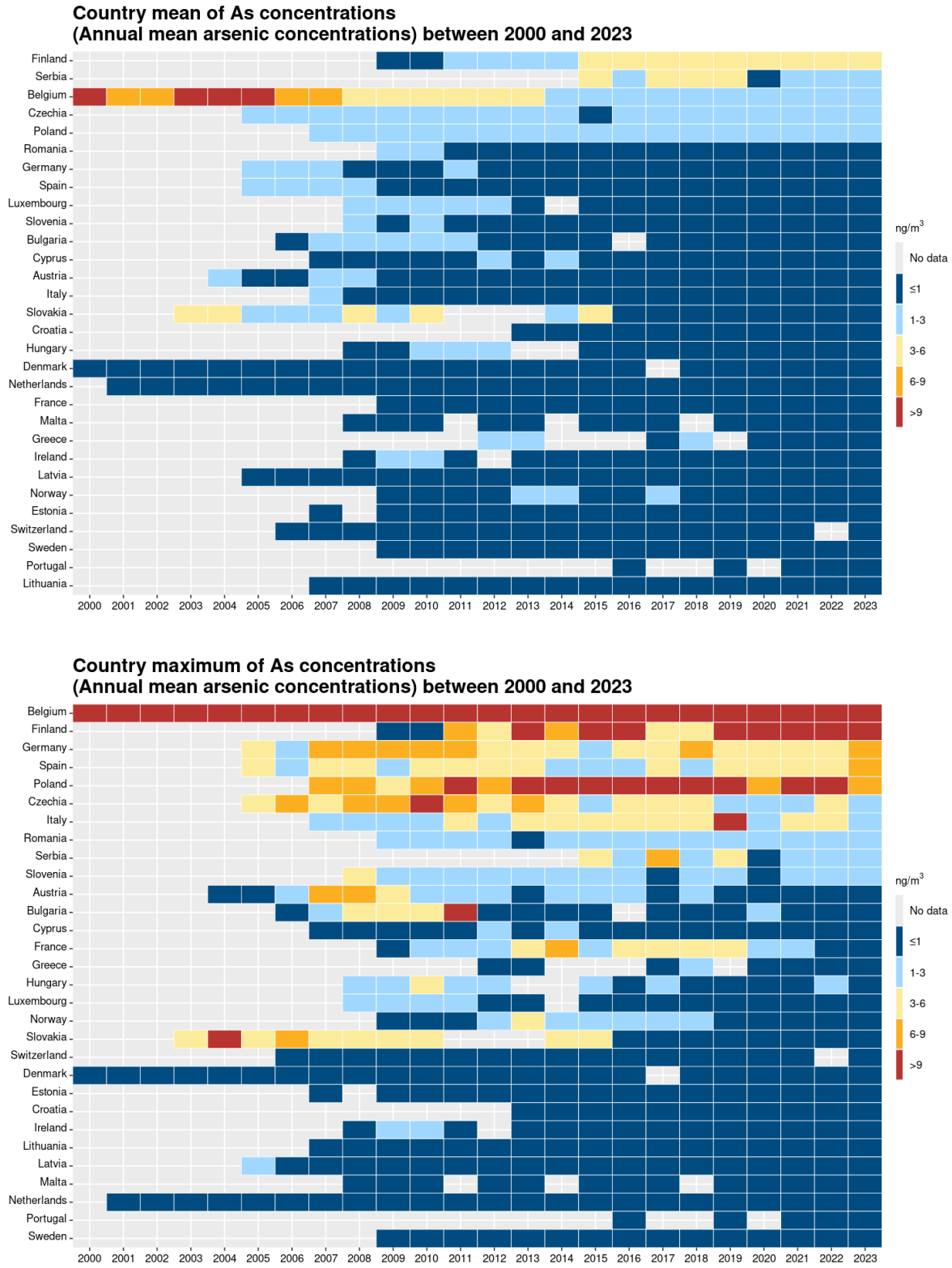
Figure 47: Map of As concentrations in 2023



Note: Observed concentrations of As in 2023. The last two colour categories correspond to concentrations above the EU target value. Only stations reporting more than 13 % of valid data have been included in the map.

Heatmaps with the evolution from 2000 of the mean (top) and the maximum (bottom) As annual mean concentrations at country level are shown in Figure 48. In this way, the evolution along years of the average and maximum measured concentration levels can be seen for each country. Note that meteorological variability has a considerable impact on year-to-year changes in ambient air concentrations of air pollutants (EEA, 2020).

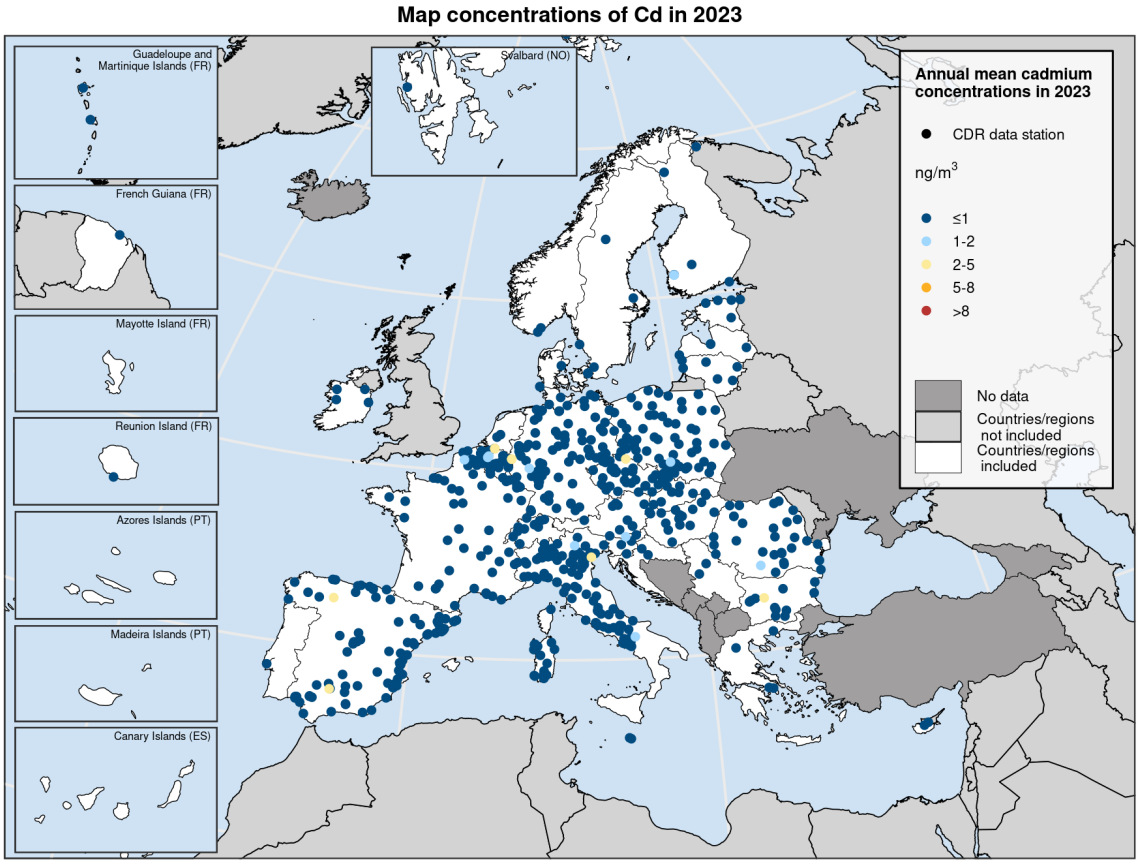
Figure 48: Evolution of mean (top) and maximum (bottom) As annual mean concentrations (target value) per country from 2000



Note: It is important to note that the figure is not based on a consistent set of stations. The number, location and classification of the stations included may vary from year to year.

Cadmium (Cd) data were reported from 635 stations in the reporting countries shown in Figure 1. Concentrations above the target value (5 ng/m^3) were not observed at any stations. At the great majority of stations (98 %), Cd concentrations were below the LAT (2 ng/m^3) (Figure 49).

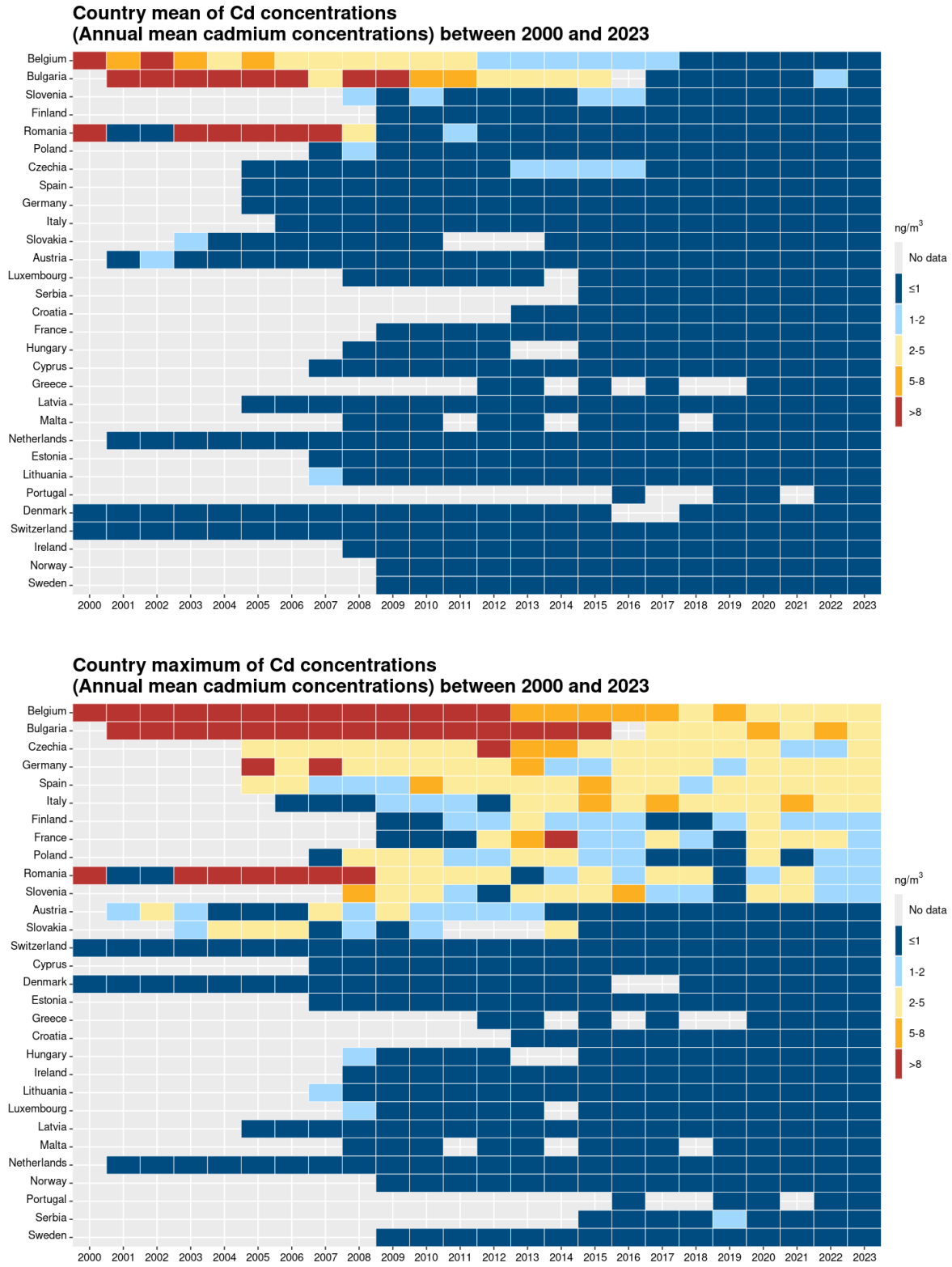
Figure 49: Map of Cd concentrations in 2023



Note: Observed concentrations of Cd in 2023. The last two colour categories correspond to concentrations above the target value. Only stations reporting more than 13 % of valid data have been included in the map.

Heatmaps with the evolution from 2000 of the mean (top) and the maximum (bottom) Cd annual mean concentrations at country level are shown in Figure 50. In this way, the evolution along years of the average and maximum measured concentration levels can be seen for each country. Note that meteorological variability has a considerable impact on year-to-year changes in ambient air concentrations of air pollutants (EEA, 2020).

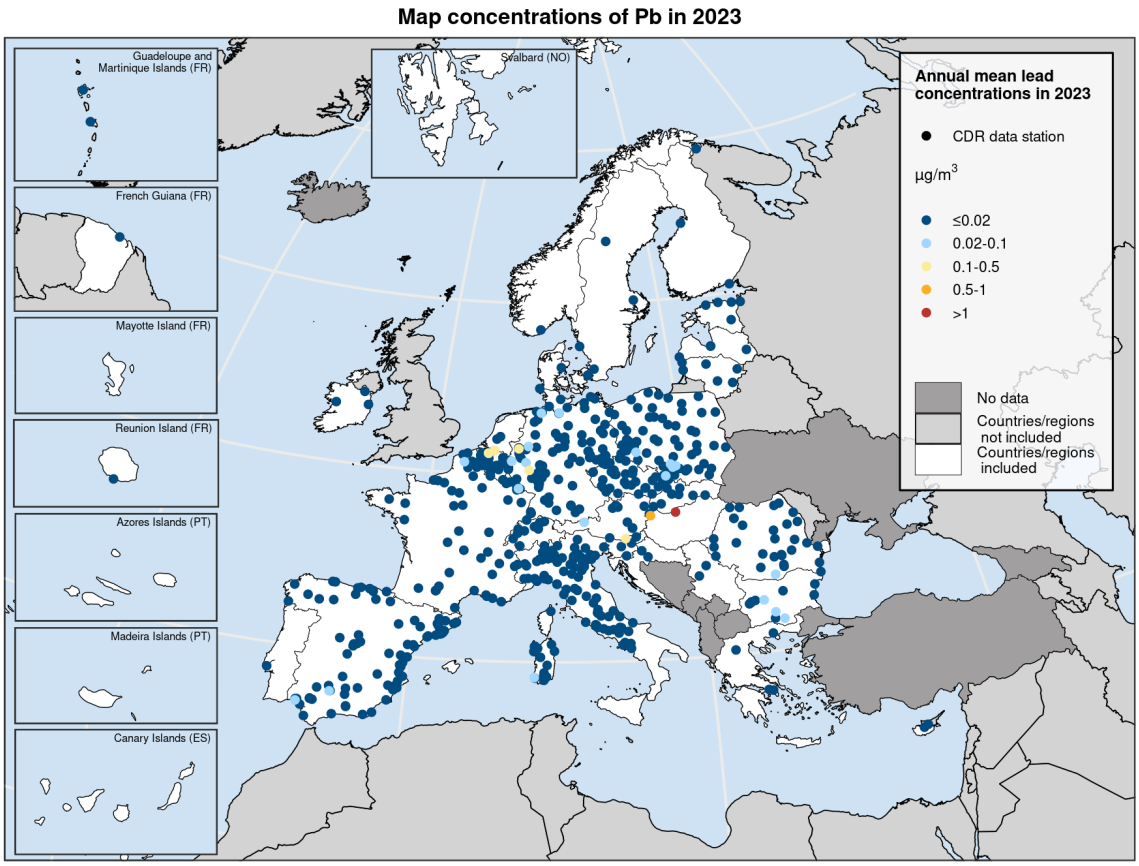
Figure 50: Evolution of mean (top) and maximum (bottom) Cd annual mean concentrations (target value) per country from 2000



Note: It is important to note that the figure is not based on a consistent set of stations. The number, location and classification of the stations included may vary from year to year.

Lead (Pb) data were reported from 607 stations in the reporting countries shown in Figure 1. Concentrations above the 0.5 µg/m^3 limit value were observed at only 2 stations located in: Hungary (two). 604 stations (100 % of the total) reported Pb concentrations below the LAT of 0.25 µg/m^3.

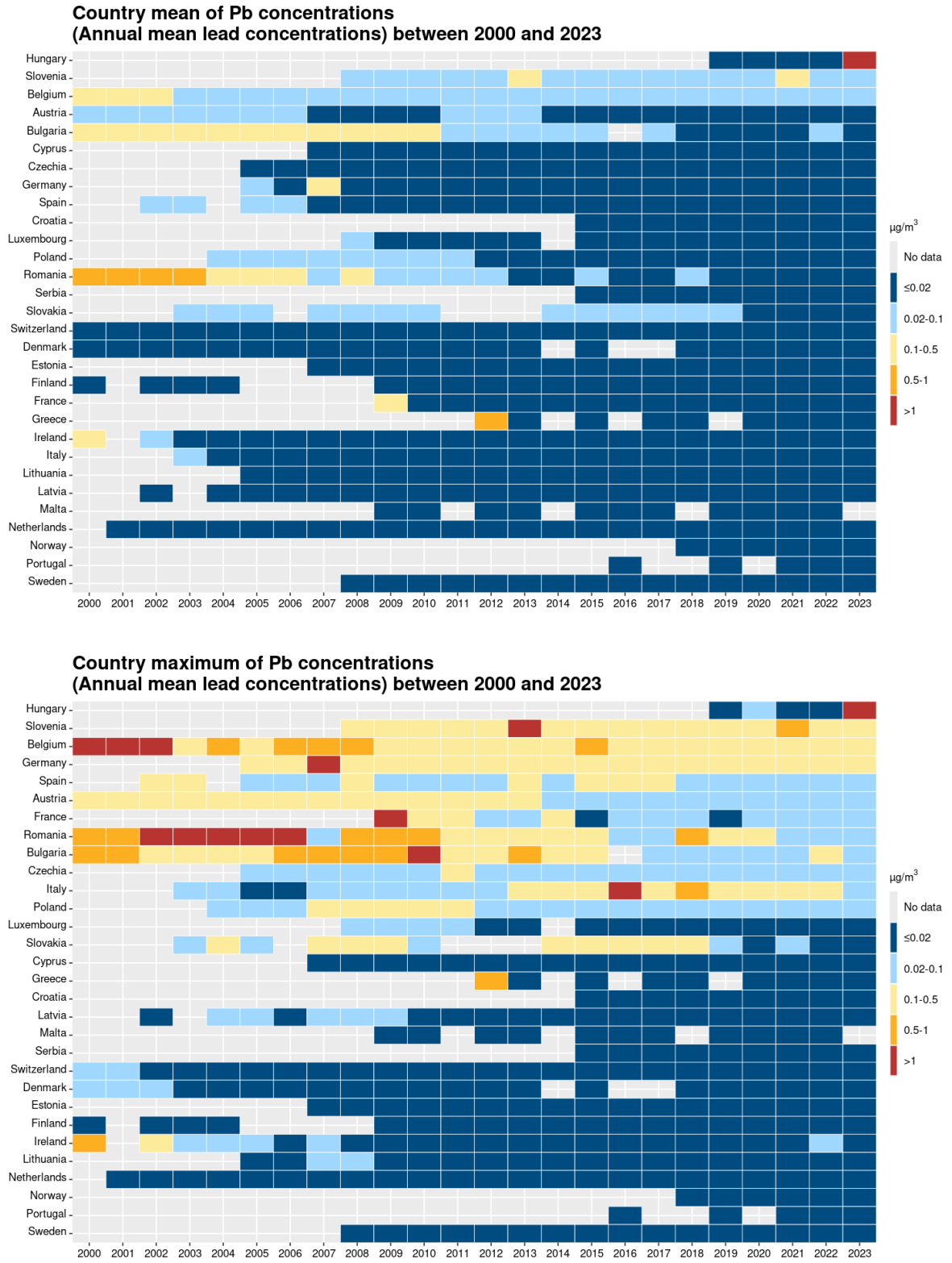
Figure 51: Map of Pb concentrations in 2023



Note: Observed concentrations of Pb in 2023. The last two colour categories correspond to concentrations above the EU annual limit value. Only stations reporting more than 13 % of valid data have been included in the map. Source: EEA, 2023.

Heatmaps with the evolution from 2000 of the mean (top) and the maximum (bottom) Pb annual mean concentrations at country level are shown in Figure 52. In this way, the evolution along years of the average and maximum measured concentration levels can be seen for each country. Note that meteorological variability has a considerable impact on year-to-year changes in ambient air concentrations of air pollutants (EEA, 2020).

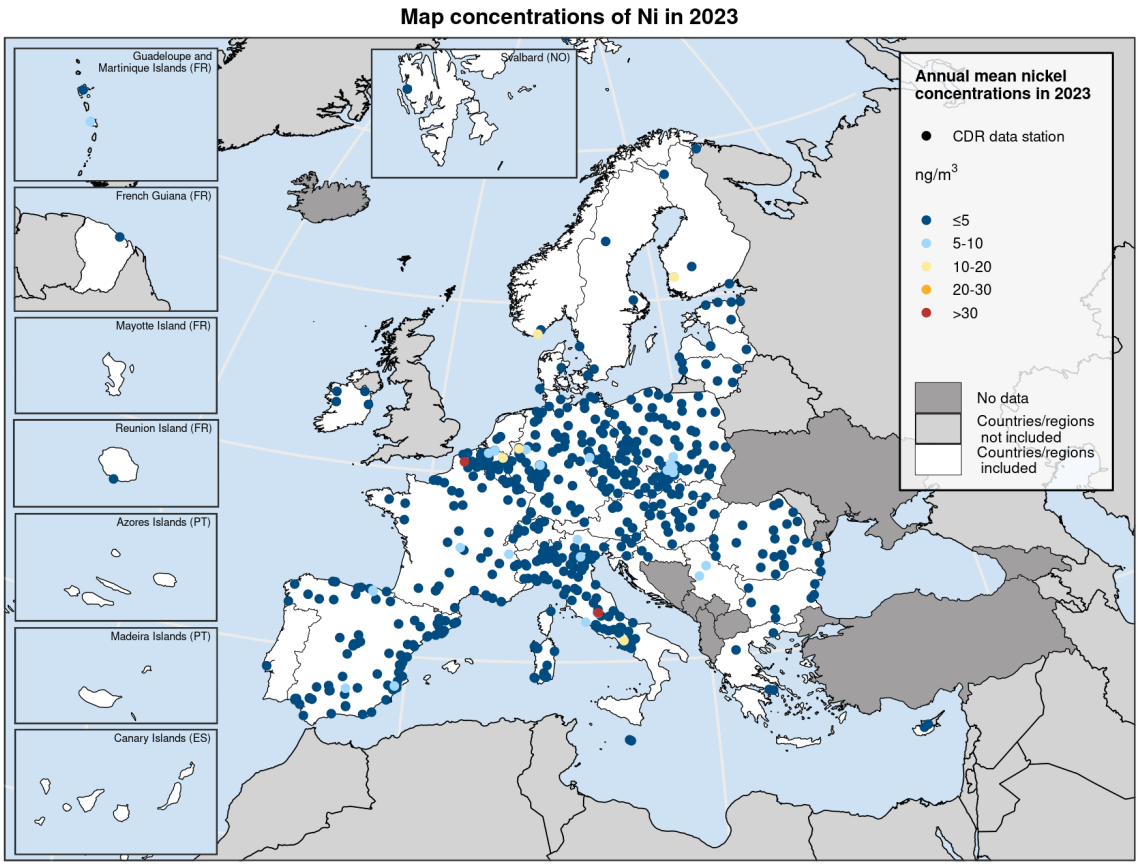
Figure 52: Evolution of mean (top) and maximum (bottom) Pb annual mean concentrations (limit value) per country from 2000



Note: It is important to note that the figure is not based on a consistent set of stations. The number, location and classification of the stations included may vary from year to year.

Nickel (Ni) data were reported from 617 stations in the reporting countries shown in Figure 1. Concentrations were above the target value of 20 ng/m^3 at 2 stations in: France (one) and Italy (one), 2 of which were industrial. About 98 % of the stations reported Ni concentrations below the LAT of 10 ng/m^3 (Figure 53).

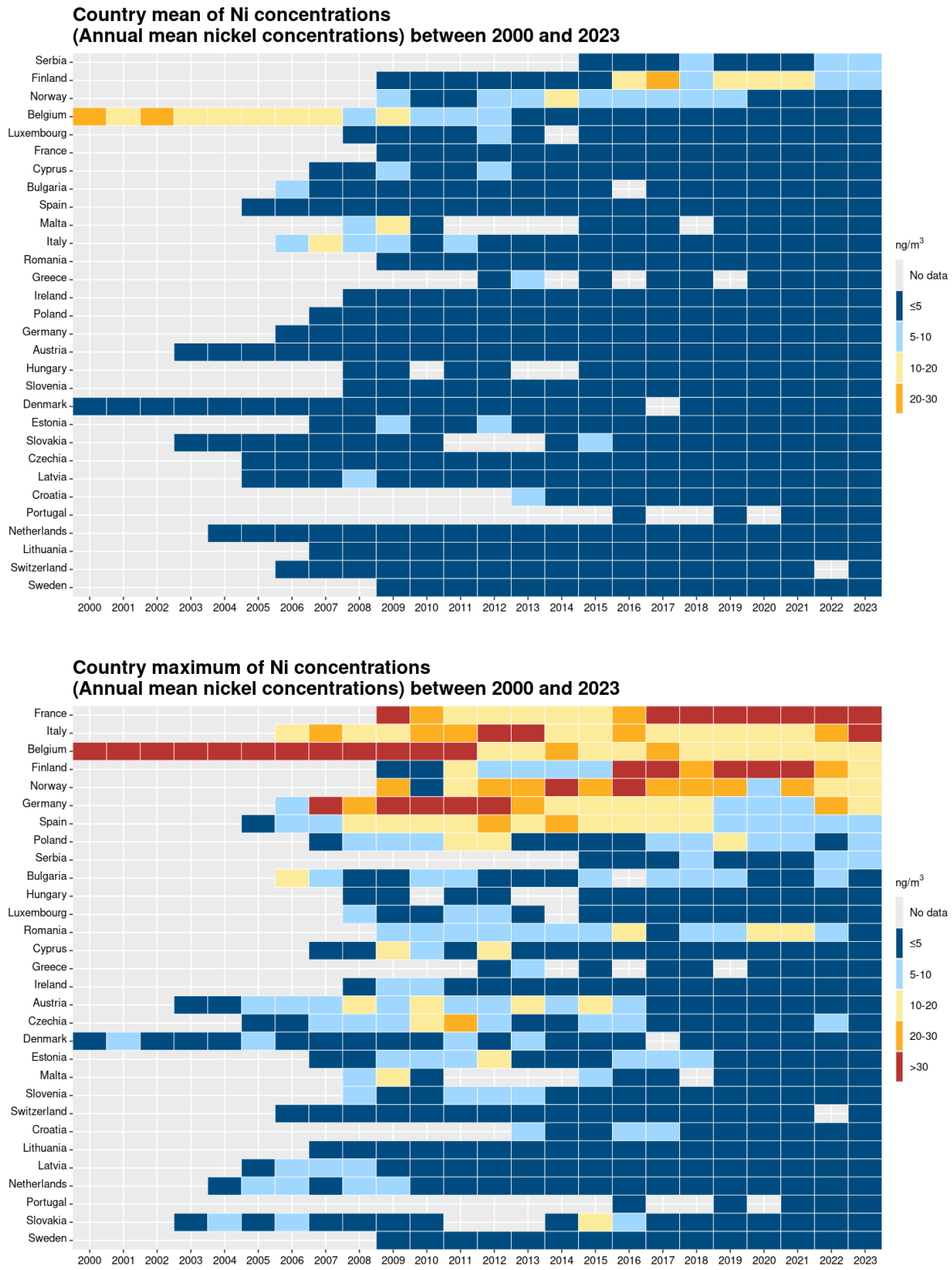
Figure 53: Map of Ni concentrations in 2023



Note: Observed concentrations of Ni in 2023. The last two colour categories correspond to concentrations above the target value. Only stations reporting more than 13 % of valid data have been included in the map.

Heatmaps with the evolution from 2000 of the mean (top) and the maximum (bottom) Ni annual mean concentrations at country level are shown in Figure 54. In this way, the evolution along years of the average and maximum measured concentration levels can be seen for each country. Note that meteorological variability has a considerable impact on year-to-year changes in ambient air concentrations of air pollutants (EEA, 2020).

Figure 54: Evolution of mean (top) and maximum (bottom) Ni annual mean concentrations (target value) per country from 2000



Note: It is important to note that the figure is not based on a consistent set of stations. The number, location and classification of the stations included may vary from year to year.

8 Abbreviations, units and symbols

µg/m^3: microgram(s) per cubic metre

AAQD: Ambient Air Quality Directives

AEI: Average exposure indicator for PM2.5 concentrations

AQG: Air quality guideline

As: Arsenic

BaP: Benzo[a]pyrene

C6H6: Benzene

Cd: Cadmium

CDR: Central data repository

CO: Carbon monoxide

ECO: Exposure concentration obligation

EEA: European Environment Agency

ETC HE: European Topic Centre on Human health and the Environment

EU: European Union

LAT: Lower assessment threshold

LV: limit value

mg/m^3: milligram(s) per cubic metre

NERT: National exposure reduction target

ng/m^3: nanogram(s) per cubic metre

Ni: Nickel

NO_2: Nitrogen dioxide

O_3: Ozone

Pb: Lead

PM: Particulate matter

$PM_{2.5}$: Particulate matter with a diameter of 2.5 µm or less

PM_{10}: Particulate matter with a diameter of 10 µm or less

RL: Reference level

SO_2: Sulphur dioxide

TV: target value

WHO: World Health Organization

9 Annex 1

Data included in this report was received by 27 January 2025 from the reporting countries. By that date the number of stations by country aggregation reporting each pollutant is summarized in Table 3. Data from stations that do not fulfil the criteria from Box 1.1 are excluded from this report.

Table 3: Number of stations reporting 2023 data with the minimum data coverage for at least one of the aggregations used in the report, by 27 January 2025

Countries	PM10	PM2.5	O3	NO2	BaP	SO2	CO	C6H6	As	Cd	Pb	Ni
EU27	2927	1891	2017	3213	769	1286	757	782	597	616	590	599
EEA32	3297	2077	2201	3477	776	1544	890	792	613	633	605	615
Total	3356	2111	2250	3542	776	1601	940	797	615	635	607	617

Data not included in this report is summarized in Table 4:

Table 4: Reporting outliers of 2023 air quality data by 27 January 2025

Country	Station EoI Code	Pollutant	Aggregation(*)	Year	Value	Units	Data Coverage
Hungary	HU0002R	Pb	P1Y	2023	3	ug/m3	15
Hungary	HU0022A	Pb	P1Y	2023	5	ug/m3	15
Hungary	HU0023A	Pb	P1Y	2023	4	ug/m3	16
Hungary	HU0025A	Pb	P1Y	2023	2	ug/m3	15
Hungary	HU0027A	Pb	P1Y	2023	7	ug/m3	15
Hungary	HU0030A	Pb	P1Y	2023	3	ug/m3	15
Hungary	HU0032A	Pb	P1Y	2023	4	ug/m3	15
Hungary	HU0041A	Pb	P1Y	2023	4	ug/m3	15
Hungary	HU0044A	Pb	P1Y	2023	3	ug/m3	15
Hungary	HU0046A	Pb	P1Y	2023	2	ug/m3	15
Hungary	HU0047A	Pb	P1Y	2023	3	ug/m3	15
Hungary	HU0049A	Pb	P1Y	2023	3	ug/m3	15
Hungary	HU0050A	Pb	P1Y	2023	2	ug/m3	15
Hungary	HU0052A	Pb	P1Y	2023	9	ug/m3	15

Table 4: Reporting outliers of 2023 air quality data by 27 January 2025 (continued)

Country	Station EoI Code	Pollutant	Aggregation(*)	Year	Value	Units	Data Coverage
Ireland	IE0118A	Pb	P1Y	2023	1401	ug/m3	100
Malta	MT00005	Pb	P1Y	2023	7	ug/m3	55
Malta	MT00009	Pb	P1Y	2023	3	ug/m3	56
Türkiye	TR0049A	PM2.5	P1Y-P1D-per99	2023	266	ug/m3	91

(*) https://dd.eionet.europa.eu/vocabulary/aq/aggregationprocess/view

The following table (Table 5) summarizes the average exposure indicator (AEI) by country.

Table 5: AEI calculated at national level

Country	Reference years	Initial AEI	Percentage of reduction	NERT
Austria	2009-2011	17.8	15.0	15.1
Belgium	2009-2011	19.0	20.0	15.2
Bulgaria	2008-2010	36.0	50.0	18.0
Croatia	2013-2015	20.6	20.0	16.5
Cyprus	2009-2011	21.5	20.0	17.2
Czechia	2009-2011	26.6	32.3	18.0
Denmark	2008-2010	14.0	15.0	11.9
Estonia	2009-2011	5.9	0.0	8.5
Finland	2009-2011	8.3	0.0	8.5
France	2009-2011	17.3	15.0	14.7
Germany	2008-2010	16.0	15.0	13.6
Greece	2008-2010	17.0	15.0	14.5
Hungary	2009-2010	21.0	20.0	16.8
Iceland	2008-2010	10.8	10.0	9.7
Ireland	2009-2011	10.2	10.0	9.2
Italy	2009-2011	19.9	20.0	15.9
Latvia	2008-2010	18.0	20.0	14.4
Lithuania	2009-2011	12.3	10.0	11.1
Luxembourg	2009-2010	17.4	15.0	14.8
Malta	2009-2011	13.2	15.0	11.2
Netherlands	2009-2011	17.0	15.0	14.5
Norway	2009-2011	10.0	10.0	9.0
Poland	2010-2011	26.9	33.0	18.0
Portugal	2008-2010	9.7	10.0	8.7
Romania	2009-2011	18.4	20.0	14.7
Slovakia	2009-2011	24.4	26.2	18.0
Slovenia	2009-2011	21.7	20.0	17.4
Spain	2009-2011	14.1	15.0	12.0
Sweden	2009-2011	6.6	0.0	8.5

Table 6 summarizes the number of sampling points per country with air quality levels above specific air quality objectives summarized through out this report. Sampling points that do not fulfil the criteria from Box 1.1 are excluded.

Table 6: Number of sampling points above air quality levels/objectives per reporting country

Levels/Objectives	Albania	Andorra	Austria	Belgium	Bosnia and Herzegovina	Bulgaria	Croatia	Cyprus	Czechia	Denmark	Estonia	Finland	France	Germany	Greece	Hungary	Iceland	Ireland	Italy	Kosovo	Latvia	Lithuania	Luxembourg	Malta	Montenegro	Netherlands	North Macedonia	Norway	Poland	Portugal	Romania	Serbia	Slovakia	Slovenia	Spain	Sweden	Switzerland	Türkiye
PM_{10} daily LV (50 µg/m^3)	1	0	0	0	17	2	1	1	0	0	0	0	2	0	10	0	0	0	73	0	0	0	0	1	0	0	12	0	3	0	1	5	2	1	26	2	0	215
PM_{10} daily 2030 LV (45 µg/m^3)	2	0	1	1	21	23	8	3	4	0	0	4	14	0	24	2	0	0	263	0	0	0	0	3	0	0	13	13	100	2	21	9	6	4	91	20	0	248
PM_{10} daily WHO AQG level (45 µg/m^3)	3	1	9	42	22	35	8	3	82	1	1	20	134	20	32	15	3	4	441	0	5	3	1	4	0	3	13	31	214	16	49	10	31	15	295	37	4	265
PM_{10} annual LV (40 µg/m^3)	0	0	0	0	6	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	1	0	0	6	0	0	0	0	2	0	0	1	0	0	131
PM_{10} annual WHO AQG level (15 µg/m^3)	3	1	38	56	22	37	9	3	87	1	1	2	135	65	34	19	1	2	507	7	7	9	4	4	0	39	13	16	230	37	58	10	39	17	328	25	2	268
PM_{10} annual 2030 LV (20 µg/m^3)	2	0	3	12	19	31	7	2	16	1	0	0	34	2	27	3	0	0	336	3	0	2	0	3	0	2	13	3	130	11	32	10	10	5	175	7	0	261
$PM_{2.5}$ annual LV (25 µg/m^3)	0	0	0	0	6	0	1	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	13
$PM_{2.5}$ annual WHO AQG level (5 µg/m^3)	3	1	63	75	11	8	16	4	86	2	1	4	212	293	18	12	0	49	315	7	5	6	4	5	0	53	10	39	135	11	30	2	47	18	267	13	7	114
$PM_{2.5}$ daily WHO AQG level (15 µg/m^3)	3	1	62	82	11	8	16	4	86	2	3	6	219	296	18	12	2	51	313	0	5	4	4	5	0	53	10	43	135	16	30	2	47	18	280	19	8	114
O_3 max daily 8h mean TV (120 µg/m^3)	0	0	13	0	10	1	2	2	5	0	0	0	45	34	14	5	0	0	152	0	0	0	0	1	0	0	0	0	1	3	0	2	2	4	44	0	23	27
O_3 long-term objective (120 µg/m^3)	1	1	104	39	17	11	14	3	64	6	9	6	276	271	23	13	0	4	298	0	4	9	5	3	0	44	5	3	98	34	13	7	20	11	301	14	30	80
O_3 max daily 8h mean 2030 LTO (100 µg/m^3)	0	0	38	7	11	1	2	2	22	0	0	0	88	88	19	5	0	0	182	0	0	0	1	1	0	5	1	0	12	4	1	3	5	5	72	0	25	34
O_3 short-term WHO AQG level (100 µg/m^3)	2	2	105	39	17	13	14	3	64	8	9	16	283	278	28	15	0	7	326	0	4	12	5	3	0	44	8	11	99	44	22	7	23	11	372	18	30	93
O_3 peak season WHO AQG level (60 µg/m^3)	1	2	105	39	16	18	14	3	64	8	9	16	278	275	12	15	0	13	333	0	4	13	5	4	0	44	8	9	90	37	26	8	22	11	403	25	30	64
NO_2 annual LV (40 µg/m^3)	0	0	0	0	0	1	0	0	0	0	0	0	5	3	4	0	0	0	14	0	0	0	0	0	0	0	0	0	4	1	1	0	0	0	0	0	0	47
NO_2 annual WHO AQG level (10 µg/m^3)	2	1	101	114	21	20	12	2	58	4	1	11	225	457	23	17	2	20	461	0	3	9	94	4	5	58	10	34	90	40	26	14	22	7	282	39	23	163
NO_2 hourly LV (200 µg/m^3)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	28
NO_2 hourly 2030 LV (200 µg/m^3)	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	45
NO_2 daily WHO AQG level (25 µg/m^3)	4	1	110	81	20	20	13	2	66	5	4	21	277	296	24	16	3	25	467	0	4	8	6	4	5	68	11	36	96	39	25	13	27	9	316	40	25	162
NO_2 daily 2030 LV (50 µg/m^3)	1	0	0	2	2	3	1	0	1	0	0	0	28	9	10	3	1	2	70	0	0	2	0	0	0	1	0	6	4	5	7	3	0	1	36	0	0	99
BaP annual LV (1 ng/m^3)	0	0	1	0	0	0	2	0	9	0	0	1	0	0	0	2	0	0	17	0	1	0	0	0	0	0	0	0	98	0	0	0	12	0	0	0	0	0
BaP annual WHO AQG level (0.12 ng/m^3)	0	0	34	4	0	12	5	0	54	1	4	7	17	50	2	19	0	2	122	0	6	4	0	0	0	1	0	4	170	0	3	0	21	3	31	0	0	0
SO_2 hourly LV (350 µg/m^3)	0	0	0	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
SO_2 hourly LV 2030 (350 µg/m^3)	0	0	0	0	13	3	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	2	0	0	0	0	0	11
SO_2 daily LV (125 µg/m^3)	0	0	0	0	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8

Table 6: Number of sampling points above air quality levels/objectives per reporting country (continued)

Levels/Objectives	Albania	Andorra	Austria	Belgium	Bosnia and Herzegovina	Bulgaria	Croatia	Cyprus	Czechia	Denmark	Estonia	Finland	France	Germany	Greece	Hungary	Iceland	Ireland	Italy	Kosovo	Latvia	Lithuania	Luxembourg	Malta	Montenegro	Netherlands	North Macedonia	Norway	Poland	Portugal	Romania	Serbia	Slovakia	Slovenia	Spain	Sweden	Switzerland	Türkiye
SO_2 daily WHO AQG level (40 µg/m^3)	0	0	0	0	20	5	0	0	1	0	0	0	1	1	0	0	1	1	0	0	0	0	0	0	1	0	0	2	1	0	0	4	0	0	5	0	0	38
CO daily LV (10 mg/m^3)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0
CO daily WHO AQG level (4 mg/m^3)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	3
C_6H_6 annual WHO RL (1.7 µg/m^3)	1	0	0	1	0	1	1	0	6	0	0	0	4	2	5	2	0	0	10	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	2	0	0	0
C_6H_6 annual 2030 LV (3.4 µg/m^3)	0	0	0	0	0	0	0	0	2	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
As annual TV (6 ng/m^3)	0	0	0	2	0	0	0	0	0	0	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0
As annual LAT (2.4 ng/m^3)	0	0	0	5	0	0	0	0	4	0	0	2	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	3	0	0	0
Cd annual LAT (2 ng/m^3)	0	0	0	3	0	1	0	0	1	0	0	0	1	3	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	0	0
Pb annual LV (0.5 µg/m^3)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pb annual LAT (0.25 µg/m^3)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Ni annual TV (20 ng/m^3)	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ni annual LAT (10 ng/m^3)	0	0	0	2	0	0	0	0	0	0	0	1	3	1	0	0	0	0	2	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0

10 Annex 2 - Air quality status in relation to the new standards in the revised AAQD (EU) 2024/2081

On 20 November 2024, the revised Directive (EU) 2024/2881 (EU, 2024) on ambient air quality and cleaner air for Europe was published and it entered into force on 10 December 2024. This Directive amends and recasts Directives 2004/107/EC (EU, 2004) and 2008/50/EC (EU, 2008). Among other changes, it has introduced new air quality (AQ) standards (or revised the ones in the 2004 and 2008 Directives) setting the attainment date at 1 January 2030. The revised and new standards for the protection of human health are summarised in table 7).

Table 7: Air quality standards for the protection of health, as given in the revised EU Ambient Air Quality Directive (EU) 2024/2881

Pollutant	Averaging period	Legal nature and concentration	Comments
PM_{10}	1 day	Limit value: 45 µg/m^3	Not to be exceeded more than 18 times per calendar year
		Alert threshold: 90 µg/m^3	To be measured as a daily average over 3 consecutive days or less at locations representative of air quality over at least 100 km^2 or an entire zone, whichever is the smaller
		Information threshold: 90 µg/m^3	To be measured over 1 day at locations representative of air quality over at least 100 km^2 or an entire zone, whichever is the smaller
	Calendar year	Limit value: 20 µg/m^3	
$PM_{2.5}$	1 day	Limit value: 25 µg/m^3	Not to be exceeded more than 18 times per calendar year
		Alert threshold: 50 µg/m^3	To be measured as a daily average over 3 consecutive days or less at locations representative of air quality over at least 100 km^2 or an entire zone, whichever is the smaller
		Information threshold: 50 µg/m^3	To be measured over 1 day at locations representative of air quality over at least 100 km^2 or an entire zone, whichever is the smaller
	Calendar year	Limit value: 10 µg/m^3	
		Average exposure reduction obligation, 10-25% reduction of the Average Exposure Indicator (AEI) in 2020	The percentage reduction depends on the initial AEI in 2020 ([a])
		Average exposure concentration objective, AIE: 5 µg/m^3	
O_3	1 hour	Alert threshold: 240 µg/m^3	
		Information threshold: 180 µg/m^3	
	Maximum daily 8-hour mean ([b])	Target value: 120 µg/m^3	Not to be exceeded on more than 18 days per calendar year averaged over 3 years ([c])

Table 7: Air quality standards for the protection of health, as given in the revised EU Ambient Air Quality Directive (EU) 2024/2881 (continued)

Pollutant	Averaging period	Legal nature and concentration	Comments
	Maximum daily 8-hour mean within a calendar year	Long term objective: 100 µg/m^3	Not to be exceeded more than 3 days per calendar year (99th percentile)
NO_2	1 hour	Limit value: 200 µg/m^3	Not to be exceeded more than 3 times per calendar year
		Alert threshold: 200 µg/m^3	To be measured as a daily average over 3 consecutive days or less at locations representative of air quality over at least 100 km^2 or an entire zone, whichever is the smaller
		Information threshold: 150 µg/m^3	To be measured over 1 day at locations representative of air quality over at least 100 km^2 or an entire zone, whichever is the smaller
	1 day	Limit value: 50 µg/m^3	Not to be exceeded more than 18 times per calendar year
	Calendar year	Limit value: 20 µg/m^3	
		Average exposure reduction obligation, 15-25% reduction of the Average Exposure Indicator (AEI) in 2020	The percentage reduction depends on the initial AEI in 2020 ([a])
		Average exposure concentration objective, AIE: 10 µg/m^3	
BaP	Calendar year	Limit value: 1,0 ng/m^3	
SO_2	1 hour	Limit value: 350 µg/m^3	Not to be exceeded more than 3 times per calendar year
		Alert threshold: 350 µg/m^3	To be measured as a daily average over 3 consecutive days or less at locations representative of air quality over at least 100 km^2 or an entire zone, whichever is the smaller
		Information threshold: 275 µg/m^3	To be measured over 1 day at locations representative of air quality over at least 100 km^2 or an entire zone, whichever is the smaller
	1 day	Limit value: 50 µg/m^3	Not to be exceeded more than 18 times per calendar year
CO	Maximum daily 8-hour mean ([b])	Limit value: 10 mg/m^3	
	1 day	Limit value: 4 mg/m^3	Not to be exceeded more than 18 times per calendar year
C_6H_6	Calendar year	Limit value: 3.4 µg/m^3	
Pb	Calendar year	Limit value: 0.5 µg/m^3	
As	Calendar year	Limit value: 6,0 ng/m^3	
Cd	Calendar year	Limit value: 5,0 ng/m^3	
Ni	Calendar year	Limit value: 20 ng/m^3	

Table 7: Air quality standards for the protection of health, as given in the revised EU Ambient Air Quality Directive (EU) 2024/2881 (continued)

Pollutant	Averaging period	Legal nature and concentration	Comments

Notes:

[a] AEI: based upon measurements at all sampling points in urban background locations in average exposure territorial units throughout the territory of a Member State, assessed as a 3-year running annual mean.

[b] The maximum daily 8-hour mean concentration shall be selected by examining 8-hour running averages, calculated from hourly data and updated each hour. Each 8-hour average so calculated shall be assigned to the day on which it ends, i.e. the first calculation period for any 1 day shall be the period from 17:00 on the previous day to 1:00 on that day; the last calculation period for any 1 day shall be the period from 16:00 to 24:00 on that day.

[c] If the 3-year average cannot be determined on the basis of a full and consecutive set of annual data, the minimum annual data required for checking compliance with the ozone target value shall be valid data for 1 year.

This annex analyses the situation in year 2023 with respect to some of the new and/or revised AQ standards ([12]) using the same air quality data as those in the main section. It provides:

- a European overview of the 2023 monitoring stations reported, and of their concentrations in relation to some EU legal standards defined in the Directive (EU) 2024/2881 (EU, 2024);
- a map with the 2023 concentrations at station level for each pollutant relevant to each AQ standard;
- a boxplot graph summarizing for each country the range of concentrations (highlighting the lowest, highest, average and the 25 and 75 percentiles) for PM_{10}, $PM_{2.5}$, NO_2 and O_3.

It should be noted that this assessment is only intended to shed light on the current situation in relation to the 2030 AQ standards, and the 'distance to target', i.e. the scale of the challenge to meet those standards by 2030. This analysis may also help to identify air quality zones where air quality roadmaps may need to be established. Roadmaps are air quality plans that must be implemented where, from 2026 to 2029, levels of pollutants are foreseen to be above the 2030 limit and target values.

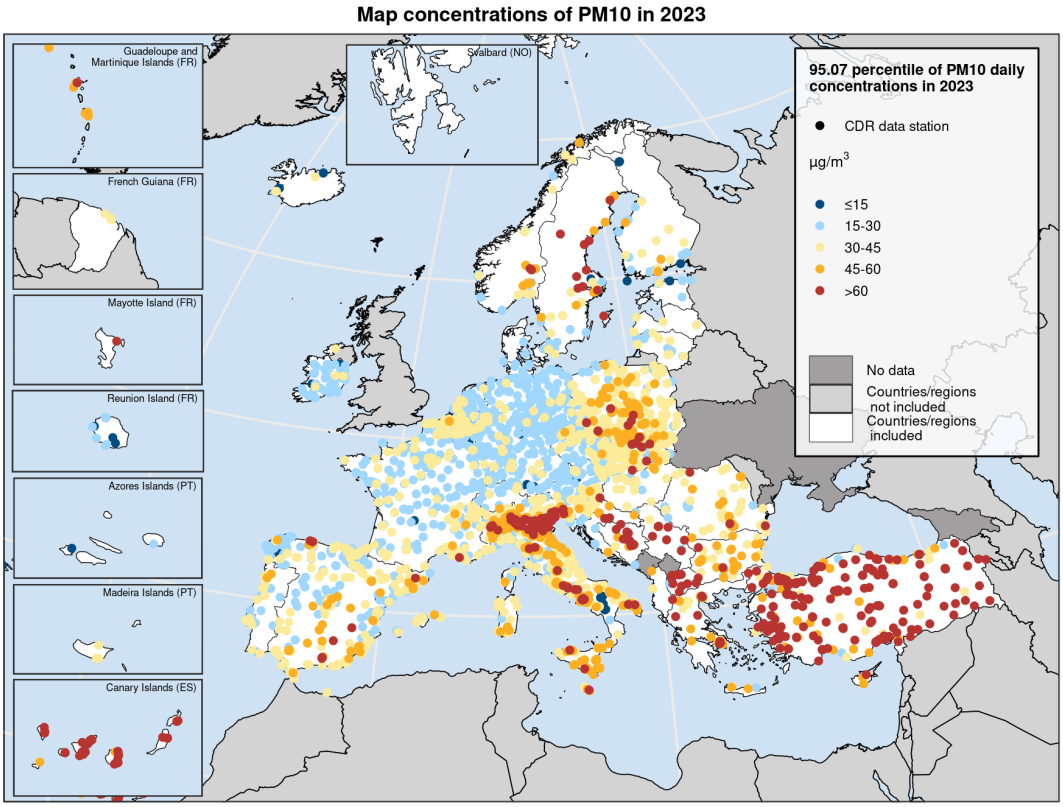
[12] Only for the limit values and O3 target value and long-term objective

10.1 Status of PM_{10} concentrations

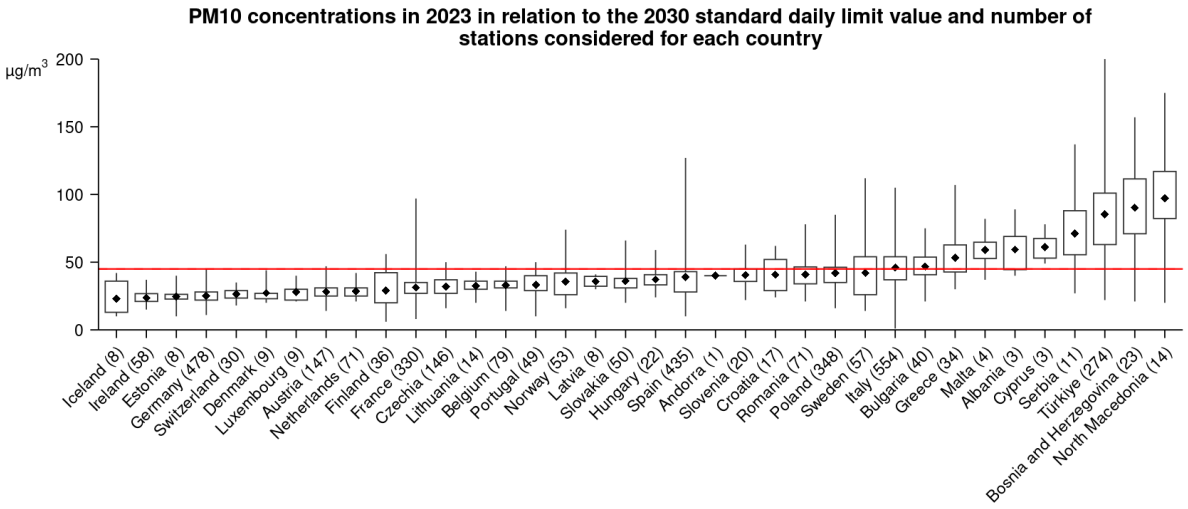
Nineteen countries in EU-27, and six other reporting countries reported PM_{10} concentrations above the 2030 EU daily limit value of 45 µg/m^3, more than 18 days over the calendar year (Figure 55). This applied to 26 % (900) of reporting stations.

Concentrations above the 2030 PM_{10} annual limit value (20 µg/m^3) were monitored in 35 % (1162 stations) of all the reporting stations, located in 22 countries in EU-27, and 7 other reporting countries (Figure 56).

Figure 55: Map and boxplot of PM_{10} concentrations in 2023 - 2030 daily limit value

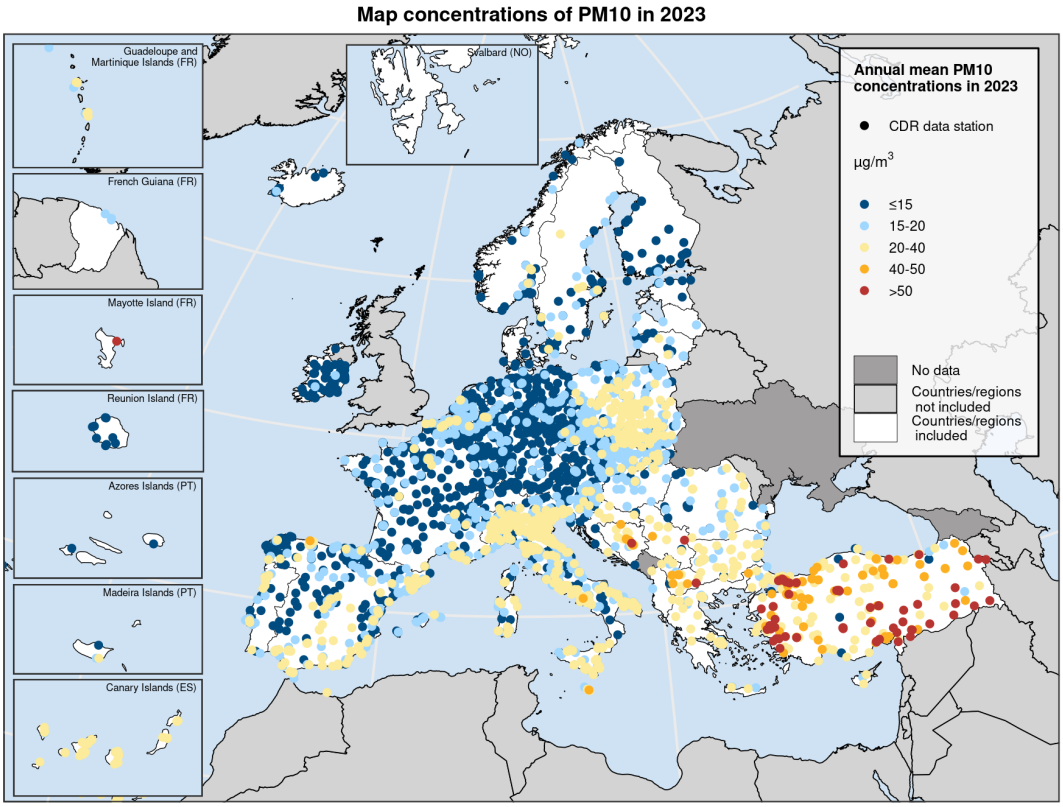


Note: The figure shows observed concentrations of PM10 in 2023. The possibility of subtracting contributions to the measured concentrations from natural sources and winter road sanding/salting has not been considered. The map shows the 95.07 percentile of the PM10 daily mean concentrations, representing the 19th highest value in a complete series. It is related to the 2030 PM10 daily limit value, allowing 18 exceedances of the 45 µg/m³ threshold over 1 year. The last two colour categories indicate stations with concentrations above this daily limit value. Only stations with more than 75 % of valid data, and more than 13 % in the case of fixed random measurements, have been included in the map.

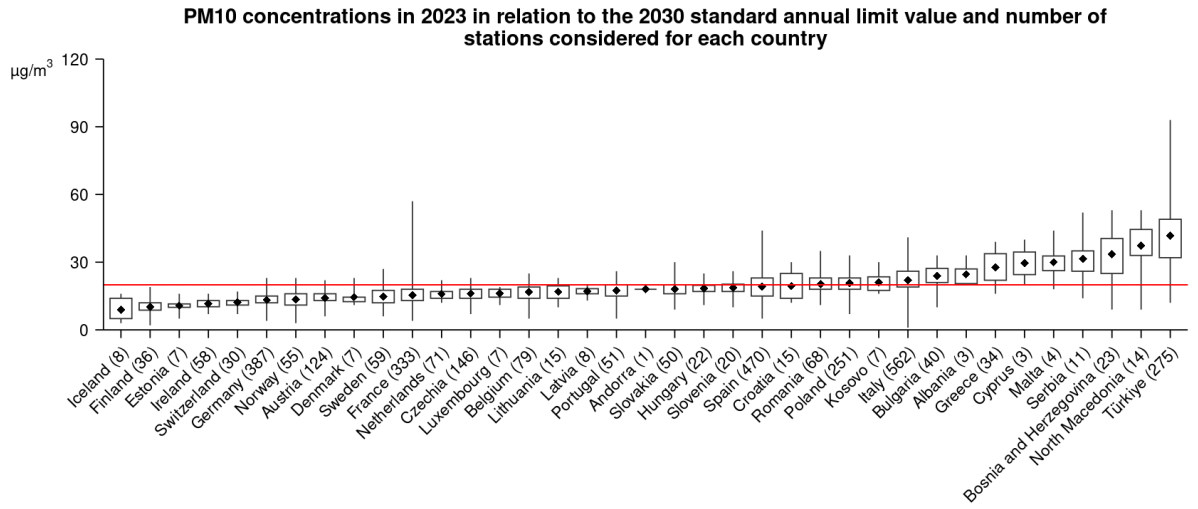


Note: The graph is based on the 95.07 percentile of daily mean concentration values corresponding to the 19th highest daily mean in complete time series. For each country, the number of stations considered for 2023 (in brackets) are given. The boxplot represents the lowest (bottom of the whisker), highest (top of the whisker) and average (black dot) 95.07 percentile values (in µg/m³). The rectangles mark the 25th and 75th percentiles. At 25% of the stations, levels are below the 25th percentile; at 25 % of the stations, concentrations are above the 75th percentile. The daily limit value set by EU legislation for 2030 is marked by the horizontal line. The graph should be read in relation to the above map, as a country's situation depends on the number of stations considered.

Figure 56: Map and Boxplot of PM_{10} concentrations in 2023 - 2030 annual limit value



Note: Observed concentrations of PM10 in 2023. The possibility of subtracting contributions to the measured concentrations from natural sources and winter road sanding/salting has not been considered. The last three colour categories indicate stations reporting concentrations above the 2030 EU annual limit value (20 µg/m³). Only stations with more than 75 % of valid data, and more than 13 % in the case of fixed random measurements, have been included in the map.



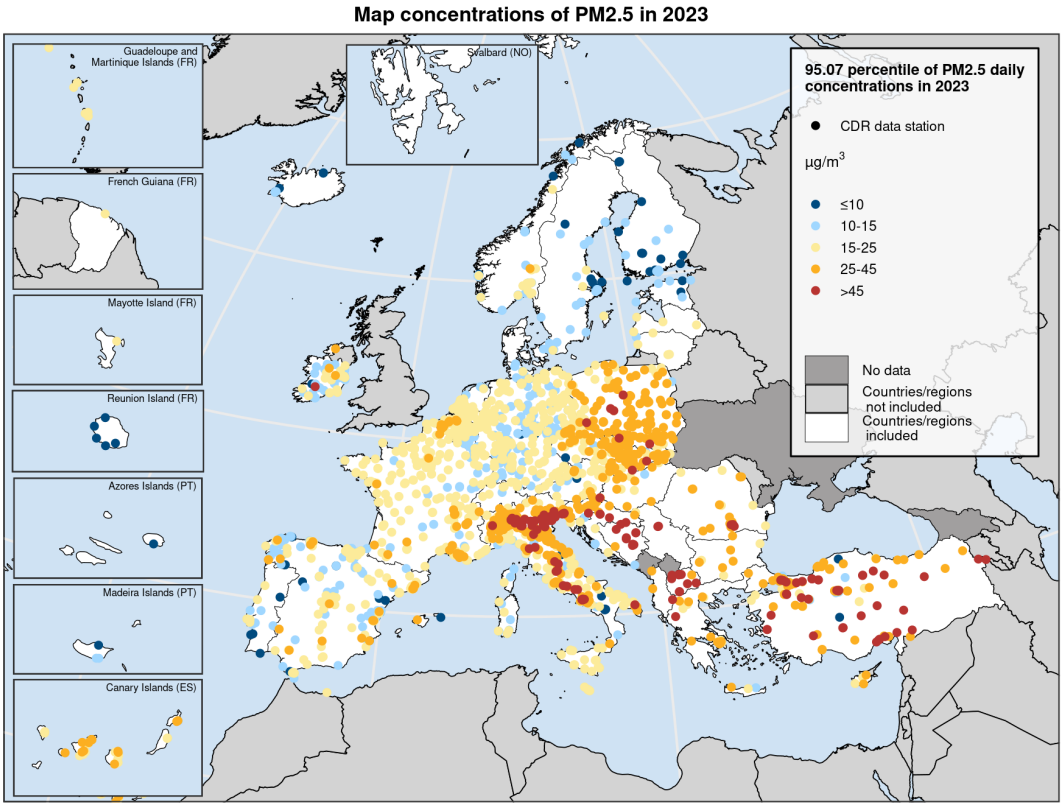
Note: The graph is based on annual mean concentration values. For each country, the number of stations considered for 2023 (in brackets) are given. The boxplot represents the lowest (bottom of the whisker), highest (top of the whisker) and average (black dot) annual mean values (in µg/m³). The rectangles mark the 25th and 75th percentiles. At 25 % of the stations, levels are below the 25th percentile; at 25 % of the stations, concentrations are above the 75th percentile. The annual limit value set by EU legislation for 2030 is marked by the continuous horizontal line. The graph should be read in relation to the above map, as a country's situation depends on the number of stations considered.

10.2 Status of $PM_{2.5}$ concentrations

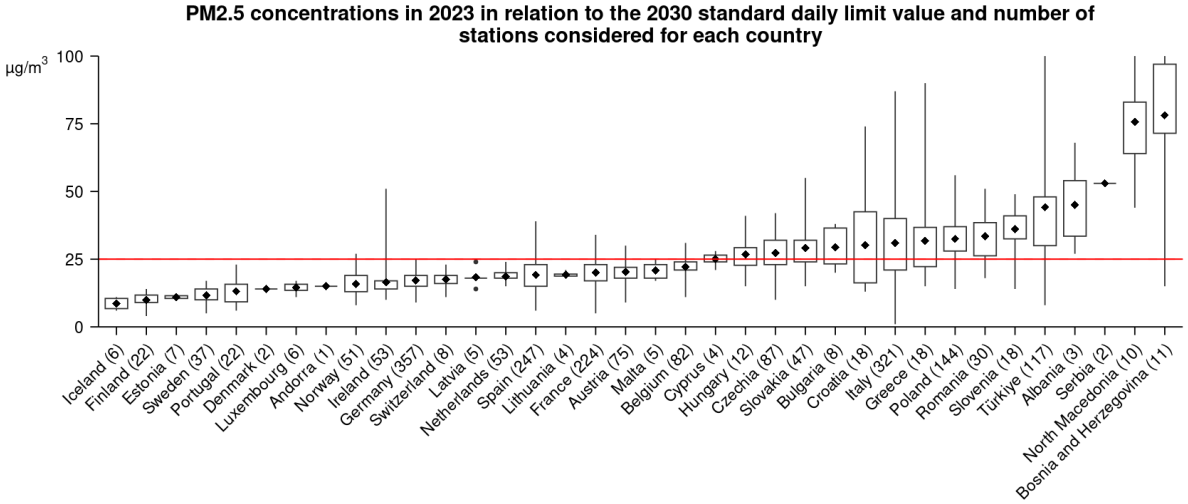
Sixteen countries in EU-27, and six other reporting countries reported $PM_{2.5}$ concentrations above the 2030 EU daily limit value of 25 µg/m^3, more than 18 days over the calendar year (Figure 57). This was the case for 31 % (660) of reporting stations (Figure 57).

The $PM_{2.5}$ concentrations were higher than the 2030 EU annual limit value (10 µg/m^3) in twenty countries in EU-27 and six other reporting countries (Figure 58). These concentrations above the limit value were registered in 41 % (864 stations) of all the reporting stations.

Figure 57: Map and boxplot of $PM_{2.5}$ concentrations in 2023 - 2030 daily limit value

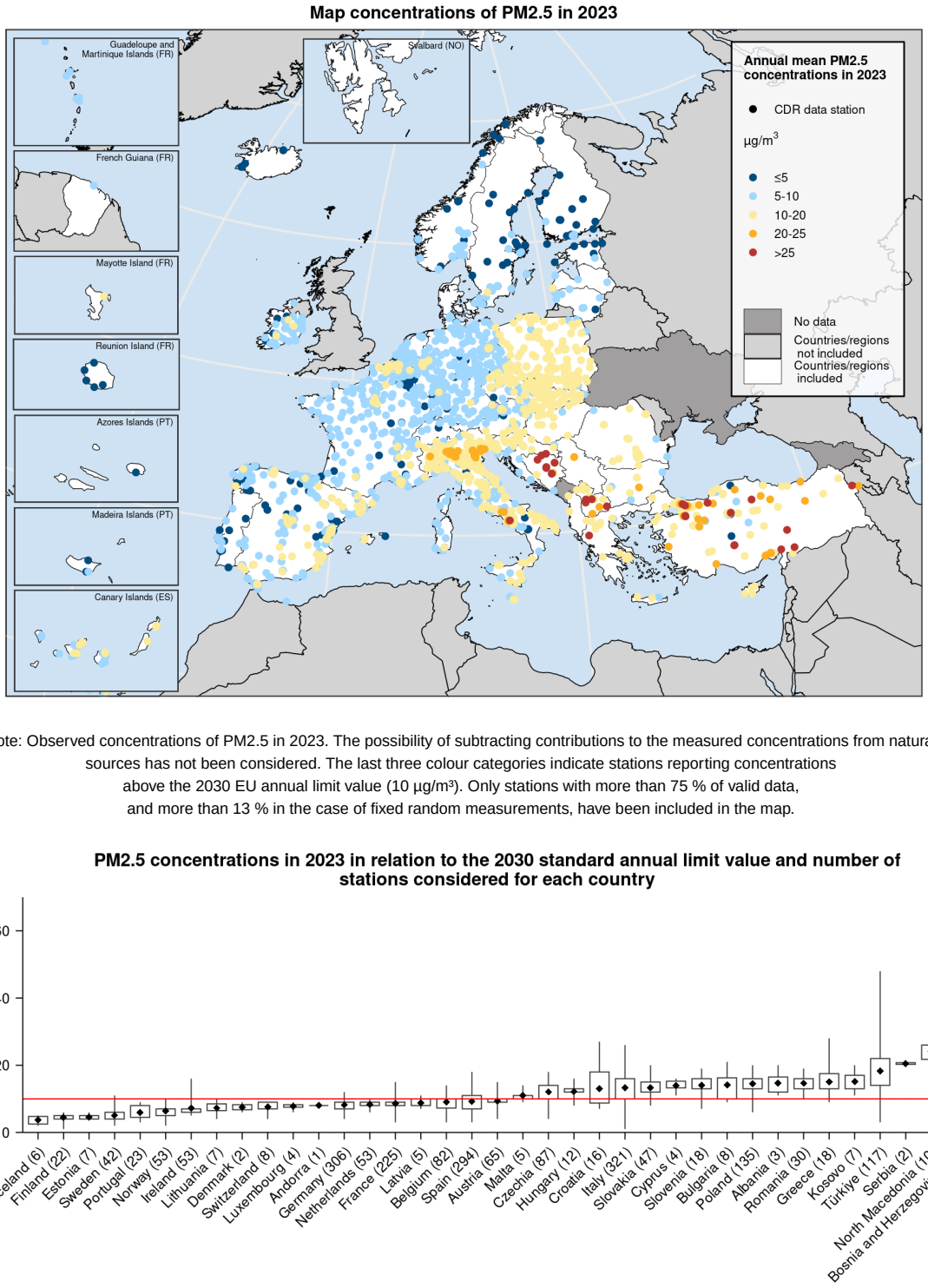


Note: The figure shows observed concentrations of PM2.5 in 2023. The possibility of subtracting contributions to the measured concentrations from natural sources has not been considered. The map shows the 95.07 percentile of the PM2.5 daily mean concentrations, representing the 19th highest value in a complete series. It is related to the 2030 PM2.5 daily limit value, allowing 18 exceedances of the 25 µg/m³ threshold over 1 year. The last two colour categories indicate stations with concentrations above this daily limit value. Only stations with more than 75 % of valid data, and more than 13 % in the case of fixed random measurements, have been included in the map.



Note: The graph is based on the 95.07 percentile of daily mean concentration values corresponding to the 19th highest daily mean in complete time series. For each country, the number of stations considered for 2023 (in brackets) are given. The boxplot represents the lowest (bottom of the whisker), highest (top of the whisker) and average (black dot) 95.07 percentile values (in µg/m³). The rectangles mark the 25th and 75th percentiles. At 25% of the stations, levels are below the 25th percentile; at 25 % of the stations, concentrations are above the 75th percentile. The daily limit value set by EU legislation for 2030 is marked by the horizontal line. The graph should be read in relation to the above map, as a country's situation depends on the number of stations considered.

Figure 58: Map and Boxplot of $PM_{2.5}$ concentrations in 2023 - 2030 annual limit value



Note: Observed concentrations of PM2.5 in 2023. The possibility of subtracting contributions to the measured concentrations from natural sources has not been considered. The last three colour categories indicate stations reporting concentrations above the 2030 EU annual limit value (10 µg/m³). Only stations with more than 75 % of valid data, and more than 13 % in the case of fixed random measurements, have been included in the map.

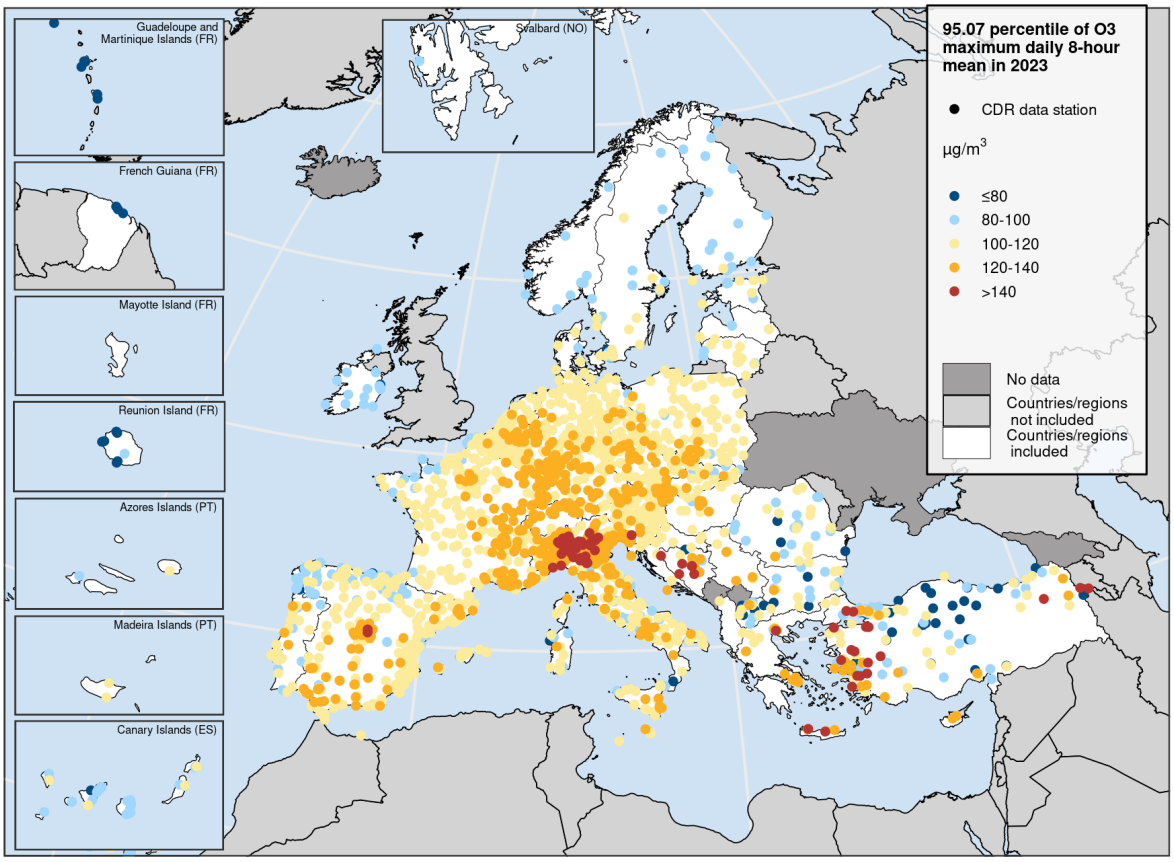
Note: The graph is based on annual mean concentration values. For each country, the number of stations considered for 2023 (in brackets) are given. The boxplot represents the lowest (bottom of the whisker), highest (top of the whisker) and average (black dot) annual mean values (in µg/m³). The rectangles mark the 25th and 75th percentiles. At 25 % of the stations, levels are below the 25th percentile; at 25 % of the stations, concentrations are above the 75th percentile. The annual limit value set by EU legislation for 2030 is marked by the continuous horizontal line. The graph should be read in relation to the above map, as a country's situation depends on the number of stations considered.

10.3 Status of O_3 ambient air concentrations

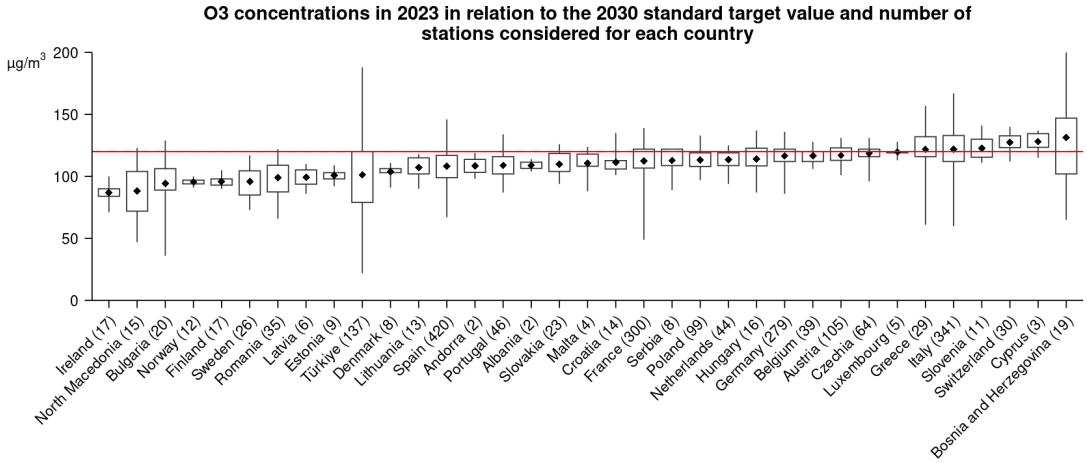
20 countries in EU-27 and 5 other reporting countries reported concentrations above the 2030 O_3 target value threshold (120 µg/m^3) more than 18 times this year (Figure 59). In total, 29 % (634 stations) of all stations reporting O_3 showed concentrations above the 2030 target value threshold for the protection of human health.

Since the 2030 long-term objective aligns with the short-term WHO AQG (100 µg/m^3 as percentile 99), please refer to the main text and Figure 22 for an overview of the current situation in relation to the 2030 long-term objective.

Figure 59: Map and boxplot of O_3 concentrations in 2023 - 2030 target value threshold.



Note: Observed concentrations of O3 in 2023. The map shows the 95.07 percentile of the O3 maximum daily 8−hour mean, representing the 19th highest value in a complete series. It is related to the 2030 O3 target value. At sites marked with the last two colour categories, the 19th highest daily O3 concentrations were above the 120 µg/m³ threshold, implying values above the 2030 target value threshold. Please note that the legal definition of the target value considers not only 1 year but the average over 3 years.



Note: The graph is based, for each country, on the 95.07 percentile of the maximum daily 8−hour mean concentration values, corresponding to the 19th highest daily maximum of the running 8−hour mean in a complete time series. For each country, the number of stations considered for 2023 (in brackets) are given. The boxplot represents the lowest (bottom of the whisker), highest (top of the whisker) and average (black dot) values (in ..g/m³). The rectangles mark the 25th and 75th percentiles. At 25 % of the stations, levels are below the 25th percentile; at 25% of the stations, concentrations are above the 75th percentile. The target value threshold set for 2030 by the EU legislation is marked by the horizontal line. Please note that the legal definition of the target value considers not only 1 year but the average over 3 years. The graph should be read in relation to the above map, as a country's situation depends on the number of stations considered.

10.4 Status of NO_2 ambient air concentrations

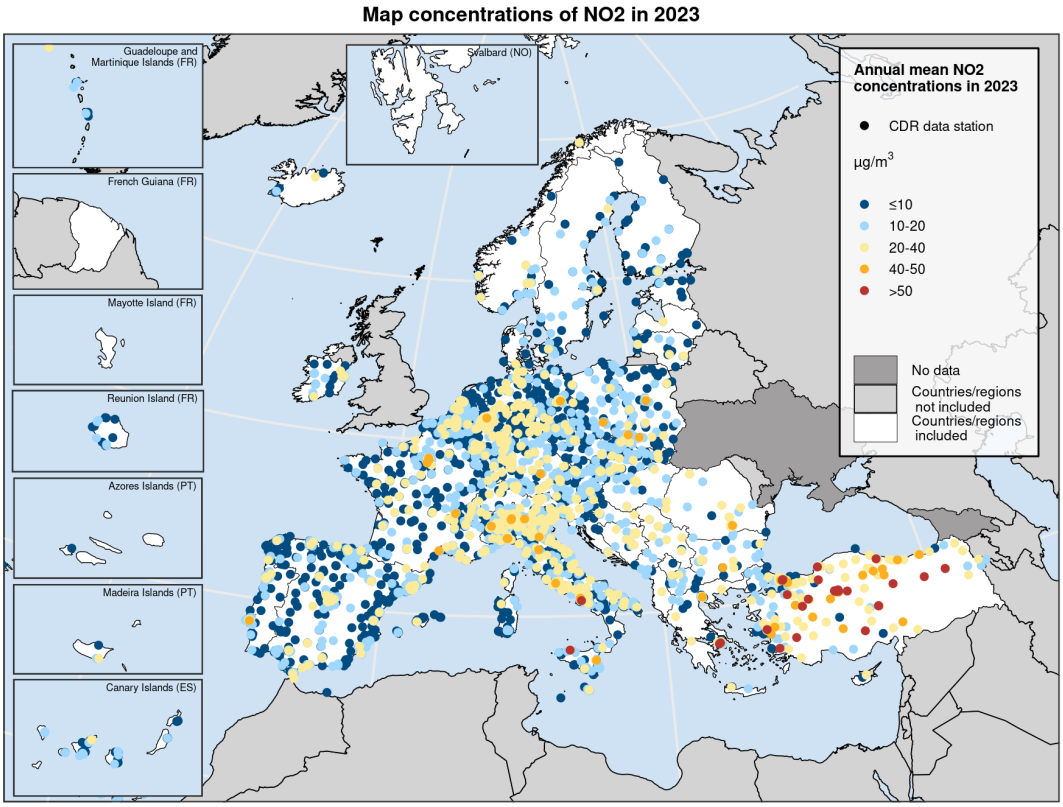
26 of the countries in EU-27 and 8 other reporting countries (Figure 60) recorded concentrations above the 2030 EU annual limit value (20 µg/m^3). This happened in 30 % (1053 stations) of all the stations measuring NO_2.

71 % (743 stations) of all values above the 2030 EU annual limit value were observed at traffic stations.

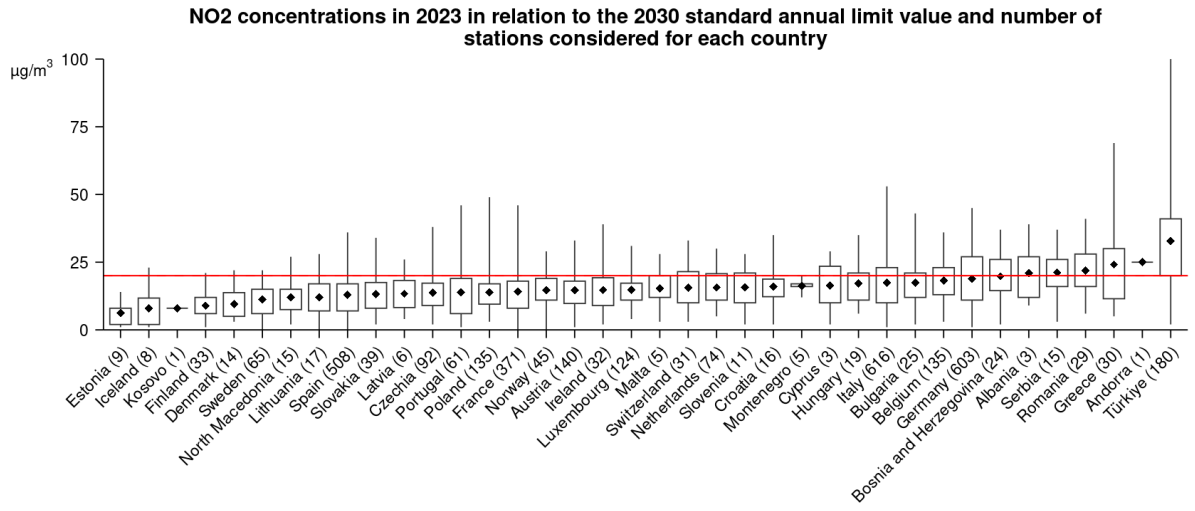
Concentrations above the 2030 EU NO_2 daily limit value (50 µg/m^3, not to be exceeded more than 18 days per year) were reported in 9 % (297 stations) of all the reporting stations in 17 of the countries in EU-27 and 6 other reporting countries (Figure 61).

Finally, concentrations above the hourly limit value (200 µg/m^3, not to be exceeded more than 3 hours per year) were observed in 1.5 % (49 stations) of all reporting stations, mostly at urban traffic stations. They were observed in five countries (number stations): Türkiye (forty-five), Belgium (one), Greece (one), Italy (one) and Spain (one).

Figure 60: Map and Boxplot of NO_2 concentrations in 2023 - 2030 annual limit value

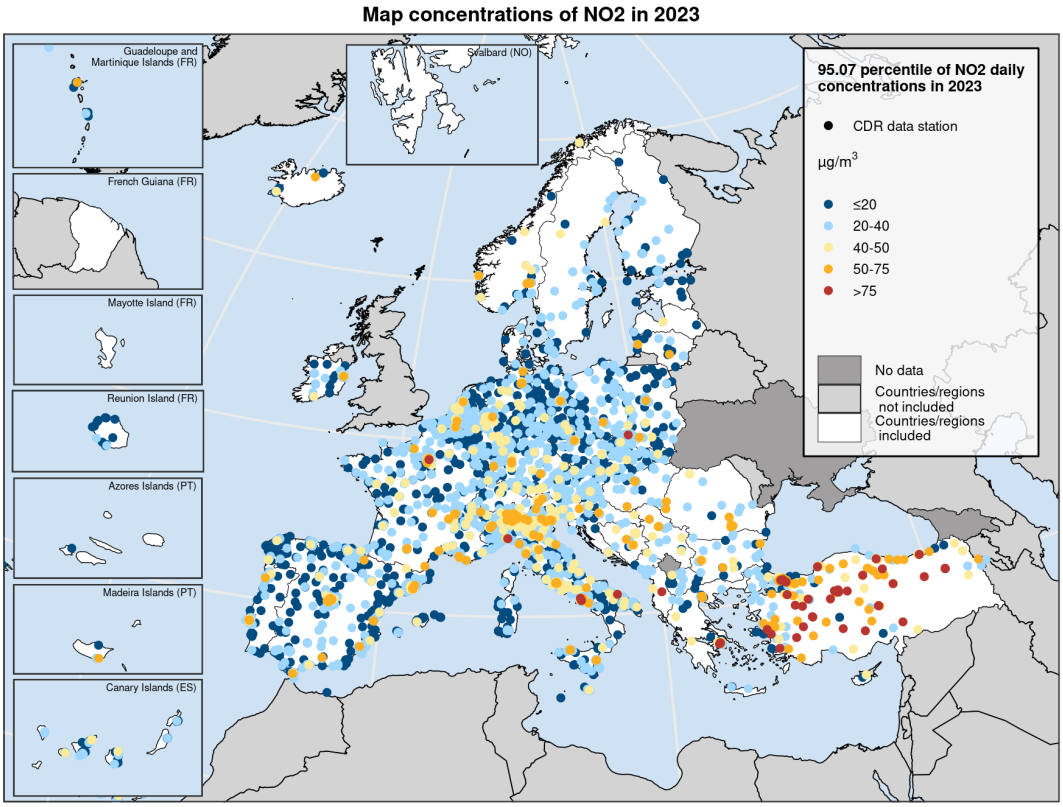


Note: Observed concentrations of NO2 in 2023. The last three colour categories indicate stations reporting concentrations above the 2030 EU annual limit value (20 µg/m³). Only stations with more than 75 % of valid data have been included in the map.

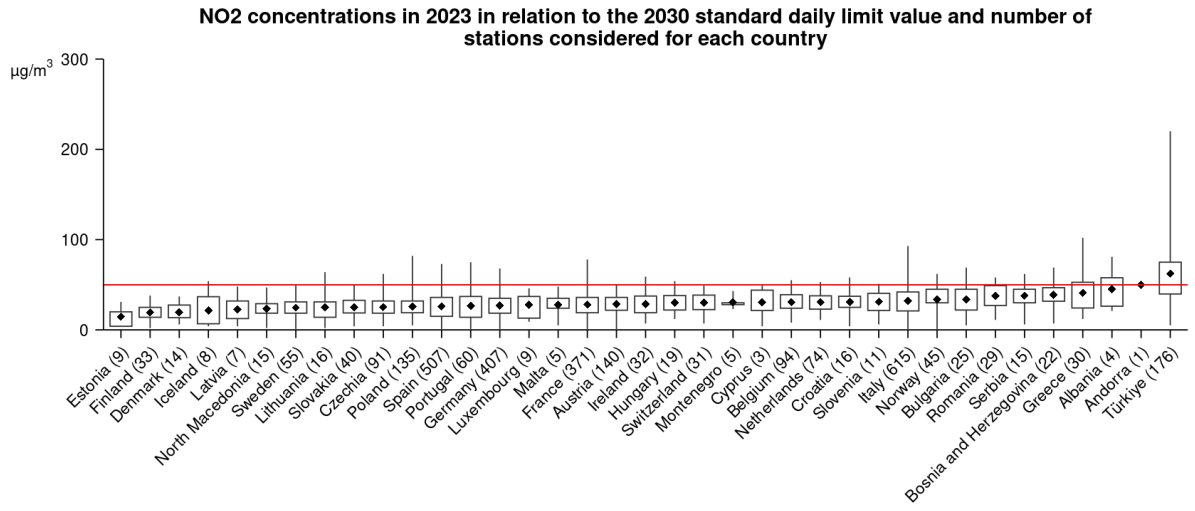


Note: The graph is based on annual mean concentration values. For each country, the number of stations considered for 2023 (in brackets) are given. The boxplot represents the lowest (bottom of the whisker), highest (top of the whisker) and average (black dot) annual mean values (in µg/m³). he rectangles mark the 25th and 75th percentiles. At 25 % of the stations, levels are below the 25th percentile; at 25 % of the stations, concentrations ar above the 75th percentile. The annual limit value set by EU legislation for 2030 is marked by the continuous horizontal line. The graph should be read in relation to the above map, as a country's situation depends on the number of stations considered.

Figure 61: Map and boxplot of NO_2 concentrations in 2023 - 2030 daily limit value



Note: The figure shows observed concentrations of NO2 in 2023. The map shows the 95.07 percentile of the NO2 daily mean concentrations, representing the 19th highest value in a complete series. It is related to the 2030 NO2 daily limit value, allowing 18 exceedances of the 50 µg/m³ threshold over 1 year. The last two colour categories indicate stations with concentrations above this daily limit value. Only stations with more than 75 % of valid data have been included in the map.



Note: The graph is based on the 95.07 percentile of daily mean concentration values corresponding to the 19th highest daily mean in complete ne series. For each country, the number of stations considered for 2023 (in brackets) are given. The boxplot represents the lowest (bottom of the whiske highest (top of the whisker) and average (black dot) 95.07 percentile values (in µg/m³).The rectangles mark the 25th and 75th percentiles. At 25% of the stations, levels are below the 25th percentile; at 25 % of the stations, concentrations are above the 75th percentile. The daily limit value EU legislation for 2030 is marked by the horizontal line. The graph should be read in relation to the above map, as a country's situation depends on the r of stations considered.

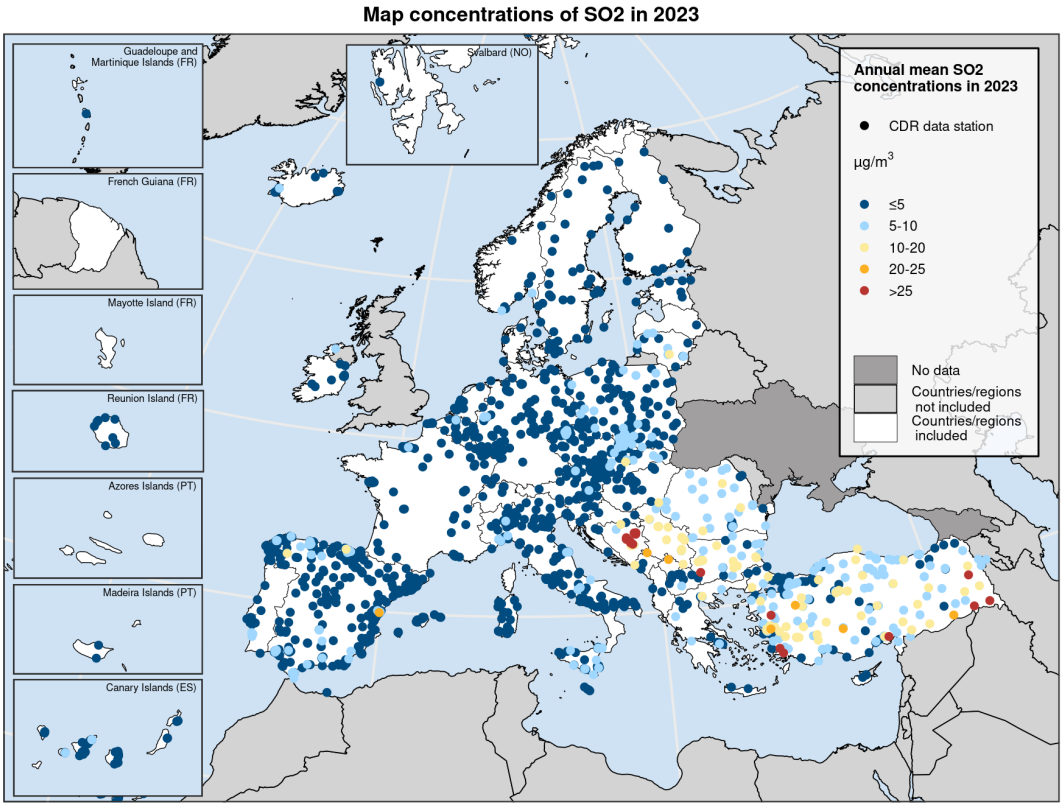
10.5 Status of SO_2 concentrations

2 of the countries in EU-27 and 4 other reporting countries (Figure 62) recorded concentrations above the 2030 EU annual limit value (20 µg/m^3). This happened in 1.8 % of all the stations measuring SO_2.

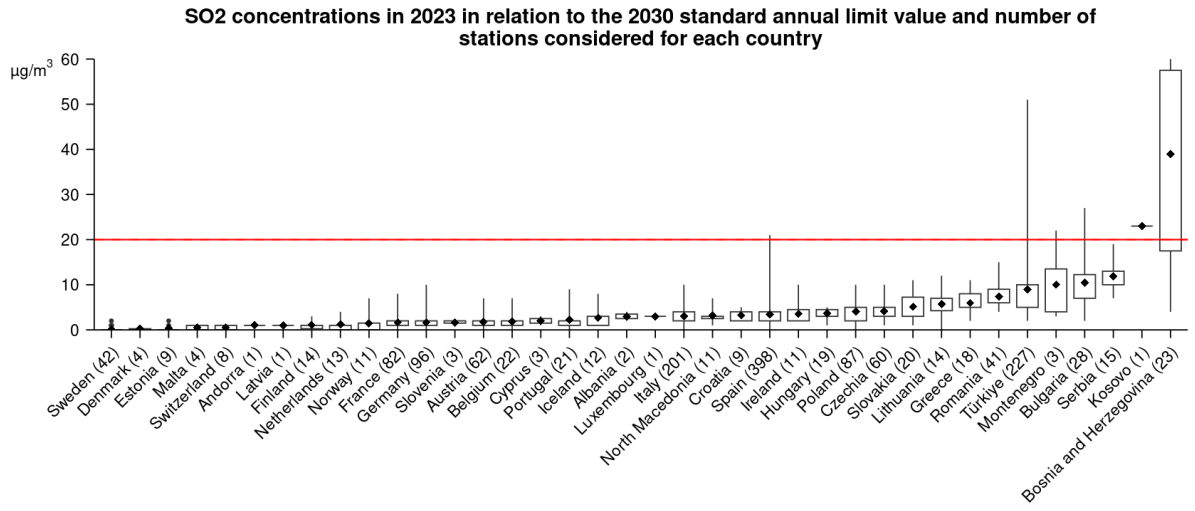
Concentrations above the 2030 EU SO_2 daily limit value (50 µg/m^3, not to be exceeded more than 18 days per year) were registered in 2 % (33 stations) of all the reporting stations in 2 of the countries in EU-27 and 4 other reporting countries (Figure 63).

Finally, concentrations above the hourly limit value (350 µg/m^3 not to be exceeden in more than 3 ocassions) were observed in 2.1 % (32 stations) of all reporting stations. They were observed in seven countries (number stations): Bosnia and Herzegovina (thirteen), Türkiye (eleven), Bulgaria (three), Serbia (two), France (one), Montenegro (one) and Norway (one).

Figure 62: Map and Boxplot of SO_2 concentrations in 2023 - 2030 annual limit value

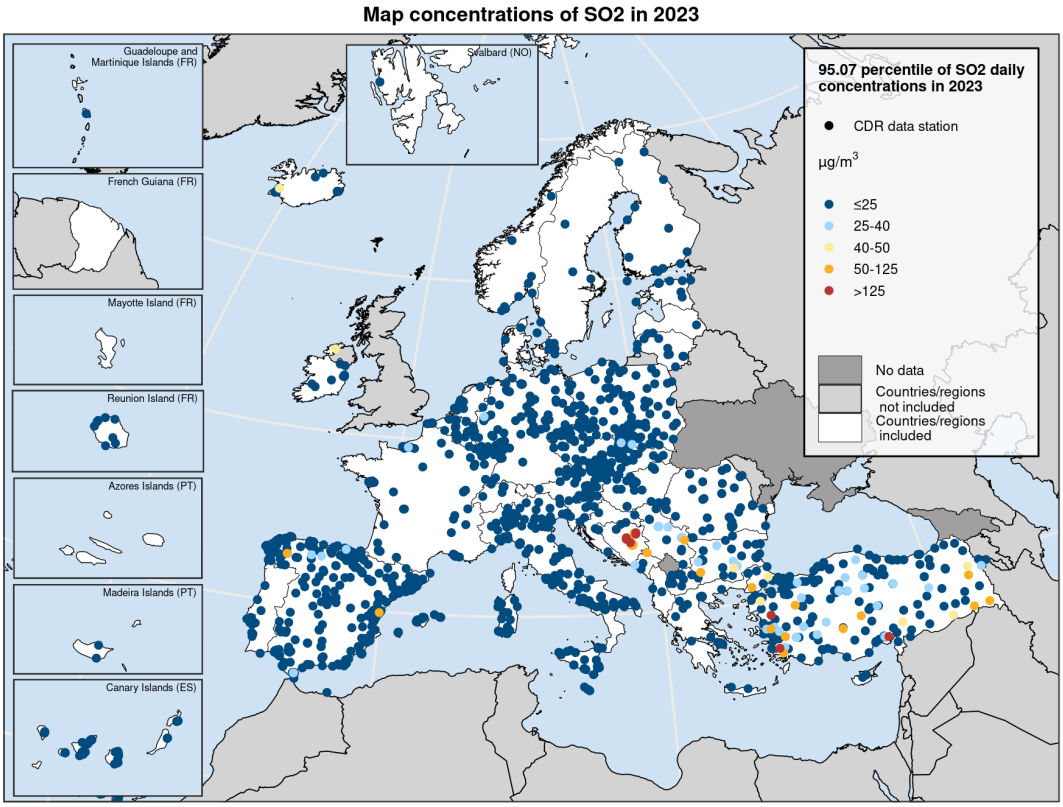


Note: Observed concentrations of SO2 in 2023. The last two colour categories indicate stations reporting concentrations above the 2030 EU annual limit value (20 µg/m³). Only stations with more than 75 % of valid data have been included in the map.

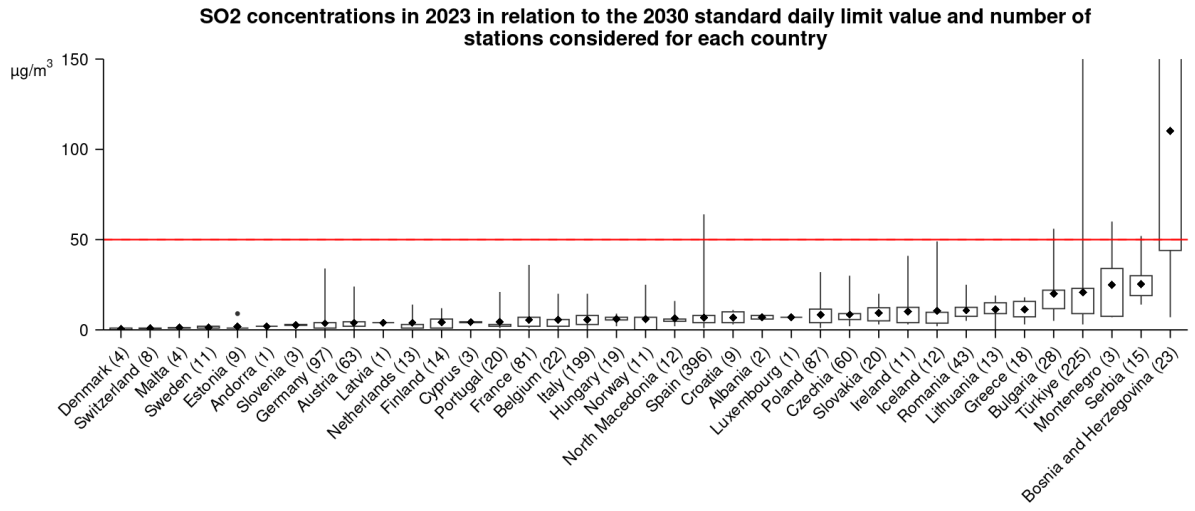


Note: The graph is based on annual mean concentration values. For each country, the number of stations considered for 2023 (in brackets) are given. The boxplot represents the lowest (bottom of the whisker), highest (top of the whisker) and average (black dot) annual mean values (in µg/m³). The rectangles mark the 25th and 75th percentiles. At 25 % of the stations, levels are below the 25th percentile; at 25 % of the stations, concentrations are above the 75th percentile. The annual limit value set by EU legislation for 2030 is marked by the continuous horizontal line. The graph should be read in relation to the above map, as a country's situation depends on the number of stations considered.

Figure 63: Map and boxplot of SO_2 concentrations in 2023 - 2030 daily limit value



Note: The figure shows observed concentrations of SO2 in 2023. The map shows the 95.07 percentile of the SO2 daily mean concentrations, representing the 19th highest value in a complete series. It is related to the 2030 SO2 daily limit value, allowing 18 exceedances of the 50 µg/m³ threshold over 1 year. The last two colour categories indicate stations with concentrations above this daily limit value. Only stations with more than 75 % of valid data have been included in the map.



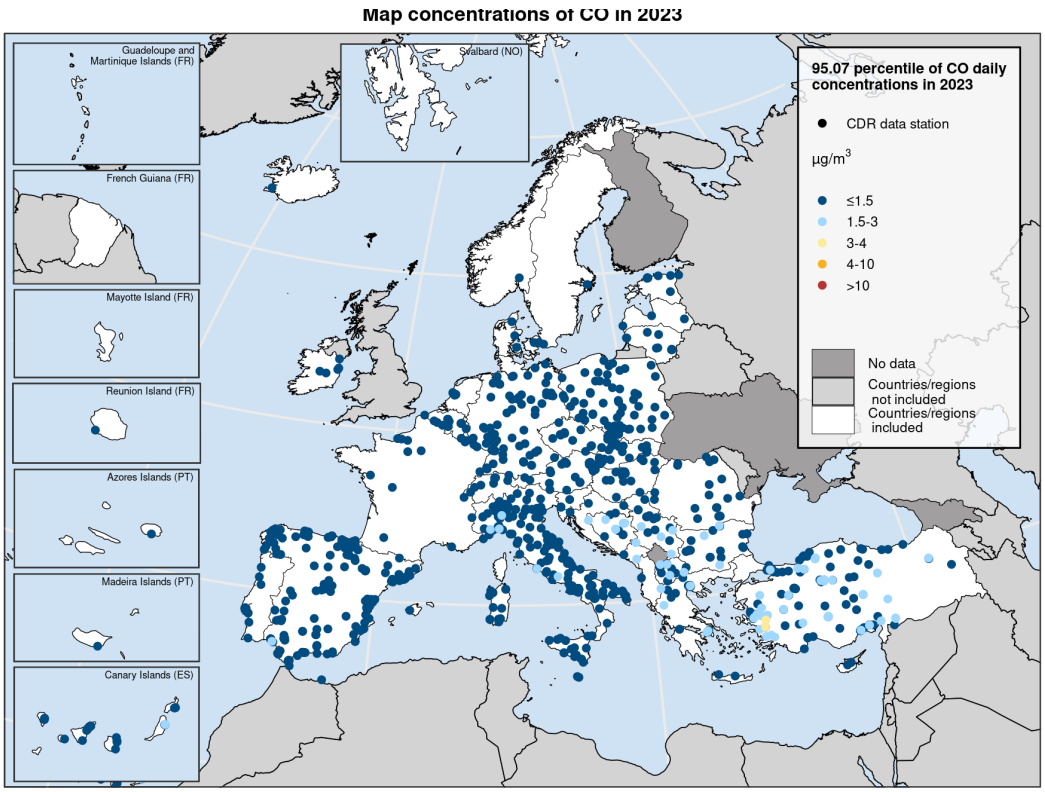
Note: The graph is based on the 95.07 percentile of daily mean concentration values corresponding to the 19th highest daily mean in complete ne series. For each country, the number of stations considered for 2023 (in brackets) are given. The boxplot represents the lowest (bottom of the whiske highest (top of the whisker) and average (black dot) 95.07 percentile values (in µg/m³).The rectangles mark the 25th and 75th percentiles. At 25% of the stations, levels are below the 25th percentile; at 25 % of the stations, concentrations are above the 75th percentile. The daily limit value set by EU legislation for 2030 is marked by the horizontal line. The graph should be read in relation to the above map, as a country's situation depends on the number of stations considered.

10.6 Status of CO concentrations

The 2030 EU maximum daily 8-hour mean limit value is the same as the current one and therefore the situation has already been described in chapter 7.2.

0 % (0 stations) in none of the countries in EU-27 and 0 other reporting countries reported concentrations above de 2030 EU daily limit value (4 mg/m^3) (Figure 64).

Figure 64: Map of CO concentrations in 2023 - 2030 daily limit value

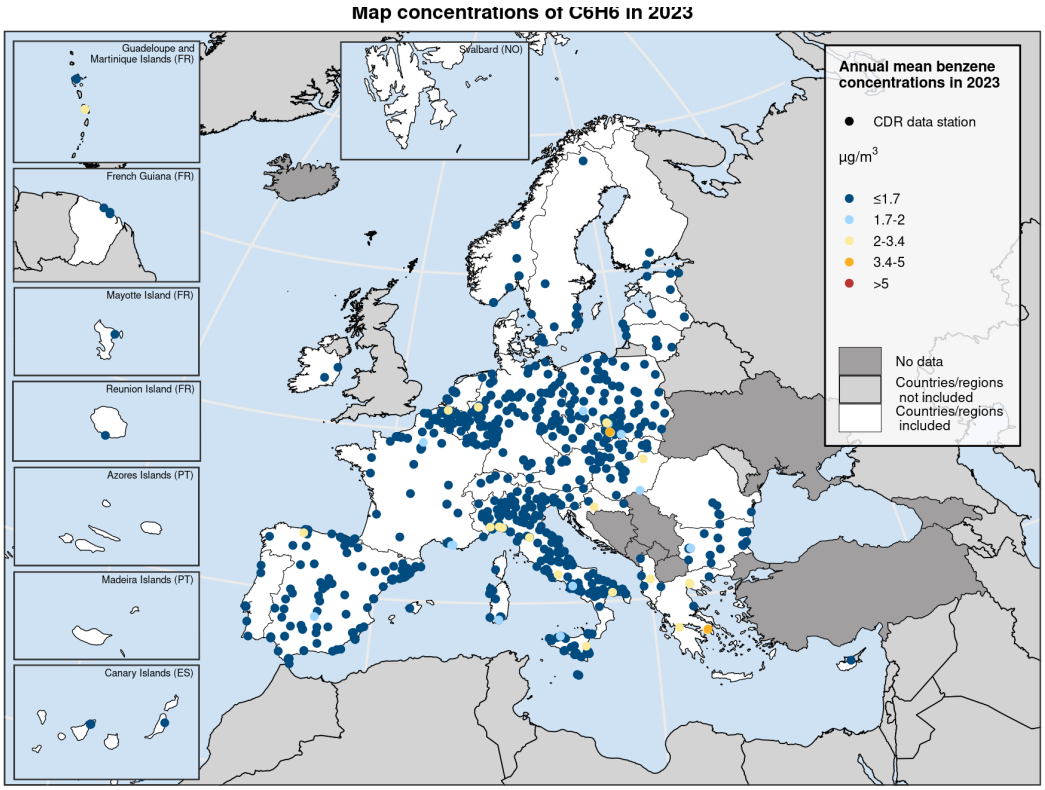


Note: Observed concentrations of CO in 2023. The map shows the 95.07 percentile of the CO daily mean concentrations, representing the 19th highest value in a complete series. It is related to the 2030 CO daily limit value, allowing 18 exceedances of the 4 mg/m³threshold over 1 year. The last two colour categories indicate stations with concentrations above this daily limit value. Only stations with more than 75 % of valid data have been included in the map.

10.7 Status of C_6H_6 concentrations

2 of the countries in EU-27 and none other reporting countries (Figure 65) recorded concentrations above the 2030 EU annual limit value (3,4 µg/m^3). This happened in 0.4 % of all the stations measuring C_6H_6.

Figure 65: Map of C6H6 concentrations in 2023 - 2030 annual limit value



Note: Observed concentrations of C6H6 in 2023. The last two colour categories correspond to values above the 2030 EU annual limit value. Only stations with more than 75 % of valid data have been included in the map.

10.8 Status of other pollutants concentrations

For BaP, the 2030 EU annual limit value is 1,0 ng/m^3. Please see the analysis against that value at chapter 6.

The 2030 EU annual limit value for Pb remains unchanged from the value currently in force under Directive 2008/50/EC. Therefore, please refer to chapter 7 for this analysis.

Similarly, for As, Cd and Ni, the 2030 EU limit values are the same as the current target values. Therefore, please refer to chapter 7 for this analysis.

References

EEA (2020). Air quality in Europe–2020 report. *EEA Report No 9/2020*, https://www.eea.europa.eu/publications/air-quality-in-europe–2020.

EU (2004). Directive 2004/107/EC of the European Parliament and of the Council of 15 December 2004 relating to arsenic, cadmiu, mercury, nickel and polycyclic aromatic hydrocarbons in ambient air. *OJ L 23, 26.1.2005, p. 3–16*.

EU (2008). Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe. *OJ L 152, 11.6.2008, pp. 1–44*.

EU (2011). Commission Implementing Decision No 2011/850/EU of 12 December 2011 laying down rules for Directives 2004/107/EC and 2008/50/EC of the European Parliament and of the Council as regards the reciprocal exchange of information and reporting on ambient air quality. *OJ L 335, 17.12.2011, pp. 86–106*.

EU (2024). Directive (EU) 2024/2881 of the European Parliament and of the Council of 23 October 2024 on ambient air quality and cleaner air for Europe.

WHO (2000). Air quality guidelines for Europe, *World Health Organization, Regional Office for Europe, Copenhagen*.

WHO (2006). Air quality guidelines: Global update 2005 — Particulate matter, ozone, nitrogen dioxide and sulphur dioxide, *World Health Organization, Regional Office for Europe, Copenhagen*.

WHO (2021). WHO global air quality guidelines. Particulate matter (PM2.5 and PM10), ozone, nitrogen dioxide, sulfur dioxide and carbon monoxide. *World Health Organization, Geneva*.

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