LIFE 15 IPE IT 013

Fondazione Lombardia per l'Ambiente

PREPAIR - action E 5
Air pollution in Europe and in the Po valley

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Lombardy Foundation for the Environment

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www.eea.europa.eu/publications/air-quality-in-europe-2019

EU air quality standards

Table 4.1 Air quality standards for the protection of health, as given in the EU Ambient Air Quality Directives

Pollutant	Averaging period	Legal nature and concentration	Comments
PM_{10}	1 day	Limit value: 50 µg/m³	Not to be exceeded on more than 35 days per year
	Calendar year	Limit value: 40 µg/m³	
$PM_{2.5}$	Calendar year	Limit value: 25 µg/m³	
		Exposure concentration obligation: 20 µg/m³	Average Exposure Indicator (AEI) (a) in 2015 (2013-2015 average)
		National Exposure reduction target: 0-20 % 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/m³	Not to be exceeded on more than 25 days/year, averaged over 3 years (b)
		Long term objective: 120 µg/m³	
	1 hour	Information threshold: 180 µg/m³	
		Alert threshold: 240 µg/m³	
NO_2	1 hour	Limit value: 200 µg/m³	Not to be exceeded on more than 18 hours per year
		Alert threshold: 400 µg/m³	To be measured over 3 consecutive hours over 100 km² or an entire zone
	Calendar year	Limit value: 40 µg/m³	
BaP	Calendar year	Target value: 1 ng/m³	Measured as content in PM_{10}
SO_2	1 hour	Limit value: 350 µg/m³	Not to be exceeded on more than 24 hours per year
		Alert threshold: 500 µg/m³	To be measured over 3 consecutive hours over 100 km² or an entire zone
	1 day	Limit value: 125 µg/m³	Not to be exceeded on more than 3 days per year
CO	Maximum daily 8-hour mean	Limit value: 10 mg/m³	
C_6H_6	Calendar year	Limit value: 5 µg/m³	
Pb	Calendar year	Limit value: 0.5 µg/m³	Measured as content in PM_{10}
As	Calendar year	Target value: 6 ng/m³	Measured as content in PM_{10}
Cd	Calendar year	Target value: 5 ng/m³	Measured as content in PM_{10}
Ni	Calendar year	Target value: 20 ng/m³	Measured as content in PM_{10}

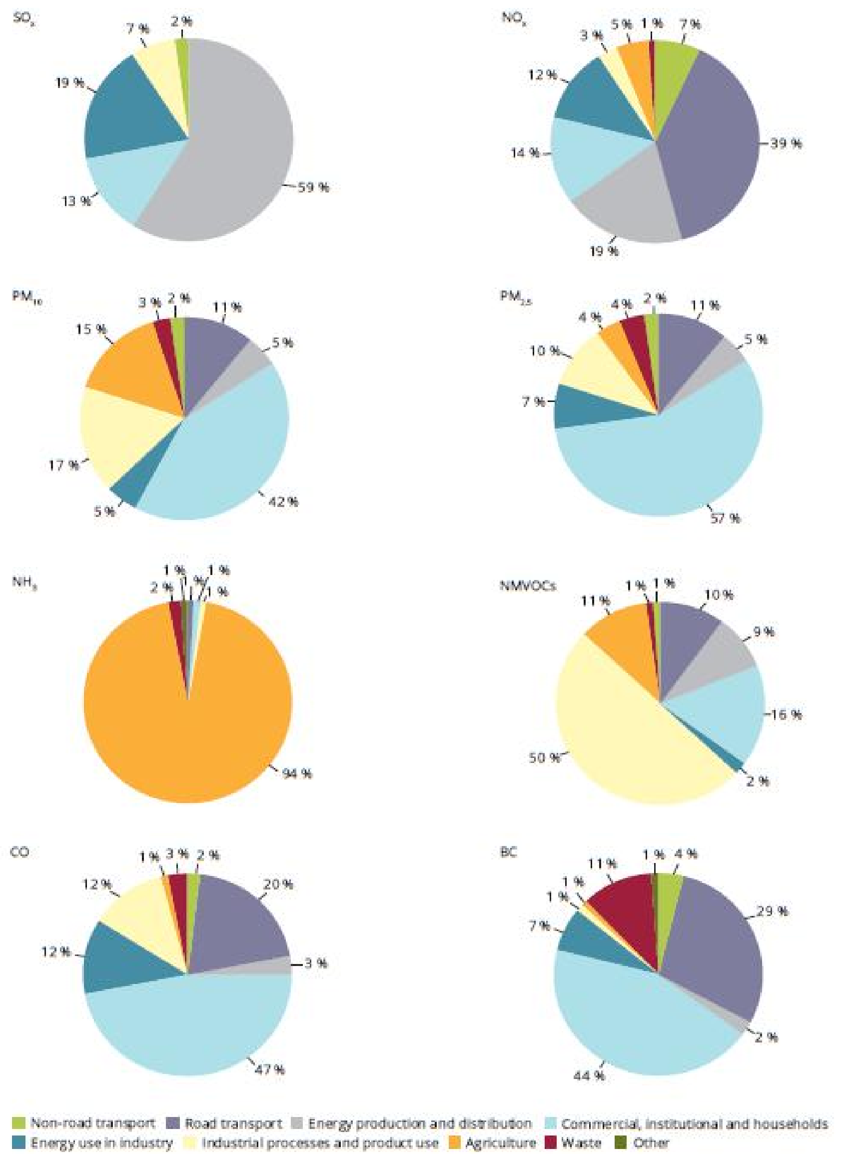
WHO air quality guidelines

Table 4.2 WHO air quality guidelines (AQG) and estimated reference levels (RL) ([a])

Pollutant	Averaging period	AQG	RL	Comments
PM_{10}	1 day	50 μg/m³		99th percentile (3 days per year)
	Calendar year	20 μg/m³		
$PM_{2.5}$	1 day	25 μg/m³		99th percentile (3 days per year)
	Calendar year	10 μg/m³		
O_3	Maximum daily 8-hour mean	100 μg/m³		
NO_2	1 hour	200 μg/m³		
	Calendar year	40 μg/m³		
BaP	Calendar year		0.12 ng/m³	
SO_2	10 minutes	500 μg/m³		
	1 day	20 μg/m³		
CO	1 hour	30 mg/m³		
	Maximum daily 8-hour mean	10 mg/m³		
C_6H_6	Calendar year		1.7 μg/m³	
Pb	Calendar year	0.5 μg/m³		
As	Calendar year		6.6 ng/m³	
Cd	Calendar year	5 ng/m³ ([b])		
Ni	Calendar year		25 ng/m³	

Pollutant emissions by sector

Figure 2.4 **Contribution to EU-28 emissions from main source sectors in 2015 of SO_X, NO_X, PM_{10}, $PM_{2.5}$, NH_3, NMVOCs, CO and BC**

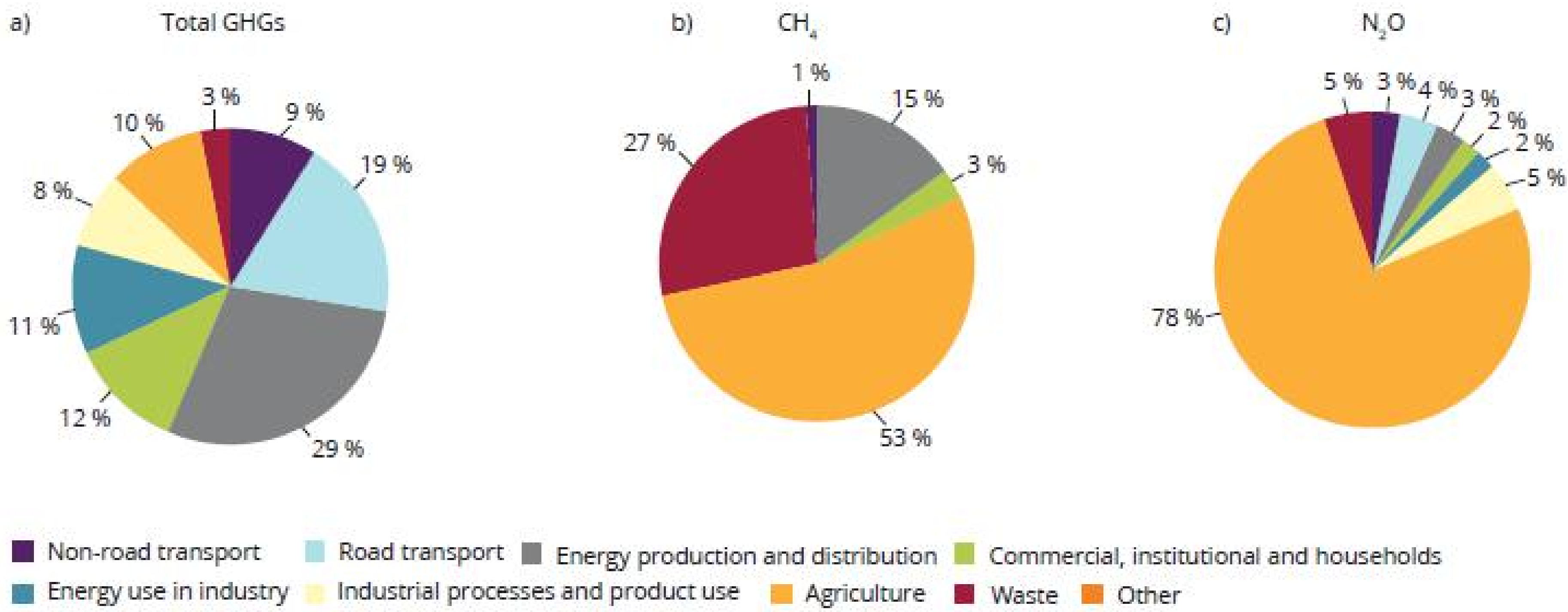


Note: For CH_4, please see Figure 3.4.

Sources: EEA, 2017c, 2017e.

GHGs by sector

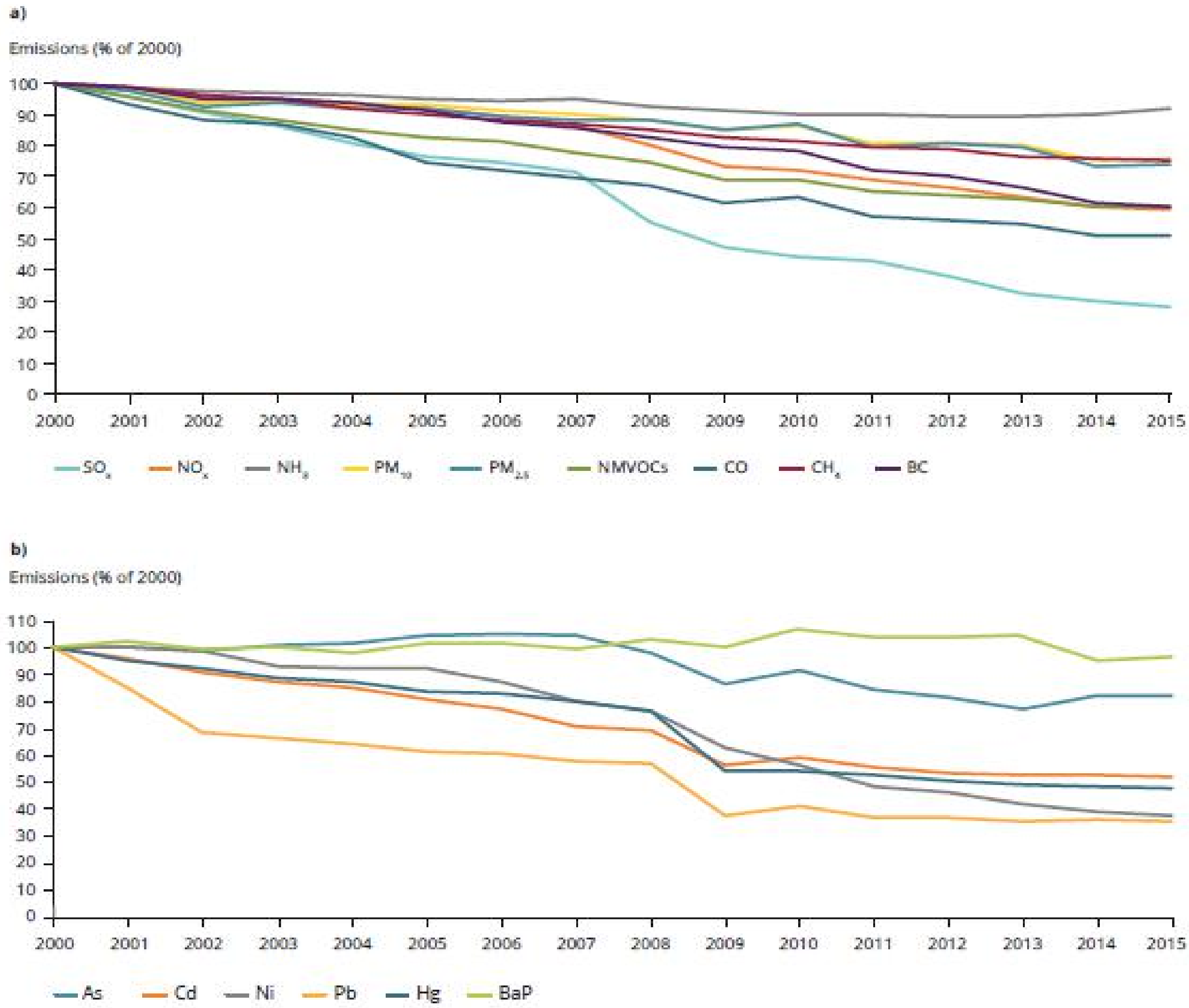
Figure 3.2 **Sectoral contribution to the total EU-28 emissions in 2015: ([a]) GHGs (CO_2-eq), ([b]) CH_4, and ([c]) N_2O**



Source: EEA, 2017e.

Emissions trend

Figure 2.1 **Development in EU-28 emissions, 2000-2015 (% of 2000 levels): ([a]) SO_X, NO_X, NH_3, PM_{10}, $PM_{2.5}$, NMVOCs, CO, CH_4 and BC; ([b]) As, Cd, Ni, Pb, Hg and BaP**

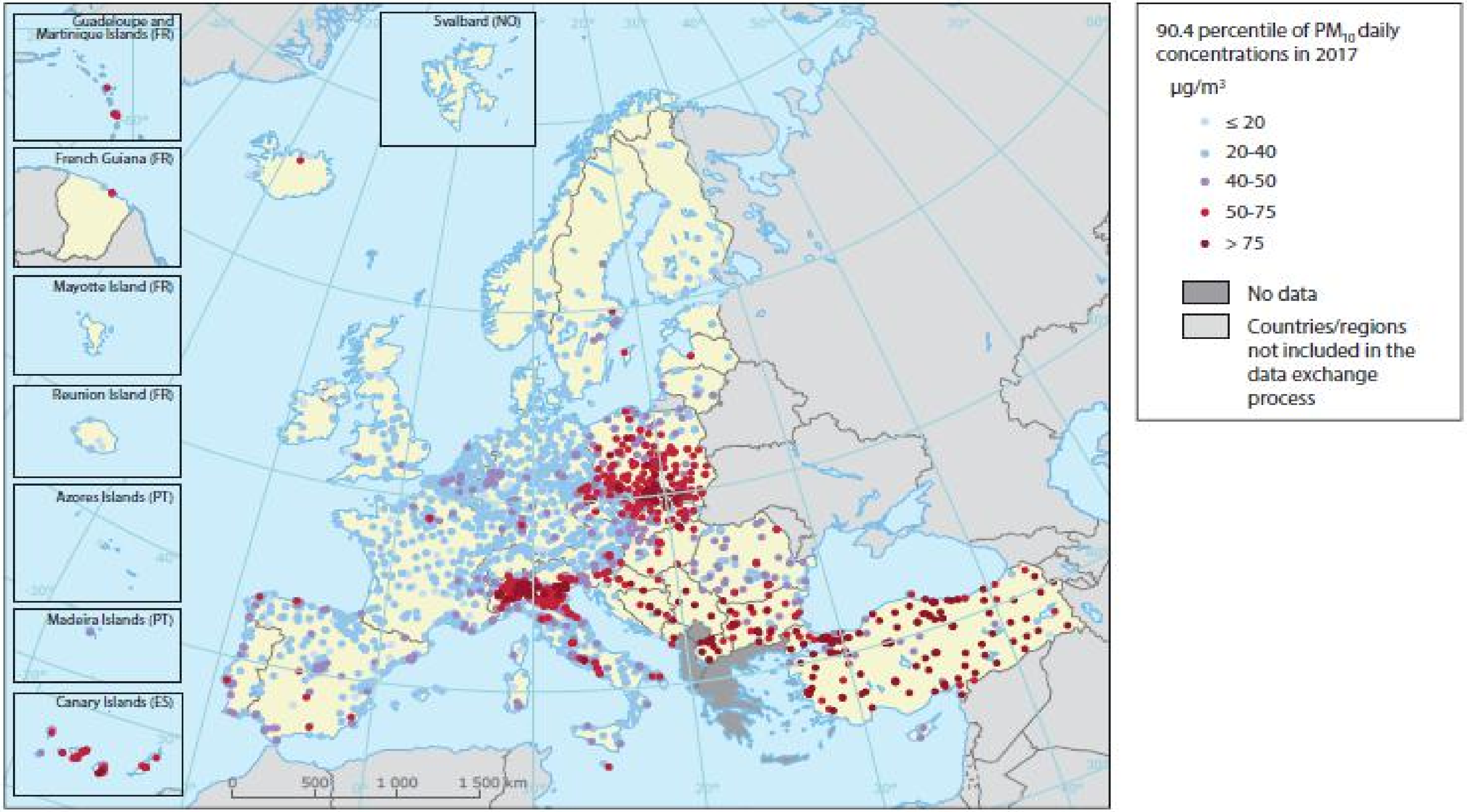


Notes: CH_4 emissions are total emissions (Integrated Pollution Prevention and Control sectors 1-7) excluding sector 5: Land use, land-use change and forestry. The present emission inventories include only anthropogenic VOCs emissions. Under the CLRTAP Gothenburg Protocol, parties are encouraged to report emissions of BC, one of the constituents of PM. It means that reporting on BC emissions has been voluntary and has not been compulsory for every country.

Sources: EEA, 2017c, 2017e.

PM 10 daily limit value 2017

Map 3.1 **Concentrations of PM_{10}, 2017 — daily limit value**

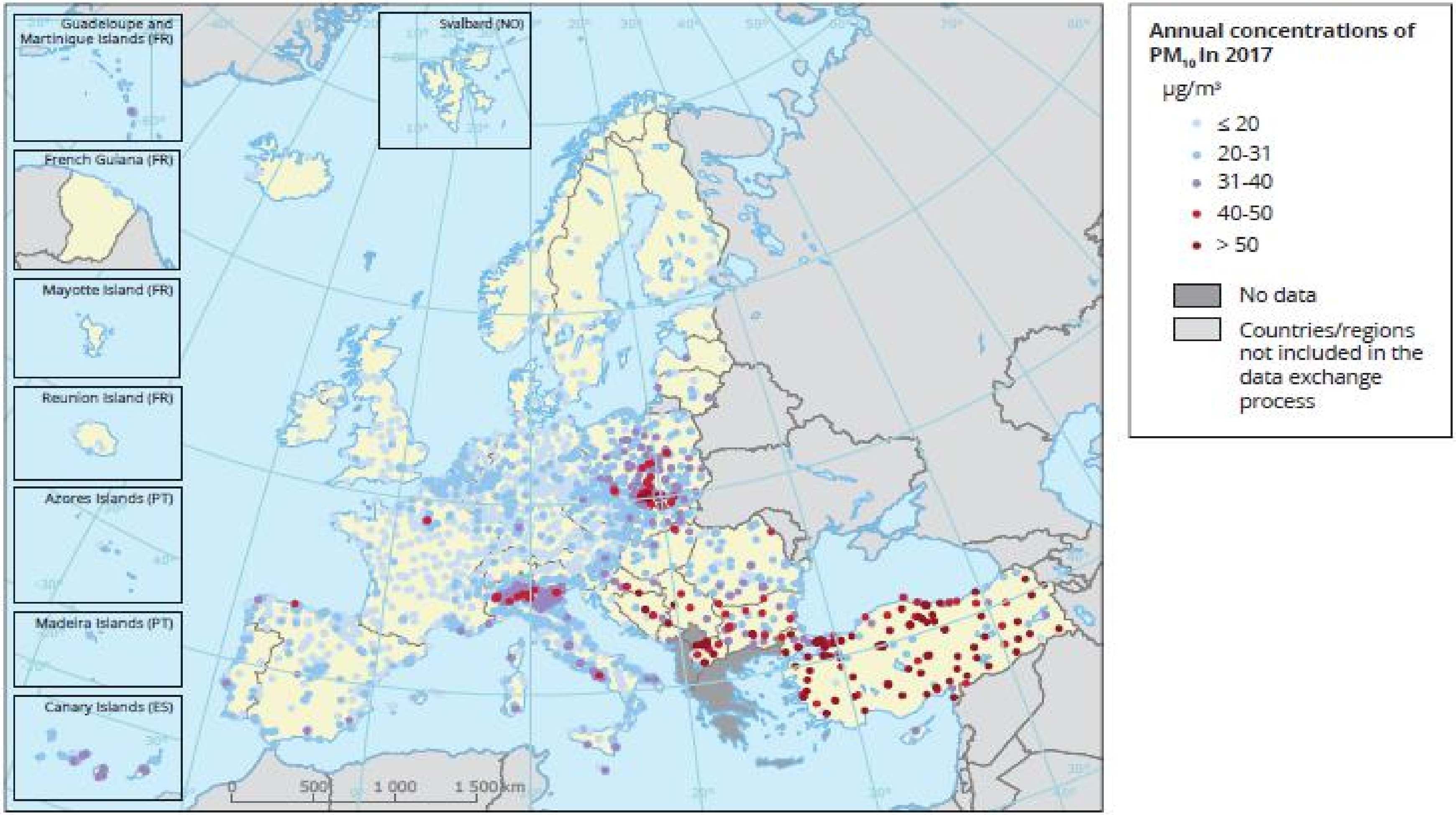


Note: Observed concentrations of PM_{10} in 2017. The possibility of subtracting contributions to the measured concentrations from natural sources and winter road sanding/salting has not been considered. The map shows the 90.4 percentile of the PM_{10} daily mean concentrations, representing the 36th highest value in a complete series. It is related to the PM_{10} daily limit value, allowing 35 exceedances of the 50 µg/m³ threshold over 1 year. Dots in 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.

Source: EEA, 2019c.

PM 10 annual limit value 2017

Map 3.2 **Concentrations of PM_{10}, 2017 — annual limit value**

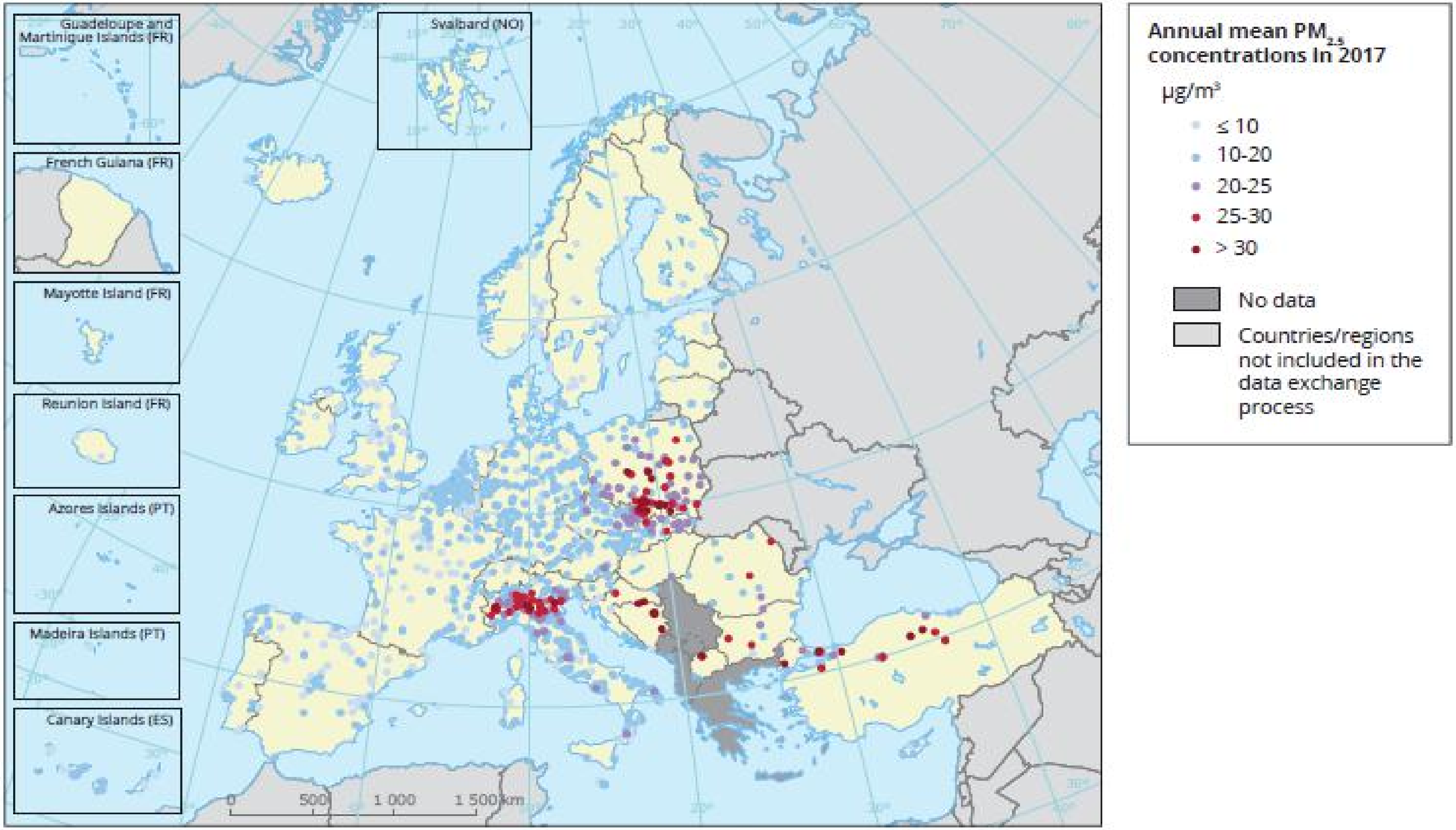


Note: Observed concentrations of PM_{10} in 2017. The possibility of subtracting contributions to the measured concentrations from natural sources and winter road sanding/salting has not been considered. Dots in the last two colour categories indicate stations reporting concentrations above the EU annual limit value (40 µg/m³). Dots in the first colour category indicate stations reporting values below the WHO AQG for PM_{10} (20 µg/m³). Only stations with more than 75 % of valid data have been included in the map.

Source: EEA, 2019c.

PM 2.5 annual limit value 2017

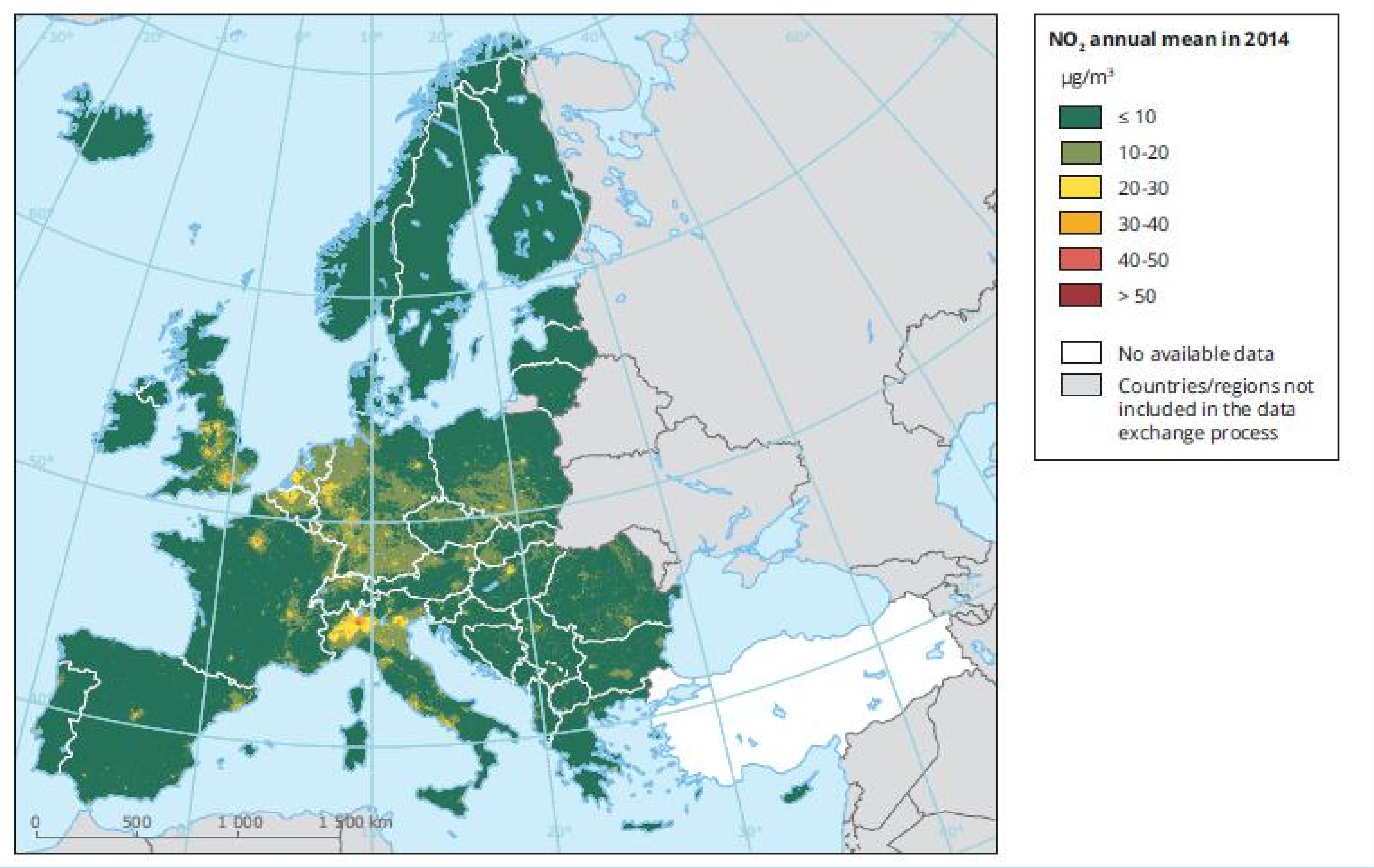
Map 3.3 **Concentrations of $PM_{2.5}$, 2017 — annual limit value**



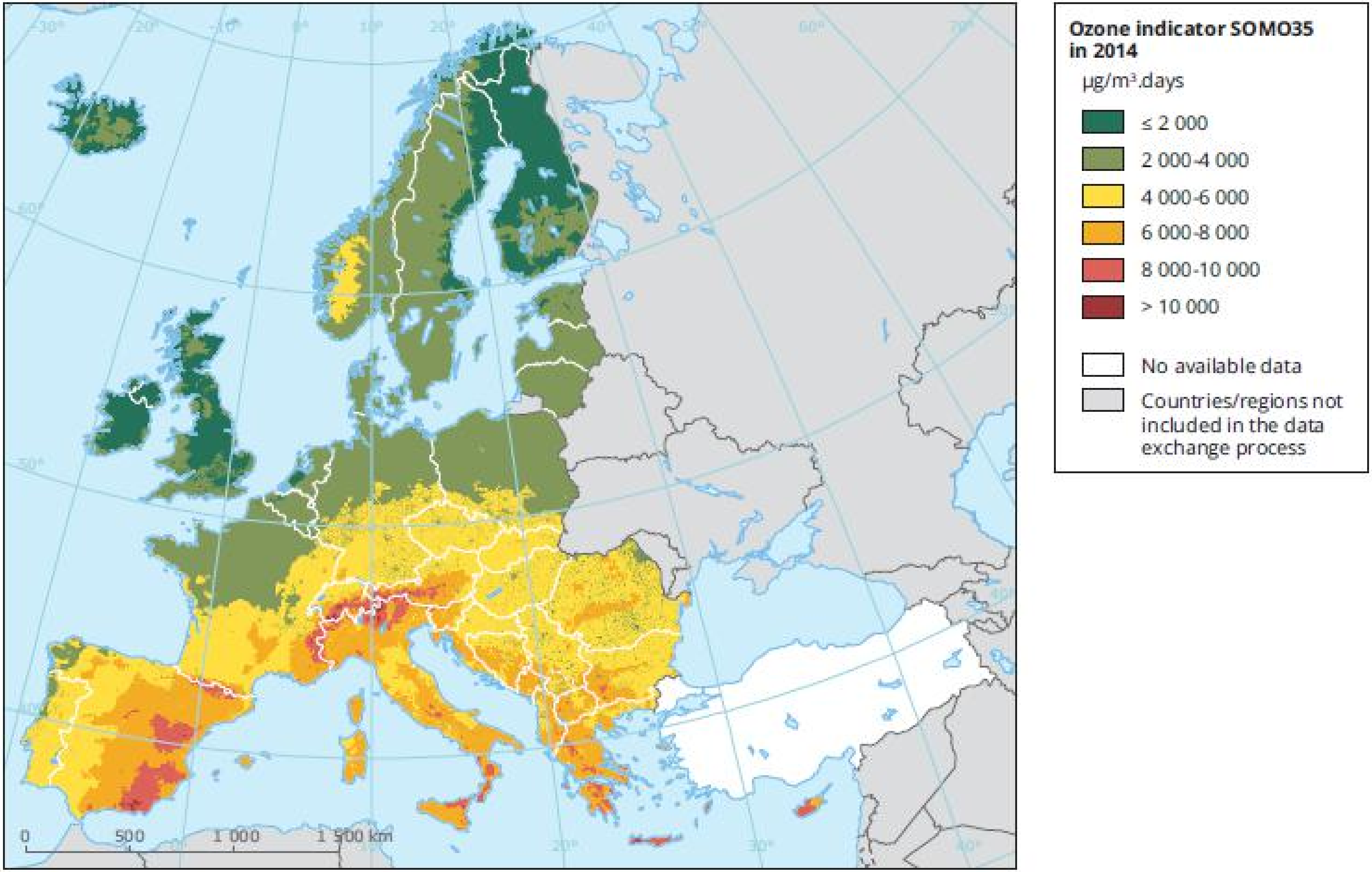
Note: Observed concentrations of $PM_{2.5}$ in 2017. The possibility of subtracting contributions to the measured concentrations from natural sources and winter road sanding/salting has not been considered. Dots in the last two colour categories indicate stations reporting concentrations above the EU annual limit value (25 μg/m³). Dots in the first colour category indicate stations reporting values below the WHO AQG for $PM_{2.5}$ (10 μg/m³). Only stations with more than 75 % of valid data have been included in the map.

Source: EEA, 2019c.

NO_2 annual mean 2014



Ozone SOMO35 2014



Population exposed to air pollutants

Table ES.1 Percentage of the urban population in the EU-28 exposed to air pollutant concentrations above certain EU and WHO reference concentrations (minimum and maximum observed between 2013 and 2015)

Pollutant	EU reference value ([a])	Exposure estimate (%)	WHO AQG ([a])	Exposure estimate (%)
$PM_{2.5}$	Year (25)	7-8	Year (10)	82-85
PM_{10}	Day (50)	16-20	Year (20)	50-62
O_3	8-hour (120)	7-30	8-hour (100)	95-98
NO_2	Year (40)	7-9	Year (40)	7-9
BaP	Year (1)	20-25	Year (0.12) RL	85-91
SO_2	Day (125)	< 1	Day (20)	20-38

Key				
	< 5 %	5-50 %	50-75 %	> 75 %

Premature deaths 2014

Table 10.1 Premature deaths attributable to $PM_{2.5}$ (a), NO_2 (a) and O_3 exposure in 41 European countries and the EU-28, 2014

		$PM_{2.5}$			NO_2			O_3	
Country	Population (1 000)	Annual mean (a)	Premature deaths (a)		Annual mean (a)	Premature deaths (a)		SOMO35 (a)	Premature deaths
			$C_0 = 0$	$C_0 = 2.5$		$C_0 = 20$	$C_0 = 10$		
Austria	8 507	12.9	5 570	4 520	19.2	1 140	3 630	4 423	260
Belgium	11 181	13.7	8 340	6 860	21.9	1 870	6 470	2 297	190
Bulgaria	7 246	24	13 620	12 280	16.5	740	3 570	2 519	200
Croatia	4 247	15.6	4 430	3 750	15.7	300	1 650	4 503	180
Cyprus	1 172 (d)	17	600	518	12.8	20	130	5 426	30
Czech Republic	10 512	18.6	10 810	9 430	16.8	550	3 640	3 822	310
Denmark	5 627	11.6	3 470	2 740	11	130	790	2 611	110
Estonia	1 316	8.7	750	540	9	10	130	1 991	20
Finland	5 451	7.4	2 150	1 440	8.3	40	450	1 615	60
France	63 798	11	34 880	27 170	17.7	9 330	23 420	3 786	1 630
Germany	80 767	13.4	66 080	54 180	20.2	12 860	44 960	3 287	2 220
Greece	10 927	17	11 870	10 190	14.9	1 660	4 280	5 926	570
Hungary	9 877	17.3	11 970	10 310	17.1	1 210	4 560	3 620	350
Ireland	4 606	9	1 480	1 070	6.1	10	160	868	20
Italy	60 783	15.8	59 630	50 550	22.5	17 290	42 480	5 569	2 900
Latvia	2 001	14.1	2 190	1 810	12.3	60	530	2 213	50
Lithuania	2 943	15.5	3 350	2 830	12.5	60	700	2 457	70
Luxembourg	550	11.9	230	190	19.9	40	180	2 872	10
Malta	425	12	220	180	16	10	100	6 946	20
Netherlands	16 829	13.8	11 200	9 240	21.9	2 560	8 610	2 244	250
Poland	38 018	23	46 020	41 300	15.1	1 700	10 200	3 425	970
Portugal	9 919	8.7	5 170	3 710	13.7	610	2 640	3 519	280
Romania	19 947	17.5	23 960	20 680	16.5	1 860	8 430	1 842	350
Slovakia	5 416	19.1	5 160	4 520	15.2	100	1 330	4 344	160
Slovenia	2 061	15.1	1 710	1 440	15	60	570	5086	80
Spain	44 229	10.7	23 180	17 910	19.9	6 740	19 470	5 436	1 600
Sweden	9 645	7.6	3 710	2 510	9.9	130	990	2 318	150
United Kingdom	64 351	11.6	37 600	29 730	22.2	14 050	35 250	1 337	590
Andorra	77	10	40	30	15	< 1	20	6 692	< 5
Albania	2 896	16.5	1 670	1 430	14.8	90	500	4 376	60

Years of Life Lost 2014

Table 10.2 Years of life lost (YLL) attributable to $PM_{2.5}$ ([a]), NO_2 ([a]) and O_3 exposure in 41 European countries and the EU-28, 2014

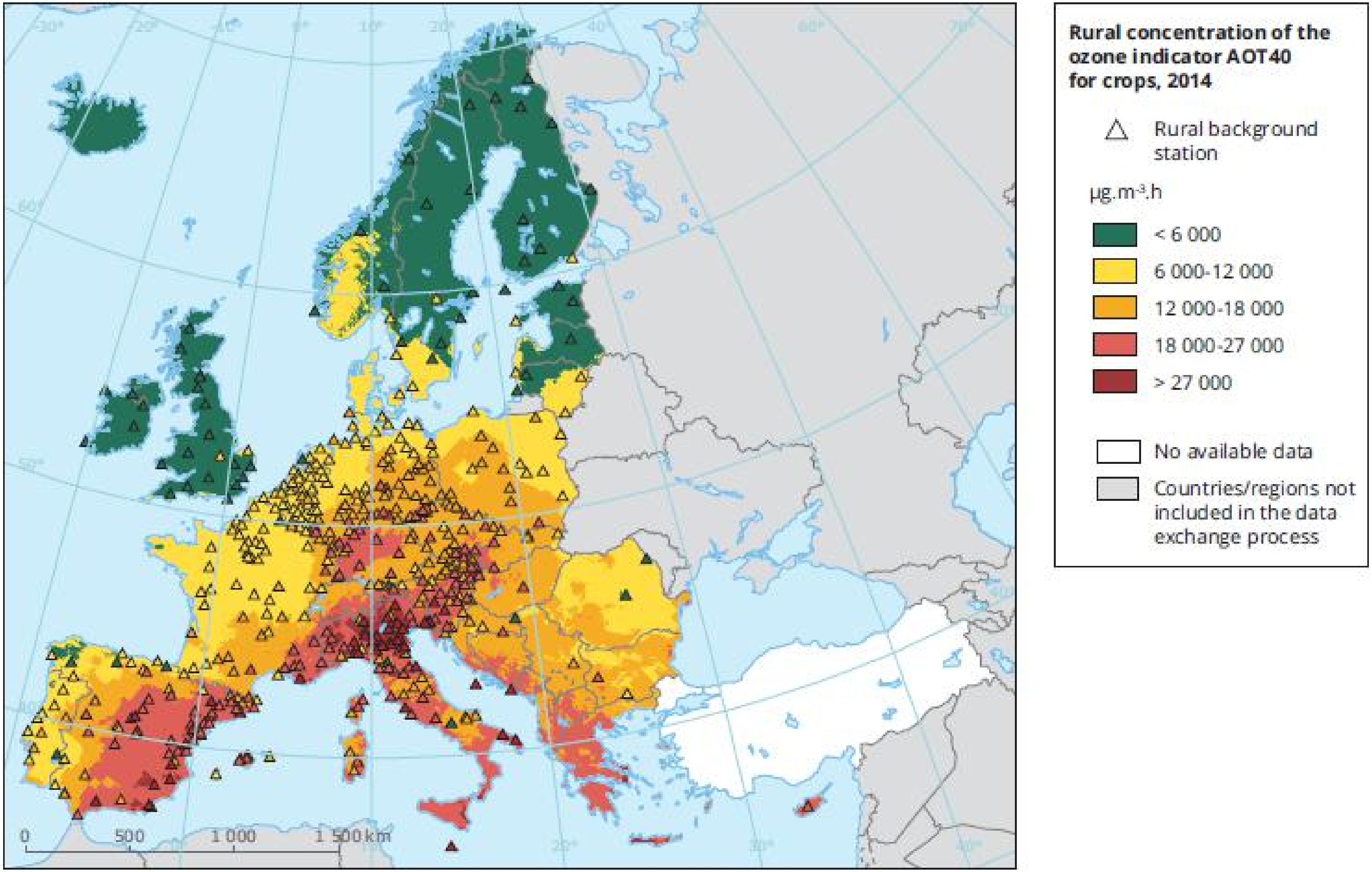
Country	$PM_{2.5}$, C_0 = 0 µg/m³		$PM_{2.5}$, C_0 = 2.5 µg/m³		NO_2 (C_0 = 20)		NO_2 (C_0 = 10)		O^3	
	YLL	YLL/ 10^5 inhab.	YLL	YLL/ 10^5 inhab.	YLL	YLL/ 10^5 inhab.	YLL	YLL/ 10^5 inhab.	YLL	YLL/ 10^5 inhab.
Austria	58 400	687	47 400	557	12 000	141	38 032	447	2 800	32
Belgium	86 000	769	70 800	633	19 300	172	66 695	597	2 000	18
Bulgaria	135 700	1 873	122 400	1 689	7 300	101	35 574	491	2 000	28
Croatia	43 900	1 035	37 200	875	3 000	71	16 415	387	1 800	41
Cyprus	6 300	537	5 400	461	170	15	1 388	118	280	24
Czech Republic	116 100	1 105	101 300	964	5 900	56	39 136	372	3 300	32
Denmark	37 800	672	29 900	531	1 500	26	8 601	153	1 200	21
Estonia	8 000	605	5 700	434	120	9	1 376	105	250	19
Finland	22 500	412	15 000	275	390	7	4734	87	660	12
France	389 600	611	303 500	476	104 200	163	261 601	410	18 200	29
Germany	687 700	851	563 900	698	133 800	166	467 917	579	23 100	29
Greece	117 500	1 075	100 900	924	16 400	150	42 353	388	5 700	52
Hungary	129 400	1 310	111 400	1 128	13 100	133	49 301	499	3 800	38
Ireland	16 800	365	12 200	265	170	4	1812	39	220	5
Italy	622 400	1 024	527 700	868	180 500	297	443 439	730	30 300	50
Latvia	22 800	1 137	18 900	943	580	29	5 544	277	490	24
Lithuania	33 100	1 125	28 000	950	580	20	6 933	236	730	25
Luxembourg	2 600	467	2 000	372	440	81	1 922	350	80	15
Malta	2 300	546	1 900	435	140	32	1 069	251	180	43
Netherlands	121 700	723	100 400	597	27 800	165	93 549	556	2 700	16
Poland	553 100	1 455	496 300	1 306	20 400	54	122 600	322	11 700	31
Portugal	52 400	529	37600	379	6 200	62	26 772	270	2 900	29
Romania	251 100	1 259	216 700	1 087	19 500	98	88 381	443	3 700	18
Slovakia	58 400	1 077	51 100	943	1 200	21	15 039	278	1 800	34
Slovenia	18 700	907	15 700	762	700	34	6 259	304	870	42
Spain	244 700	553	189 100	427	71 100	161	205 474	465	16 800	38
Sweden	36 200	375	24 400	253	1 300	14	9 616	100	1 500	15
United Kingdom	403 800	627	319 300	496	150 800	234	378 579	588	6 300	10
Andorra	430	558	320	422	< 1	< 1	198	258	40	50

Air pollution and ecosystems

Table 11.1 Air quality standards, for the protection of vegetation, as given in the EU Ambient Air Quality Directive and the CLRTAP

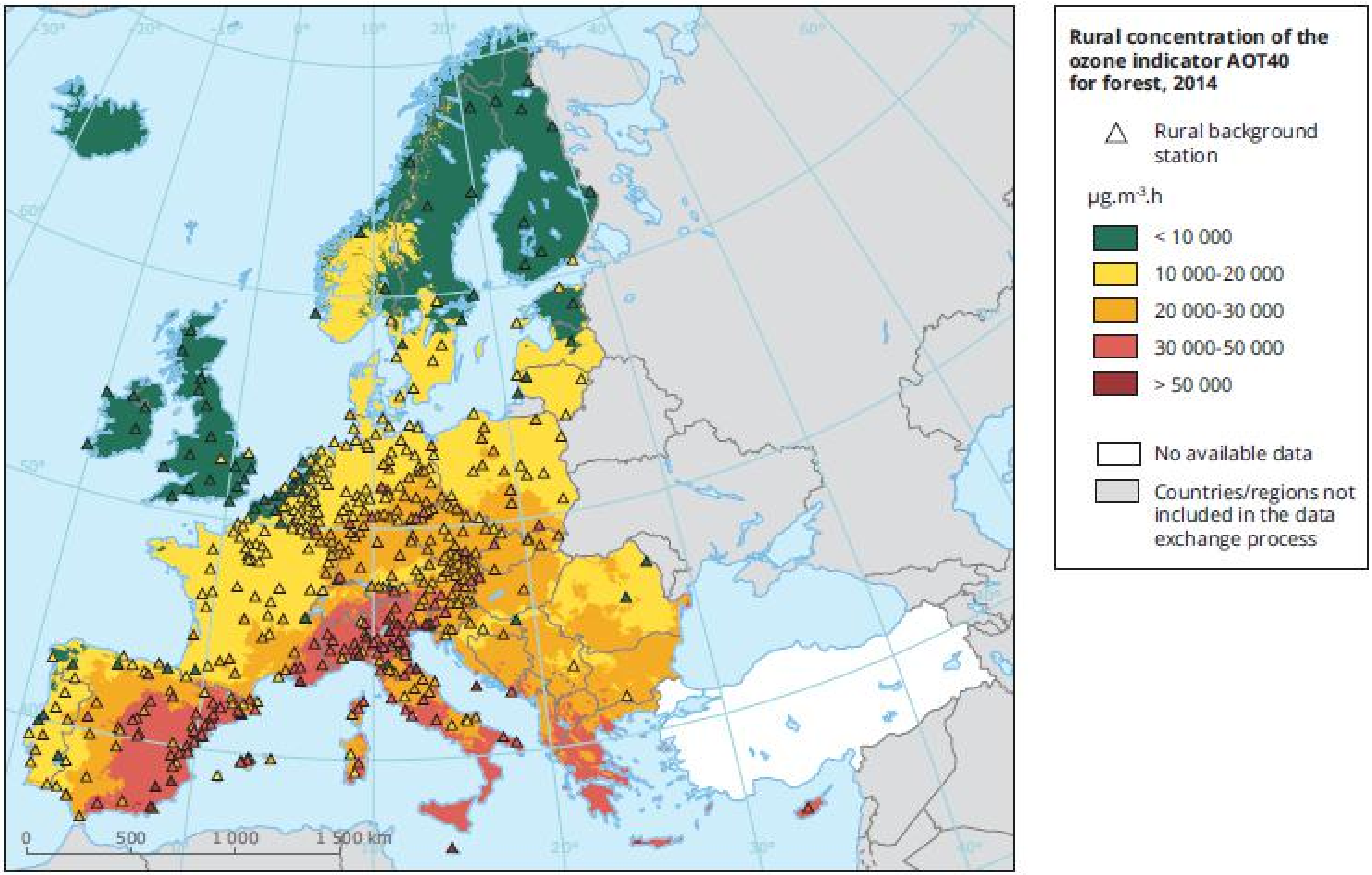
Pollutant	Averaging period	Legal nature and concentration	Comments
O_3	AOT40 ([a]) accumulated over May to July	Target value, 18 000 μg/m³ .hours	Averaged over 5 years ([b])
		Long-term objective, 6 000 μg/m³ .hours	
	AOT40 ([a]) accumulated over April to September	Critical level for the protection of forests: 10 000 μg/m³ .hours	Defined by the CLRTAP
NO_X	Calendar year	Vegetation critical level: 30 μg/m³	
SO_2	Winter	Vegetation critical level: 20 μg/m³	1 October to 31 March
	Calendar year	Vegetation critical level: 20 μg/m³	

Ozone AOT40 crops



Source: ETC/ACM (2017b).

Ozone AOT40 - forests



Source: ETC/ACM, 2017b.


SUSTAINABLE DEVELOPMENT GOALS
1 NO POVERTY
2 ZERO HUNGER
3 GOOD HEALTH AND WELL-BEING
4 QUALITY EDUCATION
5 GENDER EQUALITY
6 CLEAN WATER AND SANITATION
7 AFFORDABLE AND CLEAN ENERGY
8 DECENT WORK AND ECONOMIC GROWTH
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE
10 REDUCED INEQUALITIES
11 SUSTAINABLE CITIES AND COMMUNITIES
12 RESPONSIBLE CONSUMPTION AND PRODUCTION
13 CLIMATE ACTION
14 LIFE BELOW WATER
15 LIFE ON LAND
16 PEACE, JUSTICE AND STRONG INSTITUTIONS
17 PARTNERSHIPS FOR THE GOALS
SUSTAINABLE DEVELOPMENT GOALS

Air quality and UN SDGs

Figure 1.1 How air pollution relates to the UN Sustainable Development Goals

Reducing air pollution can help families become healthier, save on medical expenses, and improve productivity.

Air pollution can cause crop damage and affect food quality and security.

Air pollution poses a major threat to human health. It is linked to respiratory infection and cardiovascular disease. It causes increases in population morbidity and mortality.

Pollutants such as sulfur dioxide (SO_2) and nitrogen oxides (NO_x) from open fires and the combustion of fossil fuels mix with precipitation causing harmful acid rain that can compromise water quality.

Electricity from renewable energy rather than fossil fuels offers significant public health benefits through a reduction in air pollution.

Air pollution impacts on health, crop and forest yields, ecosystems, the climate and the built environment, with consequences for productivity and economic growth. Ambient and indoor air pollution also has negative effects on the working environment and its safety.

Power generation, industry and transportation are large contributors to air pollution. A new focus on decreasing energy consumption and on improving sustainable and public transportation could progressively reduce pollution.

Urban areas significantly contribute to air pollution. Making cities sustainable could progressively improve the air quality.

Chemicals released into the air increase air pollution and contribute to harmful effects on human health. Responsible production and consumption could help to reduce these harmful chemicals.

Combustion of fossil fuels plays a key role in the process of climate change, which places food, air and water supplies at risk, and poses a major threat to human health.

Deposition of air pollutants on water may negatively affect its quality and life under water. It can lead to eutrophication and acidification of fresh water bodies, and accumulation of toxic metals and Persistent Organic Pollutants (POPs) in fresh and marine waters.

Emissions from combustion of fossil fuels mixed with precipitation cause acid rains that pose a major threat to forests and ecosystems.

Thank you for your attention