



Silesian
University
of Technology



RESEARCH
UNIVERSITY
EXCELLENCE INITIATIVE
Ministry of Science
and Higher Education



EURECA-PRO

AMBIENT AIR – POLLUTANTS, EMISSIONS, REGULATIONS, STATE OF THE QUALITY

Barbara Kozielska

"Responsible consumption and production – selected environmental aspects"

6. Priority Research Area Climate and environmental protection, modern energy

The idea of sustainable development is based on the balance of its three basic dimensions: economic, environmental and social. A special role in these three aspects is played by the quality of ambient air, which is crucial to the health of people and ecosystems.

Air pollution is the greatest environmental threat to public health and economic progress. Currently, numerous actions are taken to protect the air with the most important goal as to reduce the number of diseases and deaths caused by its pollution.

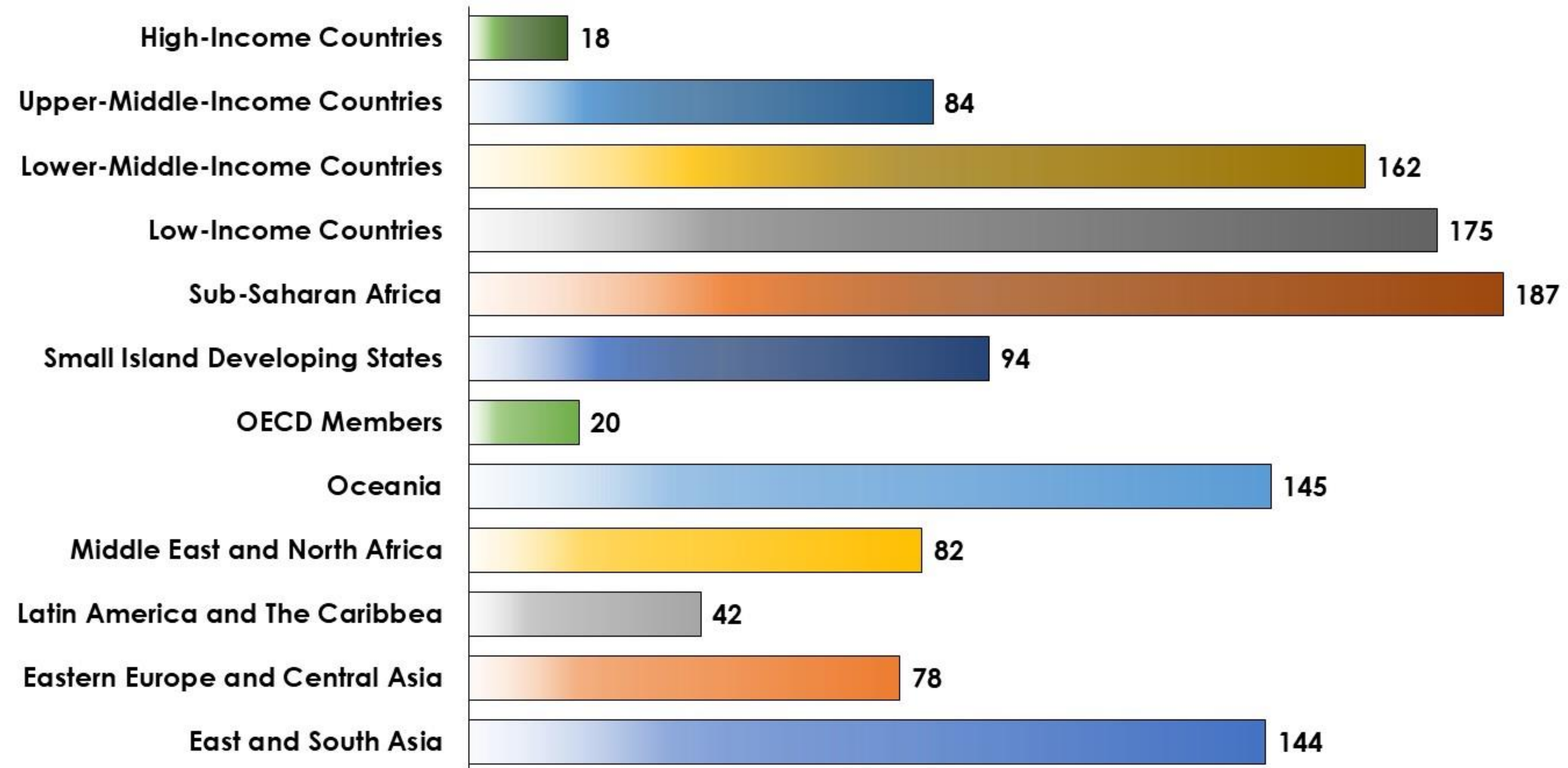
The pollutants with the most serious impacts on human health are:

- ✓ particulate matter,
- ✓ sulphur dioxide,
- ✓ nitrogen dioxide,
- ✓ ground-level ozone,
- ✓ benzene,
- ✓ polycyclic aromatic hydrocarbons including benzo[a]pyrene,
- ✓ dioxins,
- ✓ heavy metals.

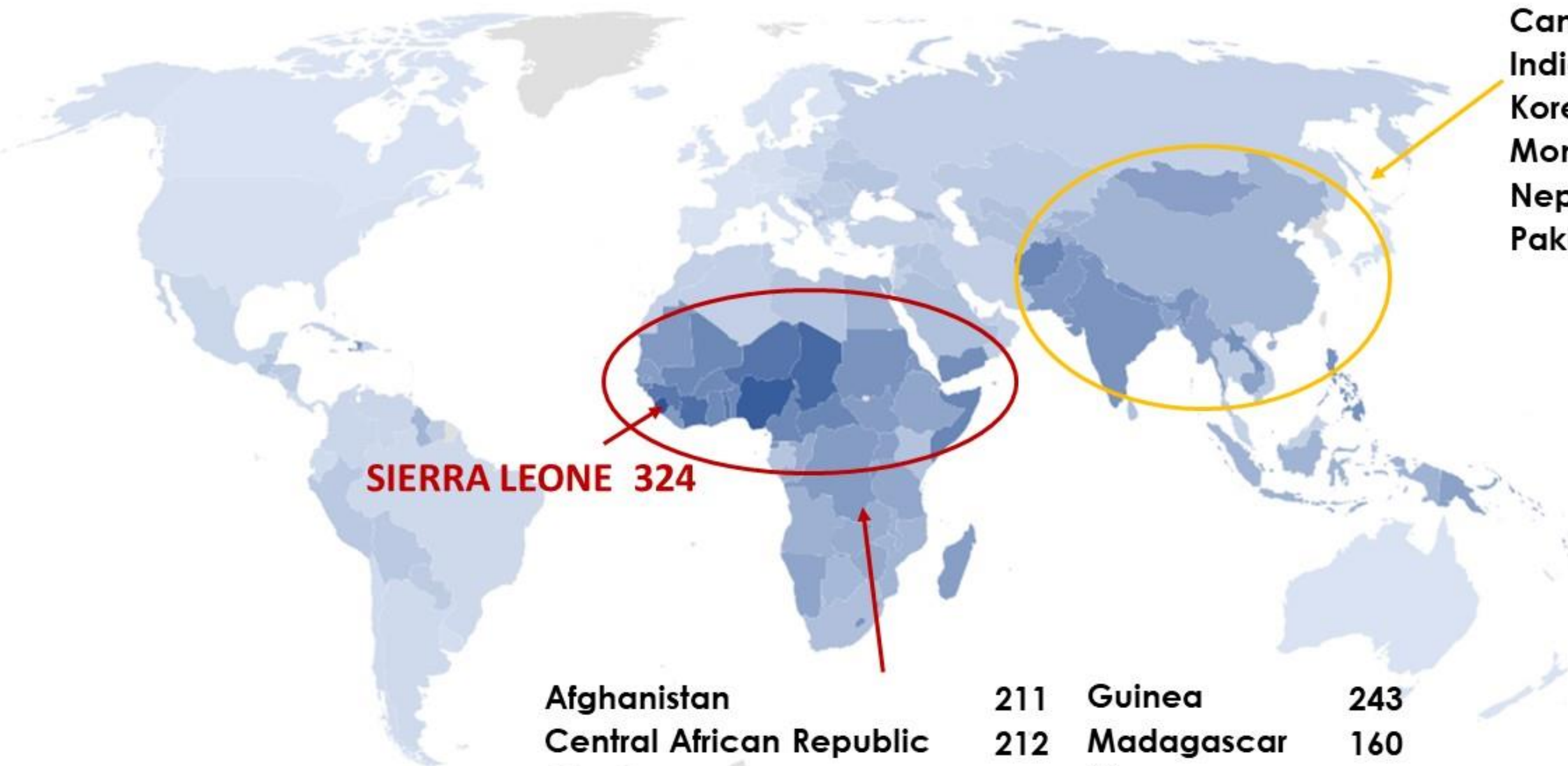


Mortality rate to household air pollution and ambient air pollution by countries with varying degrees of wealth in 2016 (per 100,000 population)

adapted from:
Sachs J.D., Lafortune G., Kroll Ch., Fuller G., Woelm F.: Sustainable development report 2022 from crisis to sustainable development: the SDGs as Roadmap to 2030 and Beyond, Cambridge University Press 2022



World



Cambodia	150
India	184
Korea	207
Mongolia	156
Nepal	194
Pakistan	174

SIERRA LEONE 324

Afghanistan	211	Guinea	243
Central African Republic	212	Madagascar	160
Chad	280	Niger	252
Congo	164	Nigeria	307
Côte D'ivoire	269	Somalia	213
Equatorial Guinea	178	Sudan	185
Eritrea	174	The Gambia	237
Ghana	204	Uganda	156

Mortality rate to household air pollution and ambient air pollution by country in 2016 (per 100,000 population)

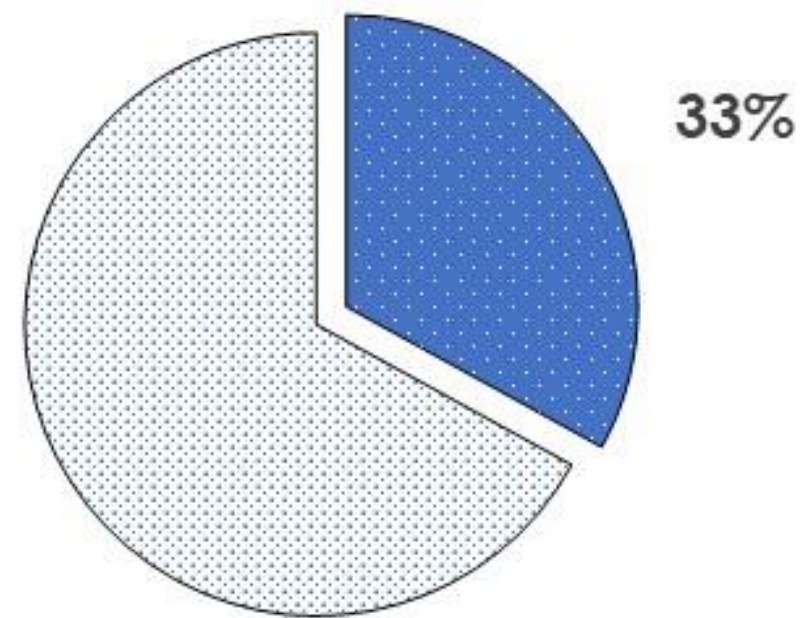


Finland	7		
Sweden	7		
Iceland	9		
Norway	9	Czech Republic	30
France	10	Lithuania	34
Portugal	10	Slovak Republic	34
Spain	10	Croatia	35
Switzerland	10	Poland	38
United Kingdom	10	Hungary	39
Ireland	12	Latvia	41
Luxembourg	12	Turkey	47
Denmark	13	Romania	59
Netherlands	14	Belarus	61
Austria	15	Bulgaria	62
Italy	15	Serbia	62
Belgium	16	Ukraine	71
Germany	16	Moldova	78
Cyprus	20	North Macedonia	82
Malta	20		
Slovenia	23		
Estonia	25		
Greece	28		

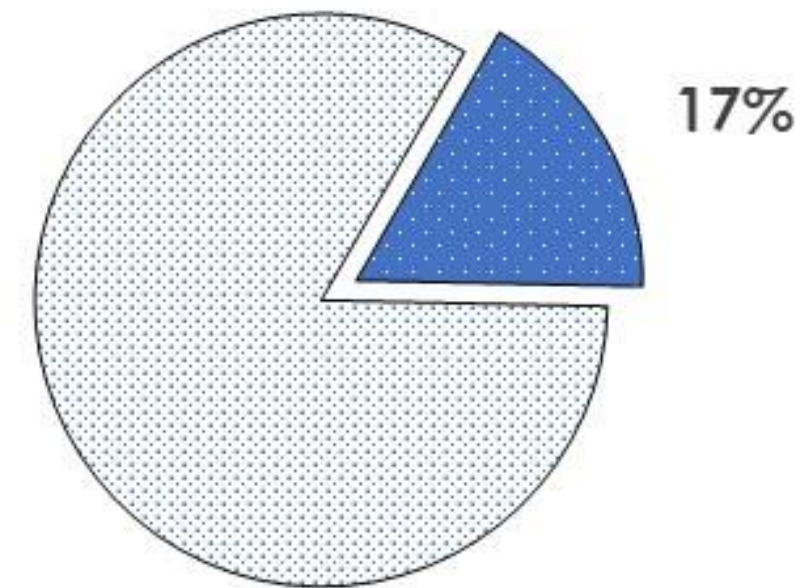
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Percentage of diseases caused by air pollution in the WHO European Region

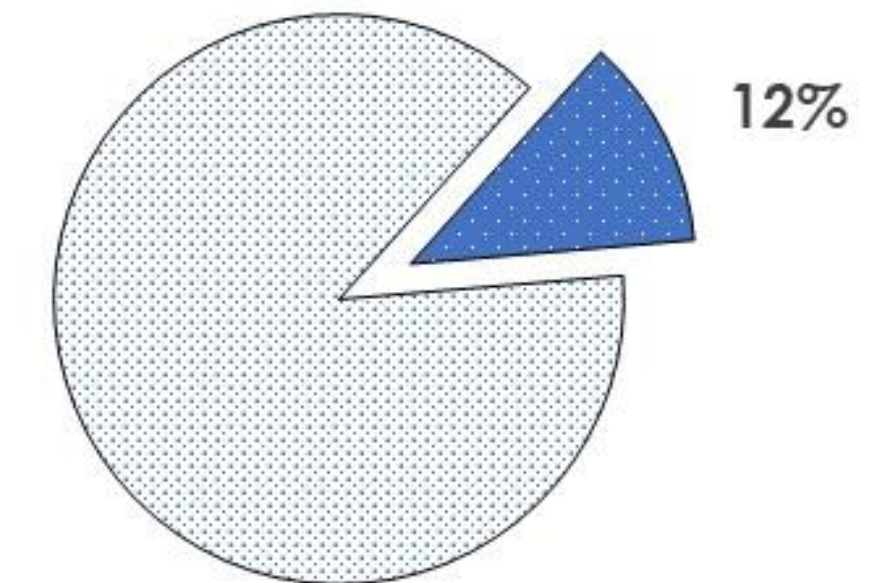
New cases of asthma in children



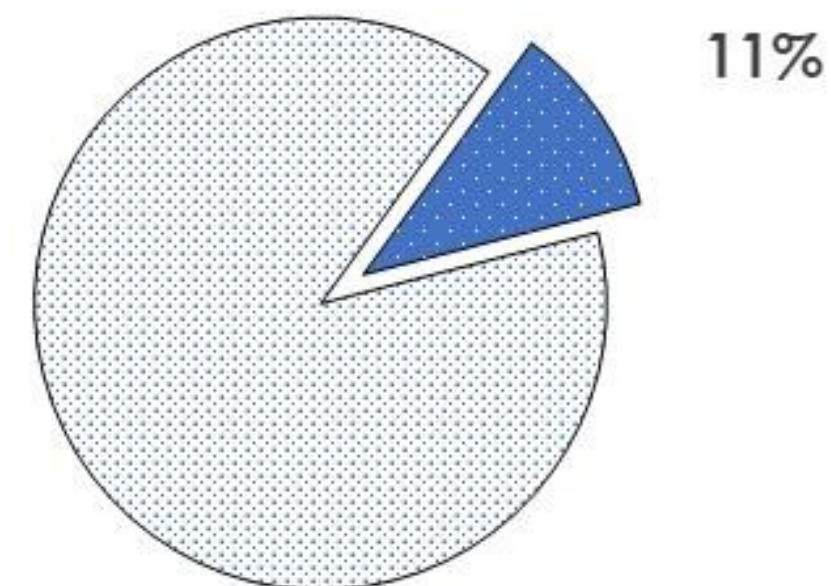
Lung cancers



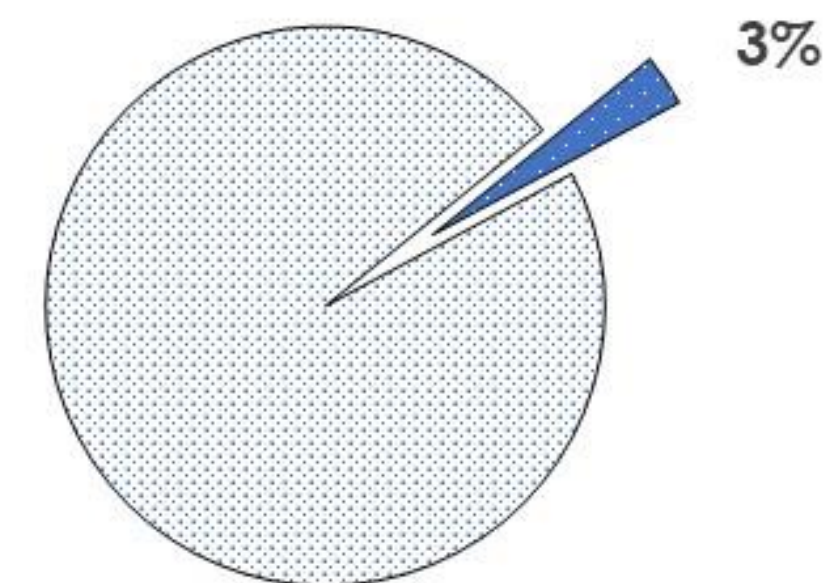
Ischemic heart disease



Heart attacks



Chronic obstructive pulmonary disease

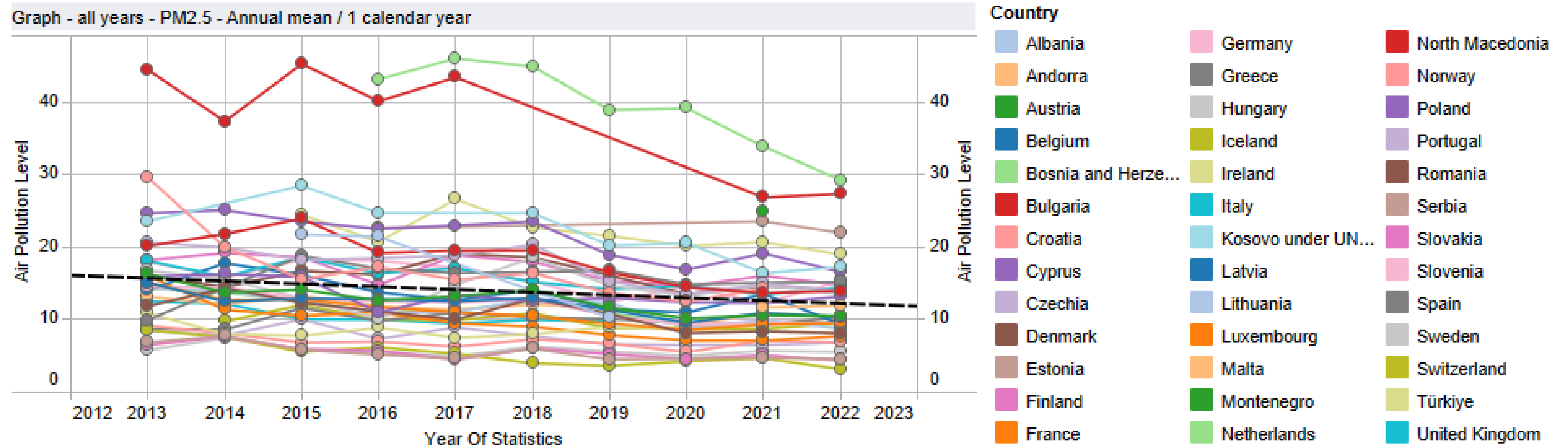


adapted from: https://www.euro.who.int/__data/assets/pdf_file/0005/397787/Air-Pollutionand-NCDs.pdf

Recommended air quality guideline levels by EU and WHO; air quality standards in selected countries

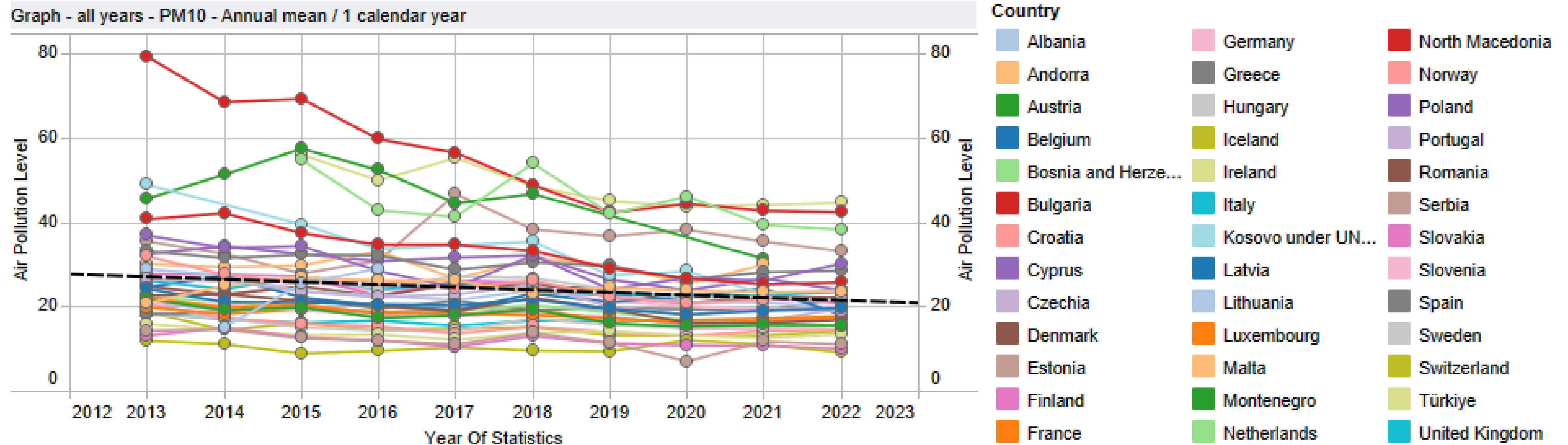
Pollutant	Averaging time	Guideline value							
		WHO	EU	Afghanistan	Australia	Japan	Jordan	Egypt	South Africa
PM _{2.5} [$\mu\text{g}/\text{m}^3$]	Annual	5	20	35	8	15	15	90 (TSP)	
	24-hour	15		75	25	35	66	230 (TSP)	
PM ₁₀ [$\mu\text{g}/\text{m}^3$]	Annual	15	40	70	20	100 (TSP)	70		40
	24-hour	45	50	150	40–50	200 (TSP)	120	70	75
NO ₂ [$\mu\text{g}/\text{m}^3$]	Annual	10	40	40	60		50		40
	24-hour	25		80		75–115	80	150	
	1-hour	200	200		230		210	400	200
O ₃ [$\mu\text{g}/\text{m}^3$]	Peak season	60			200 (1 h)				
	8-hour	100	120	100	160 (4 h)		120	120	120
SO ₂ [$\mu\text{g}/\text{m}^3$]	24-hour	40	125	50	210	106		150	125
	1-hour		350		530	226		350	350
	10-minute	500							500
CO [mg/m ³]	24-hour	4							
	8-hour	10	10	10		23		80	
	1-hour	35		30				30	
	15-minute	100							
C ₆ H ₆ [$\mu\text{g}/\text{m}^3$]	Annual		5			3			5
Pb [$\mu\text{g}/\text{m}^3$]	Annual	0.5	0.5	0.5	0.5		0.5	1	0.5
B[a]P [ng/m ³]	Annual	0.12	1						

Average annual concentrations of PM2.5 [$\mu\text{g}/\text{m}^3$] in European Countries from 2013 to 2022



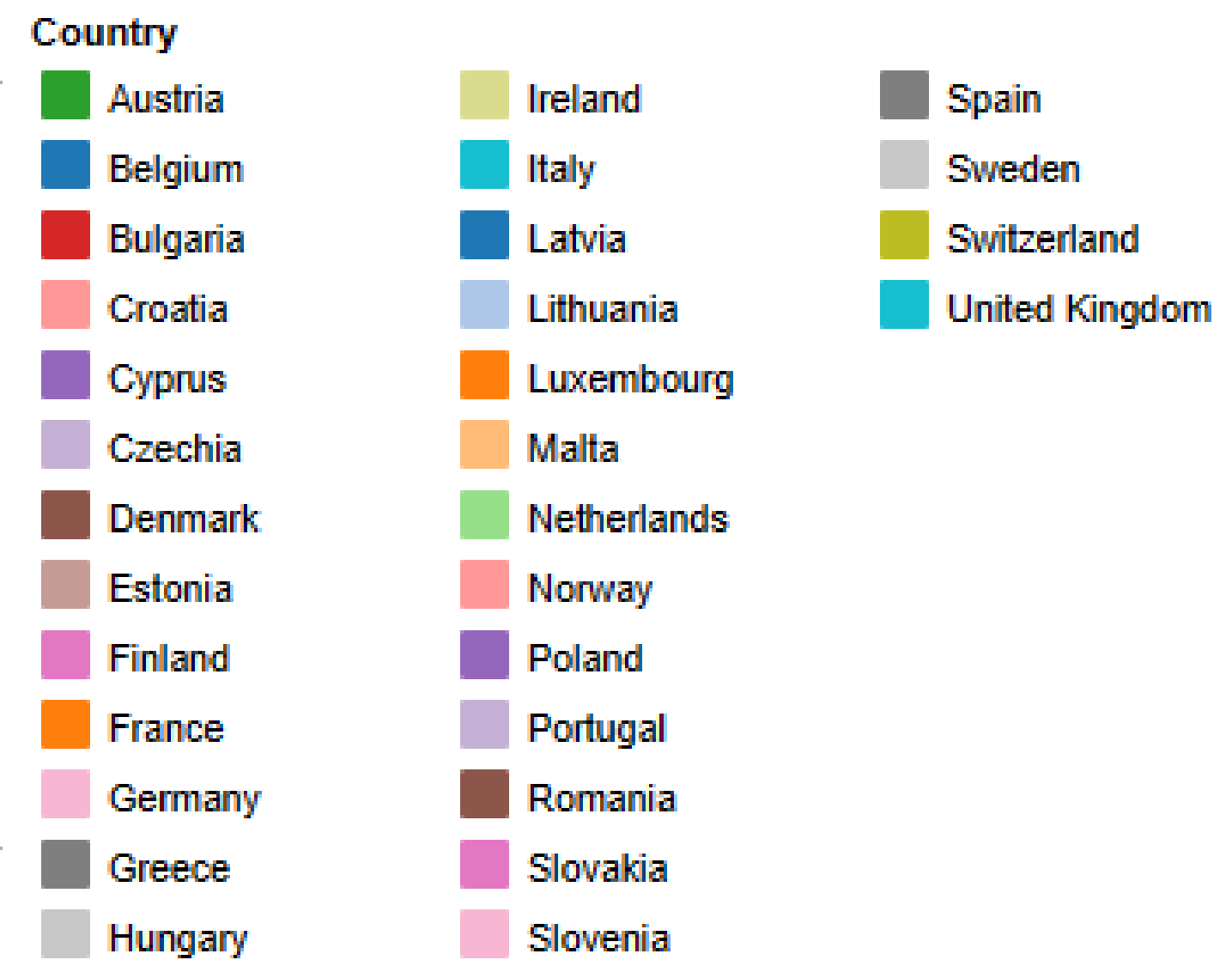
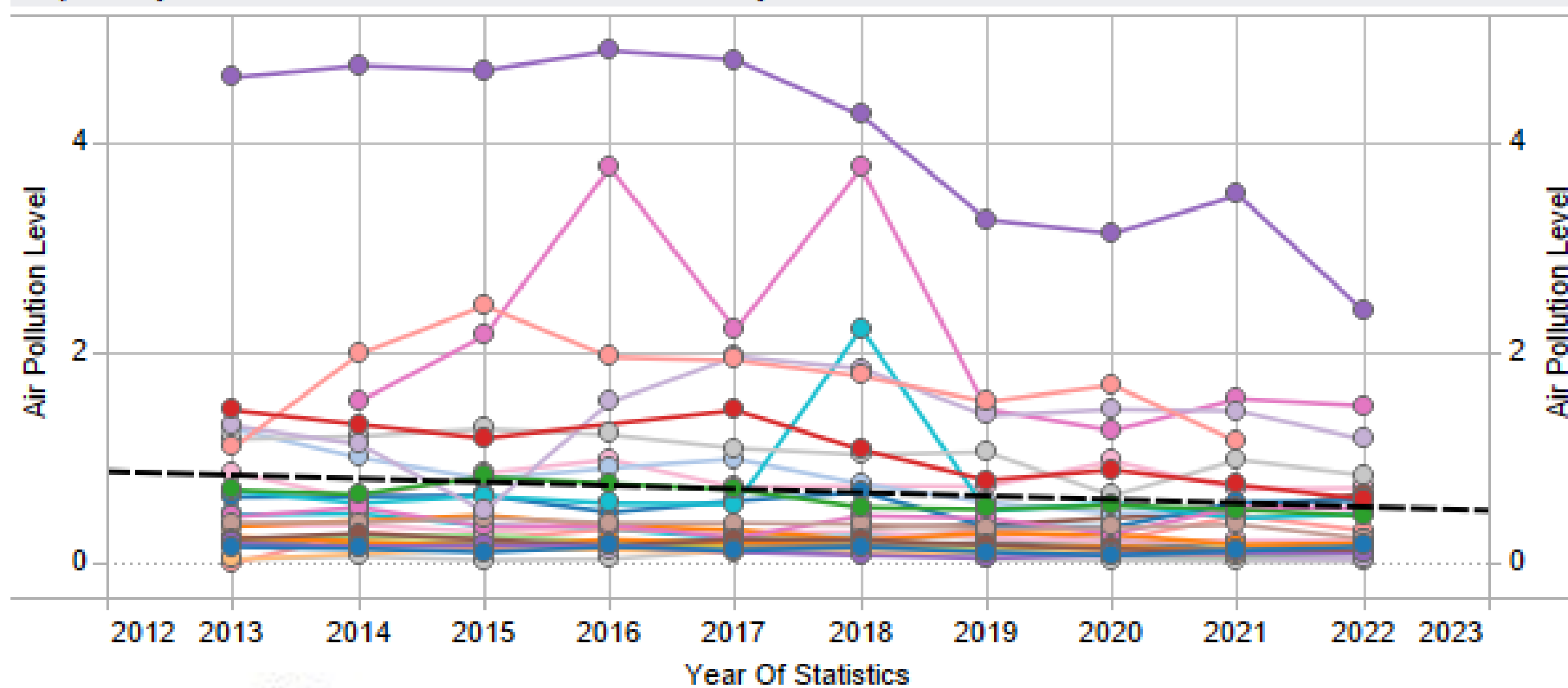
<https://www.eea.europa.eu/data-and-maps/dashboards/air-quality-statistics>

Average annual concentrations of PM10 [$\mu\text{g}/\text{m}^3$] in European Countries from 2013 to 2022

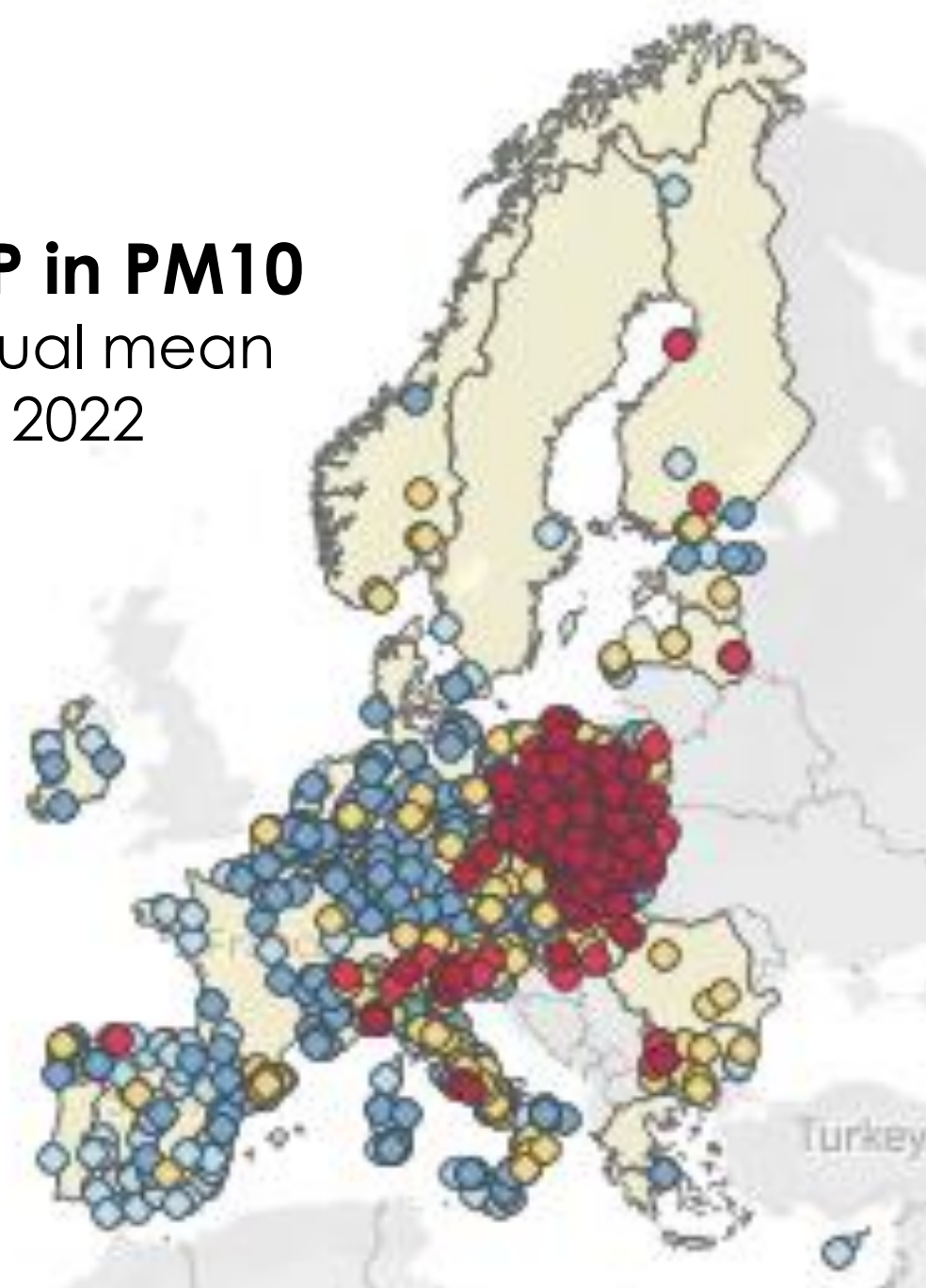


<https://www.eea.europa.eu/data-and-maps/dashboards/air-quality-statistics>

Graph - all years - BaP in PM - Annual mean / 1 calendar year



B[a]P in PM10
annual mean
2022



Total number of points displayed: 790

Concentration ranges and number of points

■	> 1.50 ng/m ³	148
■	> 1.00 and ≤ 1.50 ng/m ³	59
■	> 0.40 and ≤ 1.00 ng/m ³	177
■	> 0.12 and ≤ 0.40 ng/m ³	257
■	≤ 0.12 ng/m ³	149

EU standard – 1 ng/m³
WHO standard – 0.12 ng/m³

Average annual concentrations of
PM10-bound B[a]P [ng/m³] in European
Countries from 2013 to 2022

<https://www.eea.europa.eu/data-and-maps/dashboards/air-quality-statistics>

SUMMARY

The most important goal is to reduce the number of diseases and deaths caused by polluted air, as well as to protect the most vulnerable people.

Actions undertaken in order to protect the air comprise the cooperation with global, European, national and local partners from the business and industrial sectors, governments, municipal and health authorities, and other decision makers at various levels as well as non-governmental organizations.

Legal mechanisms to manage air pollution in EU:

- ✓ defining general air quality standards for ambient concentrations of air pollutants,
- ✓ setting national limits on total pollutant emissions,
- ✓ designing source-specific legislation, as for example to control industrial emissions or set standards for vehicle emissions, energy efficiency or fuel quality.

Acknowledgments

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THANK YOU FOR YOUR ATTENTION



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