

JORNADA

Calidad del Aire en España: Nuevos Retos

ZONAS DE BAJAS EMISIONES



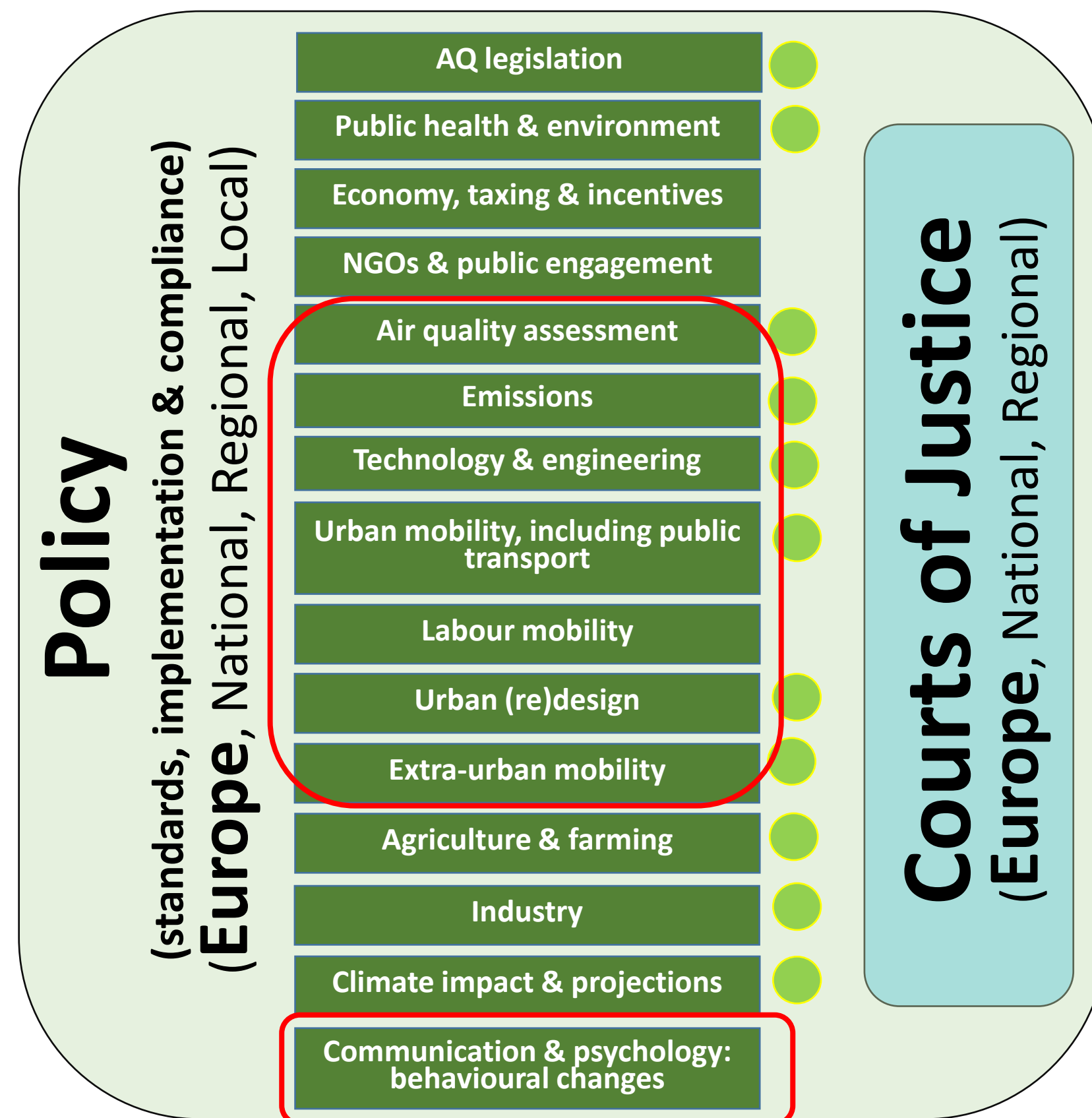
Xavier Querol

X. Querol

Calidad del Aire en España: Nuevos Retos. Madrid, 23 de abril de 2024

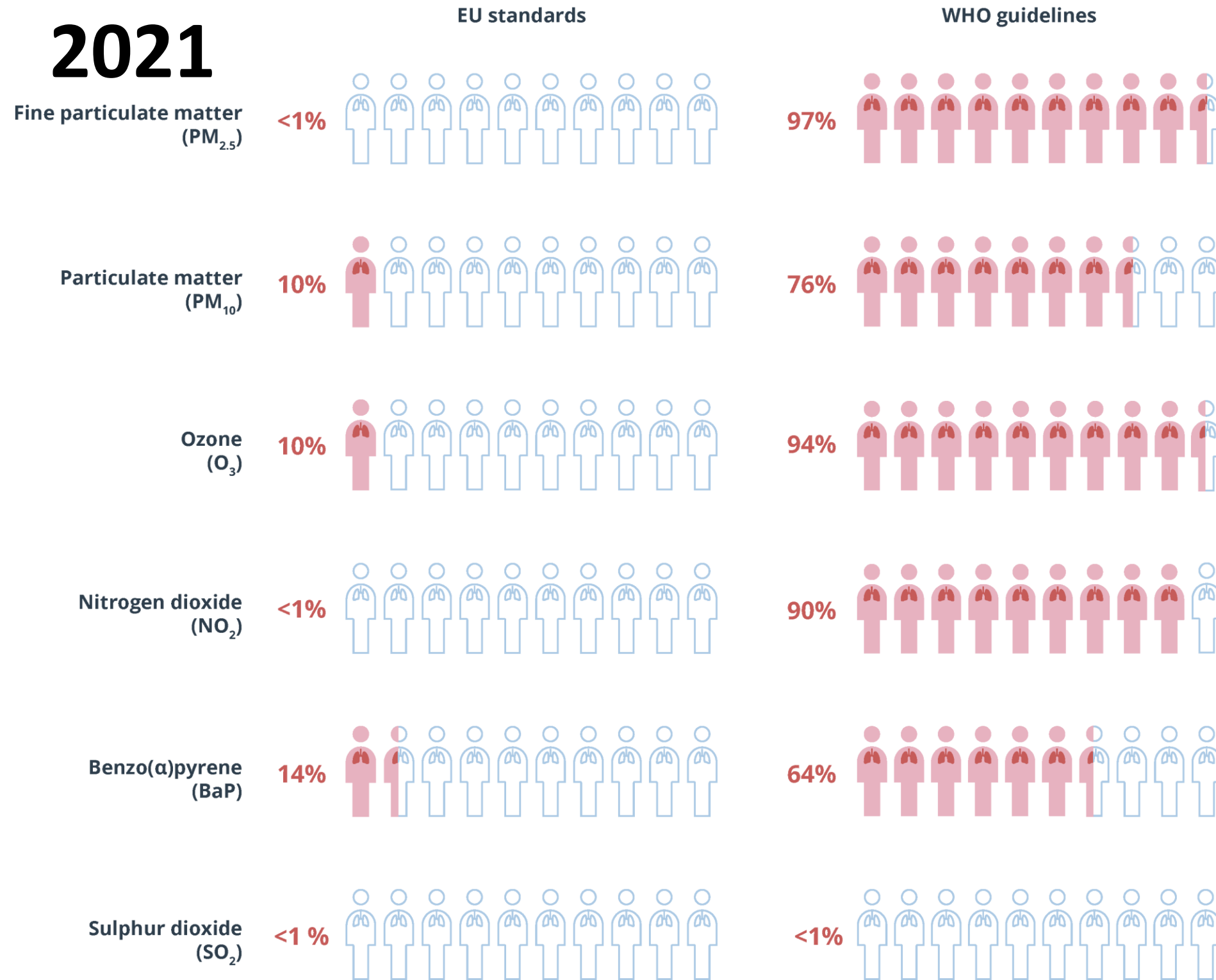
THEMATIC INVOLVEMENTS IN AIR QUALITY POLICY

● Indicates that support from **scientific research** is needed



AIR QUALITY IN EUROPE

2021



How air pollution harmed health in Europe

Total premature mortality, 2021, in the EU-27:

- 253,000 deaths were attributable to exposure to PM_{2.5} above WHO's guideline level of 5 µg/m³
- 52,000 deaths were attributable to exposure to NO₂ above WHO's guideline level of 10 µg/m³
- 22,000 deaths were attributable to short-term exposure to O₃ above 70 µg/m³.

European Environment Agency



<https://www.eea.europa.eu/publications/europes-air-quality-status-2023>

Air quality in Europe 2023, 24 Nov 2023



30/04/2024

X. Querol



Calidad del Aire en España: **Nuevos Retos**. Madrid, 23 de abril de 2024

AIR QUALITY STANDARDS AND WHO AIR QUALITY GUIDELINES

	GUIDELINES WHO (2005 & 2021)			WHO (2021)	Proposal EC Approved by the Council 08/11/2023
	2008/50/EC & 2004/107/EC RD 102/2011*	WHO (2005) Guidelines**			
Hourly	350* $\mu\text{g}/\text{m}^3$ SO ₂	500 $\mu\text{g}/\text{m}^3$ SO ₂	*24 hours/year		350 $\mu\text{g}/\text{m}^3$ (1 d/y)
Daily	125* $\mu\text{g}/\text{m}^3$ SO ₂	20 $\mu\text{g}/\text{m}^3$ SO ₂	*3 days/year	40 $\mu\text{g}/\text{m}^3$	50 $\mu\text{g}/\text{m}^3$ (18 d/y)
Hourly	200 $\mu\text{g}/\text{m}^3$ NO ₂	EC-WHO coincide	18 hours/year		200 $\mu\text{g}/\text{m}^3$ (0 h/y)
Daily					50 $\mu\text{g}/\text{m}^3$ NO ₂
Annual	40 $\mu\text{g}/\text{m}^3$ NO ₂	EC-WHO coincide	not exceeding	10 $\mu\text{g}/\text{m}^3$	20 $\mu\text{g}/\text{m}^3$ ALV, 50 $\mu\text{g}/\text{m}^3$ DLV
Annual	5 $\mu\text{g}/\text{m}^3$ C ₆ H ₆	EC-WHO coincide	not exceeding		3.4 $\mu\text{g}/\text{m}^3$
Mean 8-h max. day	10 mg/m ³ CO	EC-WHO coincide	not exceeding		10 mg/m ³ (DM8h) 4 mg/m ³ DLV
Annual	500 ng/m ³ Pb	EC-WHO coincide	not exceeding		Not changed
Annual	40 $\mu\text{g}/\text{m}^3$ PM10	20 $\mu\text{g}/\text{m}^3$ PM10	not exceeding	15 $\mu\text{g}/\text{m}^3$	20 $\mu\text{g}/\text{m}^3$
Annual	25 $\mu\text{g}/\text{m}^3$ PM2.5	10 $\mu\text{g}/\text{m}^3$ PM2.5	not exceeding	5 $\mu\text{g}/\text{m}^3$	10 $\mu\text{g}/\text{m}^3$
Daily	50* $\mu\text{g}/\text{m}^3$ PM10	50** $\mu\text{g}/\text{m}^3$ PM10	** 3 or *35	45 $\mu\text{g}/\text{m}^3$	45 $\mu\text{g}/\text{m}^3$ (18 d/y)
Daily				15 $\mu\text{g}/\text{m}^3$ PM2.5 3 days/year	25 $\mu\text{g}/\text{m}^3$ (18 d/y)
Max 8 h means day mean for 3 years	120 $\mu\text{g}/\text{m}^3$ O ₃	100 $\mu\text{g}/\text{m}^3$ O ₃	25 days/year	100 $\mu\text{g}/\text{m}^3$	120 $\mu\text{g}/\text{m}^3$ (3 d/y)
Annual	1 ng/m ³ BaP	0.12 ng/m ³ BaP	not exceeding	0.12 $\mu\text{g}/\text{m}^3$	Not changed

1st Challenge: Closing the gap between EU AQ standards and WHO guidelines

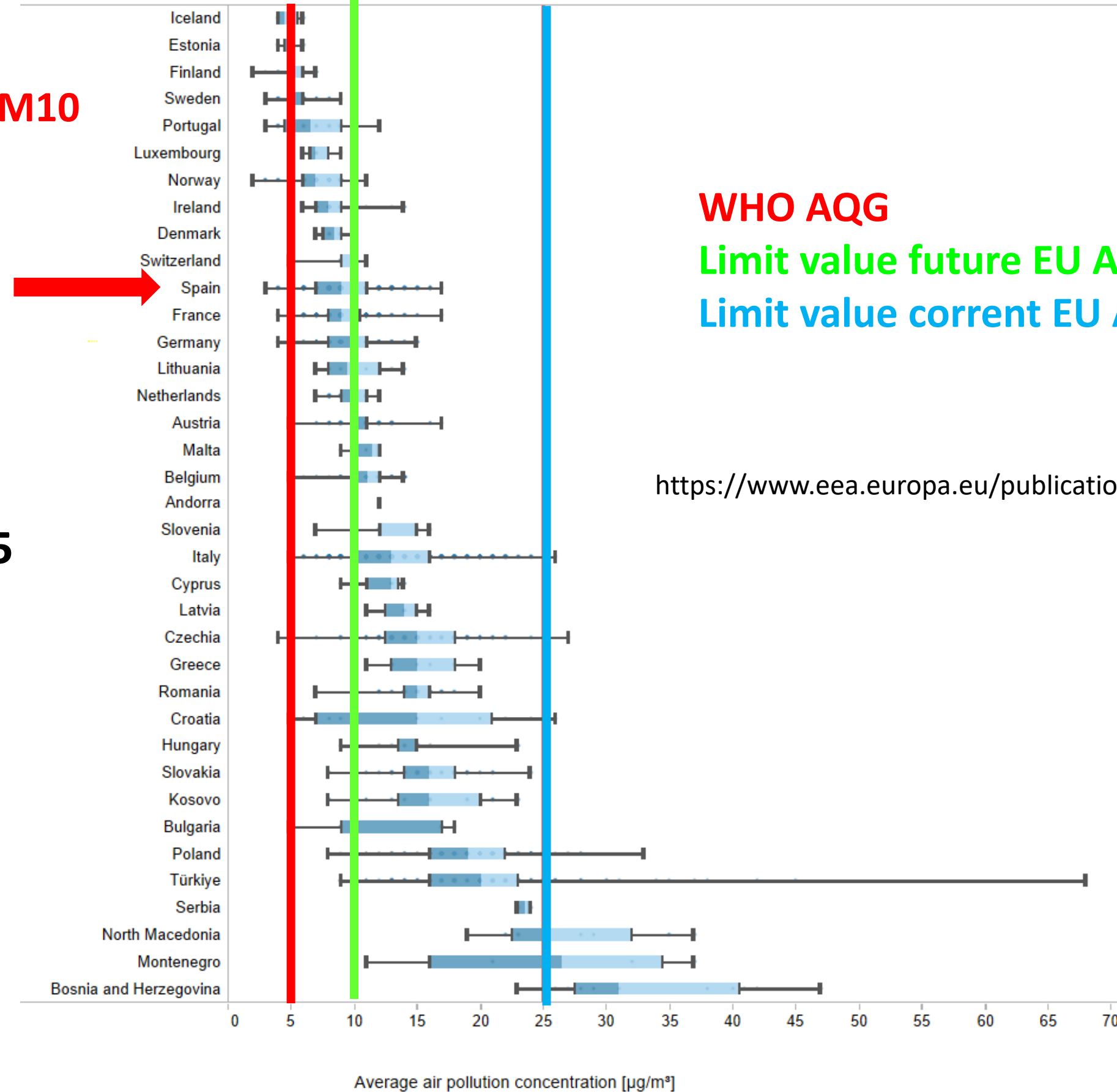


THE ISSUE OF PM2.5

2nd Challenge abating PM2.5 and PM10

2021 Annual Limit Value for PM2.5

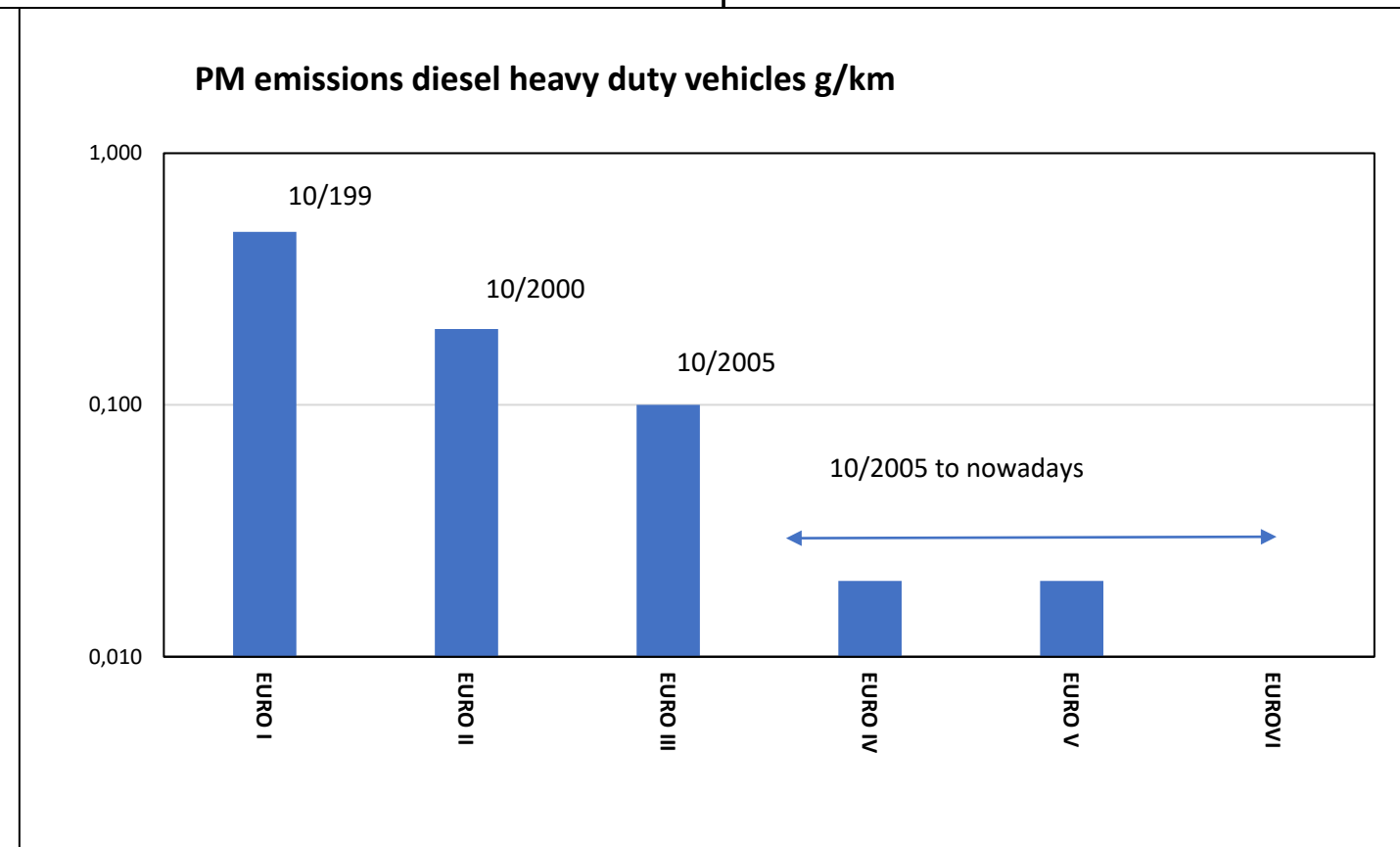
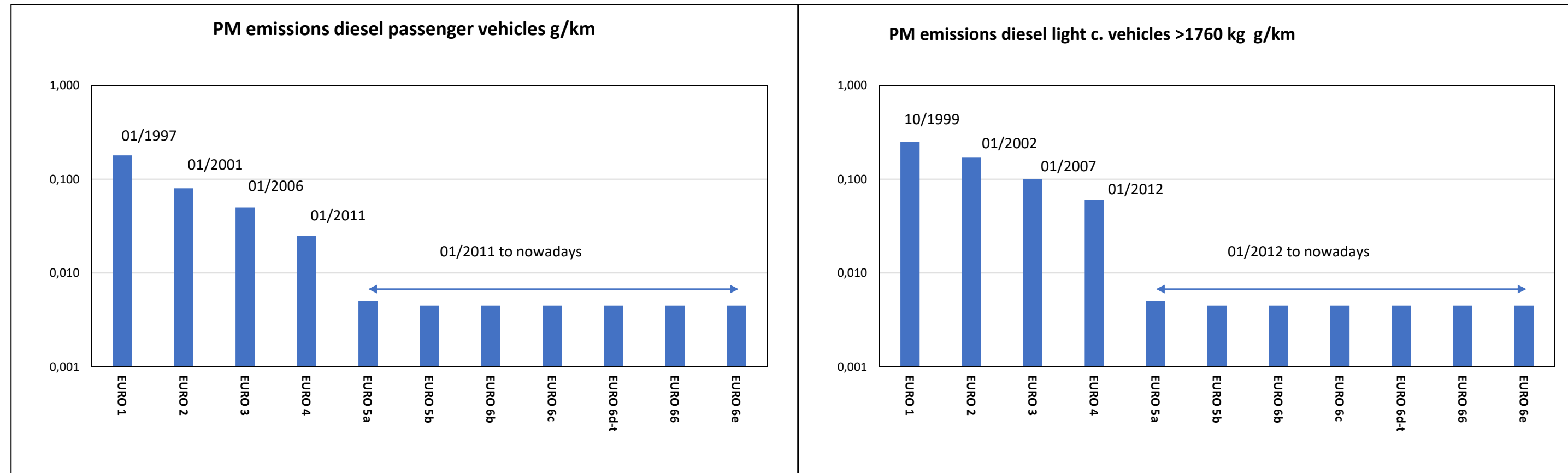
European Environment Agency 
 Air quality in Europe 2023
 31st May 2023



WHO AQG
 Limit value future EU AQ Directive
 Limit value corrent EU AQ Directive

<https://www.eea.europa.eu/publications/europes-air-quality-status-2023>

THE ISSUE OF PM2.5



THE ISSUE OF PM2.5

International Agency for Research on Cancer



PRESS RELEASE
N° 213

12 June 2012

IARC: DIESEL ENGINE EXHAUST CARCINOGENIC

Lyon, France, June 12, 2012 – After a week-long meeting of international experts, the International Agency for Research on Cancer (IARC), which is part of the World Health Organization (WHO), today classified diesel engine exhaust as **carcinogenic to humans (Group 1)**, based on sufficient evidence that exposure is associated with an increased risk for lung cancer.

Background

In 1988, IARC classified diesel exhaust as *probably carcinogenic to humans (Group 2A)*. An Advisory Group which reviews and recommends future priorities for the IARC Monographs Program had recommended diesel exhaust as a high priority for re-evaluation since 1998.

There has been mounting concern about the cancer-causing potential of diesel exhaust, particularly based on findings in epidemiological studies of workers exposed in various settings. This was re-emphasized by the publication in March 2012 of the results of a large US National Cancer Institute/National Institute for Occupational Safety and Health study of occupational exposure to such emissions in underground miners, which showed an increased risk of death from lung cancer in exposed workers (1).

Evaluation

The scientific evidence was reviewed thoroughly by the Working Group and overall it was concluded that there was *sufficient evidence* in humans for the carcinogenicity of diesel exhaust. The Working Group found that diesel exhaust is a cause of lung cancer (*sufficient evidence*) and also noted a positive association (*limited evidence*) with an increased risk of bladder cancer (Group 1).

The Working Group concluded that gasoline exhaust was possibly carcinogenic to humans (Group 2B), a finding unchanged from the previous evaluation in 1989.

Public health

Large populations are exposed to diesel exhaust in everyday life, whether through their occupation or through the ambient air. People are exposed not only to motor vehicle exhausts but also to exhausts from other diesel engines, including from other modes of transport (e.g. diesel trains and ships) and from power generators.

Given the Working Group's rigorous, independent assessment of the science, governments and other decision-makers have a valuable evidence-base on which to consider environmental standards for diesel exhaust emissions and to continue to work with the engine and fuel manufacturers towards those goals.

Increasing environmental concerns over the past two decades have resulted in regulatory action in North America, Europe and elsewhere with successively tighter emission standards for both diesel and gasoline engines. There is a strong interplay between standards and technology – standards drive technology and new technology enables more stringent standards. For diesel engines, this required changes in the fuel such as marked decreases in sulfur content, changes in engine design to burn diesel fuel more efficiently and reductions in emissions through exhaust control technology.

However, while the amount of particulates and chemicals are reduced with these changes, it is not yet clear how the quantitative and qualitative changes may translate into altered health effects; research into

The Diesel Exhaust in Miners Study: A Cohort Mortality Study With Emphasis on Lung Cancer ^{FREE}

Michael D. Attfield, Patricia L. Schleiff, Jay H. Lubin, Aaron Blair, Patricia A. Stewart, Roel Vermeulen, Joseph B. Coble, Debra T. Silverman

JNCI: *Journal of the National Cancer Institute*, Volume 104, Issue 11, 6 June 2012, Pages 869–883, <https://doi.org/10.1093/jnci/djs035>

Published: 06 June 2012 Article history ▾

Page 2

IARC: Diesel engines exhaust carcinogenic

this question is needed. In addition, existing fuels and vehicles without these modifications will take many years to be replaced, particularly in less developed countries, where regulatory measures are currently also less stringent. It is notable that many parts of the developing world lack regulatory standards, and data on the occurrence and impact of diesel exhaust are limited.

Conclusions

Dr Christopher Portier, Chairman of the IARC working Group, stated that "The scientific evidence was compelling and the Working Group's conclusion was unanimous: diesel engine exhaust causes lung cancer in humans." Dr Portier continued: "Given the additional health impacts from diesel particulates, exposure to this mixture of chemicals should be reduced worldwide."(2)

Dr Kurt Straif, Head of the IARC Monographs Program, indicated that "The main studies that led to this conclusion were in highly exposed workers. However, we have learned from other carcinogens, such as radon, that initial studies showing a risk in heavily exposed occupational groups were followed by positive findings for the general population. Therefore actions to reduce exposures should encompass workers and the general population."

Dr Christopher Wild, Director, IARC, said that "while IARC's remit is to establish the evidence-base for regulatory decisions at national and international level, today's conclusion sends a strong signal that public health action is warranted. This emphasis is needed globally, including among the more vulnerable populations in developing countries where new technology and protective measures may otherwise take many years to be adopted."

Summary evaluation

The summary of the evaluation will appear in *The Lancet Oncology* as an online publication ahead of print on June 15, 2012.

(1) JNCI J Natl Cancer Inst (2012) doi:10.1093/jnci/djs034
<http://jnci.oxfordjournals.org/content/early/2012/03/05/jnci.djs034.abstract>; and
JNCI J Natl Cancer Inst (2012) doi: 10.1093/jnci/djs035
<http://jnci.oxfordjournals.org/content/early/2012/03/05/jnci.djs035.abstract>

(2) Dr Portier is Director of the National Center for Environmental Health and the Agency for Toxic Substances and Disease Registry at the Centers for Disease Control and Prevention (USA).

For more information, please contact

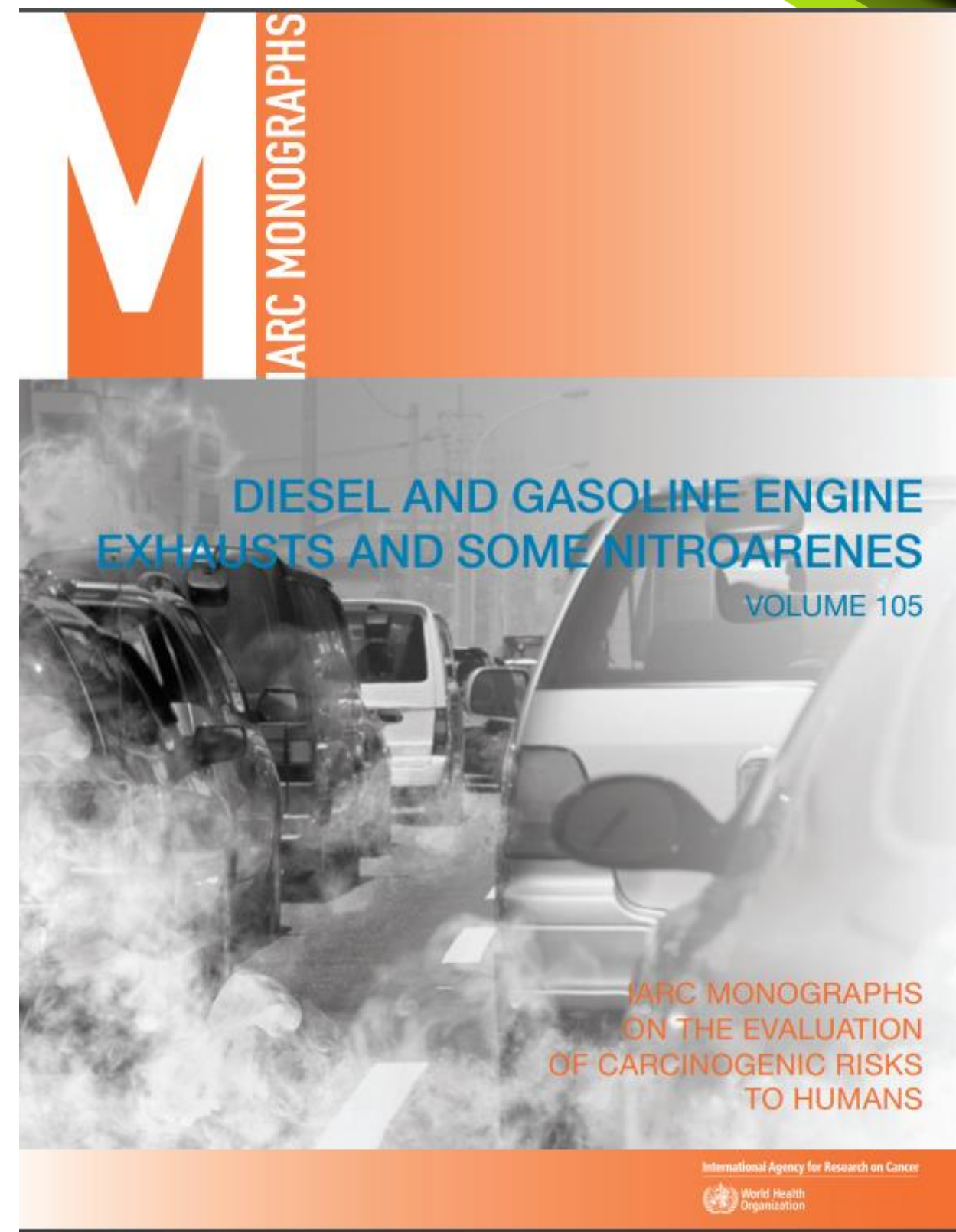
Dr Kurt Straif, IARC Monographs Section, at +33 472 738 507, or straifk@iarc.fr;
Dr Lamia Tallaa, IARC Monographs Section, at +33 472 738 385, or tallaa@iarc.fr;
Nicolas Gaudin, IARC Communications Group, at +33 472 738 478, or com@iarc.fr;
Fadela Chalbi, WHO News Team, at +41 79 475 55 56, or chalbf@who.int.

Link to the audio file posted shortly after the media briefing:
http://terrance.who.int/mediacentre/audio/press_briefings/

About IARC

The International Agency for Research on Cancer (IARC) is part of the World Health Organization. Its mission is to coordinate and conduct research on the causes of human cancer, the mechanisms of carcinogenesis, and to develop scientific strategies for cancer control. The Agency is involved in both epidemiological and laboratory research and disseminates scientific information through publications, meetings, courses, and fellowships.

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<https://monographs.iarc.fr/wp-content/uploads/2018/06/mono105.pdf>



30/04/2024

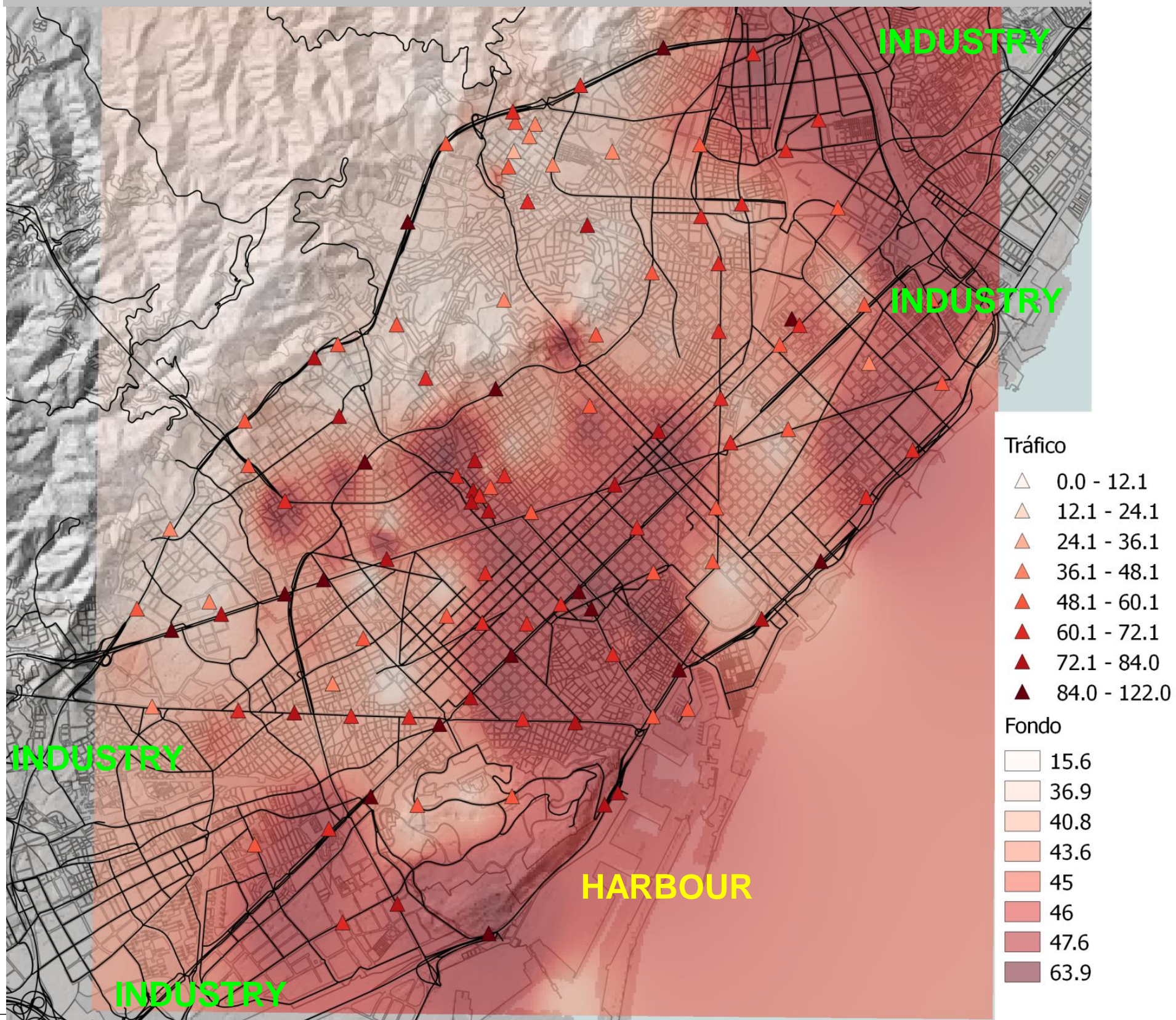
X. Querol



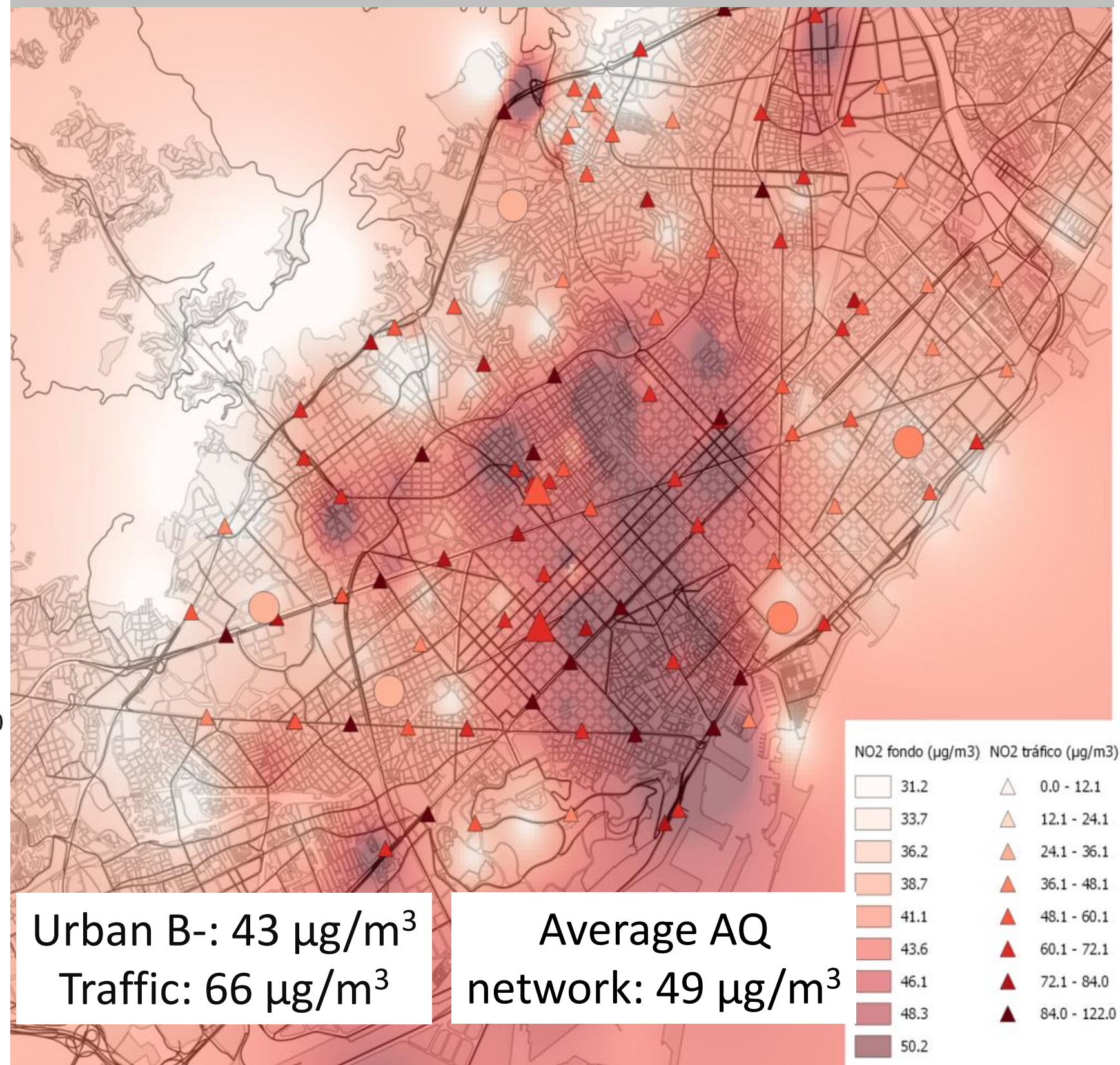
Calidad del Aire en España: Nuevos Retos. Madrid, 23 de abril de 2024

THE ISSUE OF NO₂

NO₂ FEBRUARY-MARCH 2017, 225 PASSIVE DOSIMETERS

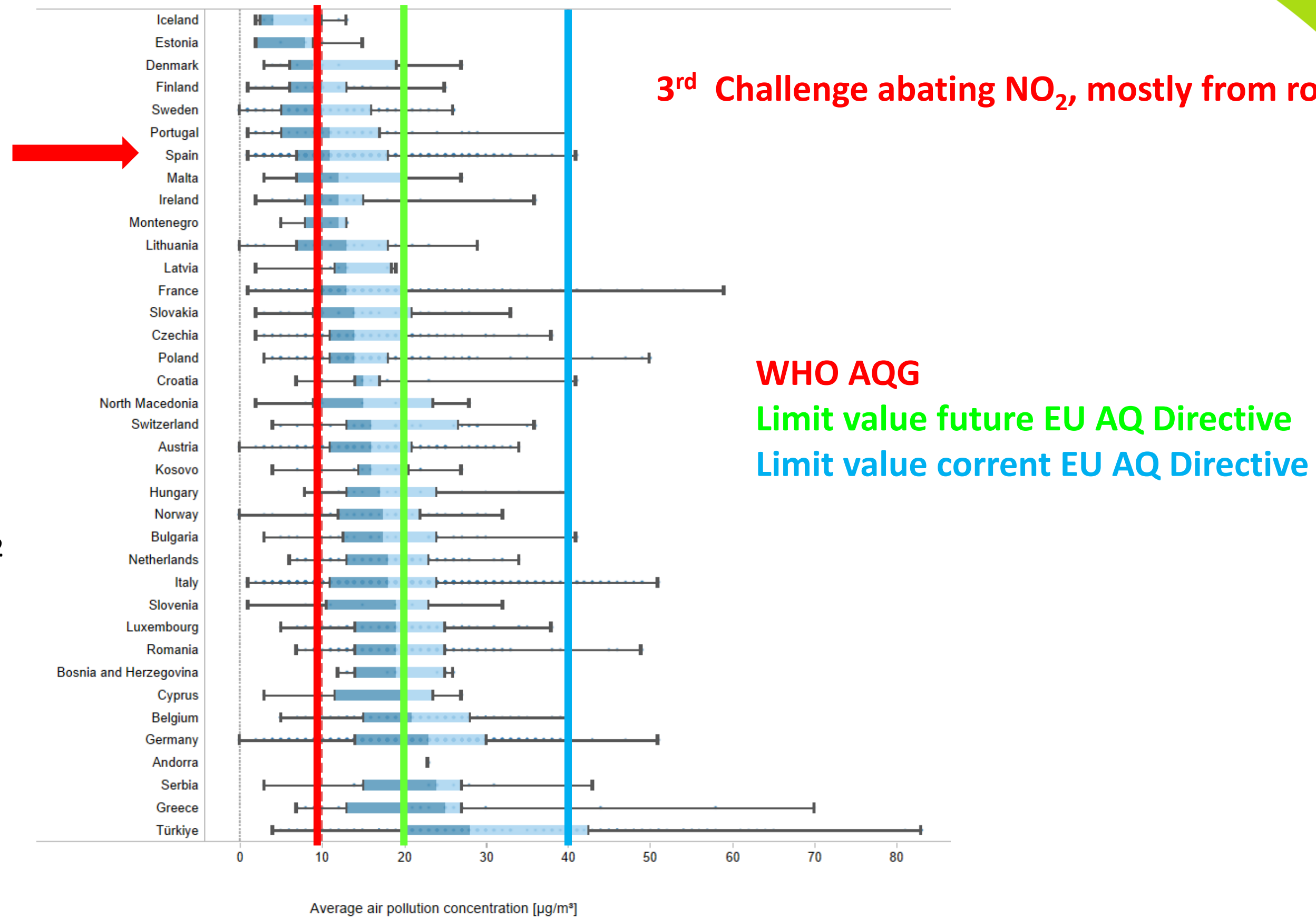


NO₂ JUNE 2018, 233 PASSIVE DOSIMETERS



THE ISSUE OF NO₂

<https://www.eea.europa.eu/publications/europes-air-quality-status-2023>



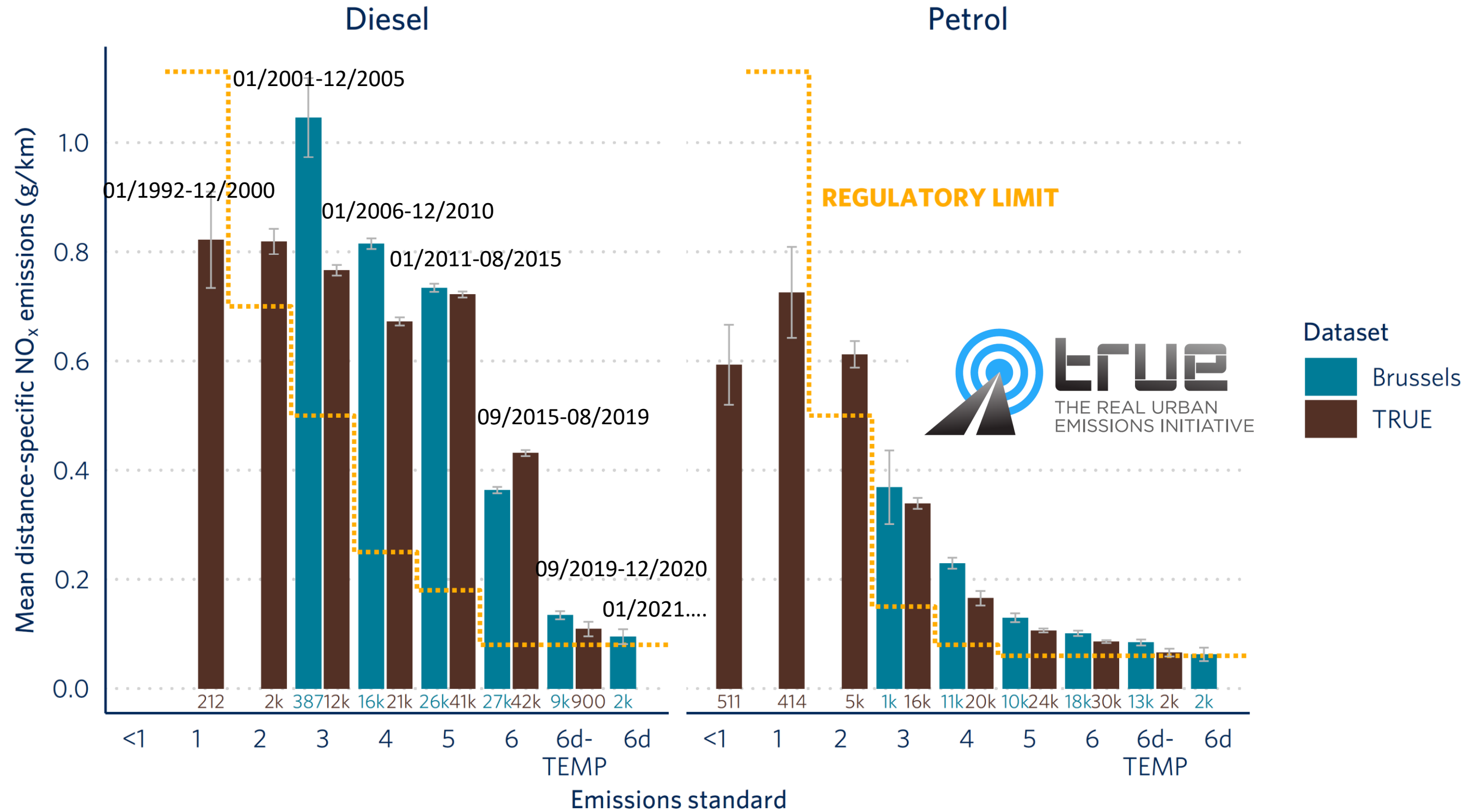
3rd Challenge abating NO₂, mostly from road traffic

WHO AQG
 Limit value future EU AQ Directive
 Limit value corrent EU AQ Directive

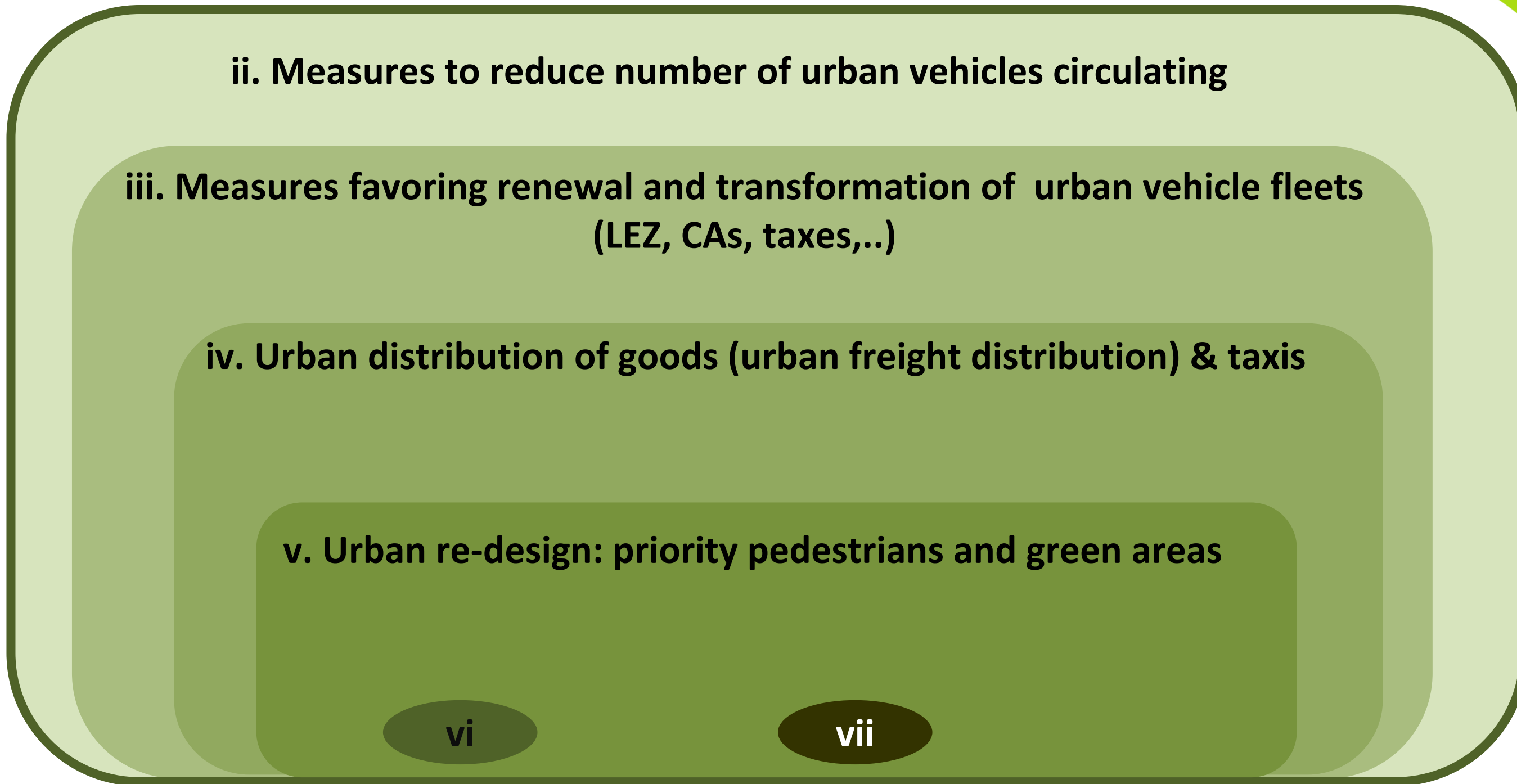
2021
 Annual Limit Value for NO₂

THE ISSUE OF NO₂

<https://www.trueinitiative.org/media/792040/true-brussels-report.pdf>
Brussels, fall 2020



ABATING EMISSIONS FROM ROAD TRAFFIC



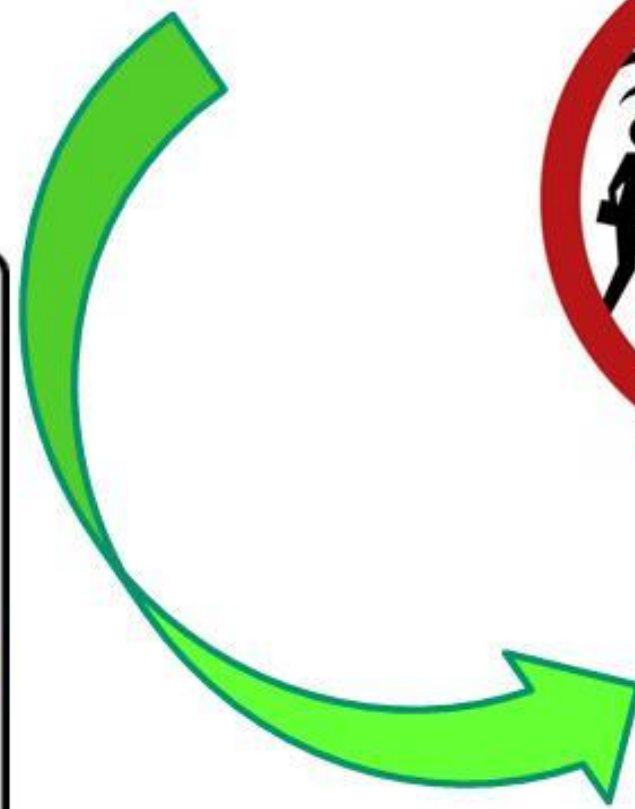
i. Improving metropolitan public transport with links to park & rides connecting cities and bus lines

vi. Remediation measures
vii. Other non-technological measures



ABATING EMISSIONS FROM ROAD TRAFFIC

Measures to change fleets: LEZ & e-transition



If we reduce vehicles by 30%, the 70% that will access have to be clean!!!!

+ plug-in-mobility

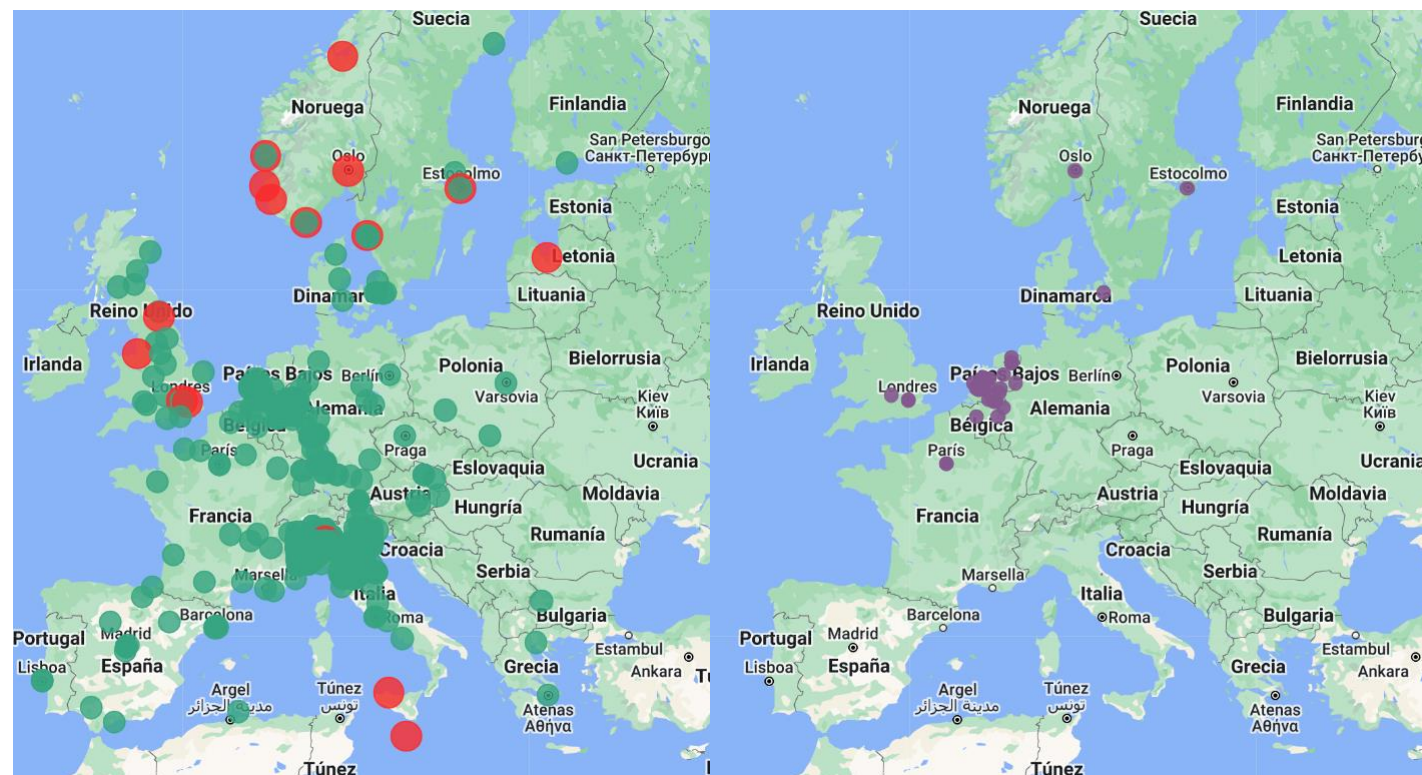


ABATING EMISSIONS FROM ROAD TRAFFIC

Measures to change fleets: LEZ, ULEZ, ZEZ & e-transition

Hollman C. et al., 2014 Atmos Environ: Effectiveness of LEZs in EU

LEZ, CC & ZEZ



<http://es.urbanaccessregulations.eu/>

ULEZ: April 2019: London will ban access diesel older than 09/2015 & gasoline older than 2005

CLEAN AIR ZONES (CAZS) in UK

ZERO EMISSION ZONES, general or for logistics only

CONGESTION CHARGES

TRAFFIC LIMITED ZONES



LOW EMISSION ZONES

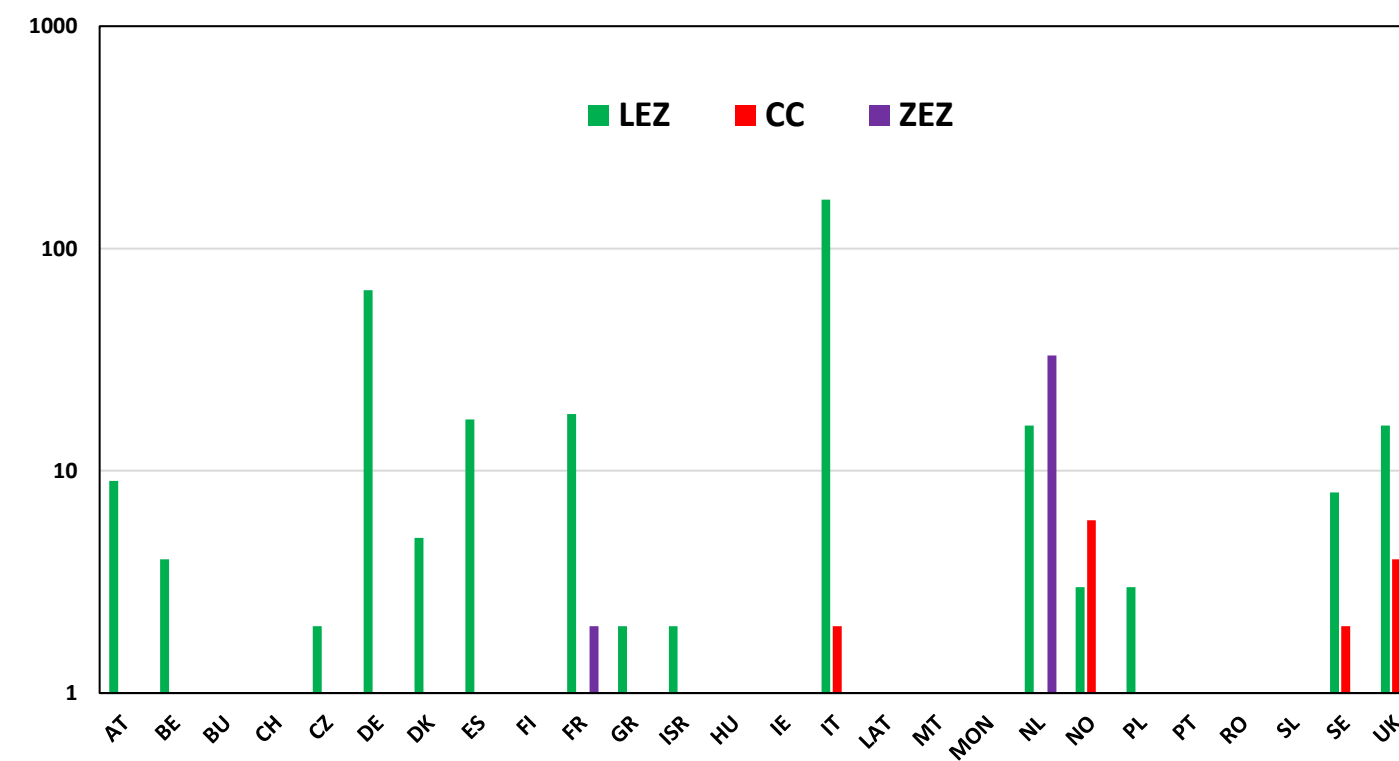
18 COUNTRIES, 339 CITIES:

AT, BE, BL, CZ, SE, DK, ES, FI, FR, DE, GR, IS, IT, NL, NO, PL, PT, SE, CH, UK
ONLY HU, IE, MAL, MON, RO, SLO, CH without LEZ

ES (17)

Madrid, Alcobendas, Barcelona, Córdoba, Parla, Pontevedra, A Coruña, Sevilla, Badalona, Pamplona, Granada, Rivas-Vaciamadrid, San Cugat del Vallés, Valencia, Sant Joan Despí, Zaragoza, Vitoria, Torremolinos

- **Must apply to ALL vehicle types**
- **Strict in application**
- **Also motor pets and motorbikes**
- **Use real world driving criteria**

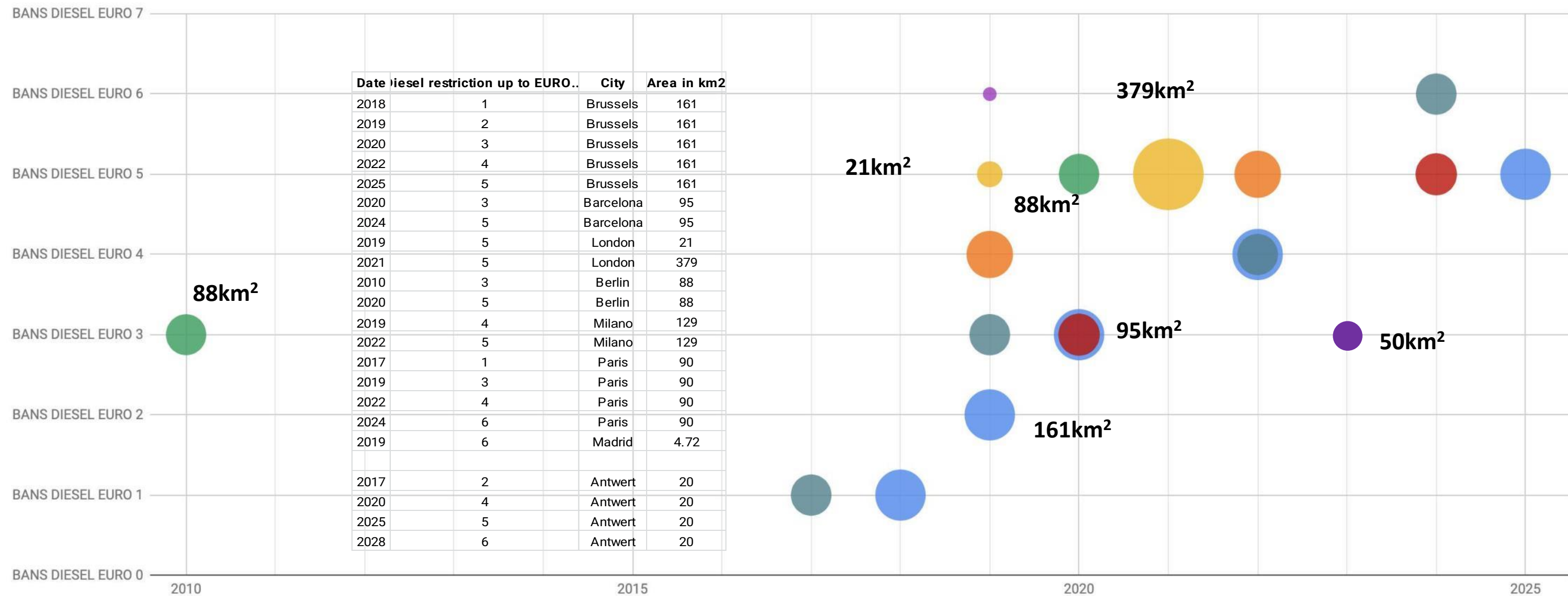


ABATING EMISSIONS FROM ROAD TRAFFIC

Measures to change fleets: LEZ & e-transition

Low Emission Zones (LEZ) Diesel Vehicles Restrictions in European Cities
Circle size = LEZ area

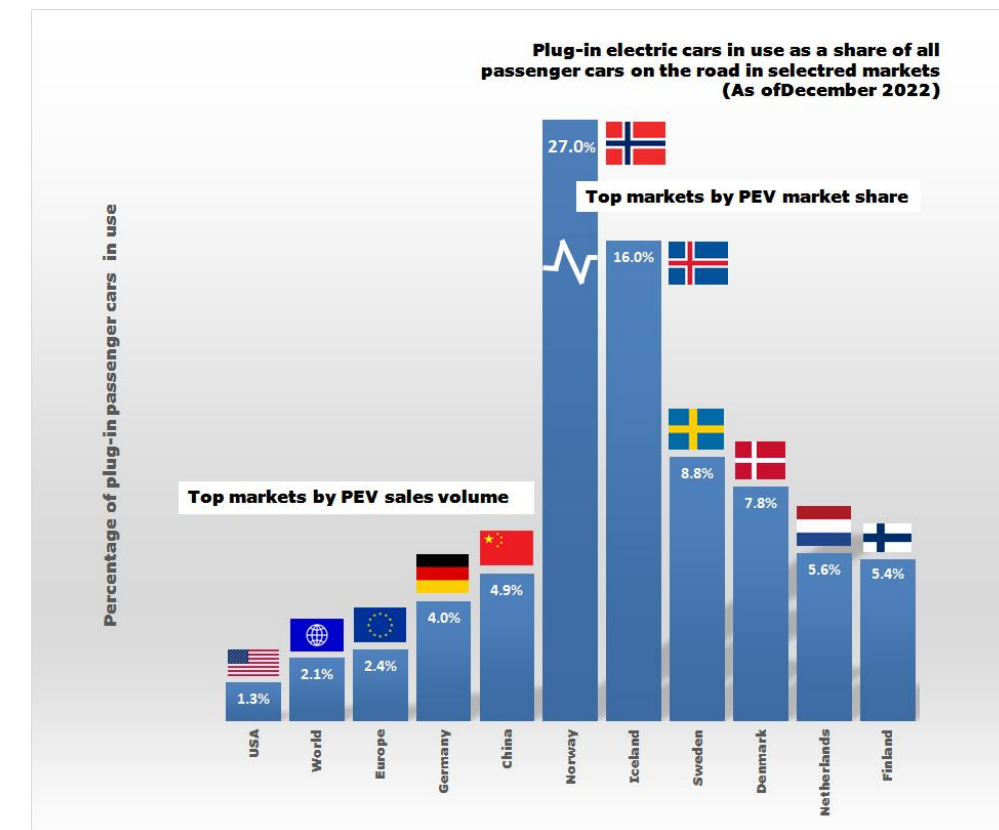
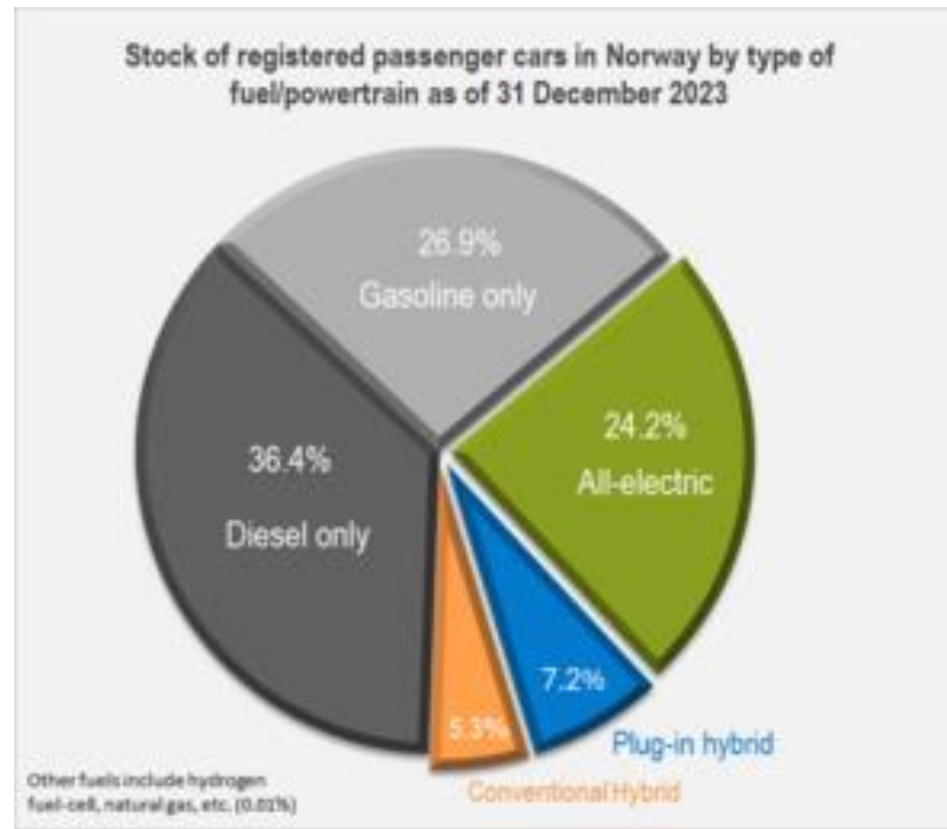
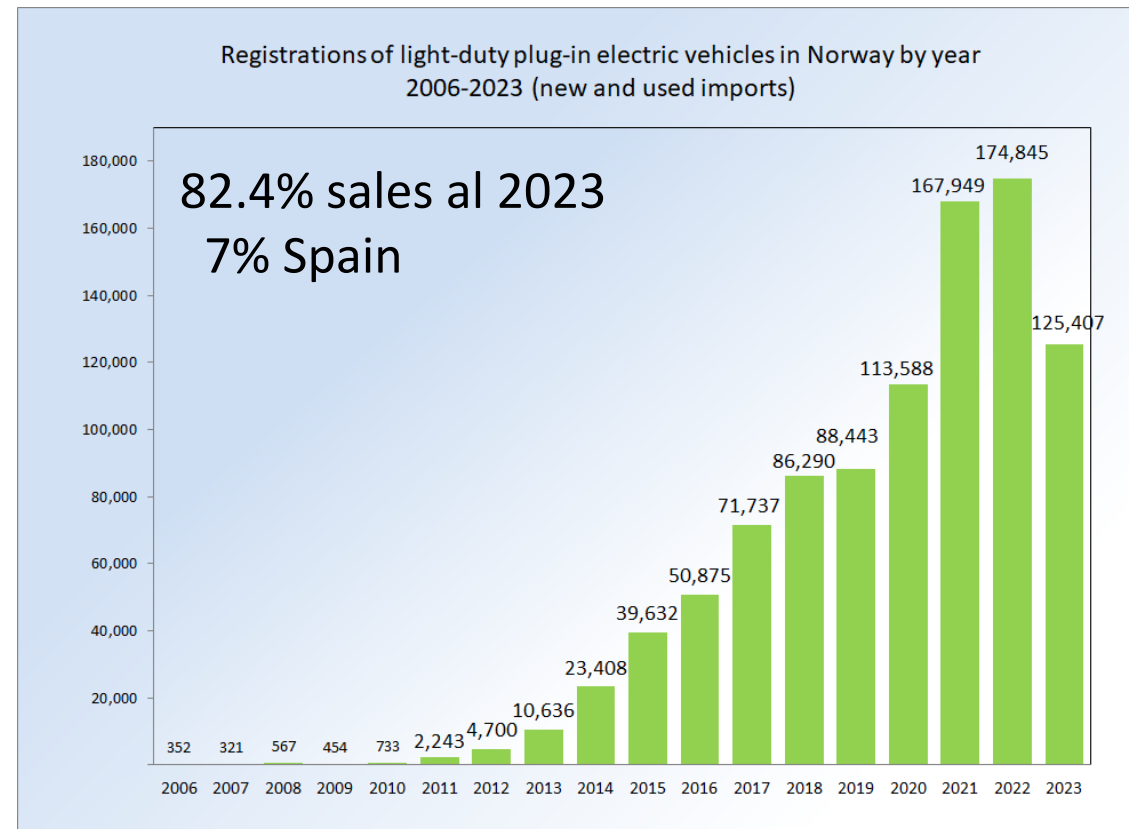
● Brussels ● Barcelona ● London ● Berlin ● Milano ● Paris ● Madrid



ABATING EMISSIONS FROM ROAD TRAFFIC

Measures to change fleets: LEZ & e-transition

e-vehicles



Norway 27% e-vehicles al 2023 (20% full electric)

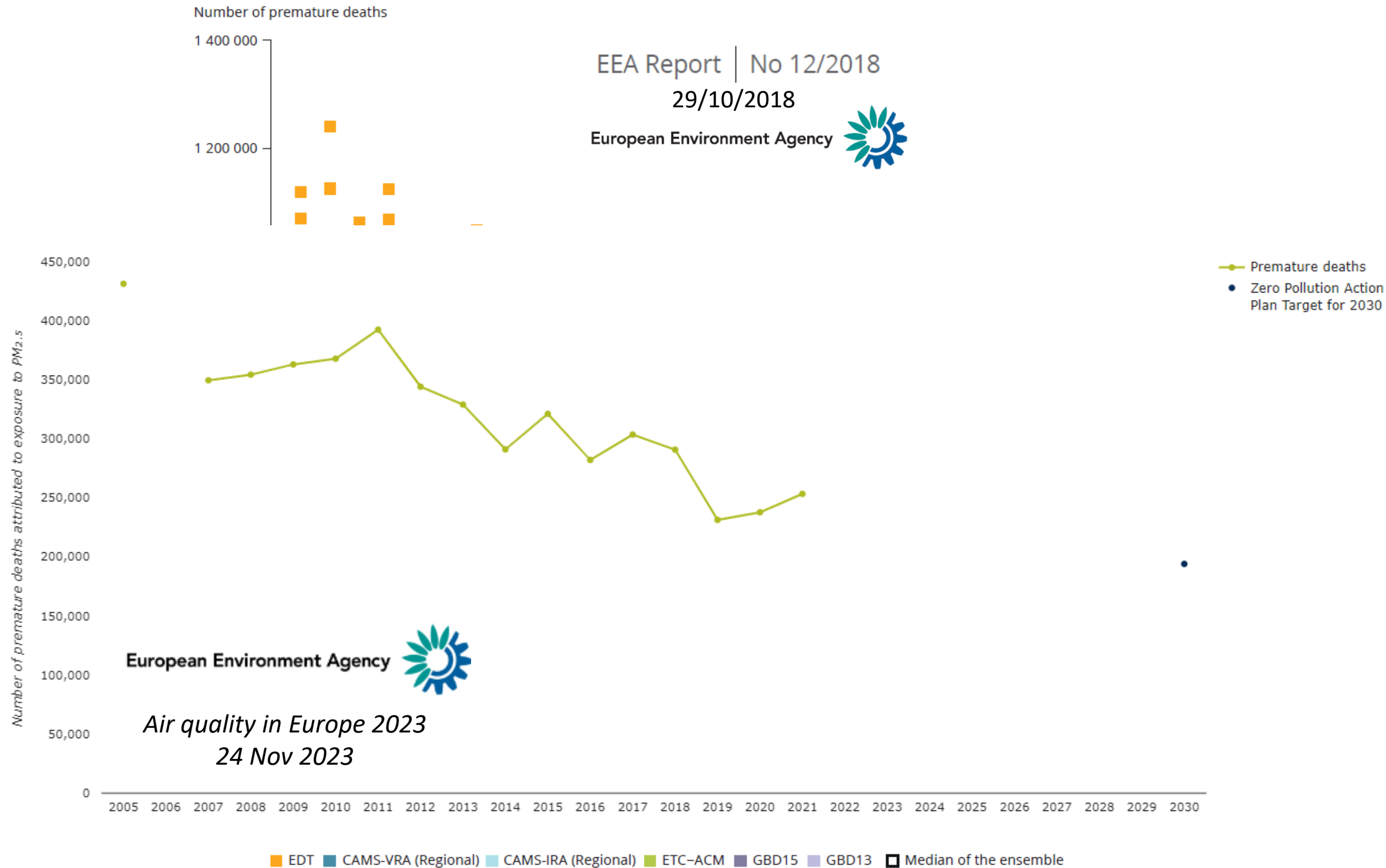
- Starting with urban freight Distribution & taxi, with higher km/day
- Urban motorbikes

Norwegian Road Federation (OFV) (2022, 2021, 2020, 2019, 2018, 2017, 2016, 2015, 2014)
Bilsalget in 2022, 2021, 2020, 2019, 2018, 2017, 2016, 2015, 2014, 2013. " [Car sales in 2022,
2021, 2020, 2019, 2018, , 2017, 2016, 2015, 2014, 2013] (in Norwegian).

OFV. Retrieved 2022-01-20. <https://ofv.no/>

Optimistic!!!!!!!

Figure 10.1 Premature deaths due to exposure to PM_{2.5} (all-cause (natural) mortality) in Europe over the period 1990-2016 for various data sets of PM_{2.5} concentration



¡¡¡¡ Gracias por su atención!!!!



CONSEJO SUPERIOR DE INVESTIGACIONES CIENTÍFICAS
Instituto de Diagnóstico Ambiental y Estudios del Agua
Departamento de Geociencias



Grupo de Geoquímica Ambiental e Investigaciones Atmosféricas

RI
URBANS



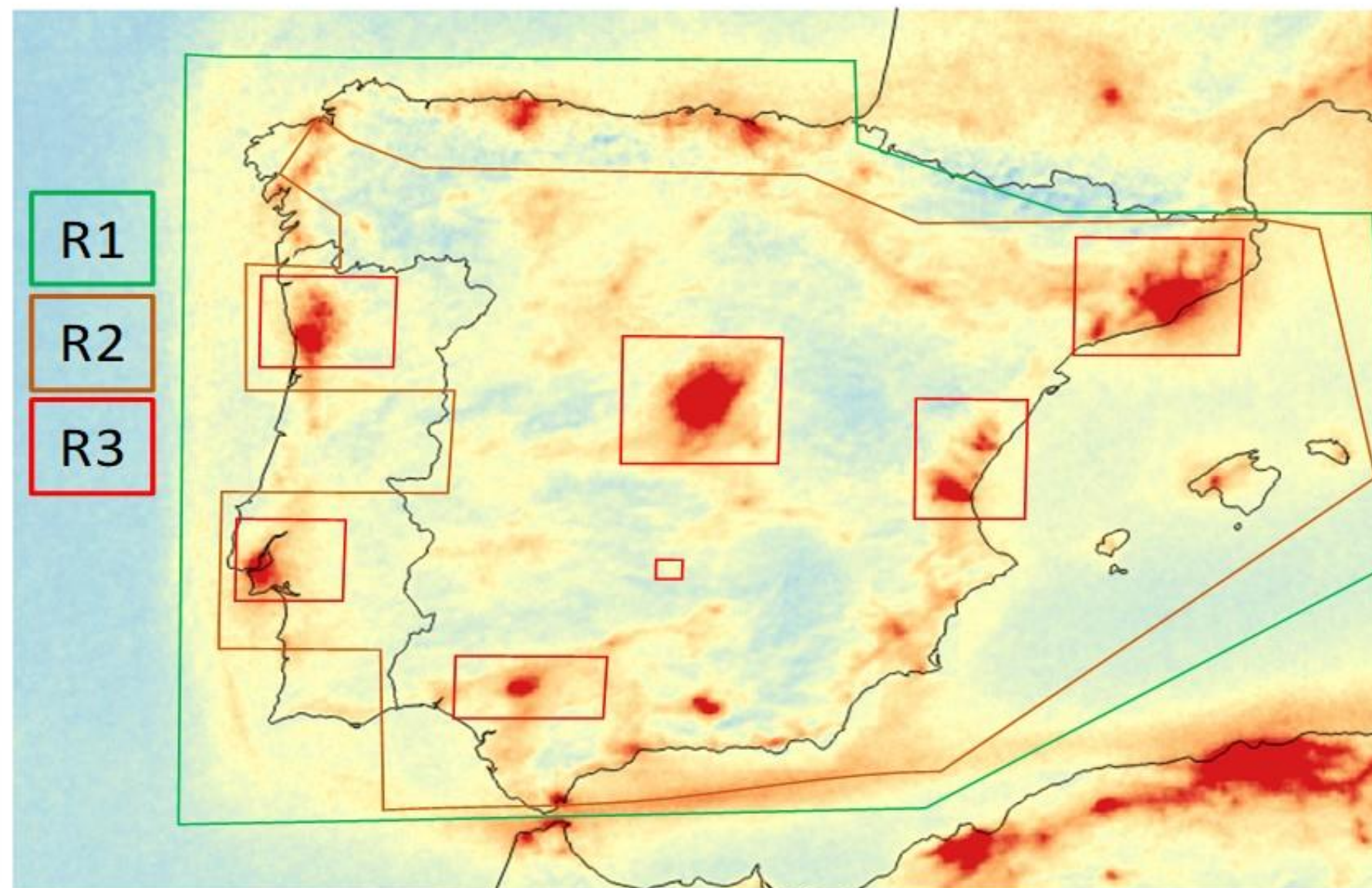
JORNADA

Calidad del Aire en España: Nuevos Retos

Organiza: Patrocina: Colabora:



TROPOMI –ESA- NO2 COLUMN JJA 2019



AREA WITH NO₂ ≥ 40 μmol m⁻² Madrid 2733 km²
Barcelona 2043 km²