FINDING THE RIGHT SOLUTIONS TO IMPROVE AIR QUALITY

Implications of the new WHO AQ Guidelines to compliance in Europe

15th Concawe Symposium
18 March 2024, Brussels

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Road Map

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Introduction

- Key Research Questions
- Motivation
- Project Description

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Case Studies

- Particulate Matter
- NO_2
- Ozone

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Key takeaways

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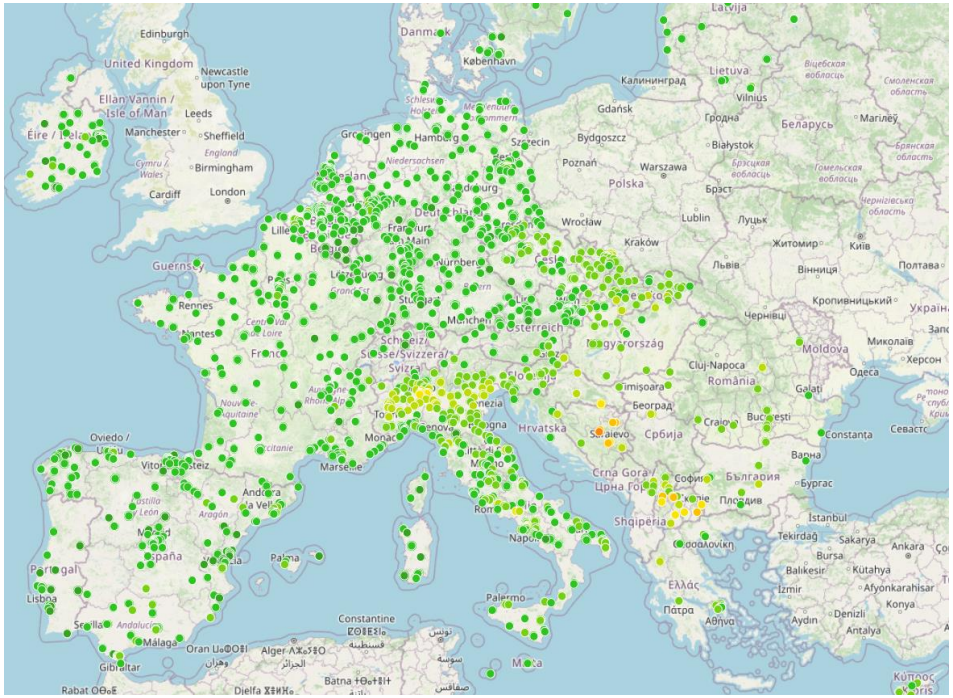
Some key research questions

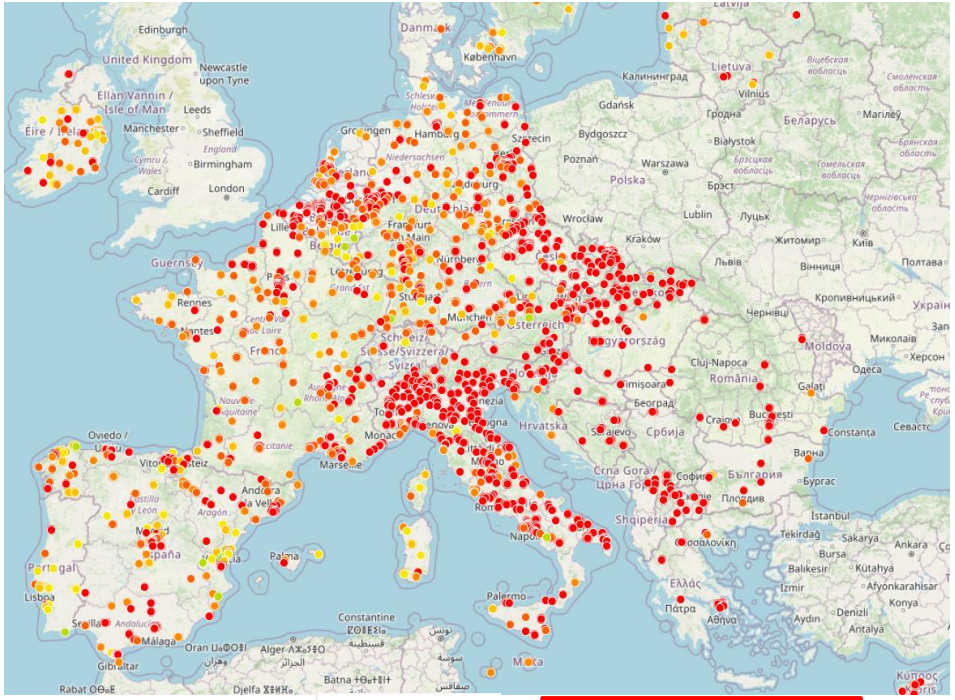
- What is the current status of air pollutants concentrations in Europe and compliance with Air Quality Standards (AQS)?
- What's the contribution of different sectoral emissions?
- Can already legislated measures ensure compliance with the new proposed AQS by 2030 and close alignment with World Health Organisation (WHO) AQ Guidelines by 2050? What is the role of each sector individually?
- Will additional measures be needed to ensure full alignment with WHO AQ Guidelines by 2050? Would this be feasible?
- Would binding limit values be always effective in improving air quality?
- How air quality modelling can help in supporting air quality assessment and planning?
- What are the research areas that further focus needs to be given to better understand air quality?

$PM_{2.5}$ in Europe -More than 95% of stations above WHO AQG in 2022

EU Standard today - 25 µg/m³



WHO AQG - 5 µg/m³



Source: Concawe Air Quality Analysis Tool (CAQAT) using EEA's AQ e-Reporting Data

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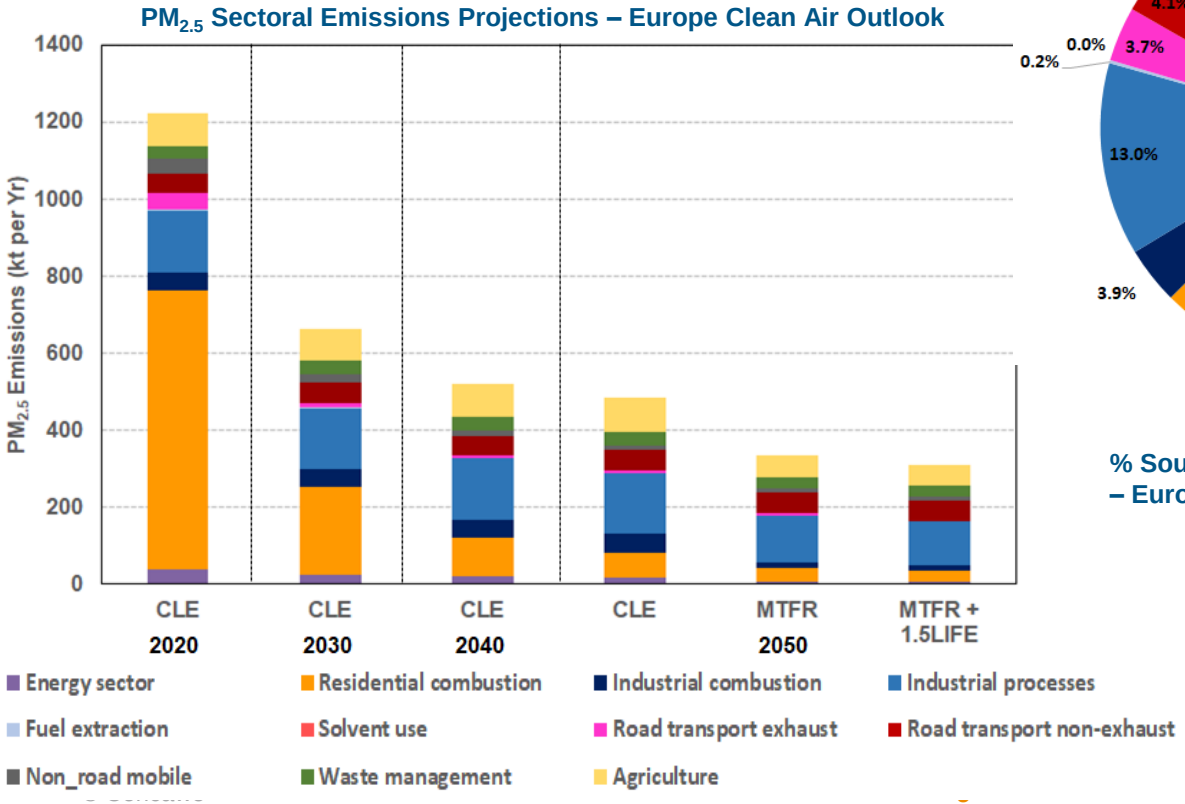
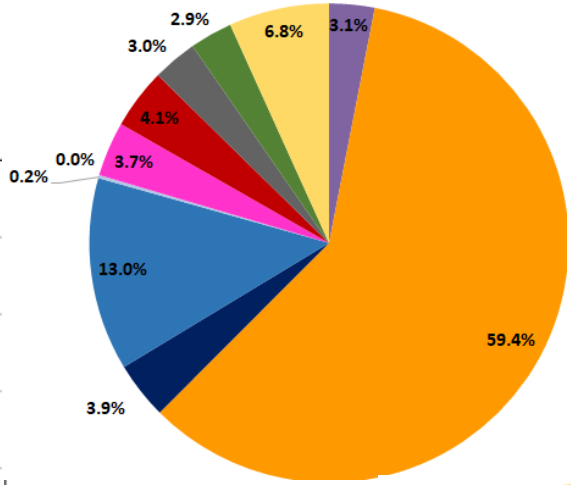
Understand your emissions sources is key

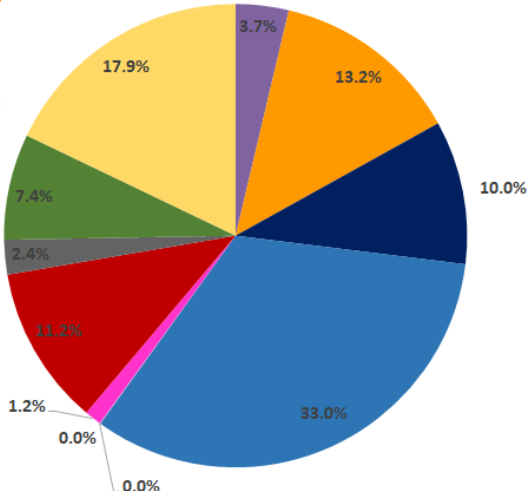
$PM_{2.5}$ Emissions – Road Transport exhaust a minor contributor





% Sources Contribution – Europe (CLE, 2020)

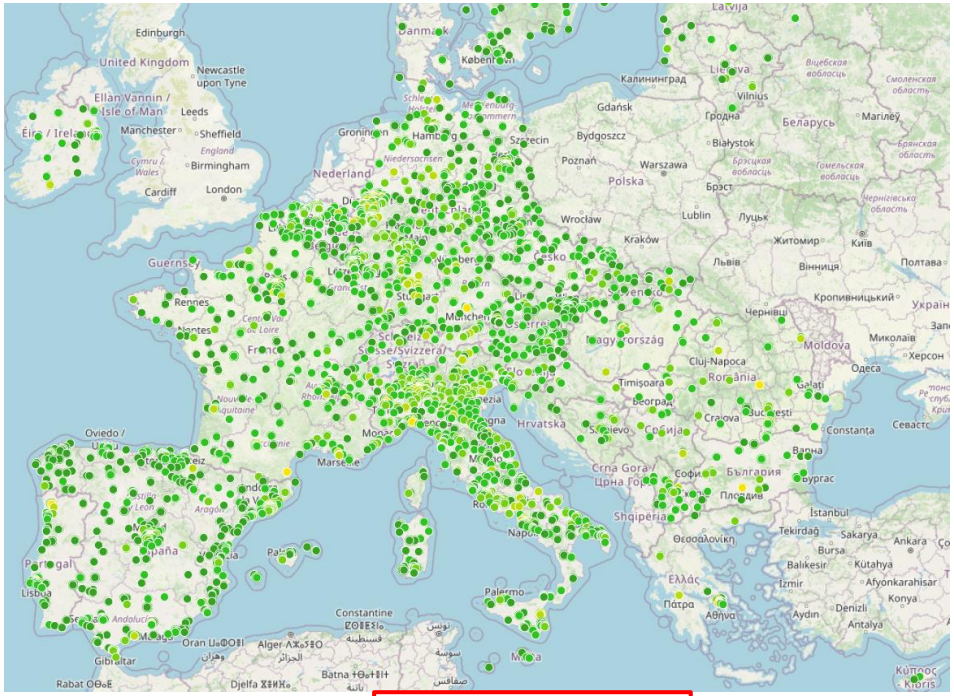
% Sources Contributio – Europe (CLE, 2050)



Source: IIASA GAINS, CAO2

NO_2 in Europe - 75% of stations above WHO AQG in 2022

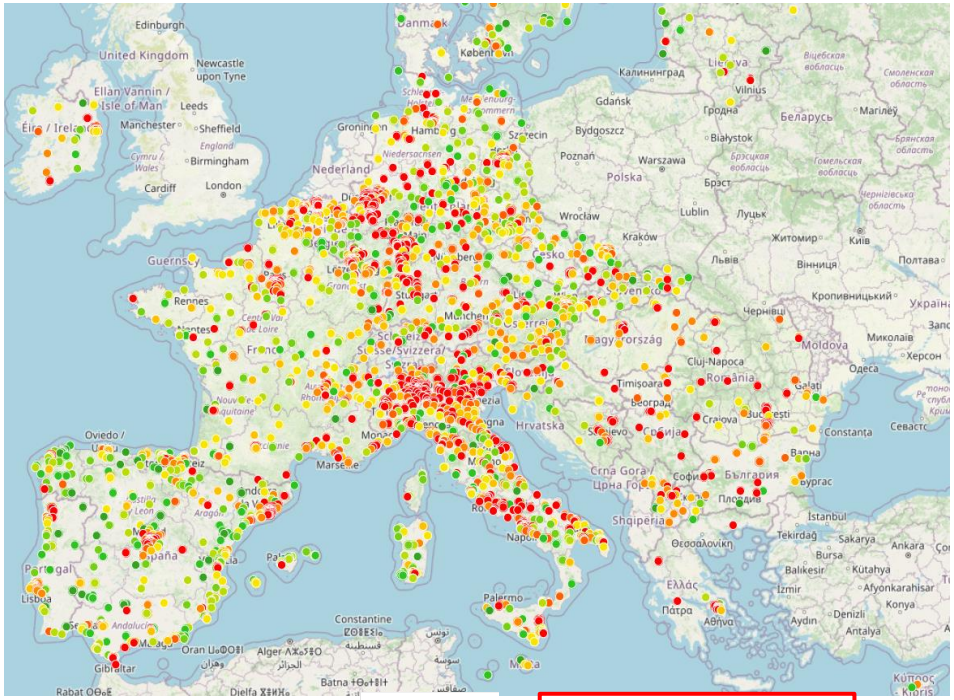
EU Standard today - 40 µg/m³



801	0-10 µg/m³
1246	10-20 µg/m³
810	20-30 µg/m³
306	30-40 µg/m³
35	40-50 µg/m³
6	50-60 µg/m³
1	60-70 µg/m³

3205 Total Sampling Points
98.7% Below Limit
1.31% Above Limit

WHO AQG - 10 µg/m³



95	0-2.5 µg/m³
181	2.5-5 µg/m³
208	5-7.5 µg/m³
317	7.5-10 µg/m³
334	10-12.5 µg/m³
349	12.5-15 µg/m³
295	15-17.5 µg/m³
268	17.5-20 µg/m³
1158	> 20 µg/m³

3205 Total Sampling Points
25.0% Below Limit
75.0% Above Limit

Source: Concawe Air Quality Analysis Tool (CAQAT) using EEA's AQ e-Reporting Data

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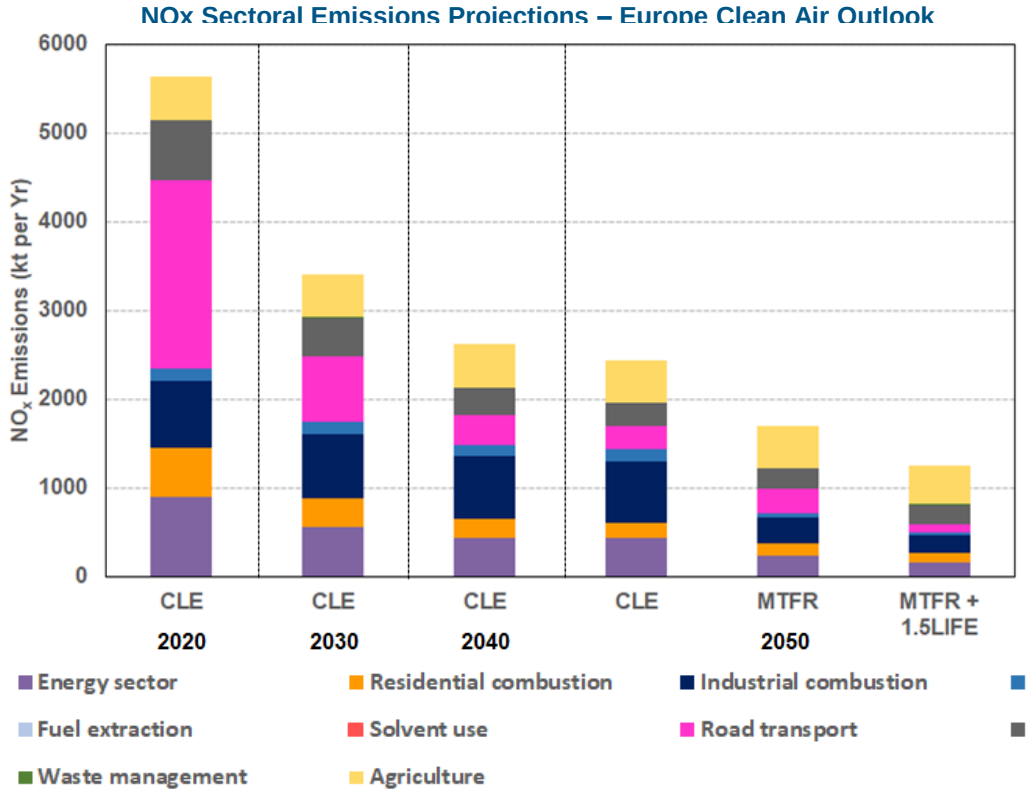
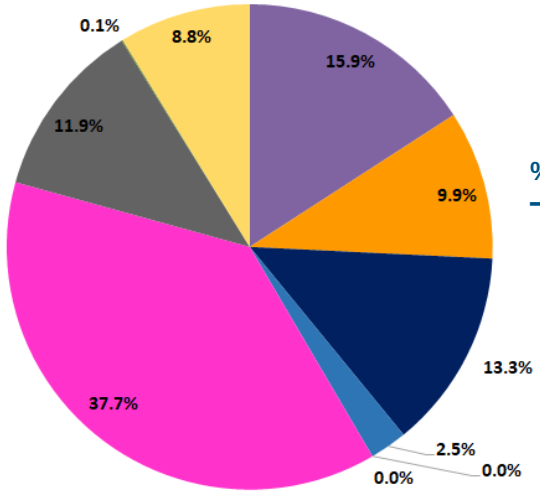
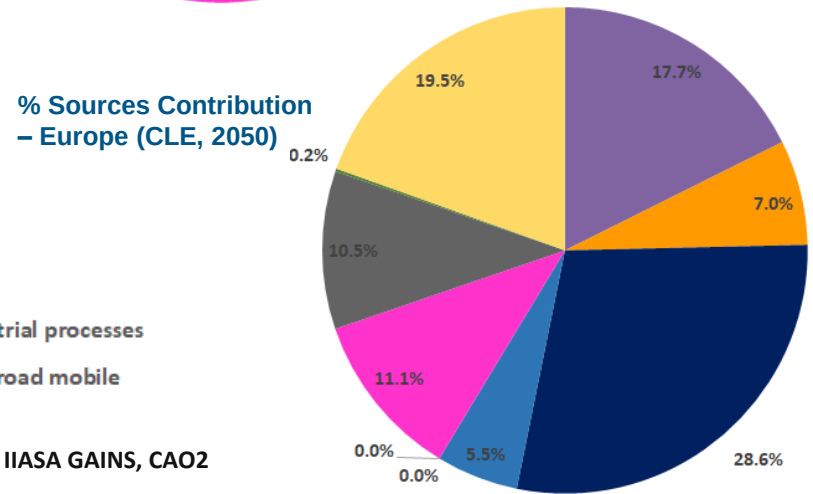
Understand your emissions sources is key

87% less road transport NOx emissions in 2050 due to fleet turnover







Source: IIASA GAINS, CAO2

Project: Monitoring stations compliance with WHO Air Quality Guidelines

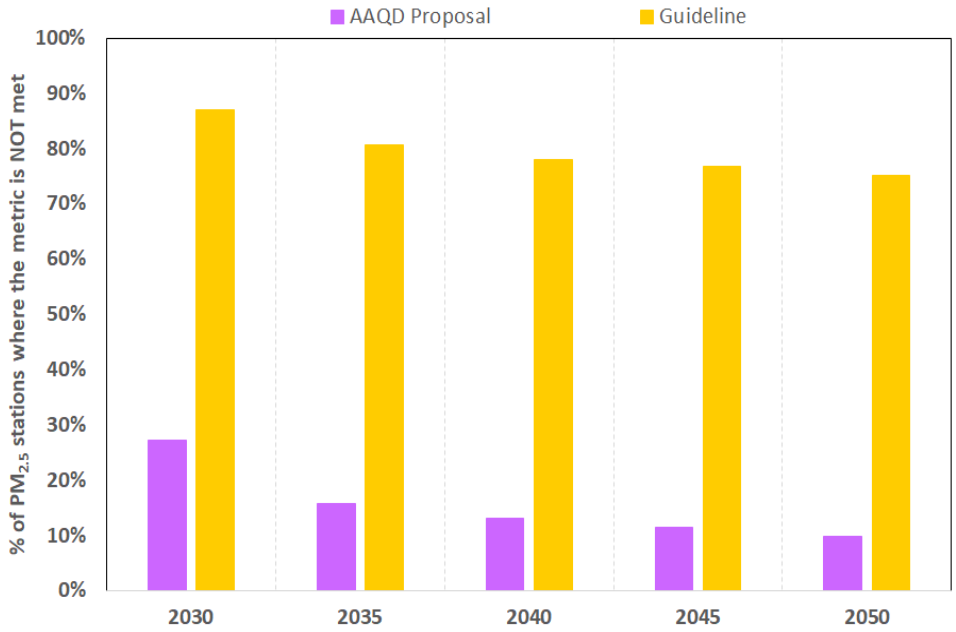
- Concawe – ACEA joint modelling study to forecast predictions of air pollutants concentrations across the European monitoring network for the period 2015 to 2050.
- Same methodology as the supporting studies carried out for the Second Clean Air Outlook (CAO2) of the EC, that used also in the impact assessment during the AAQD revision process.
- Three activity scenarios of the CAO2 were used:
  a) Baseline scenario (CLE): projection of emissions subject to existing legislation, both effected and yet to come into force.
  b) An emission reduction scenario based on maximum technically feasible reductions (MTFR).
  c) A scenario consistent with climate change measures with MTFR applied to controls (MTFR + 1.5 LIFE).
- Six additional sectoral emission removal scenarios were considered.
- Predictions for $PM_{2.5}$/PM_{10}, O_3, and NO_2 have been compared with the air quality interim target and guideline values proposed by WHO in its recent revision.
- Results for EU-27 and for individual MS are available
- Concawe Report 3/23 – Available here

a)

Case Study – $PM_{2.5}$

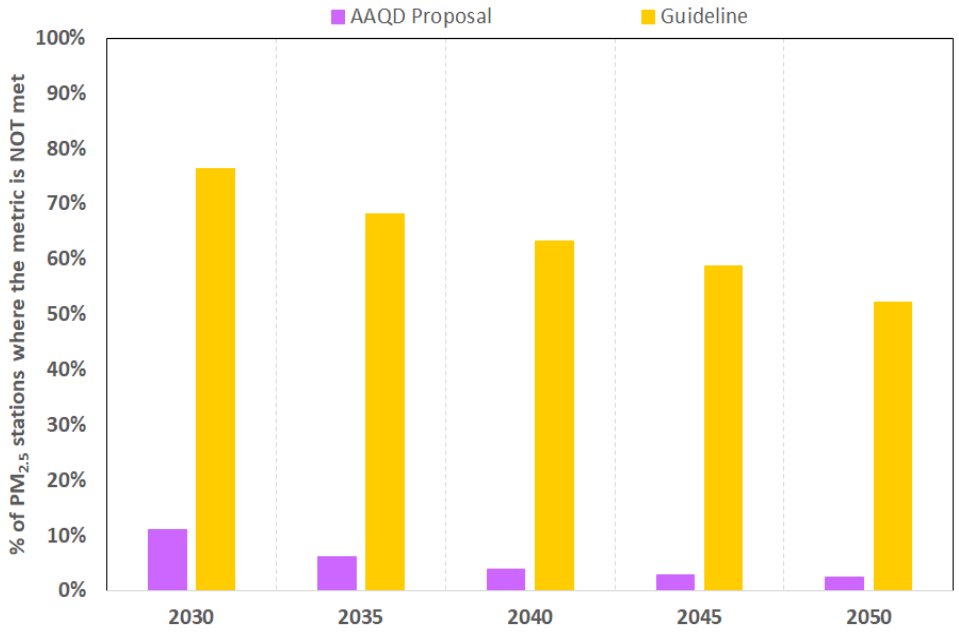
EU-27: $PM_{2.5}$ - Meeting the WHO AQG will be challenging

CAO2 – Baseline Scenario



75% of monitoring stations above WHO AQ Guideline for $PM_{2.5}$ annual mean in 2050 (5 µg/m³)

CAO2 – Maximum Technically Feasible Reductions (MTFR) Scenario



More than 50% of the stations above WHO AQ Guideline in 2050

- AAQD Proposal: 10 µg/m³
- Guideline: 5 µg/m³

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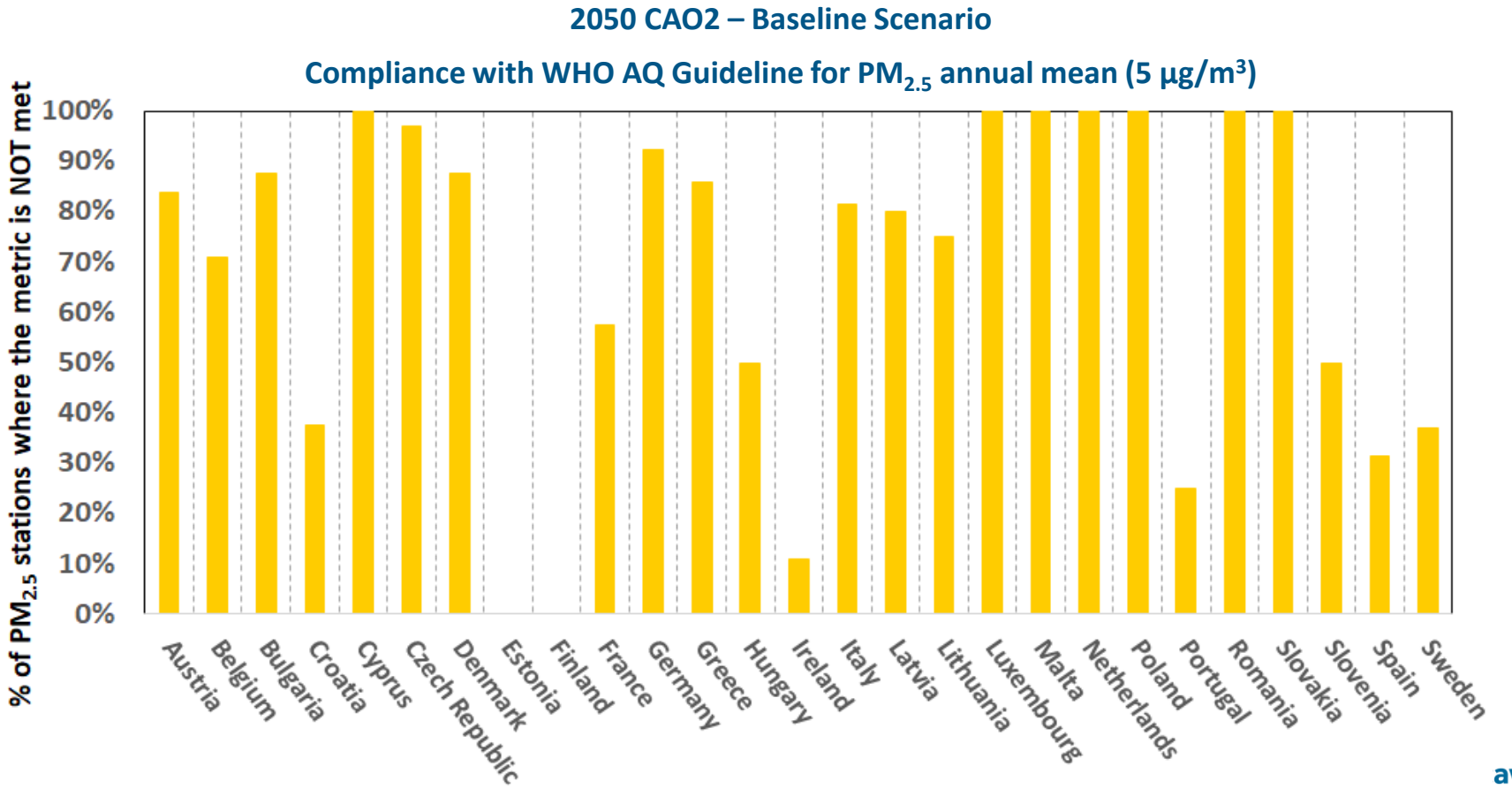
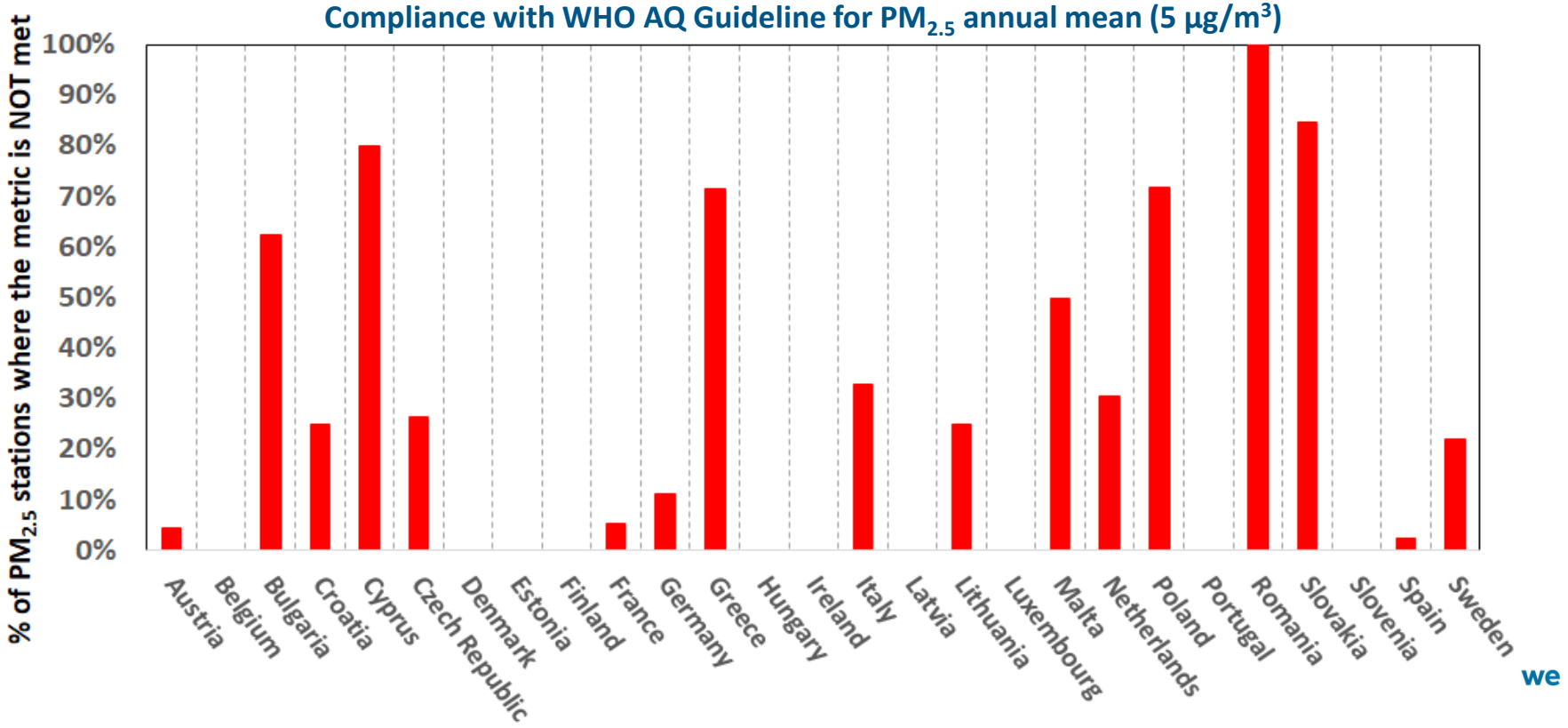
Compliance status varies among EU Member States



Targeting Agriculture the most effective in getting closer to WHO AQG

Scenario: Zero agricultural emissions



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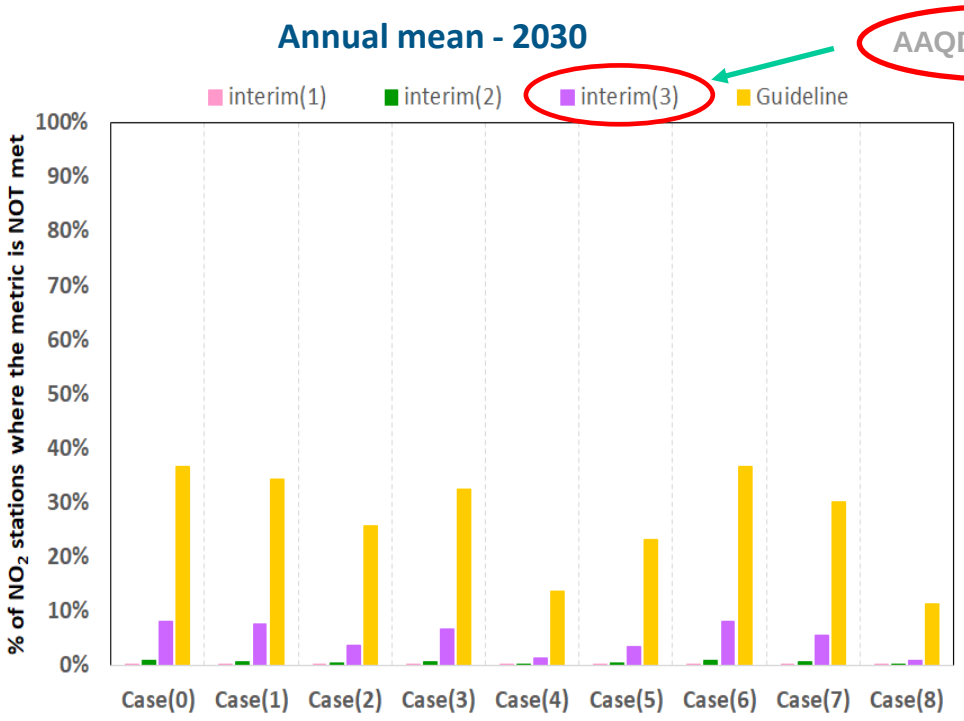
b)

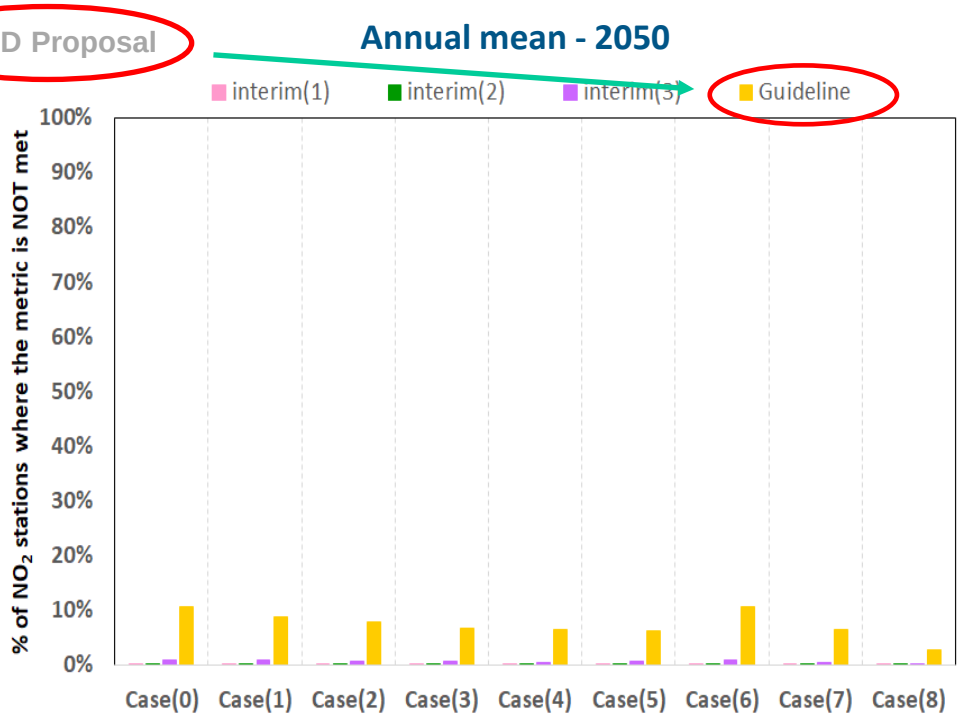
Case Study - NO_2

EU-27: NO_2 - More than 90% of stations meet new EU AQS by 2030

BUT full alignment with WHO AQG still challenging



AAQD Proposal



Case (0)	Baseline, only mandated reductions
Case (1)	Zero energy sector emissions
Case (2)	Zero domestic and commercial emissions
Case (3)	Zero industry and solvent product/use emissions
Case (4)	Zero road transport emissions
Case (5)	Zero non-road transport/machinery emissions
Case (6)	Zero agricultural emissions
Case (7)	(MTFR) Emissions
Case (8)	MTFR + 1.5 LIFE Emissions

- IT 1: 40 µg/m³ (current AQS)
- IT 2: 30 µg/m³
- **IT 3: 20 µg/m³ (proposed new AQS by 2030)**
- **WHO AQG: 10 µg/m³**

Source: Concawe Rpt 3/23: (link)

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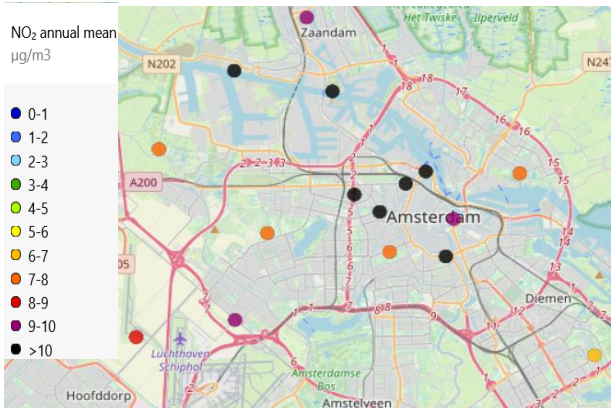
Targeted city-specific measures may be more effective to improve NO_2 compliance

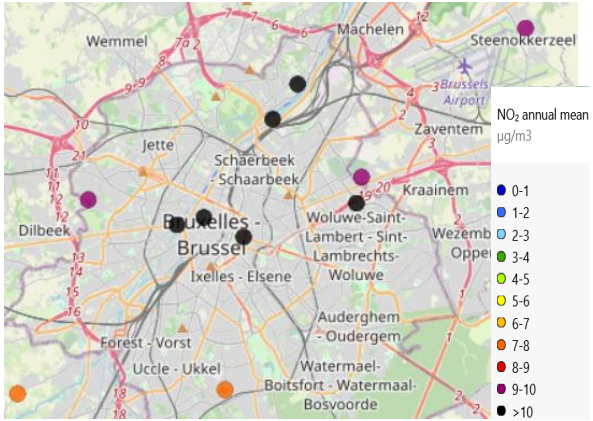
Amsterdam – Baseline 2050

Amsterdam – Zero road transport

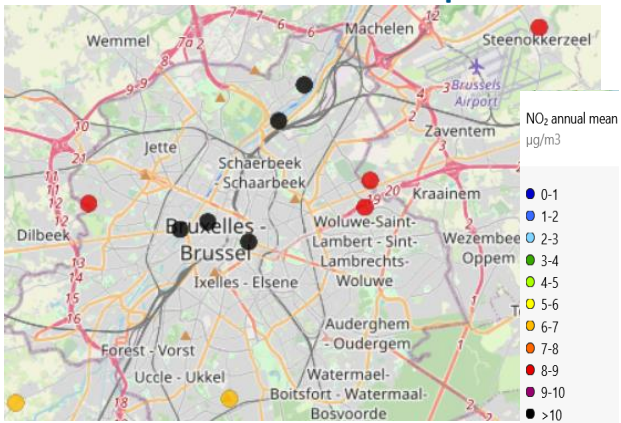
Amsterdam – Zero aviation & shipping



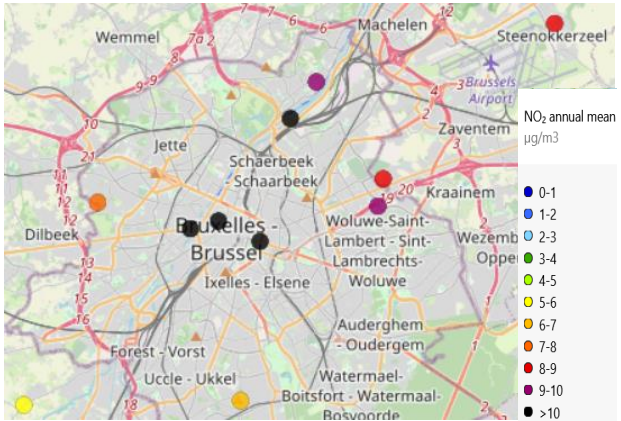
Brussels – Baseline 2050



Brussels – Zero road transport



Brussels – Zero public power



03 Key takeaways

Key Takeaways

Meeting the new proposed EU AQ Standards by 2030 and the WHO AQ Guidelines by 2050 will be challenging for some pollutants

The role and contribution of emissions sources, available control measures, technical feasibility, cost-effectiveness, socio-economic conditions, natural background need to be considered to ensure that the proposed EU AQ Standards will get closer to what recommended as soon as possible.

Further improvement will require targeted region/city-specific measures based on a thorough source attribution analyses; EU-wide and/or national reductions measures may no longer be effective.

Other sectors than “traditional” emissions sources may become more important in the future.

- Need for accurate emission inventories to better understand the impacts is essential

Air quality modelling can offer a means of robust, evidence-based approach in supporting air quality assessment and assessing how air quality can be further improved.

Binding limit values can only be effective when pollutant cycle is well understood : e.g., difficult for Ozone formation, due to NOx titration and transboundary effects, natural emissions, etc.

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Environmental Science
for European Refining

www.concawe.eu

Thank you for your attention

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Understand your emissions sources is key

Ambient Air Quality Directive Revision Process

Ambient Air Quality Directive (2008/50/EC and 2004/107/EC) – Main EU instrument to **improve ambient air quality**, thereby **reducing pollution to levels which minimize harmful effects** on human health and the environment as a whole

Revision proposal:

- 'Sets out a **zero pollution objective** for air quality with the general objective to **reduce air pollution to levels no longer harmful** to health and natural ecosystems **at the latest by 2050'**

- Fitting with European Green Deal Zero Pollution Ambition action plan – non-toxic environment

- AAQD revision aims to:
  - **Align EU Air Quality Standards (AQS)** more closely **with** most recent revision of **WHO Air Quality Guidelines (Sep'21)**
    - **Sets new EU Air Quality Standards (AQS), defined as limit values – To be met by 2030**
  - **Streamline legislative framework** (e.g., penalties, compensation and public information)
  - **Strengthen air quality monitoring**, modelling and **air quality plans**

AAQD Revised AQS limit and target values

		Averaging time	Current AAQD	AAQD Proposal 1/1/2030	WHO Air Quality Guidelines				
					Interim Target 1	Interim Target 2	Interim Target 3	Interim Target 4	Guideline Level
$PM_{2.5}$ ($\mu g/m^3$)	Limit	Annual 24-hour	25	**10** **25**	35 75	25 50	15 37.5	10 25	**5** **15**
PM_{10} ($\mu g/m^3$)	Limit	Annual 24-hour	40 50	**20** **45**	70 150	50 100	30 75	20 50	**15** **45**
O_3 ($\mu g/m^3$)	Target	Max daily 8-hr mean Peak season	120	**120***	160 100	120 70			**100**** **60**
NO_2 ($\mu g/m^3$)	Limit	Annual 24-hour 1-hour	40 200	**20** **50** **200**	40 120	30 50	20		**10** **25**

*AAQD Proposal sets allowance of 18 days/year.
** WHO AQG sets allowance of 3-4 days/year

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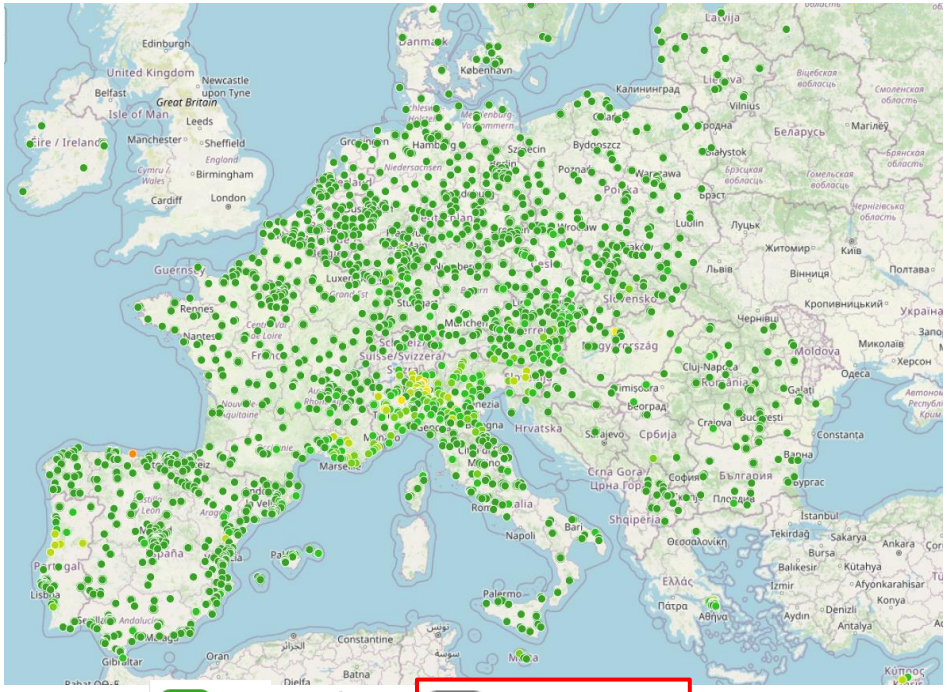
Case Study – Ozone

O_3 in Europe – More than 90% of stations above WHO AQG in 2022

EU Standard today – 120 µg/m³ (<25 exceed. days)



WHO AQG: 100 µg/m³ (<3 exceed. days)

Source: Concawe Air Quality Analysis Tool (CAQAT) using EEA's AQ e-Reporting Data

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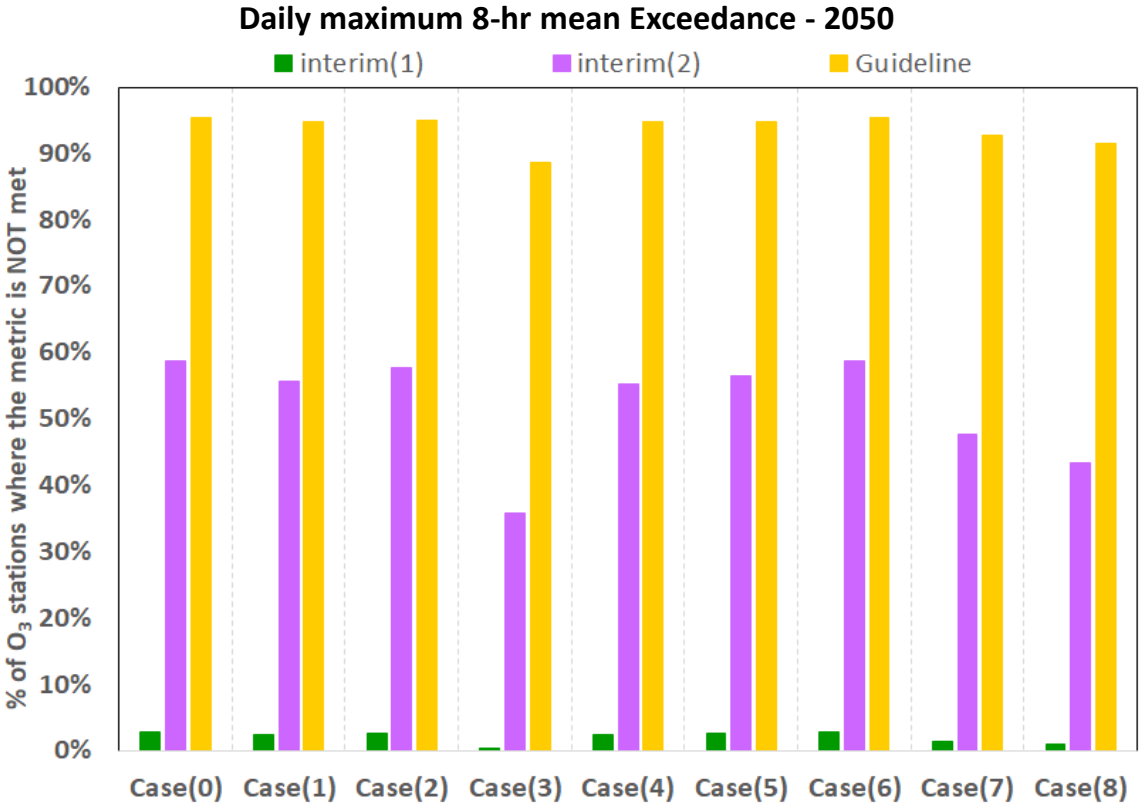
Ozone - Far away from meeting WHO AQ Guideline by 2050



Emission reduction scenarios

Case (0)	Baseline, only mandated reductions
Case (1)	Zero energy sector emissions
Case (2)	Zero domestic and commercial emissions
Case (3)	Zero industry and solvent product/use emissions
Case (4)	Zero road transport emissions
Case (5)	Zero non-road transport/machinery emissions
Case (6)	Zero agricultural emissions
Case (7)	Maximum Technically Feasible Reductions (MTFR) Emissions
Case (8)	MTFR + 1.5 LIFE Emissions

- IT 1: 160 µg/m^3
- IT 2: 120 µg/m^3 (current EU AQS)
- WHO AQG: 100 µg/m^3
- No more than 3 exceedance days per year

Concawe Rpt 3/23: "*Revising ambient air quality standards – the implications for compliance in Europe towards 2050*" (link)

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