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Air Quality Intelligence

An analysis of future Urban Air Quality Compliance - Real Driving Emissions and EV Scenarios

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Chris Boocock, Senior Analyst
Aeris Europe

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- Conclusions and Closing Remarks

Introduction

- This analysis extends previous Concawe commissioned work* but now informed using actual Euro6 performance data provided by Ricardo
- Comprehensive study with EU-wide focus.
- Includes case studies for 10 European cities:
  - Antwerp, Berlin, Bratislava, Brussels, London, Madrid, Munich, Paris, Vienna, Warsaw
- This presentation will present a sample of two cities (Munich and Paris).

* https://www.concawe.eu/publication/urban-air-quality-study-report-no-1116/

Scenarios presented

- **Scenario 1 - Ricardo Median**:
  - Assumes the median of the Ricardo Euro6 RDE data.

- **Scenario 2 - ZEV Scenario**:
  - all Diesel PC registered after 2020 are replaced with zero exhaust emission vehicles undertaking the same activity.

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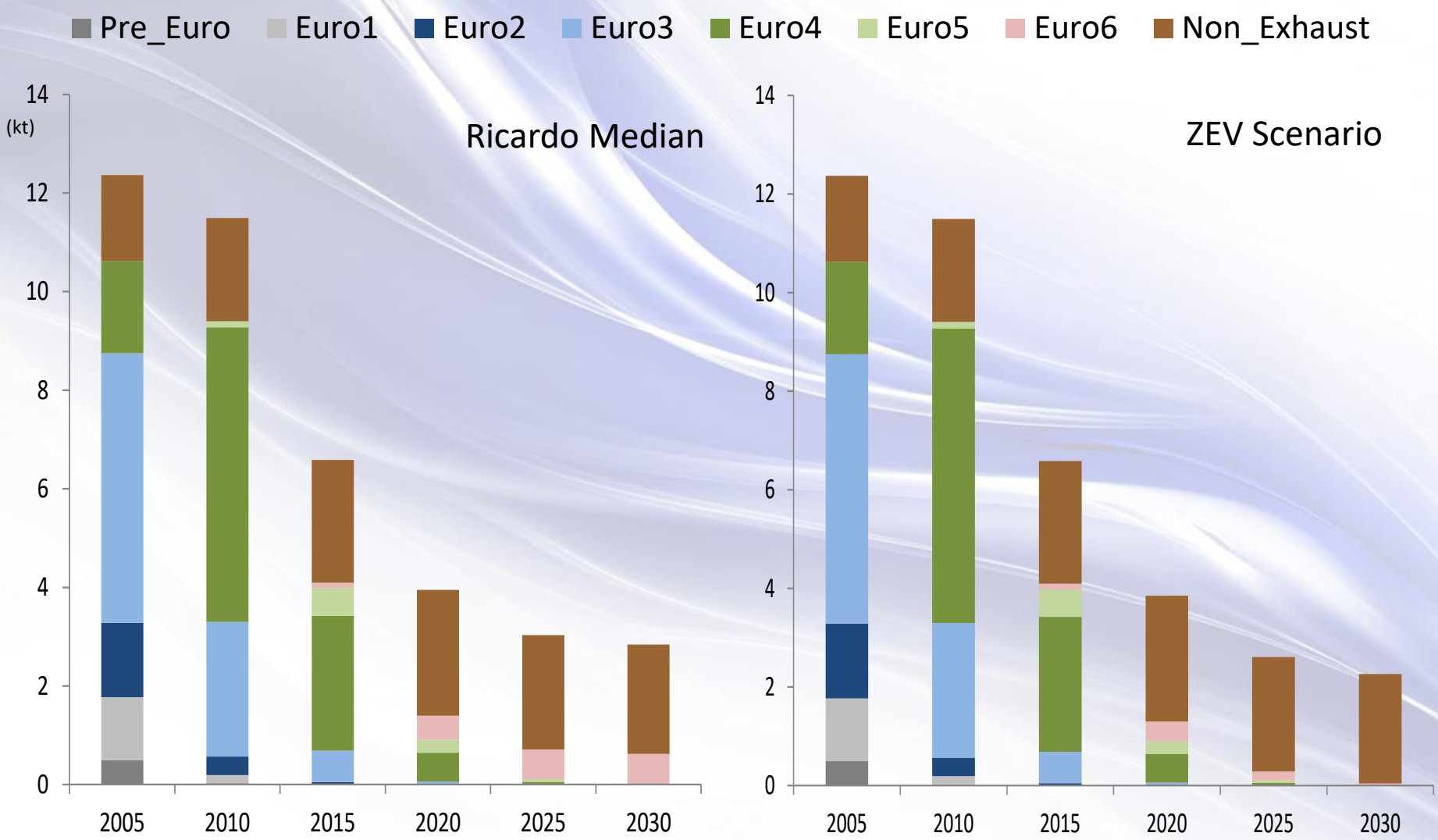
$PM_{2.5}$ Emissions by Scenario – Germany PCD Ricardo Median and ZEV post 2020



Beyond 2020, non-exhaust emissions dominate transport PM emissions

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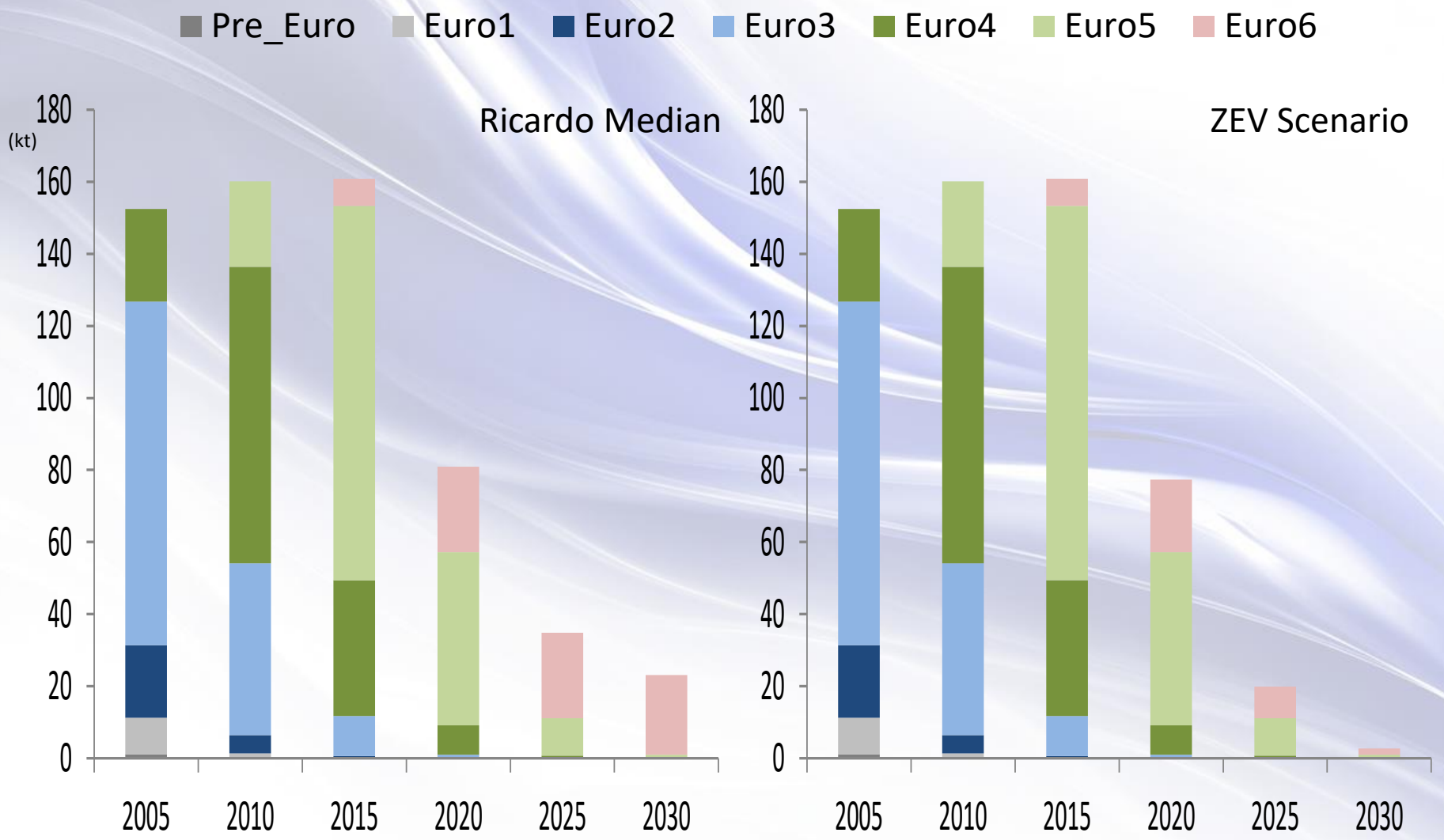
NO_X Emissions by Scenario – Germany PCD Ricardo Median and ZEV post 2020



Results

What is the impact of these emissions on ambient air quality?

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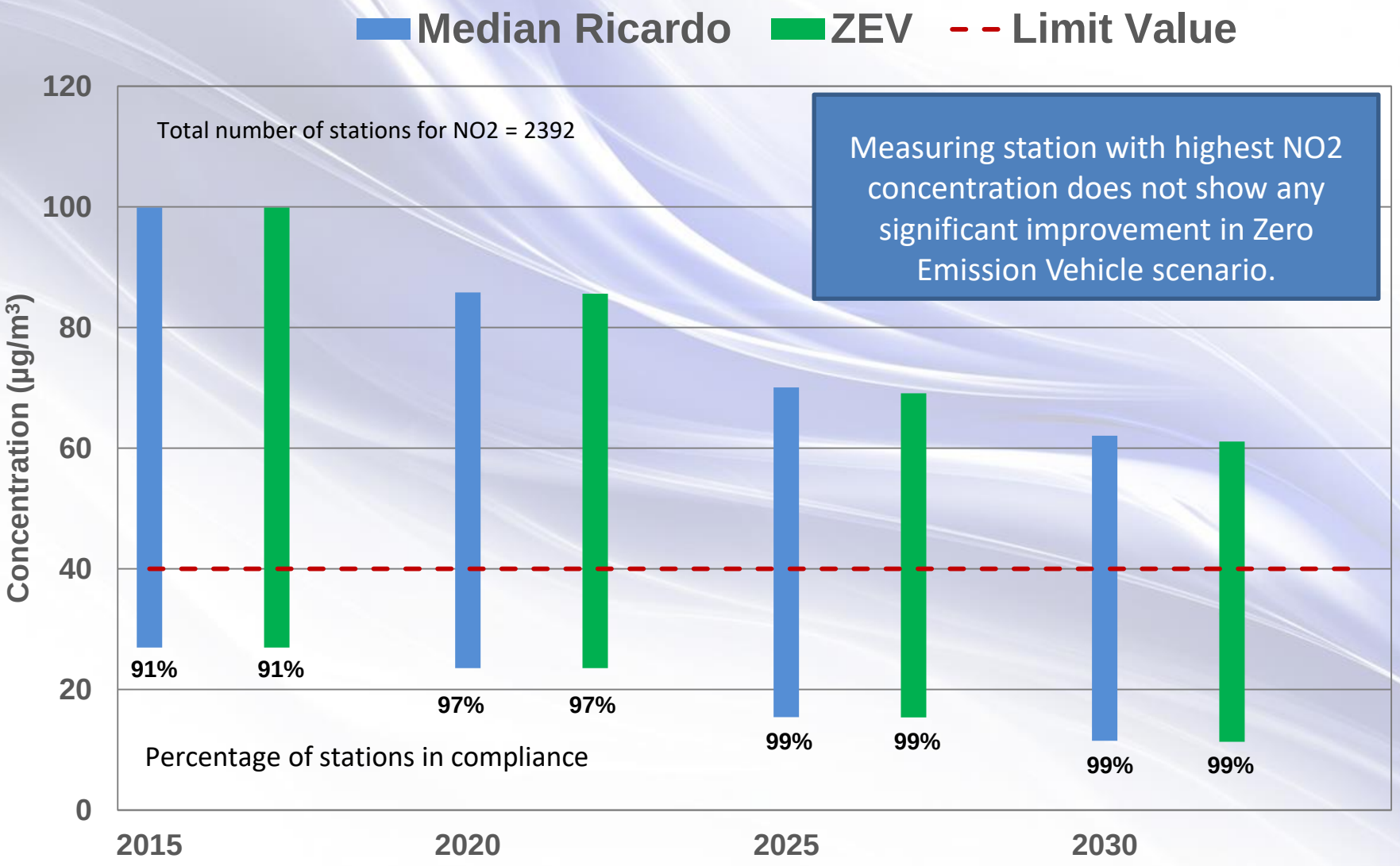
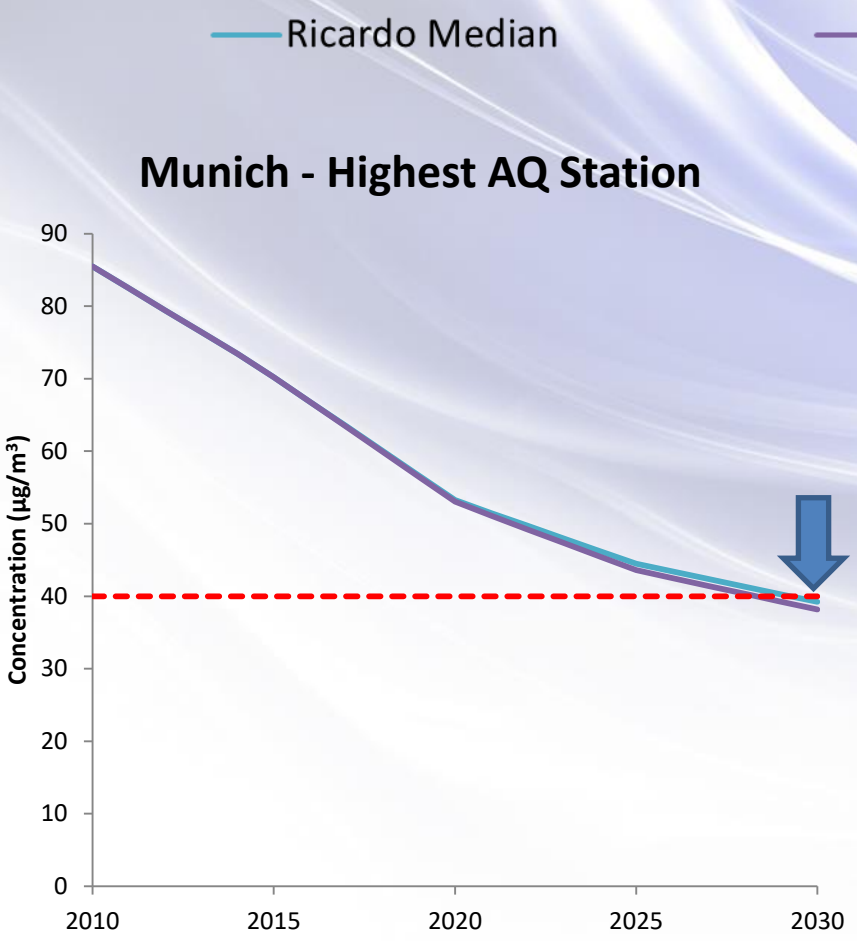
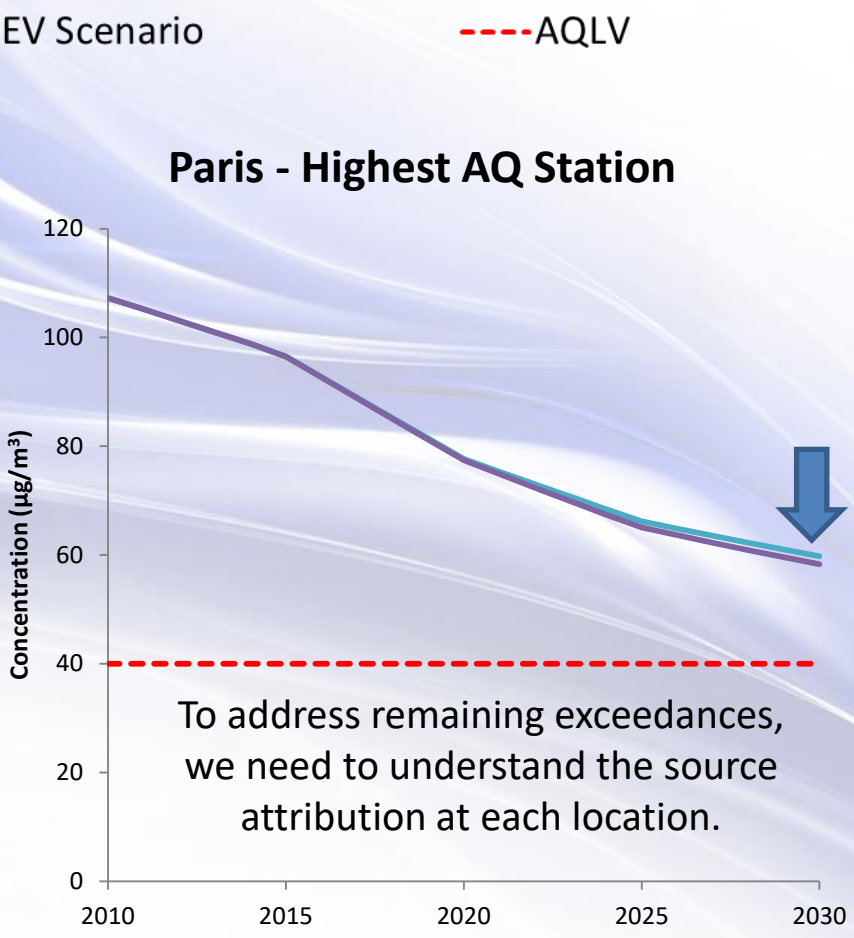
NO_2 Range of Maximum Concentration Across all Stations in EU28



Air Quality benefit of ZEV Scenario

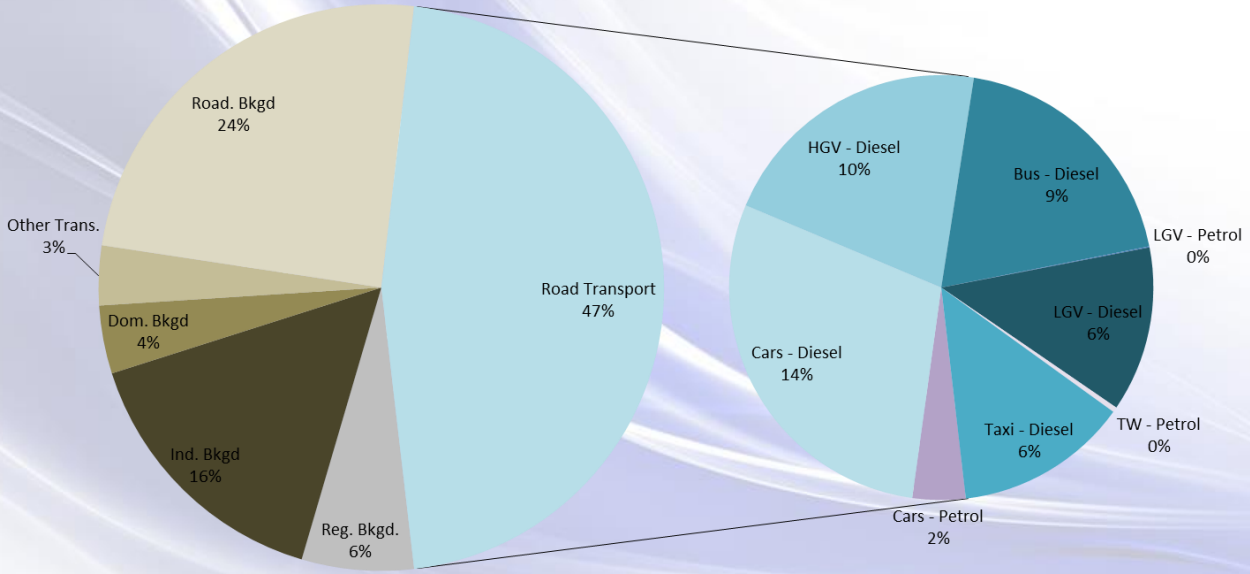
Highest measuring stations show ~ zero response to ZEV scenario:





Sample of UK DEFRA NO_2 Source Attribution for London's Hot Spots

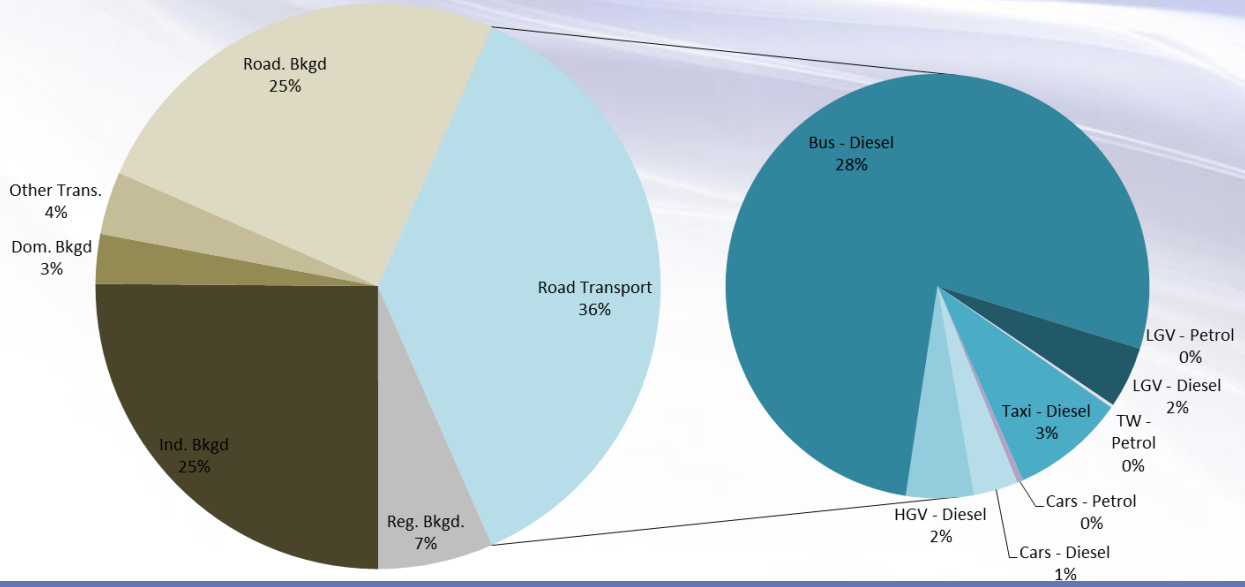
Road Census ID: 26429



Bus 9%
PCD 14%

NO2 = 71 µg/m3

Road Census ID: 38534

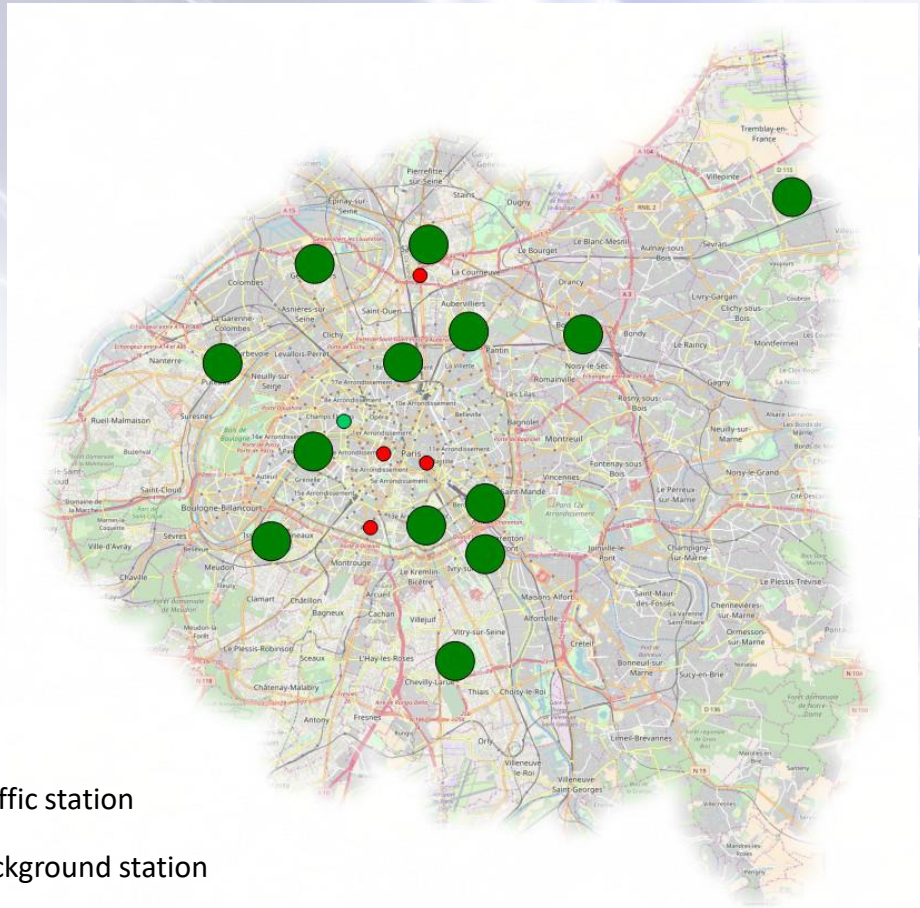


Bus 28%
PCD 1%

NO2 =66 µg/m3

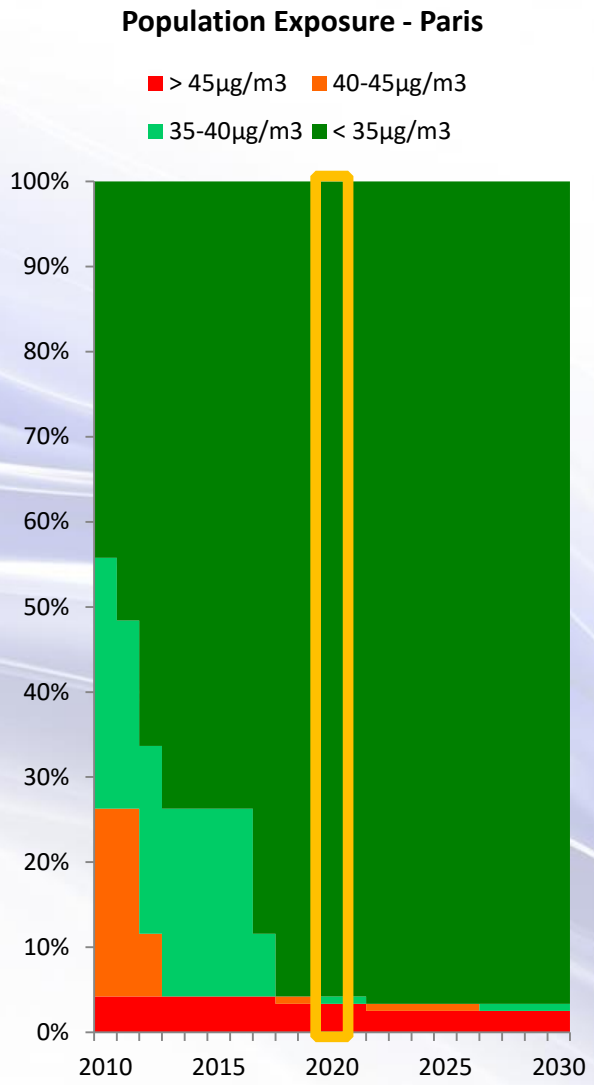
Population Exposure (NO_2) EEA Methodology*

Paris 2020



=> Traffic station

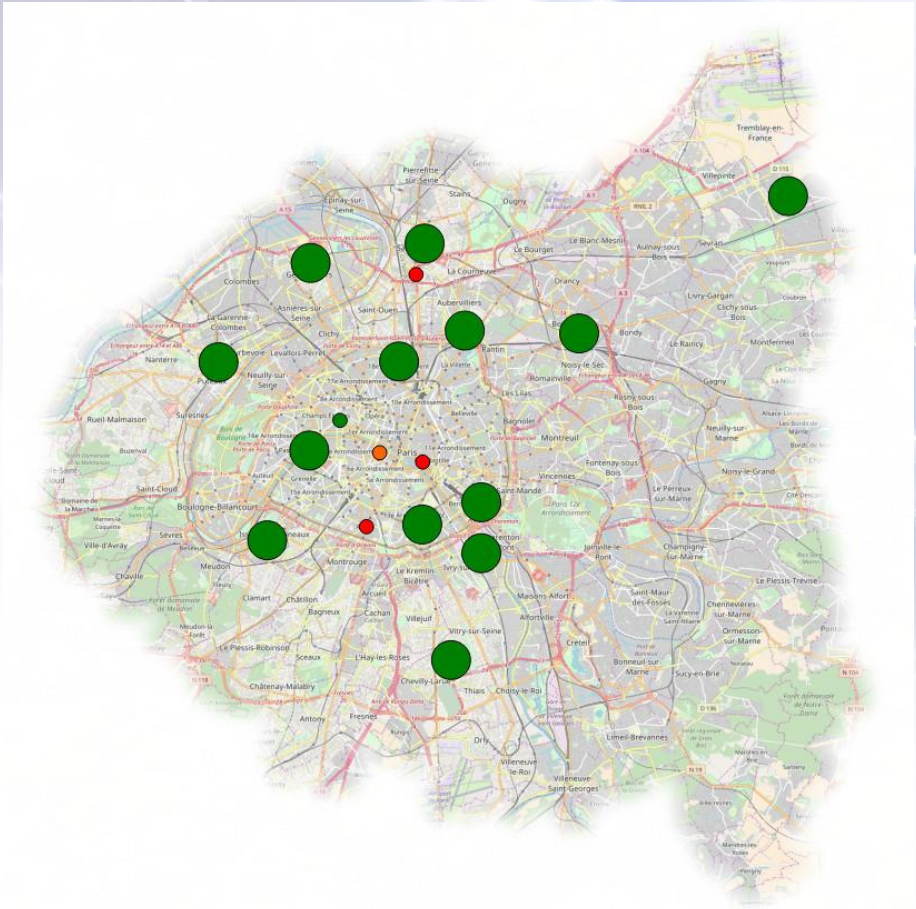
=> Background station

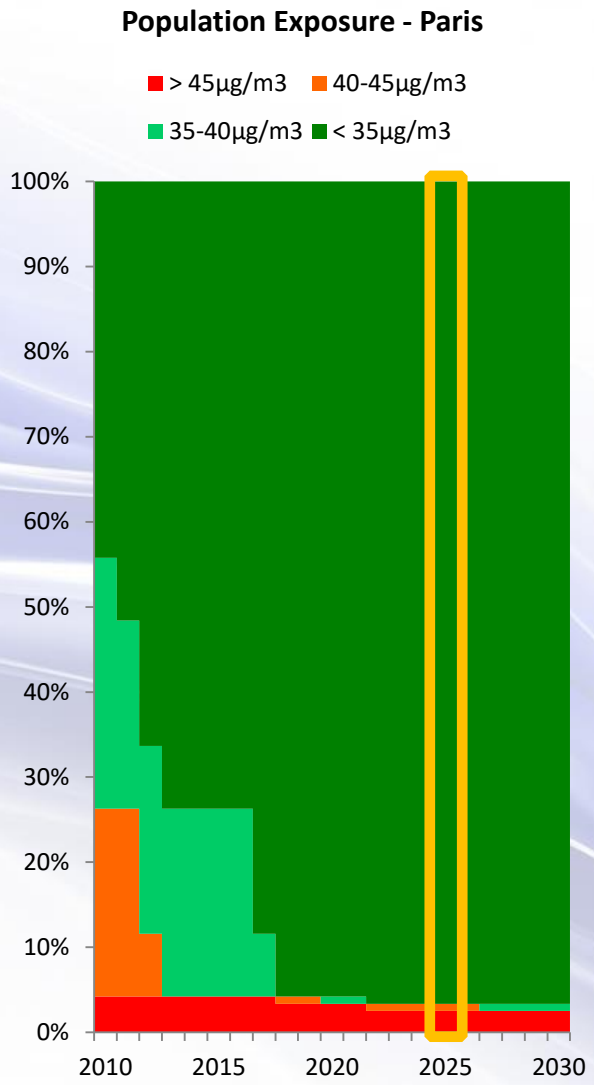


* "Exceedance of air quality standards in urban areas" EEA annually reviewed indicator
https://www.eea.europa.eu/data-and-maps/indicators/exceedance-of-air-quality-limit-3/assessment-3/download.pdf

Population Exposure (NO_2) EEA Methodology

Paris 2025





Population Exposure (NO_2) EEA Methodology

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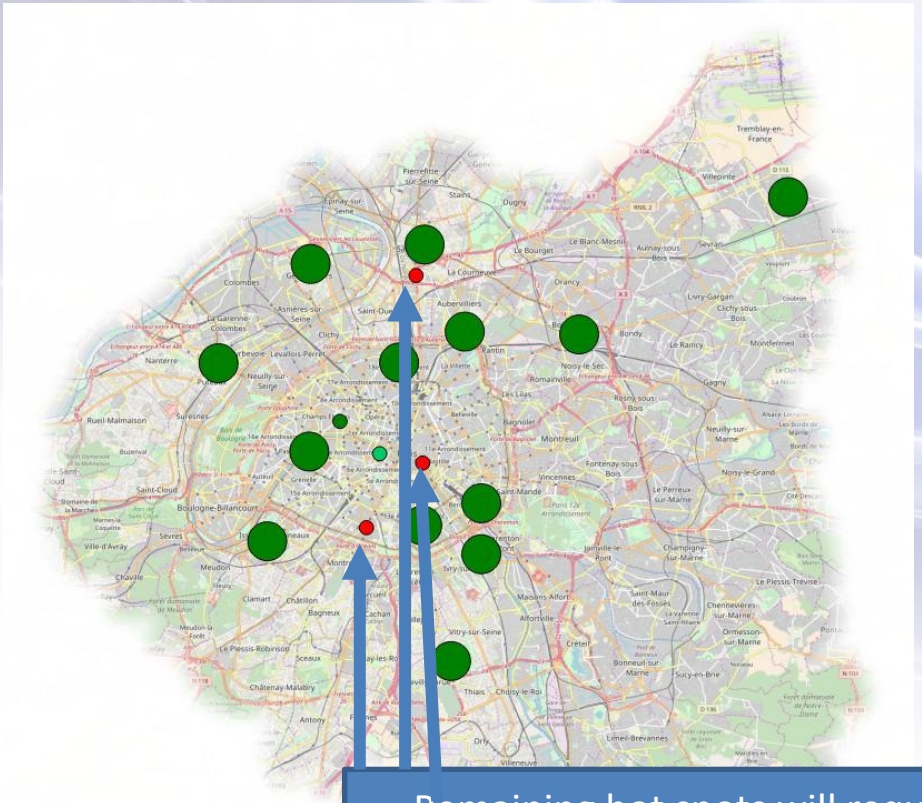
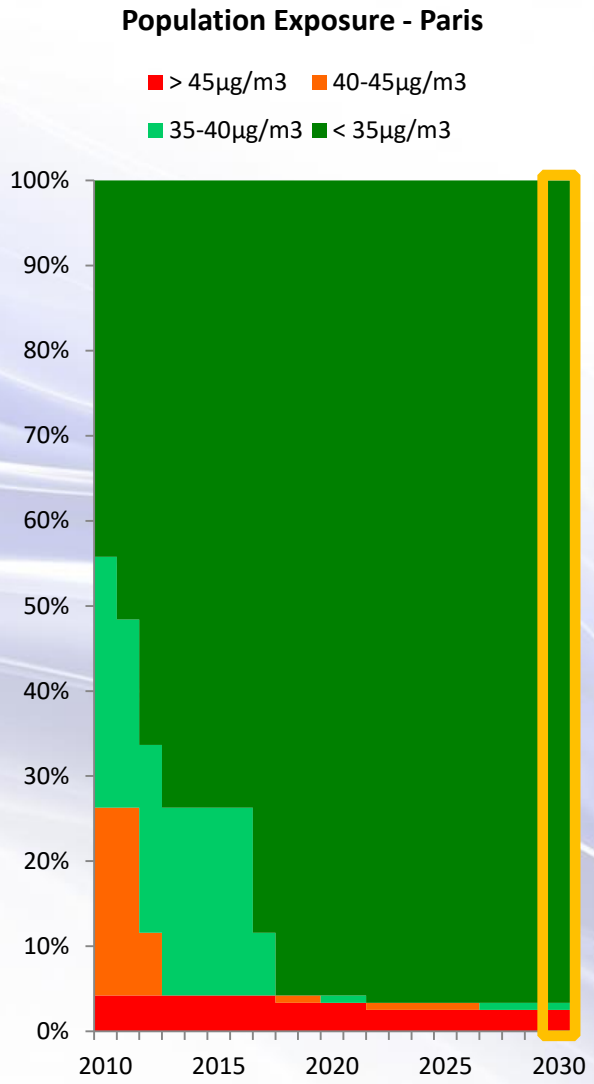
Paris 2030

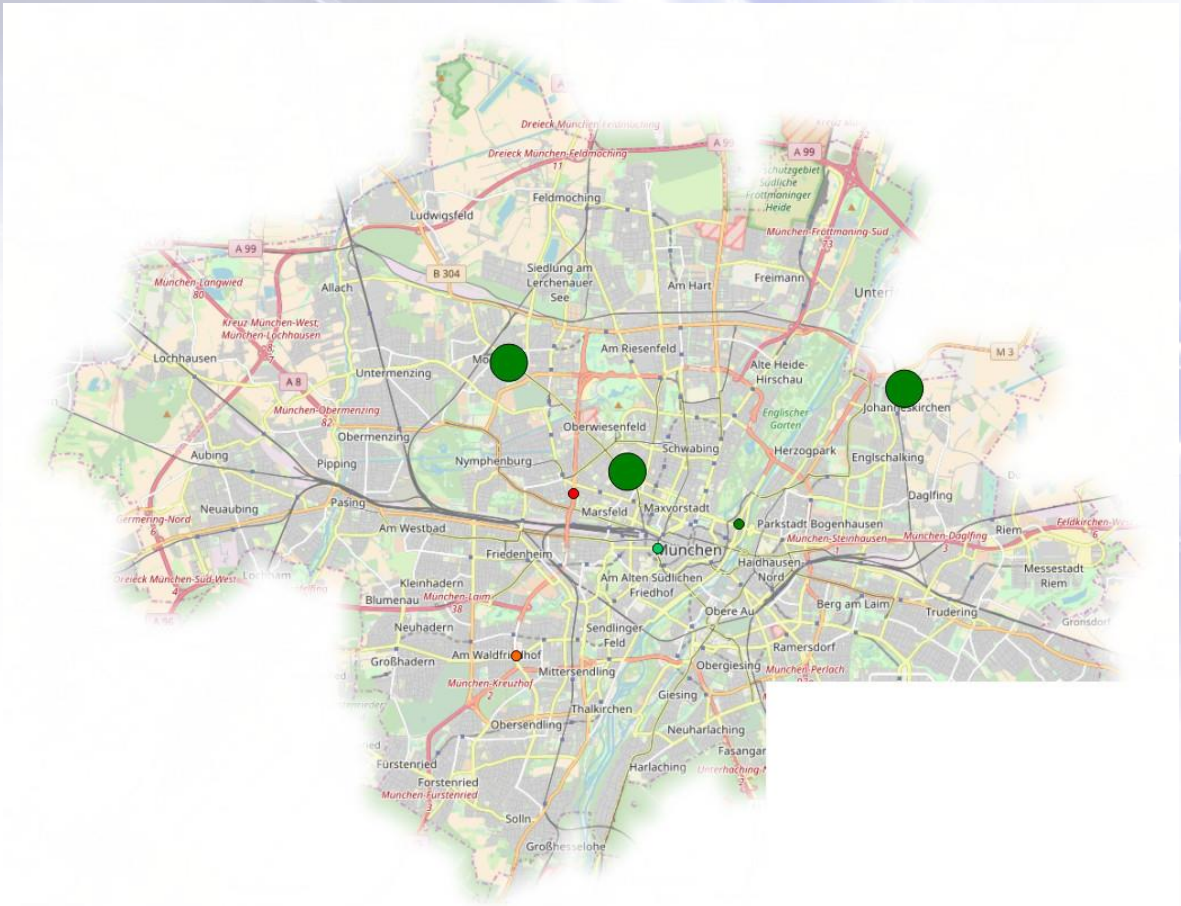


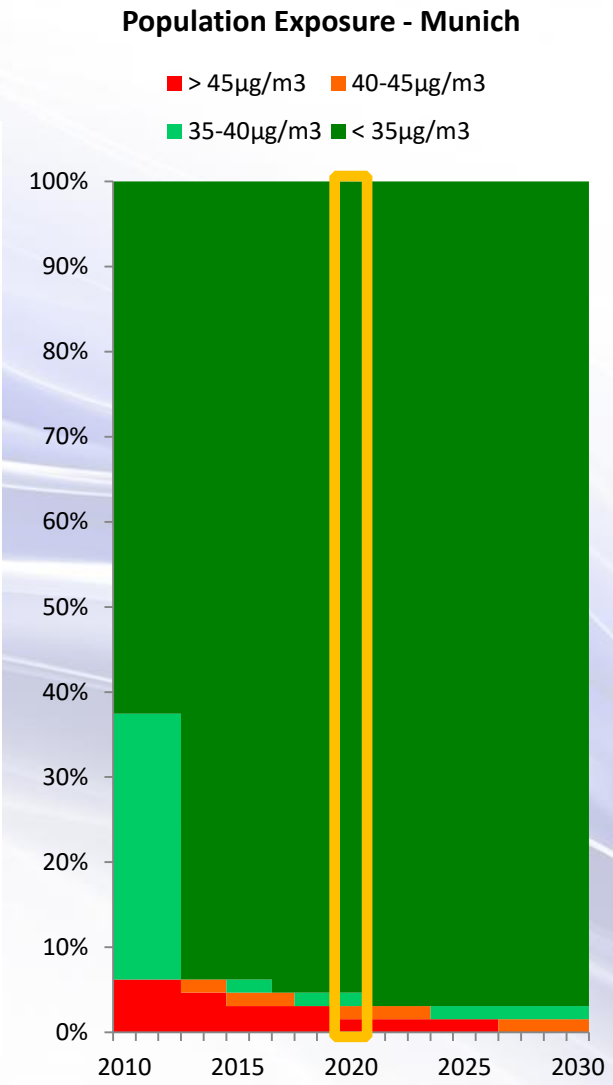
Remaining hot spots will require targeted measures based on the emission source to make them compliant



Population Exposure (NO_2) EEA Methodology

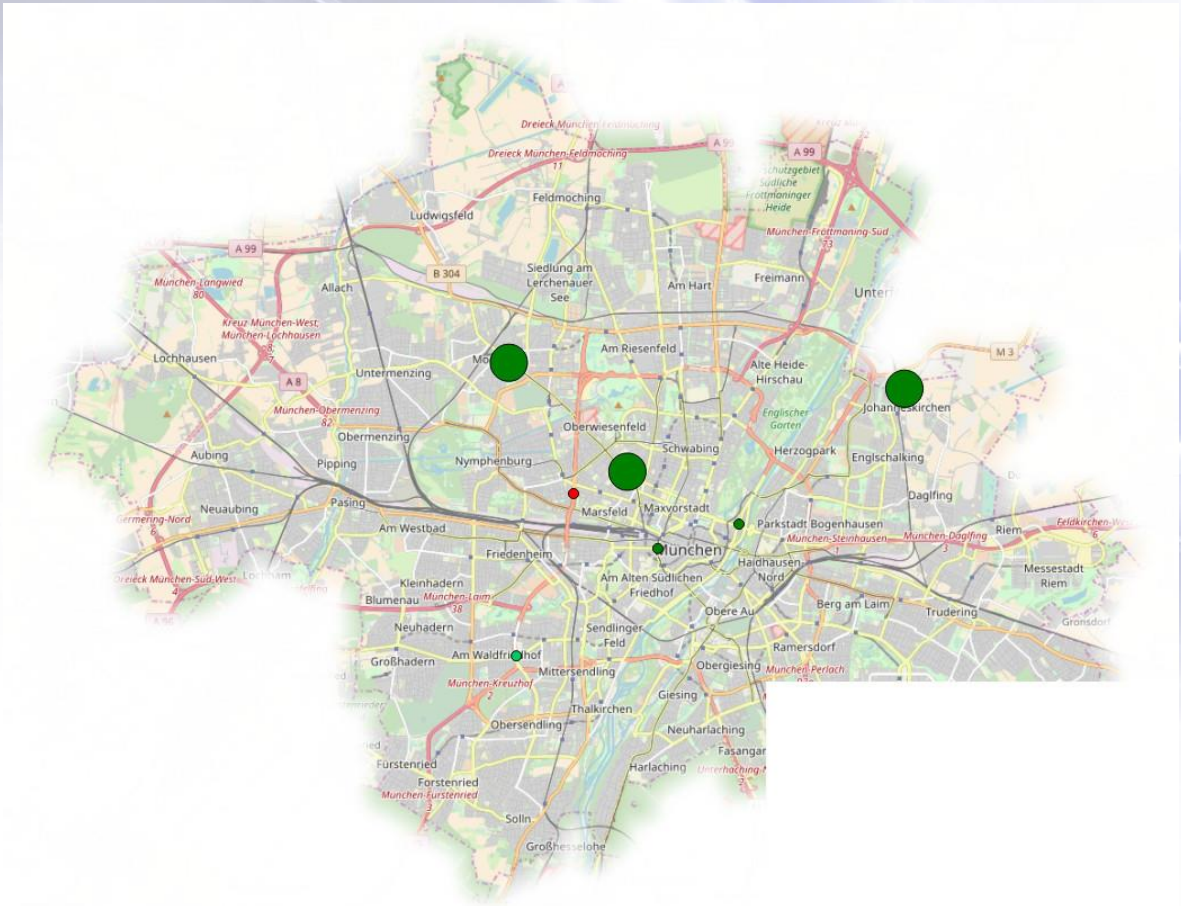
Munich 2020

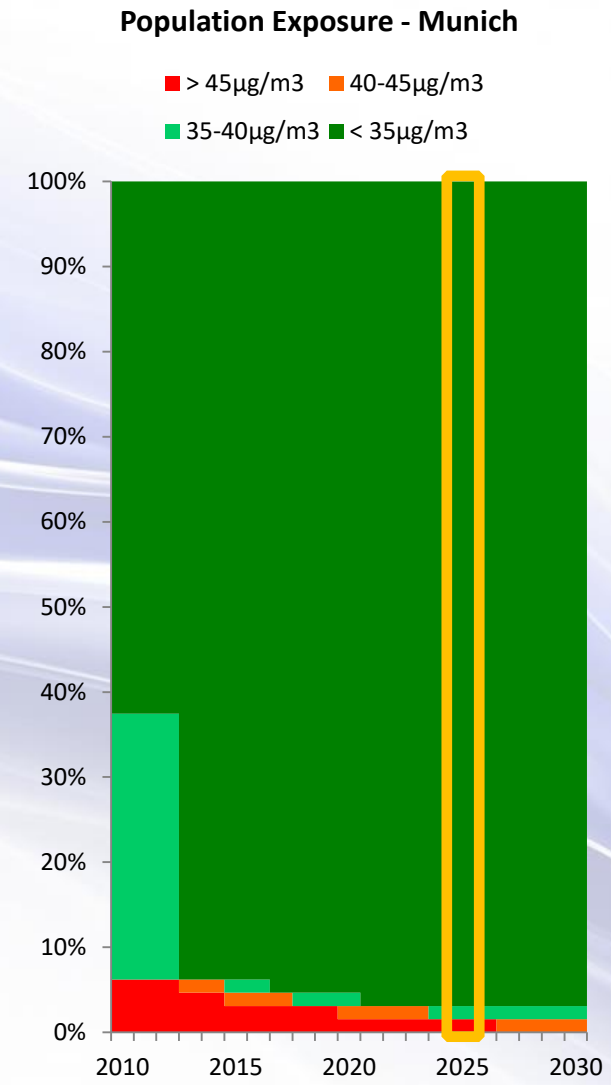




Population Exposure (NO_2) EEA Methodology

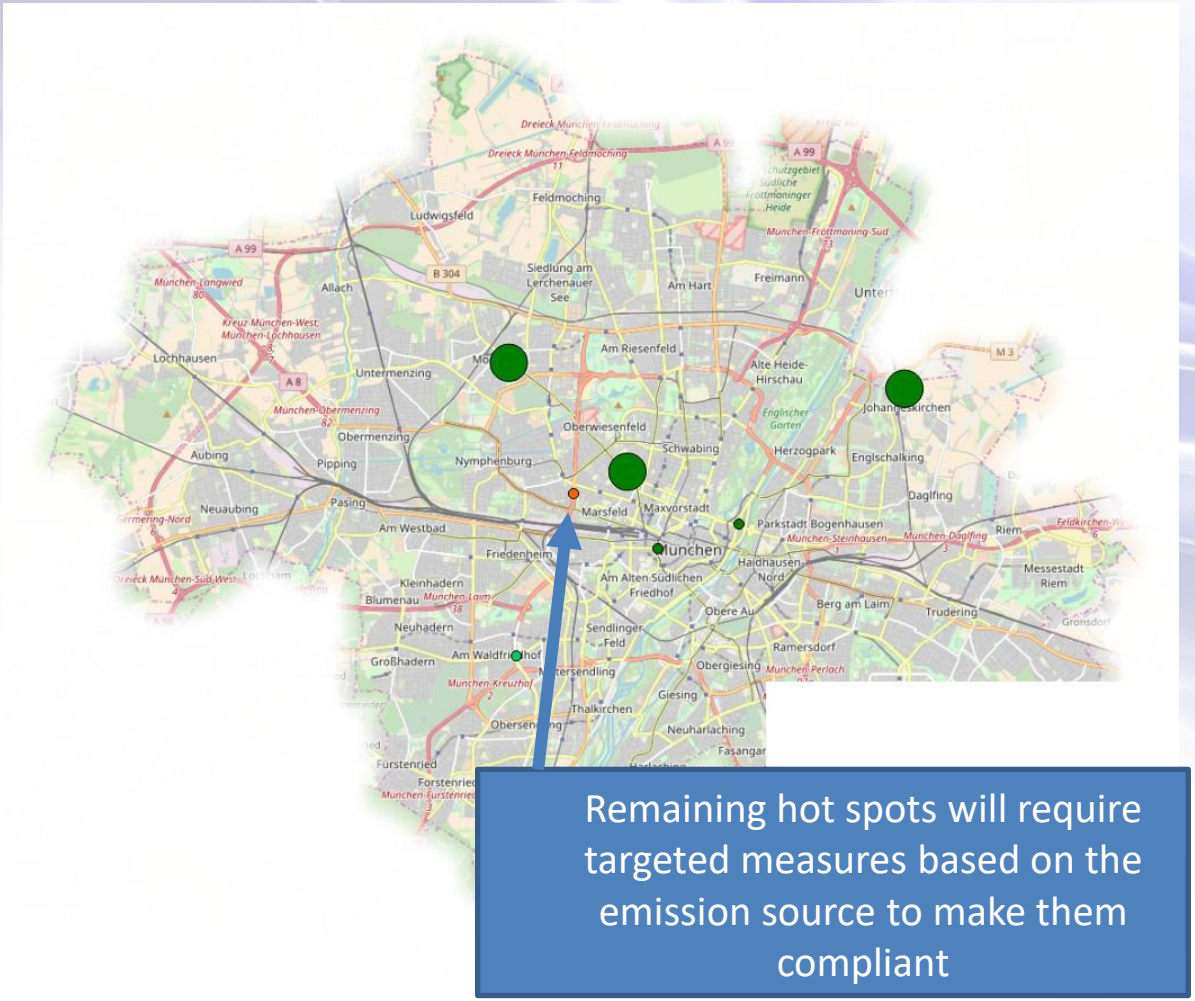
Munich 2025



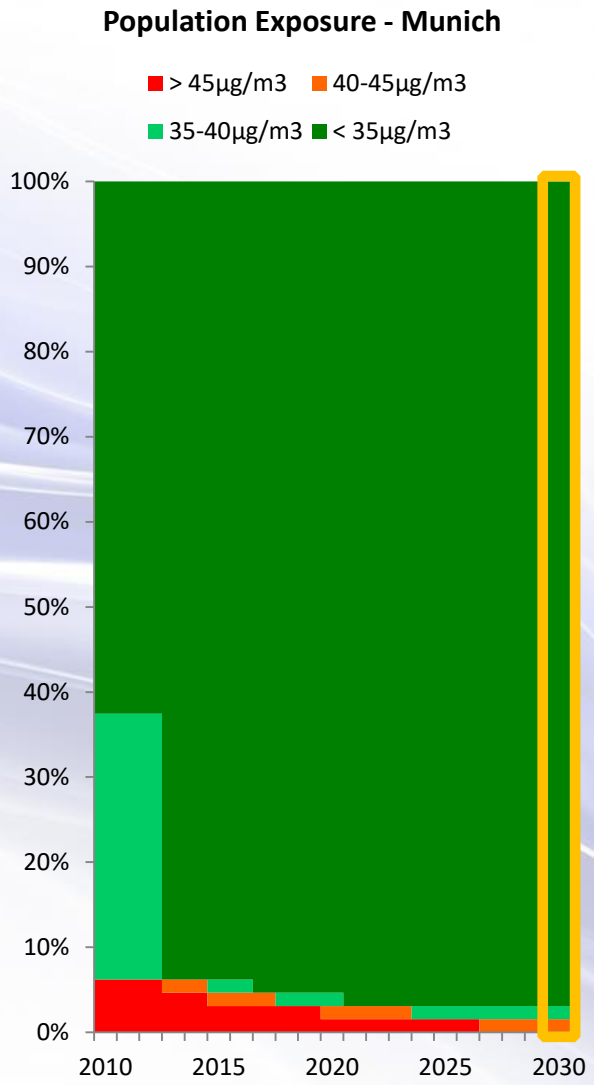


Population Exposure (NO_2) EEA Methodology

Munich 2030



Remaining hot spots will require targeted measures based on the emission source to make them compliant



Conclusions and Closing Remarks

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Summary

- Based on Ricardo's estimates for EURO 6d emission levels under RDE conditions, compliance with current air quality regulated emission limits will be largely achieved by 2025/30
  - For NO2, in 2020 approx. 4% of monitoring stations are assessed to be non-compliant, and by 2025 this reduces to 2%.
  - By 2030 1% of the stations remain uncompliant, in both scenarios.
  - Diesel PM exhaust is a diminishingly small contributor to Urban Air Quality
  - Brake & tyre wear dominates primary PM emissions from passenger cars regardless of the powertrain technology.
- AERIS modelling shows that by 2030 there is no difference in population exposure between the ZEV scenario and the Ricardo Median scenario.
- Using London as a case study, extensive modelling work by DEFRA highlights the importance of 'source attribution' in designing effective local responses to address the remaining 'hotspots'.

Conclusion: AERIS modelling shows that, from 2020 onwards, replacing all new diesel vehicles by zero emission vehicles (tailpipe) will offer little improvement to the compliance outlook compared with the Ricardo Median Euro6d scenario

Back-up

Scenarios presented - details

- **Ricardo Median** - assumptions:
  - a. Euro 6 Diesel PCs registered before 2015 meet the median of the Ricardo test results given in Table 1 for 'Euro 6b Pre-2015' i.e. an RDE of 5.41
  - b. Euro 6 Diesel PCs registered between 2015 and 2017 meet the median of the Ricardo test results for 'Euro 6b Post-2015' i.e. an RDE of 1.9
  - c. Euro 6 Diesel PCs registered between 2017 and 2019 meet the median of the Ricardo test results for 'Euro 6c' i.e. an RDE of 1.21
  - d.Euro 6 Diesel PCs registered from 2020 onwards meet the median of the Ricardo test results for 'Euro 6d temp' but with an RDE capped 1 rather than 0.76
- **EV Scenario –** assumptions:
  - all Diesel PC registered after 2020 are replaced with zero exhaust emission vehicles undertaking the same activity.
  - PM non-exhaust emissions are as per Diesel PC

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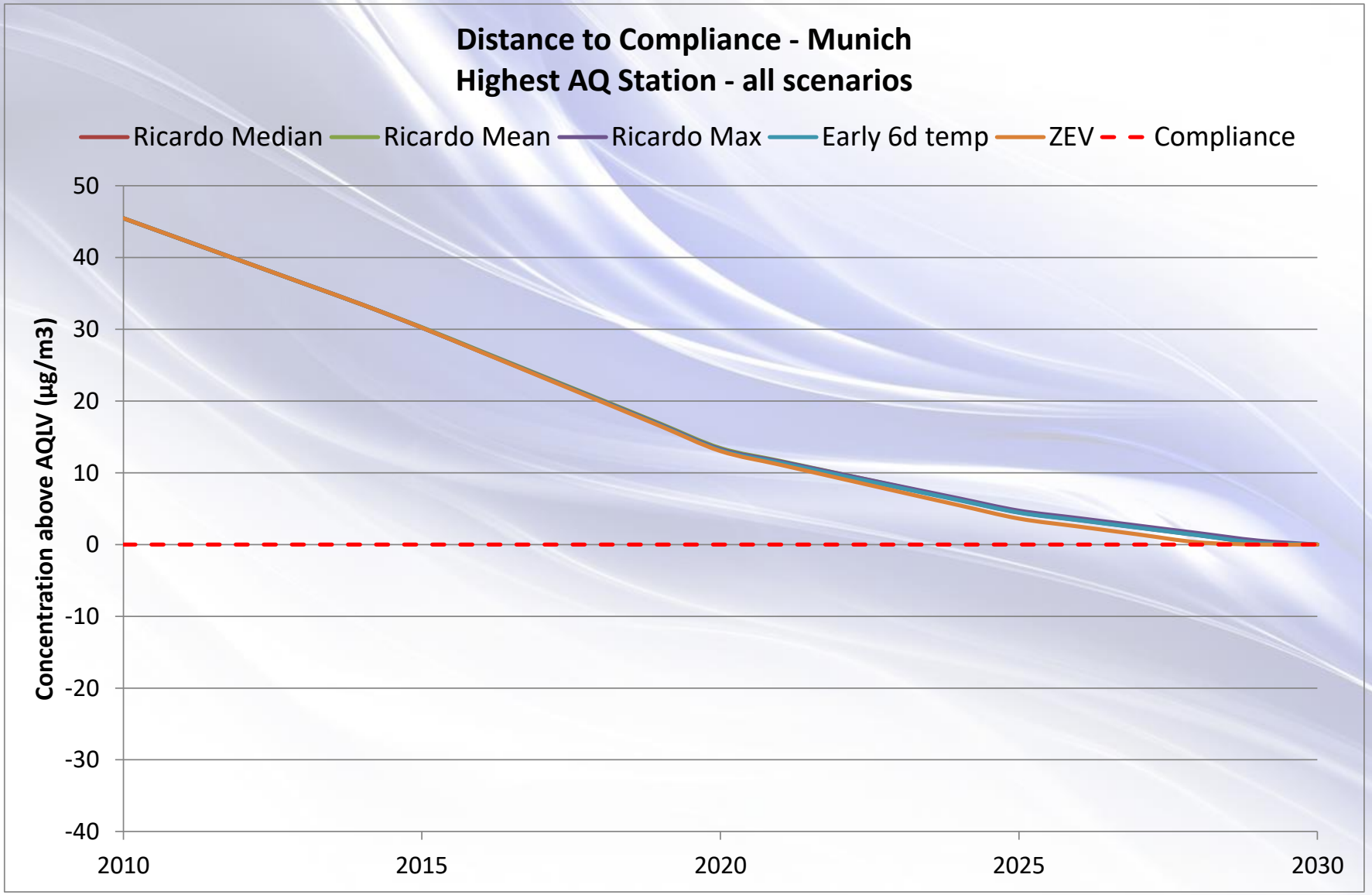
All Scenarios - example



Sources and Methods

- EEA Airbase for monitoring data
- IIASA GAINS for emissions data
- COPERT 4v11 for emission factors
- TREMOVE for vehicle stock and activity
- Concawe in house traffic emissions model
- Full details published in *UAQ Study Report, March 2016:*

* https://www.concawe.eu/publication/urban-air-quality-study-report-no-1116/