

International approaches for real-world vehicle emissions monitoring and control

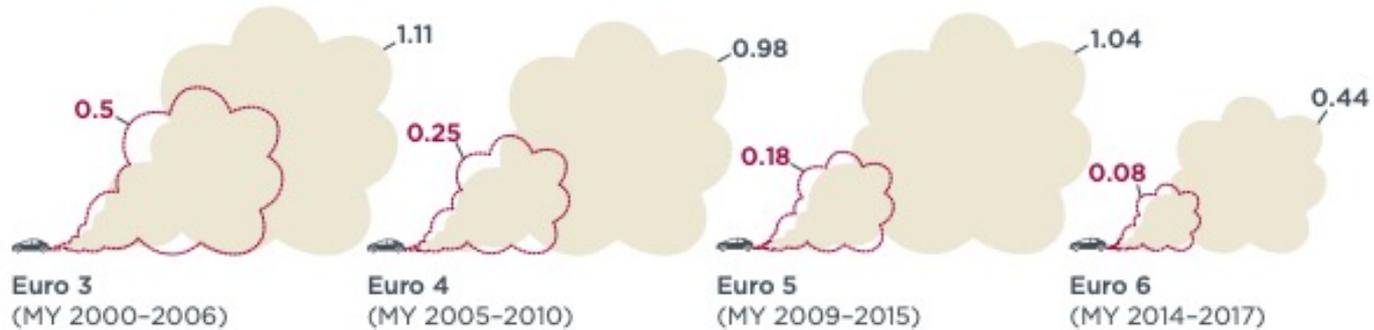
Tim Dallmann

The Road to Cleaner Emissions webinar

5 August 2021

Real-world vehicle emissions can greatly exceed regulatory limits

Diesel cars: Nitrogen oxide (NO_x) emissions (in g/km)

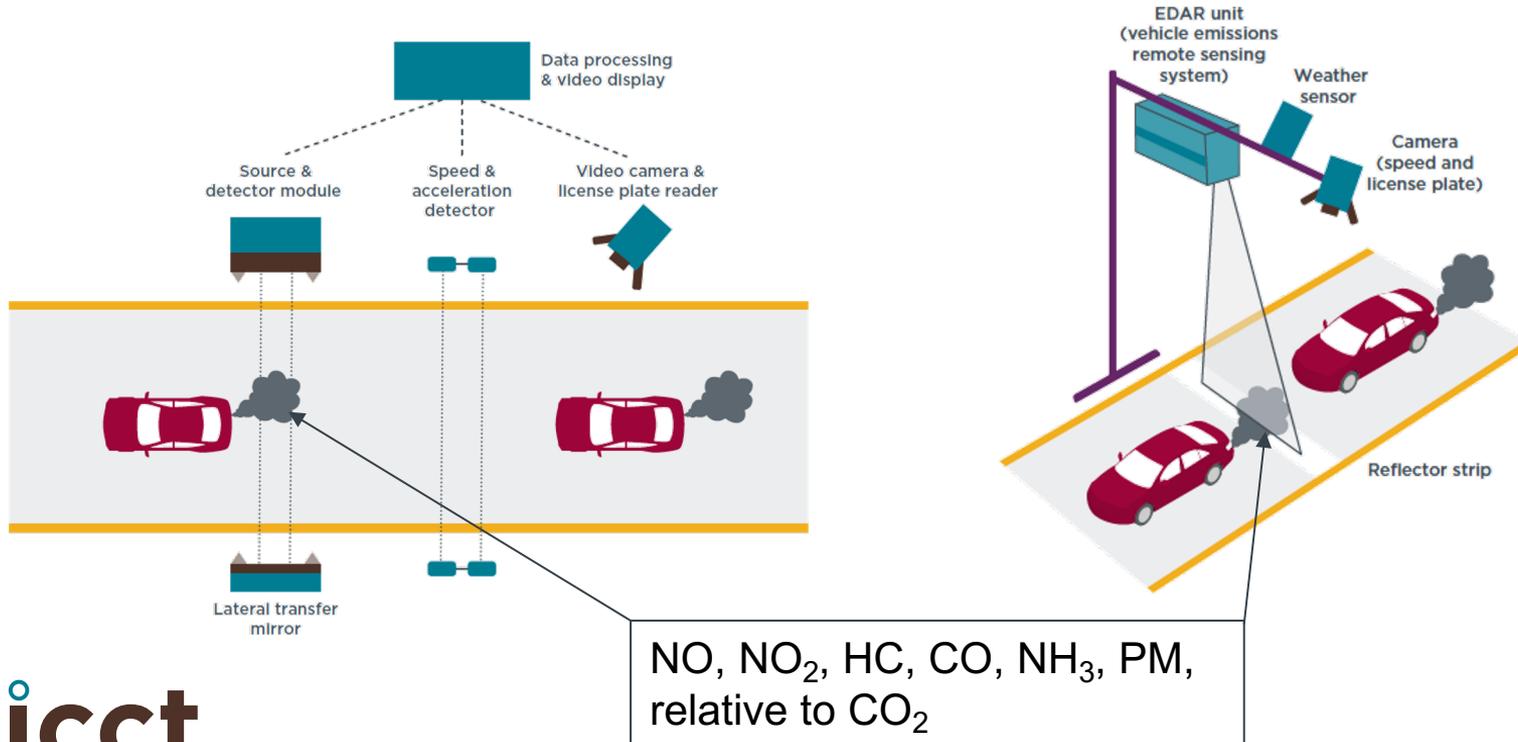


Gasoline cars: Nitrogen oxide (NO_x) emissions (in g/km)



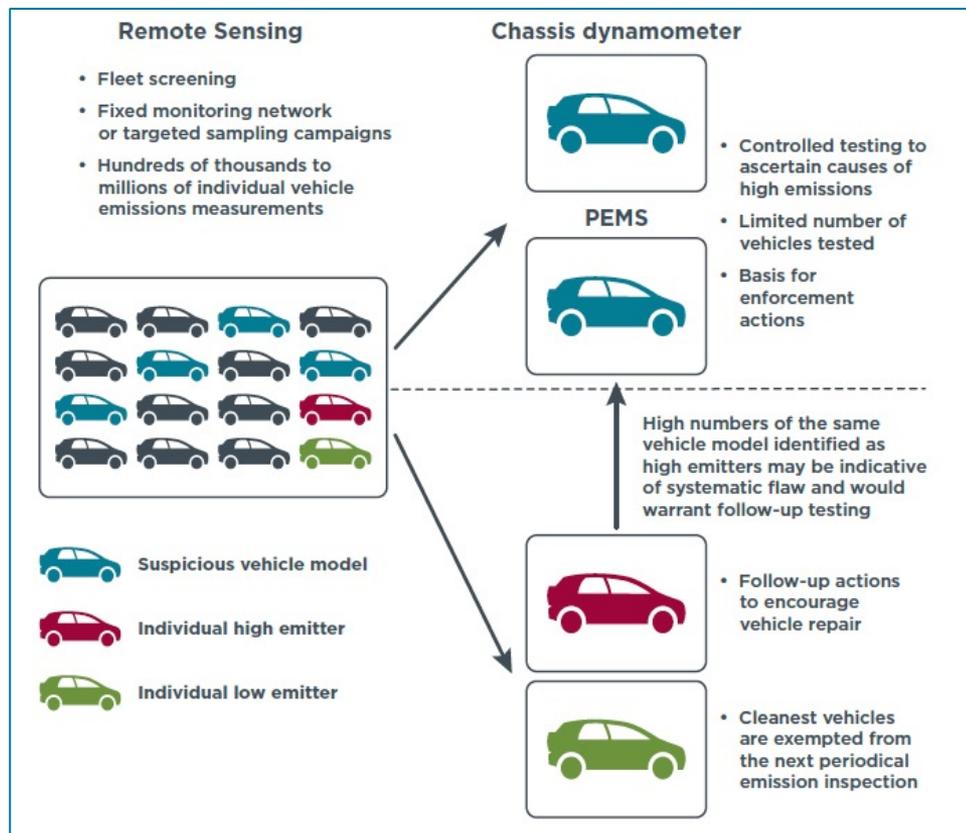
Figure 2. Nitrogen oxide (NO_x) emissions (in g/km) estimated via remote sensing of the on-road fleet, from Euro 3 to Euro 6, for EU passenger vehicles.

Real-world emissions monitoring can support in-use emissions control programs

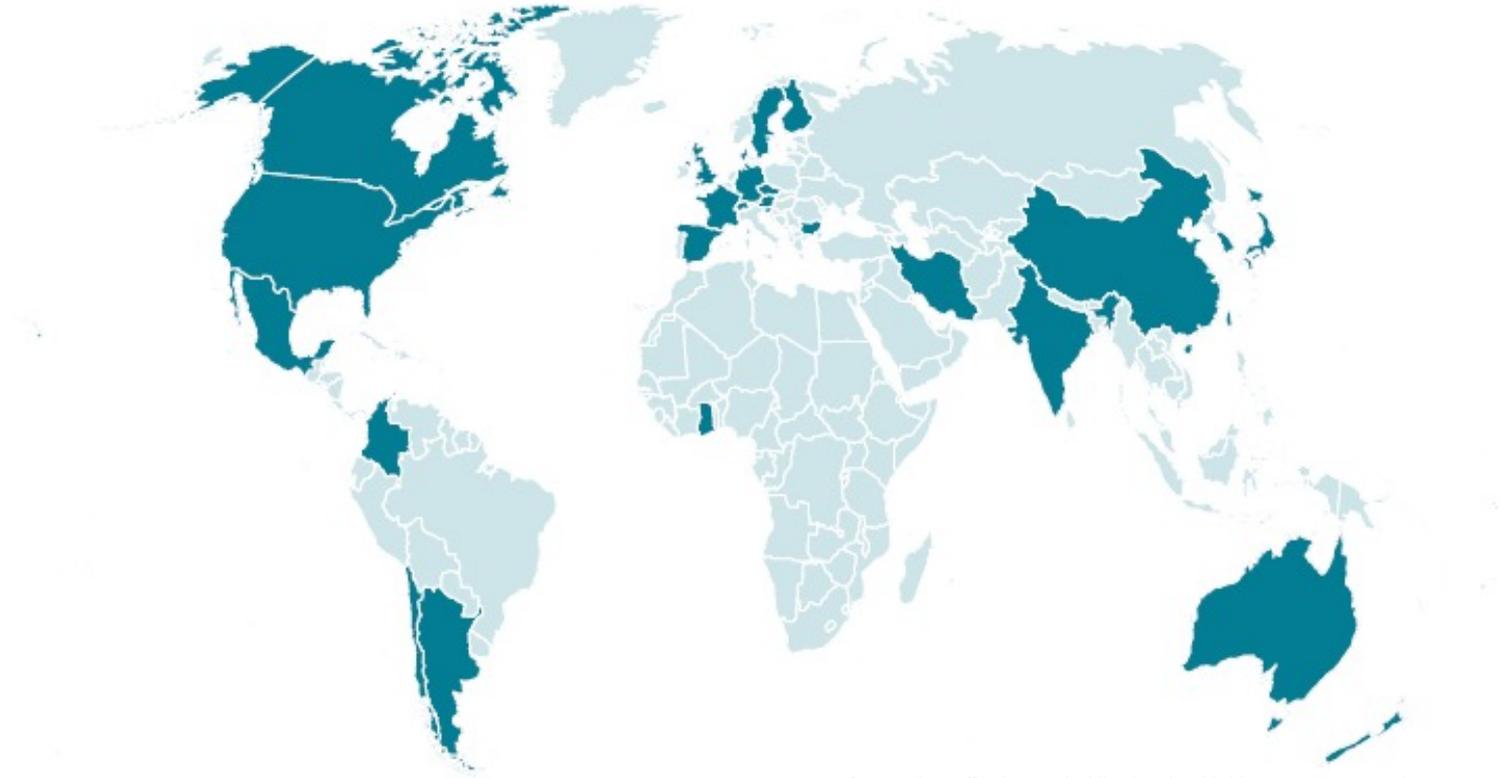


Applications of real-world emissions data

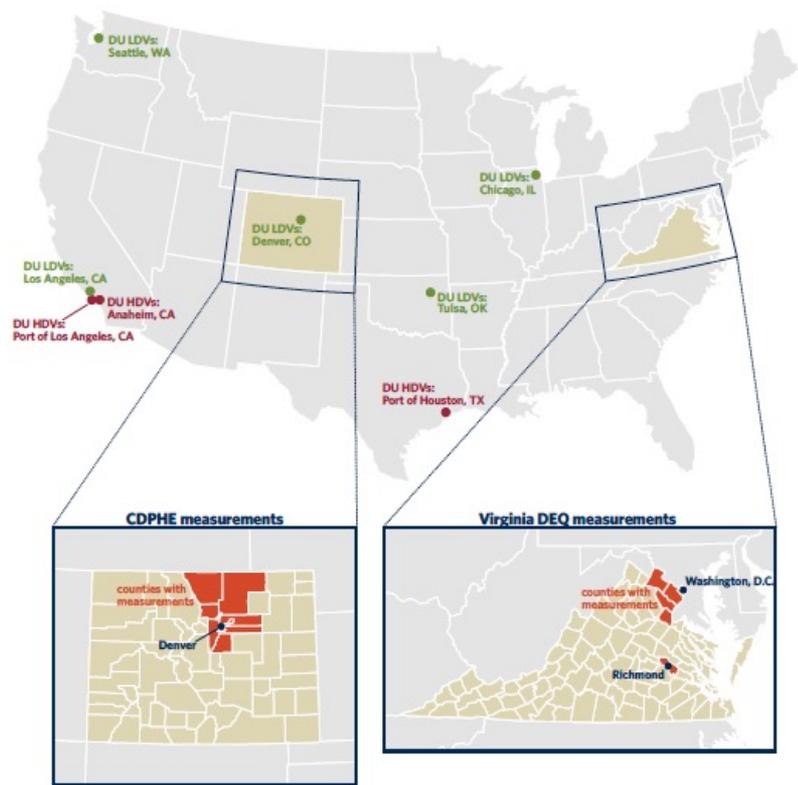
- High-emitter identification or clean screening
- Fleet screening/market surveillance
- Tampering detection and enforcement
- Develop support for new policies
- Track real-world policy and technology effectiveness
- Increase public awareness



International applications of vehicle remote sensing since 2010



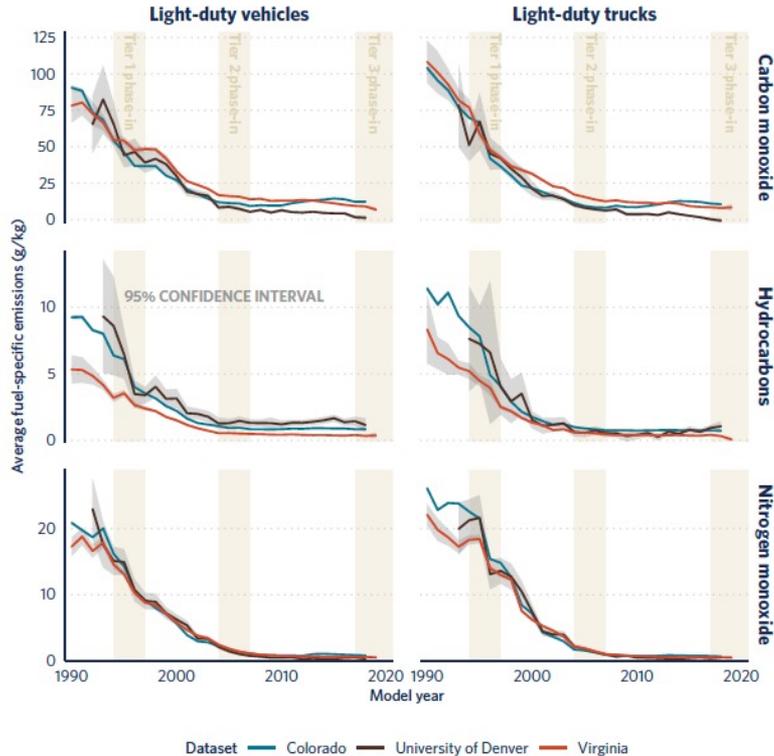
United States: Remote sensing used to support state I/M programs



- In “Clean Screen” programs roadside monitoring used to exempt vehicles from garage-based inspection requirements
- Remote sensing also used in high-emitter identification programs

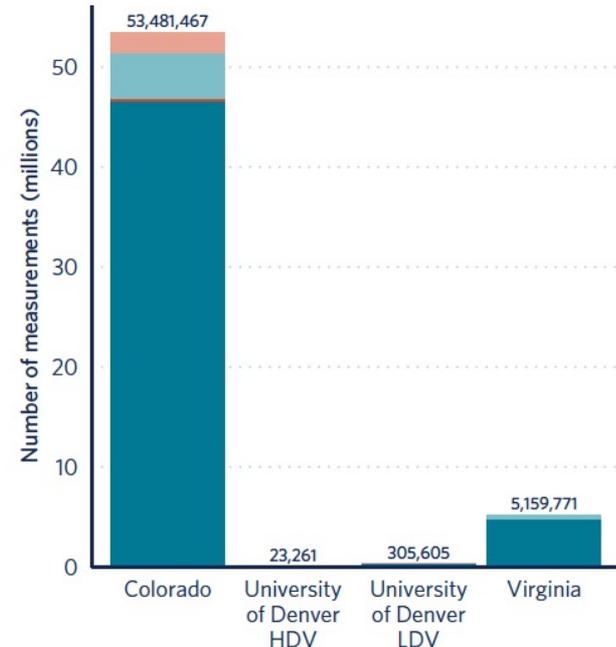
Figure 2. Measurement locations for data compiled in TRUE U.S. database.

Data provides rich view of real-world emissions and has applications beyond I/M programs



Average fuel-specific pollutant emissions (g/kg fuel) of gasoline light-duty vehicles by vehicle class and data source.

TRUE U.S. vehicle emissions database overview



Roadside monitoring to be included in California's new HDV I/M program

Draft: Roadside Emissions Monitoring System Network

- Real-time emissions monitoring equipment to be deployed throughout the state
- Network will screen for high emitting vehicles for follow up compliance testing



China has established an extensive remote sensing monitoring network to support in-use control programs

Table 9. Remote-sensing emission limits for diesel vehicles in China

Pollutant	Limits
Opacity	30%
Ringelmann blackness	Level I (20%)
NO	1,500 ppm

Note. The NO limit is only used for screening high-emitting vehicles.

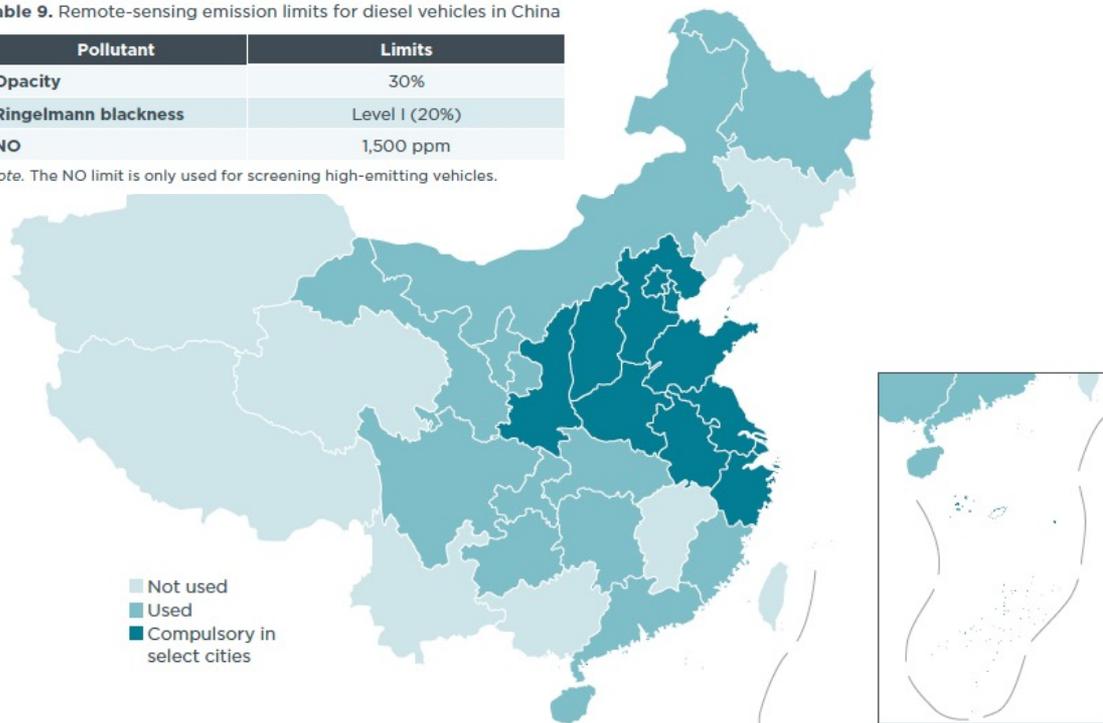
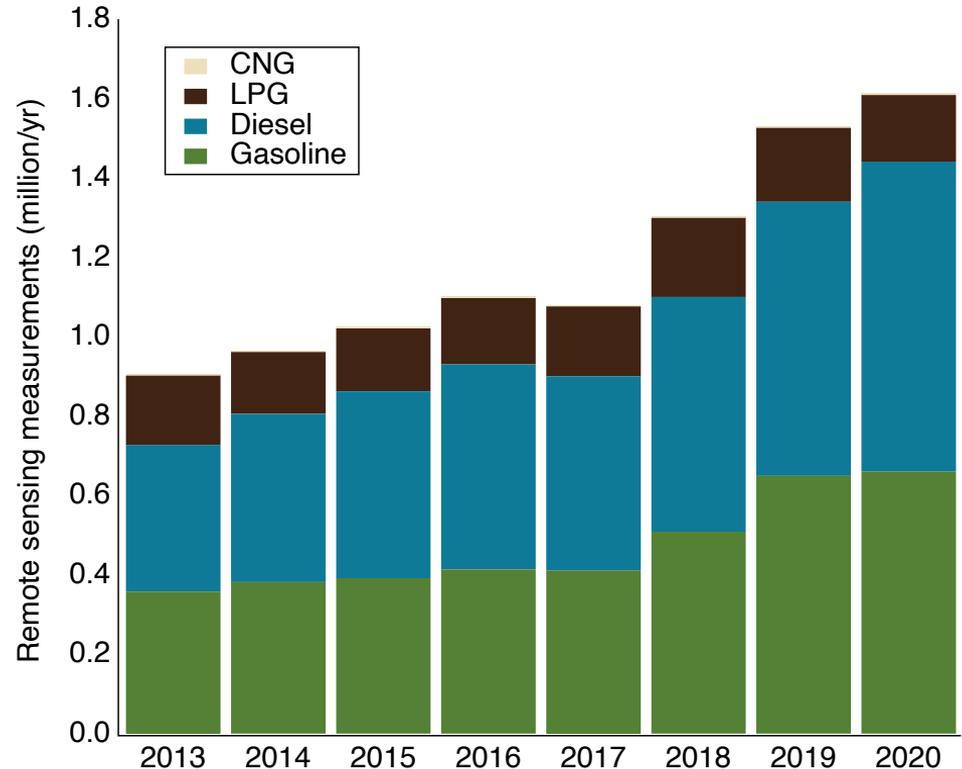


Figure 5: Location of remote sensing activities across China by the end of 2018. More information can be found in Appendix B.

- National-level remote-sensing regulation introduced in 2017
- 2,671 remote-sensing stations by end 2019; 960 additional stations planned
- 273 million measurements in 2018

South Korea has used remote sensing as part of periodic inspection programs since 2013

- In-use limits for gasoline and LPG vehicles
- 39 locations in Capital region and 5 additional metropolitan areas
- Data applications:
 - Identify high-emitting vehicles
 - Evaluate status of in-use emissions
 - Shape emissions control policies



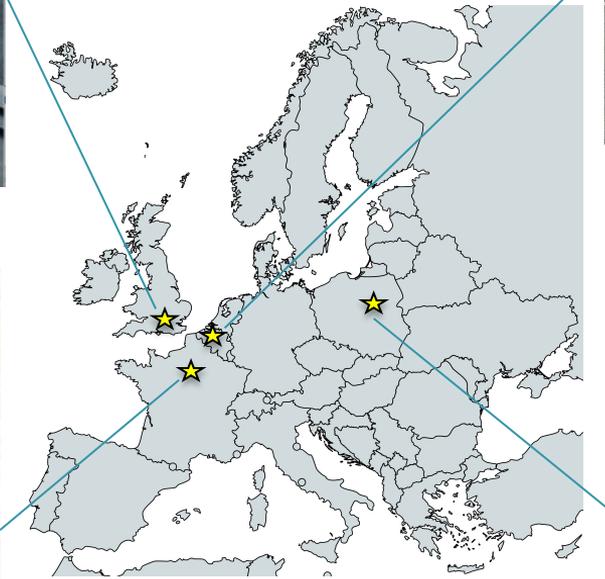
London 2017–2018



Paris 2018



TRUE Europe
remote sensing studies



TRUE seeks to supply cities with data regarding the real-world emissions of their vehicle fleets and equip them with technical information that can be used for strategic decision making.

Brussels 2020



Warsaw 2020



Remote-sensing data provide evidence of very high emissions from the London diesel taxi fleet



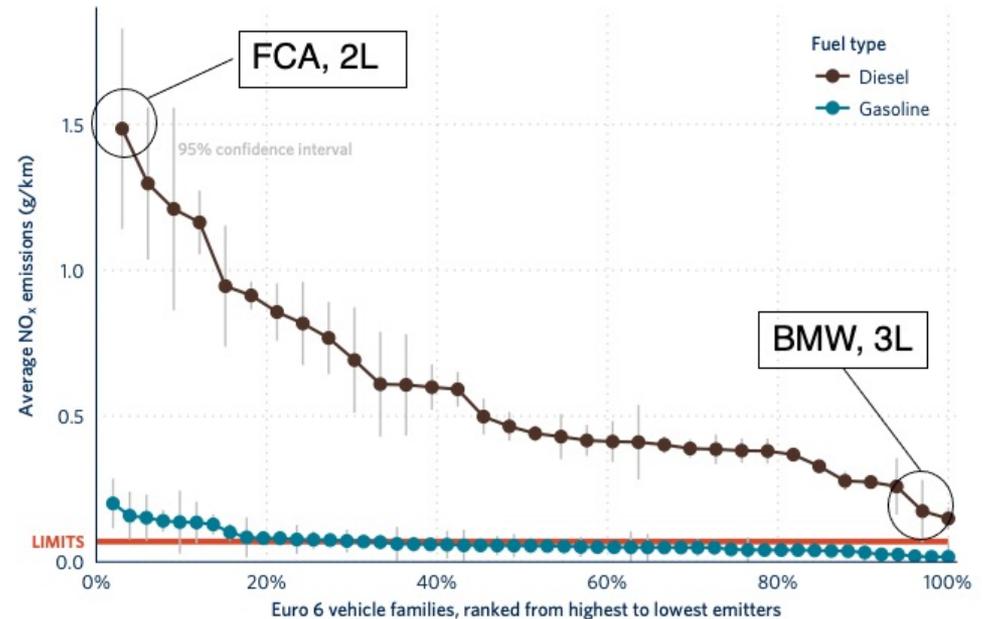
London “black” taxis

- Euro 5 NO_x emissions are as high as Euro 2...
- And 10x type-approval limits

New policies enacted to speed transition to zero emission capable alternatives

Remote sensing data can support public awareness and market surveillance activities

- With sufficient data, mean real-world emission rates for individual vehicle families can be evaluated
- Comparisons across families can inform consumers and support more efficient targeting of market surveillance resources

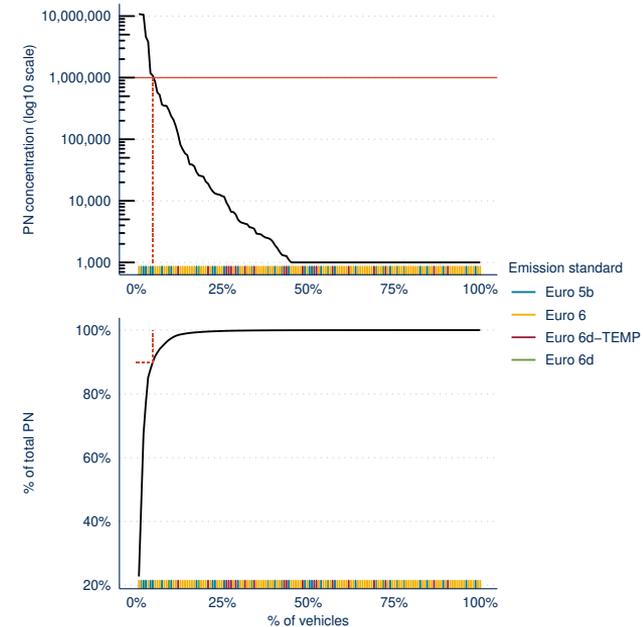


TRUE rating for European cars

Manufacturer ↓	Model	Fuel Type	Emissions Standard	Engine Size (L)	Vehicle Class	TRUE Rating (NOx)
HYUNDAI	Accent	Diesel	Euro 4 (2005-2010)	1.5	Medium	Poor

Brussels particle number testing results inform adoption of more stringent PTI requirements

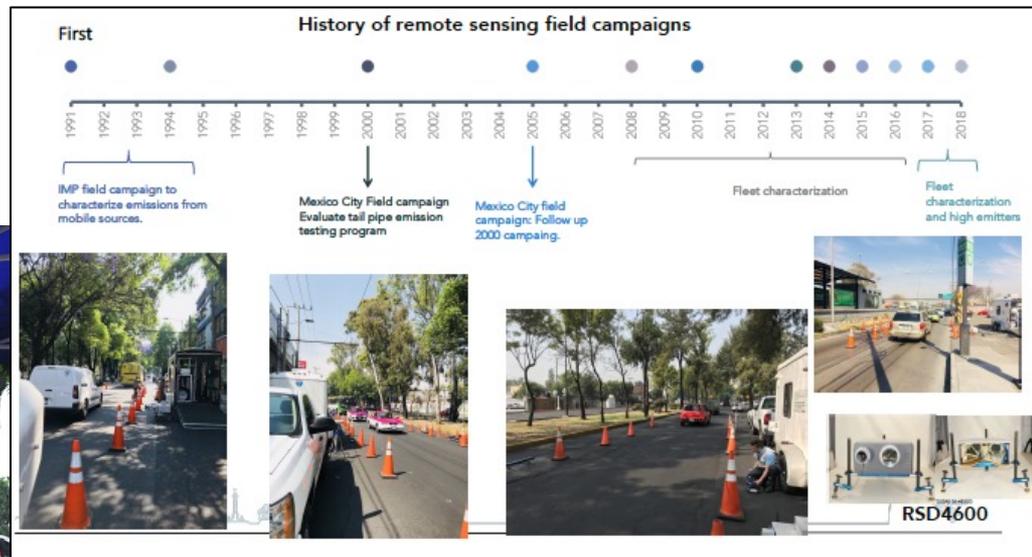
- About 5% of tested diesel Euro 5b and 6 exceeded **1 Million particles / cm³**
- That represents over **90% of total PN emitted** by this category
- In March Belgium adopted PN testing requirements for PTI program, starting July 2022



Jakarta



Mexico City



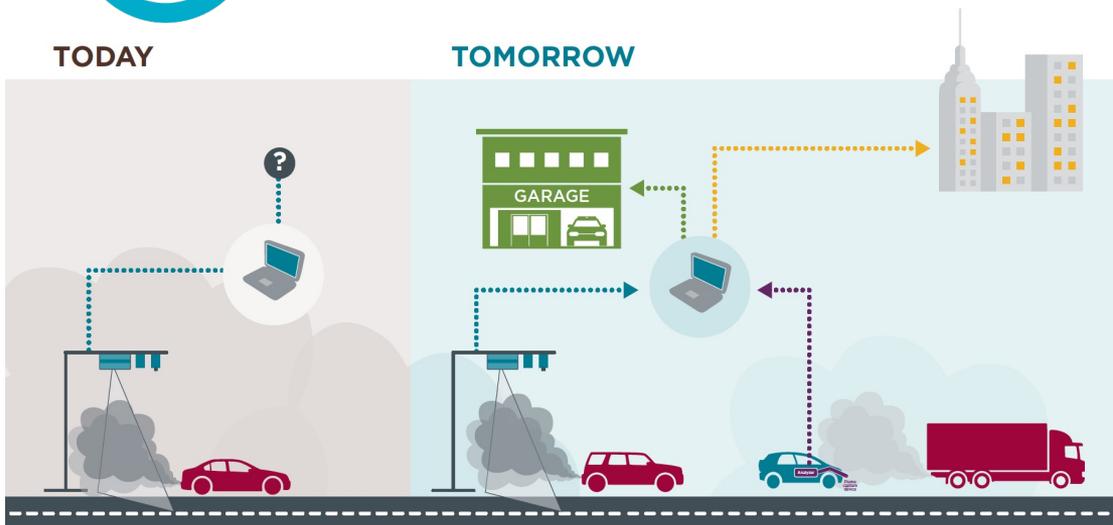


CARES

CITY AIR REMOTE EMISSION SENSING

TODAY

TOMORROW



<https://cares-project.eu/>



Noise and Emissions Monitoring and Radical Mitigation

NEMO delivers cutting-edge technologies enabling emission-based tolling and mitigation solutions to reduce urban air and noise pollution from transport.

Remote sensing, multifunctional barriers and novel road pavements lead the way to cleaner, quieter and healthier urban environments.

NEMO's three-step approach:

- 1 Identify polluting and noisy vehicles through remote sensing of exhaust gases and noise
- 2 Verify measurements with an accepted methodology to provide scalable solutions
- 3 Cleaning and silencing of the traffic by innovative solutions in the pavement and road vicinity.

<https://nemo-cities.eu/>

Summary

- Measuring and publishing real-world emissions data can be impactful
- Remote sensing is a well suited for obtaining real-world emissions data
- Remote sensing data can be applied in many ways to build understanding of real-world emissions and inform evidence-based policy evaluation and development – at both city and national levels

Questions?
Contact t.dallmann@theicct.org

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ON CLEAN TRANSPORTATION