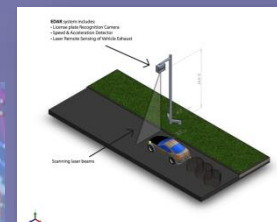


Scottish Air Quality Database and Website Annual Seminar 2018



Vehicle Emission Monitoring and Informing LEZ Enforcement

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Transport Scotland



Vehicle Emission Monitoring and Informing LEZ Enforcement

- 1 Why do we need emissions evidence
- 2 What are we doing
- 3 What others are doing
- 4 Collaboration
- 5 Next steps

Determine that the thing can
and shall be done and then
we shall find the way.
– Abraham Lincoln

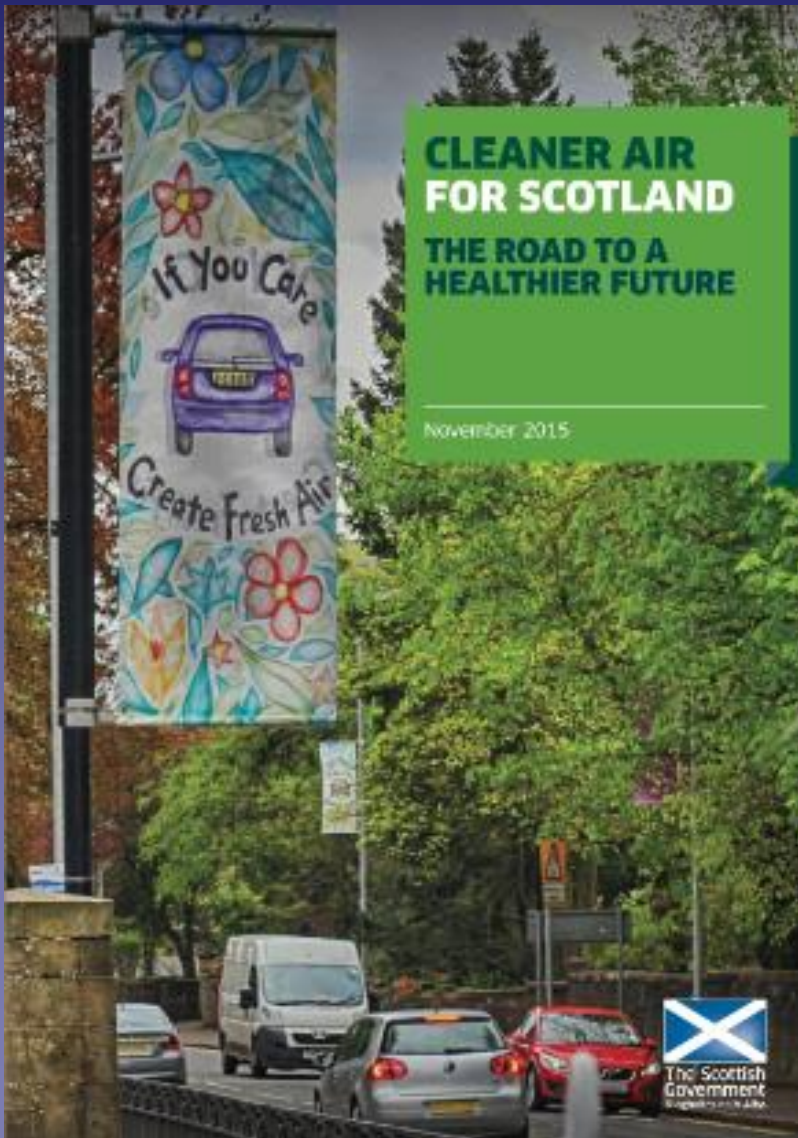




We are on the brink of a clean industrial revolution, and all sectors will be impacted. Digitalisation, decarbonisation, investment and the needs of people will be core elements in that change, all being pushed ahead by innovation and investment. EU Transport Commissioner, Violeta Bulc

Evidence required

CAFS Commitment



10.12 An effective local NMF model will rely on accurate, high-quality, local fleet composition data (especially in densely populated city centres) and up-to-date emission factors. To achieve this we will follow a two-phased approach. The first phase will ensure that data is collected over a sufficiently large area to inform the model build. The second phase will involve collecting more detailed traffic categorisation data, including Automatic Number Plate Recognition and tailpipe monitoring at specific locations of particular concern. This will ensure that local models – for city centres and surrounding areas of all four major cities in Scotland – are produced at a resolution that offers accurate, insightful information. We will also include future prediction modelling to:

- evaluate the impact of planned improvements to the fleet; and
- develop a national cost/benefit analysis process for assessing actions related to potential scenarios.

Evidence required



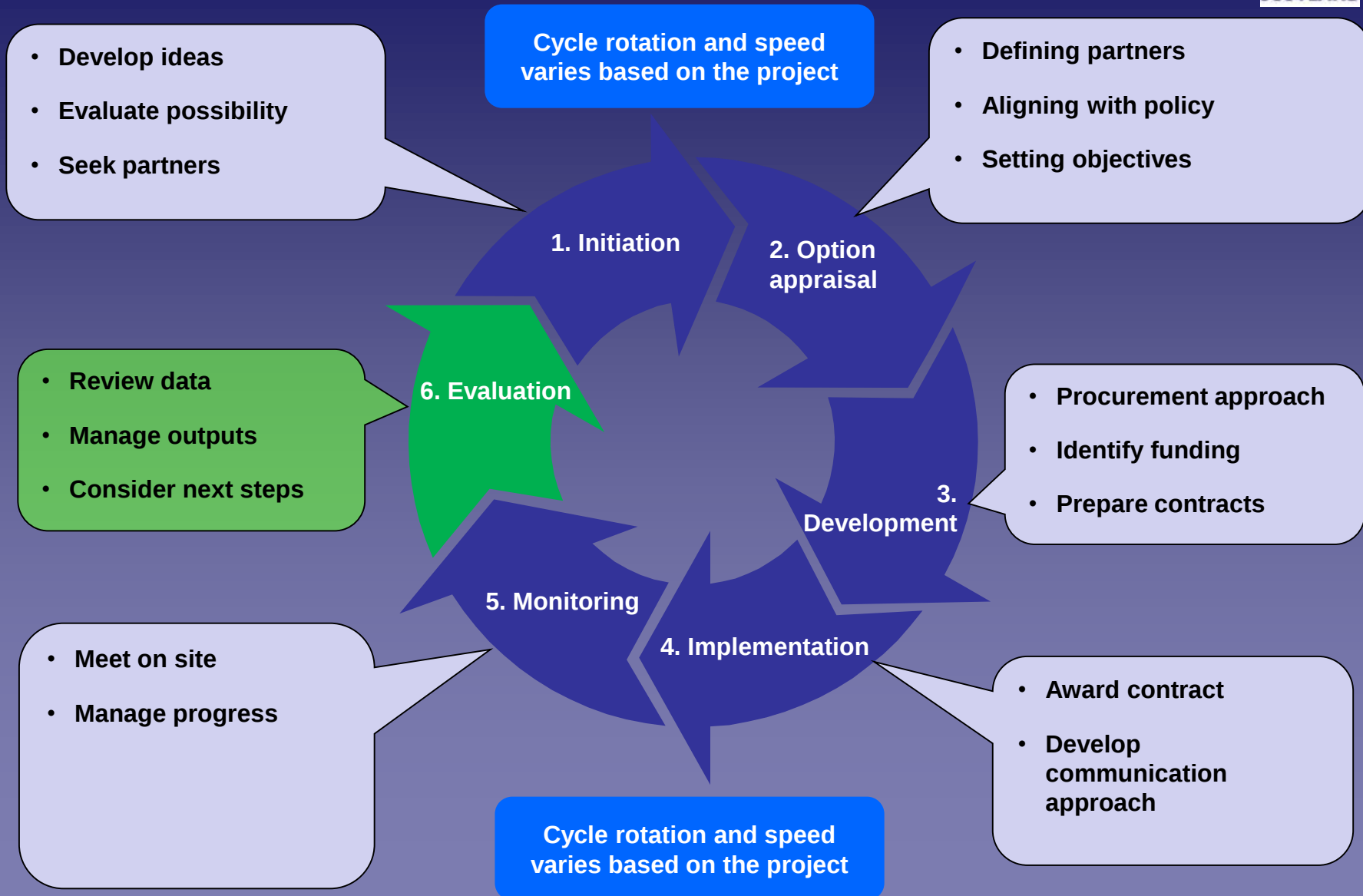
transport.gov.scot

Building Scotland's Low Emission Zones A Consultation

The Scottish Government is proposing that the primary objective of LEZs in Scotland will be to **support the achievement of Scottish Air Quality Objectives** that focus on nitrogen dioxide and particulate matter.

As our learning around LEZs matures, the focus **could widen to incorporate additional Scottish Air Quality Objectives pollutants and support the reduction of greenhouse gas emissions.**

Research and Analysis Policy Cycle



EDAR system includes:

- License plate Recognition Camera
- Speed & Acceleration Detector
- Laser Remote Sensing of Vehicle Exhaust

EDAR is “much more accurate than current remote sensing systems”

-United States Environmental Protection Agency

EDAR was successfully introduced to the North American emissions industry at the I/M Solutions Conference in Salt Lake City, Utah, in April 2014.

EDAR has been successfully deployed commercially in:

- California
- Texas
- Connecticut
- Arizona
- Tennessee
- London
- Birmingham
- Chicago
- Scotland

- Trials taken forward by East Central Scotland Vehicle emissions Partnership (ECSVEP) and North Lanarkshire Council.
- Work part of continuous engagement with others on developing applied technology.

Project Objectives

1. Support the work of the Vehicle Emissions Partnerships
2. Gather fleet emission data
3. Gather data on high polluting sections of the fleet
4. Consider the use of instantaneous vehicle emission data in LEZ awareness raising and enforcement

EDAR - What we are doing

- Using vehicle emission data to contact high polluters on emissions, using the powers of the Road Traffic (Vehicle Emissions) (Fixed Penalty) (Scotland) Regulations of 2003.

- Accurate factors for the NMF

- Collate results and conduct structured discussions with bus, freight, and taxi fleets. Present findings in forums to manage change.

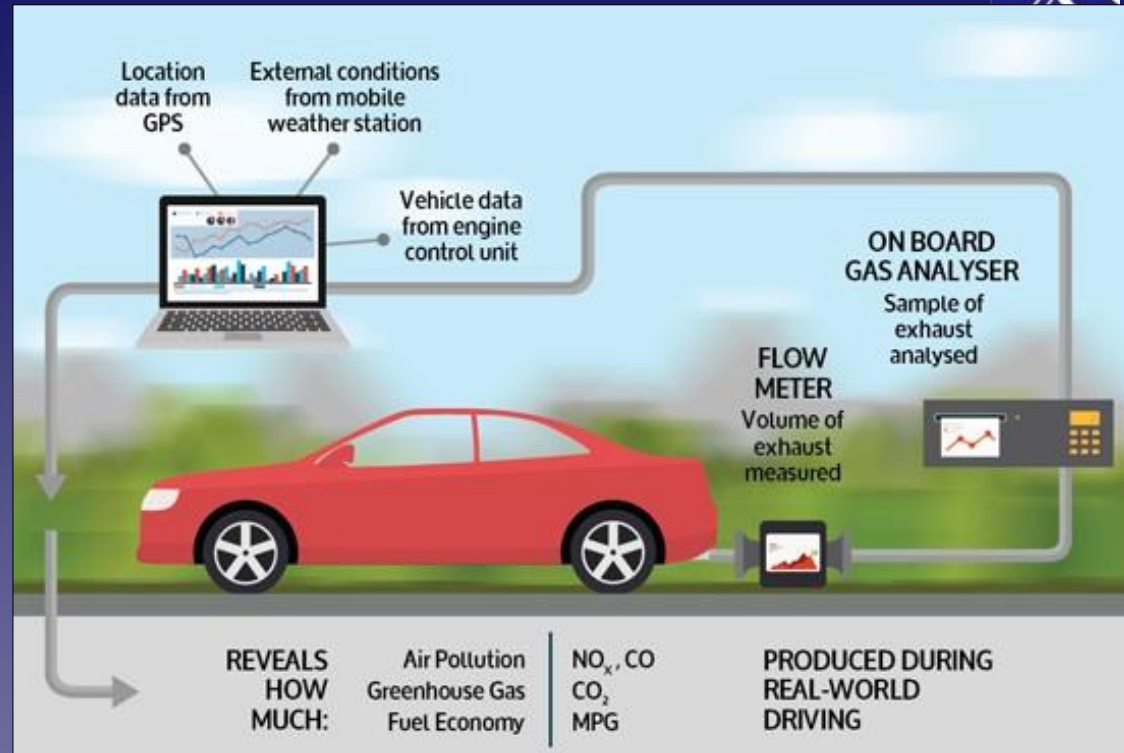
- Real time information.
- Link to decision making.
- Collate data for performance monitoring

EDAR - Snapshot



Preliminary results,
verification required

PEMS - Continuous analysis



Preliminary results,
verification required

EDAR – Preliminary results

- Diesel NO_x emissions higher than expected
- Appears to be a higher than expected incidence of excess polluters in the local fleet.
- Several, relatively young vehicles emitted 3- to 6-times higher than the median level for similar vehicles.



EDAR Pilot Program

Prepared for:

EAST CENTRAL SCOTLAND
VEHICLE EMISSIONS PARTNERSHIP

September 8, 2017



EDAR Pilot Program

Prepared for:

EAST CENTRAL SCOTLAND
VEHICLE EMISSIONS PARTNERSHIP

November 21, 2017



Local Authorities
Sites

West Lothian, and North Lanarkshire
3, Maybury A8, Broxburn A89, and
Coatbridge A725

Total Vehicles

Over 100,000

Time

3 Weeks



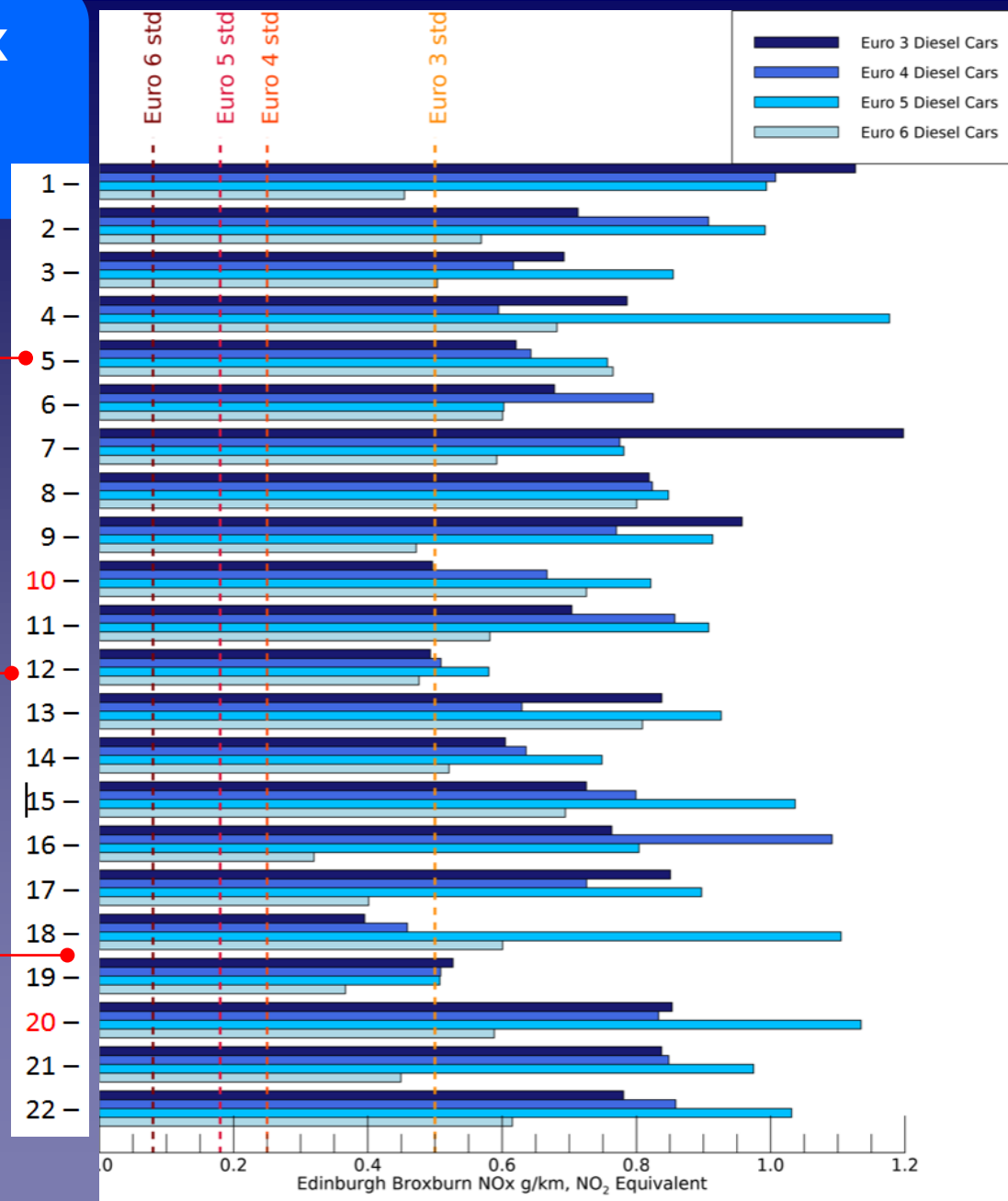
Broxburn, Average NOx by Euro Class for 22 Diesel manufacturers

One group with Euro 3, 4, and better than 6 (group 5)

Many groups with Euro 3 and 4 better than 5 (2 to 5, 8, 10 to 15, 17, 18, 20 to 22)

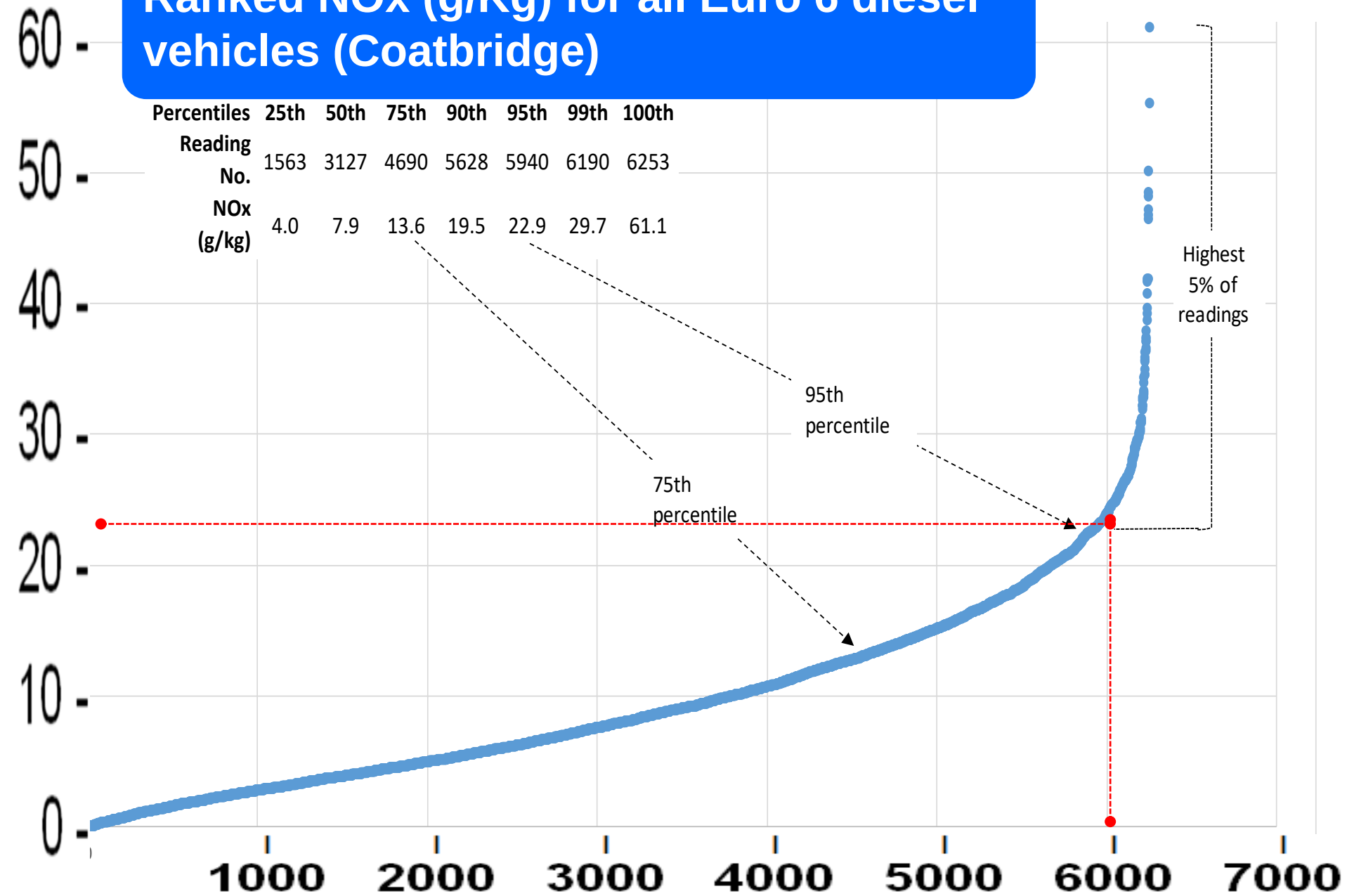
All groups worse than standard

Preliminary results, verification required



Ranked NOx (g/Kg) for all Euro 6 diesel vehicles (Coatbridge)

Percentiles	25th	50th	75th	90th	95th	99th	100th
Reading No.	1563	3127	4690	5628	5940	6190	6253
NOx (g/kg)	4.0	7.9	13.6	19.5	22.9	29.7	61.1



EDAR – Further analysis

- 1 Derive representative CO₂ (g/km) values for the fleet and use these to convert EDAR measured ratios.
- 3 Perform a Pareto style analysis on the complete data set of emissions and compare results between Scotland sites.
- 5 Categorise by emissions management technology.
- 6 Undertake specialist analysis of the buses subset of the EDAR dataset.
- 7 Understand variability of repeat measurements (same vehicle)
- 8 Assess EDAR's capability to measure exhaust temperature data.
- 9 Assess absolute emissions (g/km) measurement capability (sensor in correct position)
- 10 Determine prevalence of UHEVs and Gross Emitters
- 11 Comparison of Emissions Analytics and EDAR/

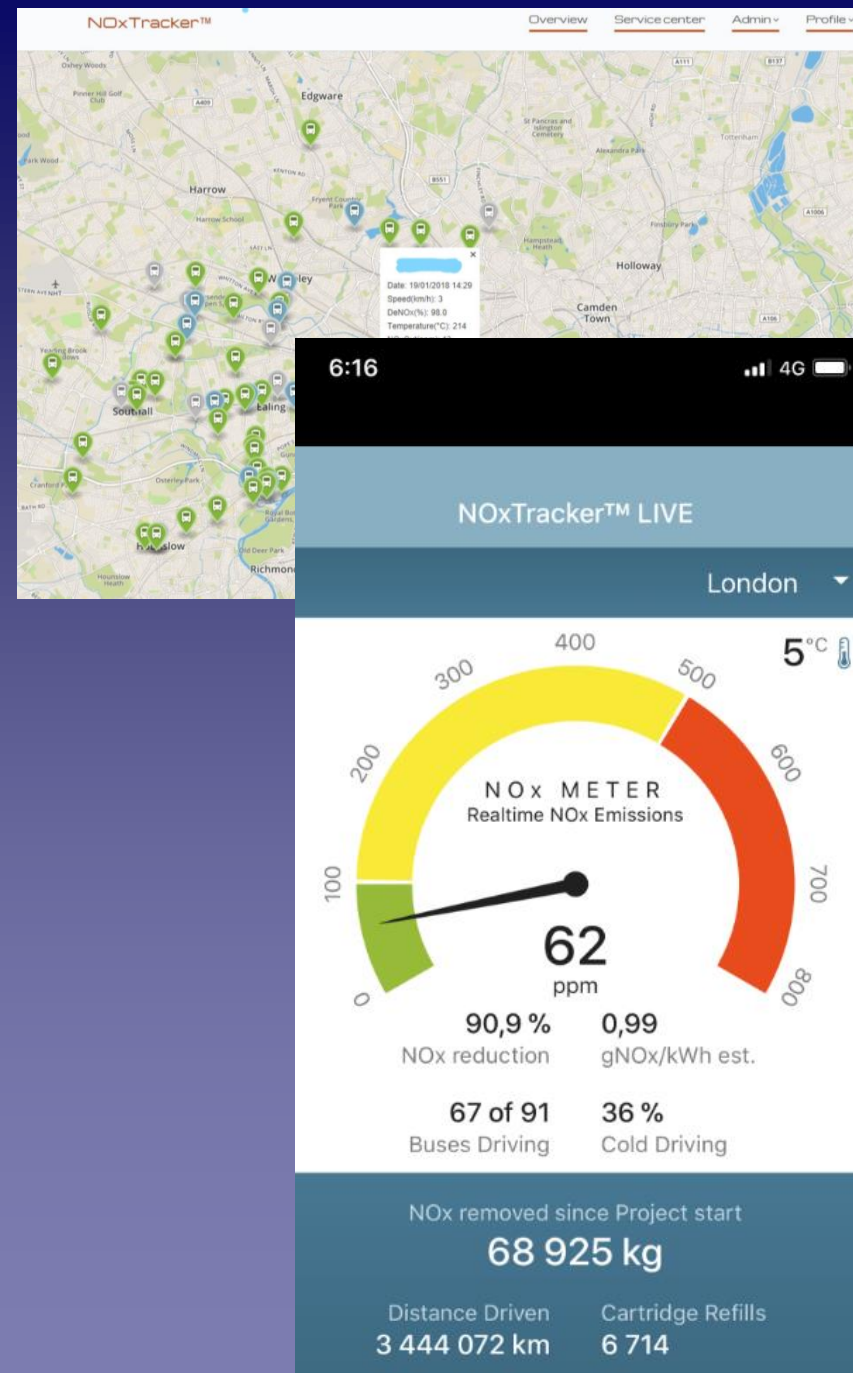
What we are doing

BEAR Scheme

Bus Emissions Abatement and Retrofit (BEAR)

- Support bus operators to reduce nitrogen dioxide (NO_x) and particulate matter (PM) emissions of vehicles within AQMAs through the installation of Clean Vehicle Retrofit Accreditation Scheme accredited retrofit technology measures.
- Demonstrate and evidence the effectiveness of retrofit technology to Scottish bus operators through an effective monitoring framework collecting, analysing and sharing operational data to demonstrate real world emissions reduction from the use of the retrofit technology

Clean Vehicle Retrofit Accreditation Scheme (CVRAS)



What others are doing

EQUA Index

Independent index on vehicle performance

PEMS used on typical route

Used for consumers (to help new car choice), and manufacturers (to provide grounding of real emissions).

TfL links to website to support ULEZ introduction and consider new car choice.



GLA - Mayor unveils new cleaner vehicle checker scheme

29 March 2017

Emissions scoring tool will test new cars on real life roads to help purchasers identify worst polluting vehicles

"My scheme will put an end to the smoke and mirrors that have been employed in official emissions tests "

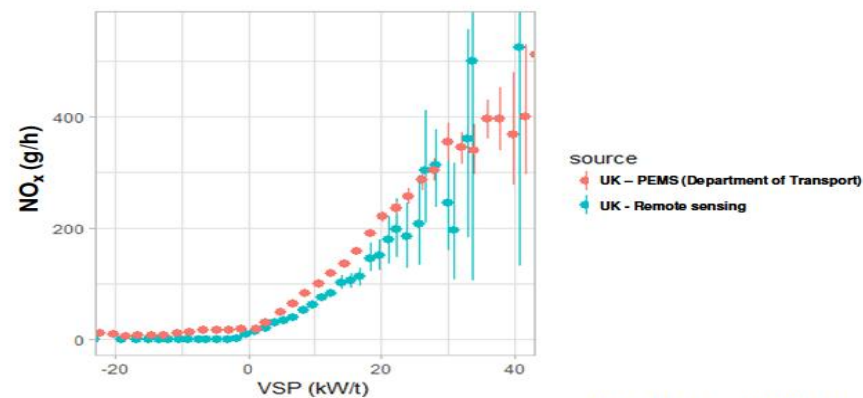
What others are doing

The CONOX Project

A European and US collaboration to analyse how large datasets from remote sensing can be used as a complement to existing approaches to measure road vehicle emissions to achieve a better understanding of the European issue of air pollution from road transport.

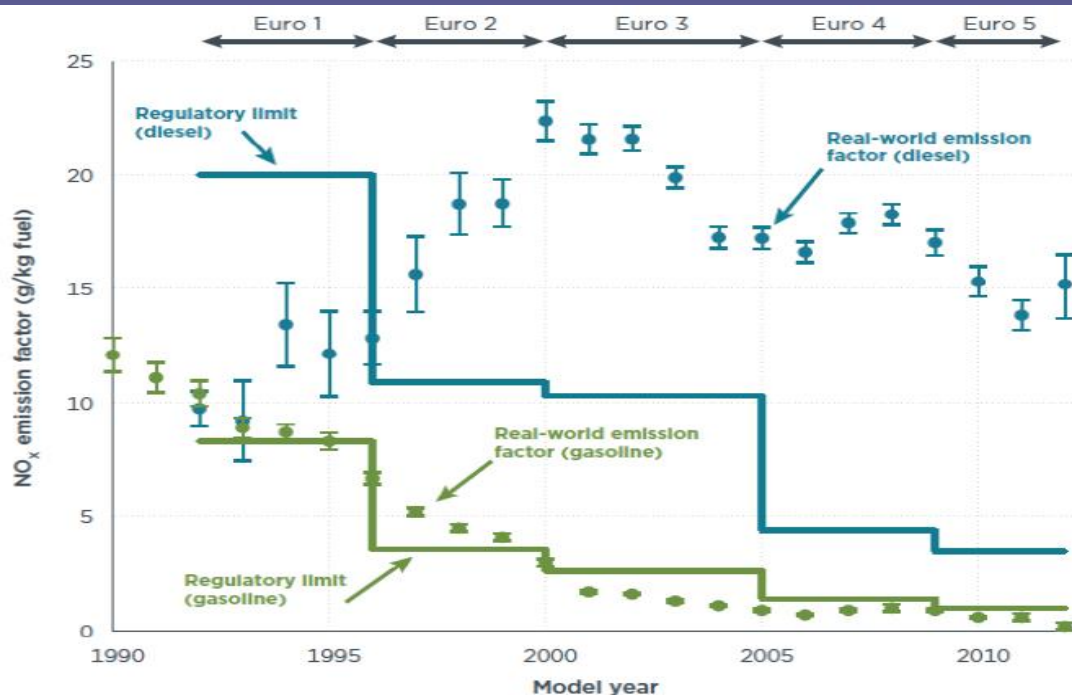
How RSD and on-board (i.e PEMS) results compare for NO_x emissions ?

- Instantaneous NO_x emissions for Euro 6 diesel passenger cars as a function of the vehicle specific power



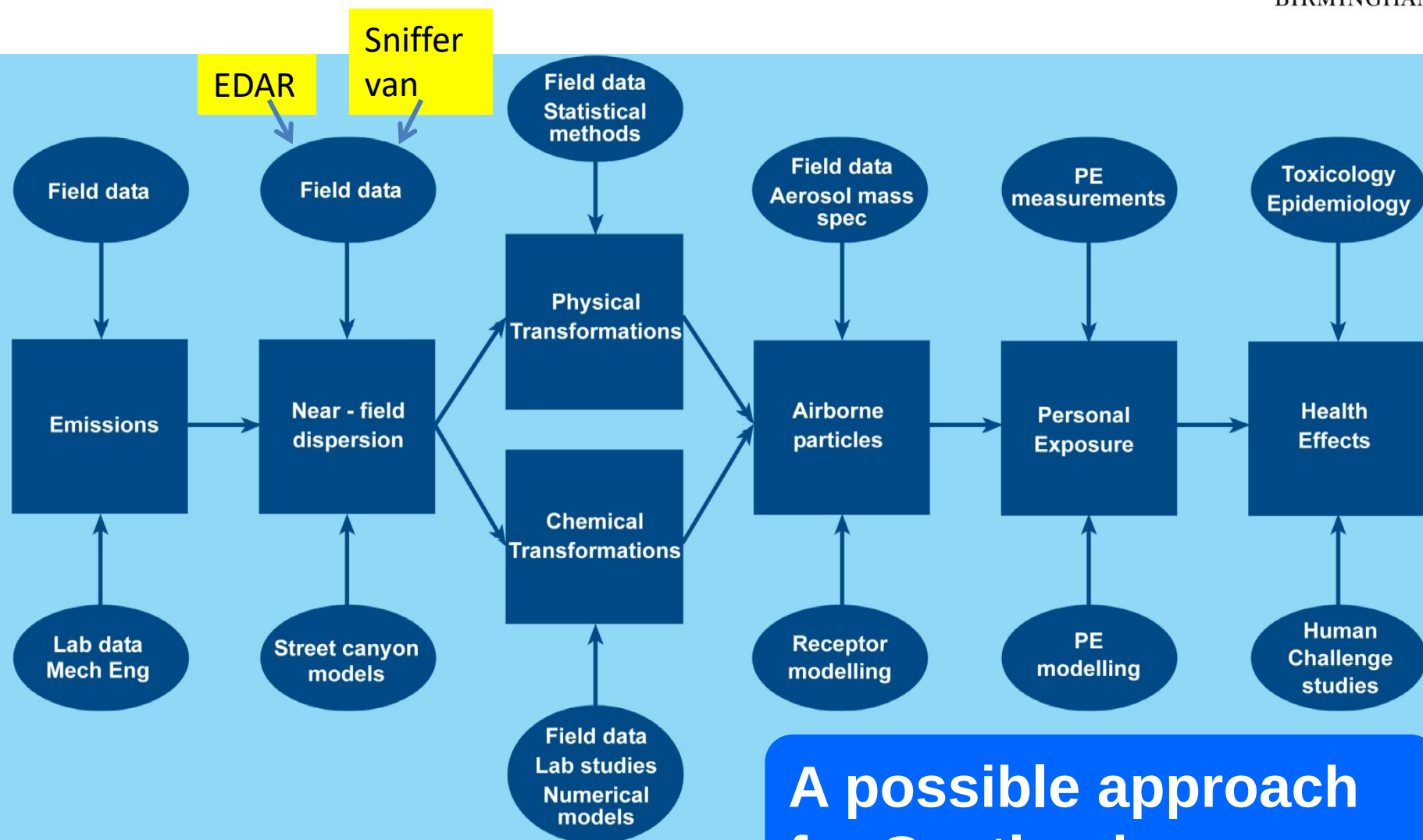
CONOX

Preliminary results based on CONOX data



Collaboration

Full Life Cycle of Pollutants



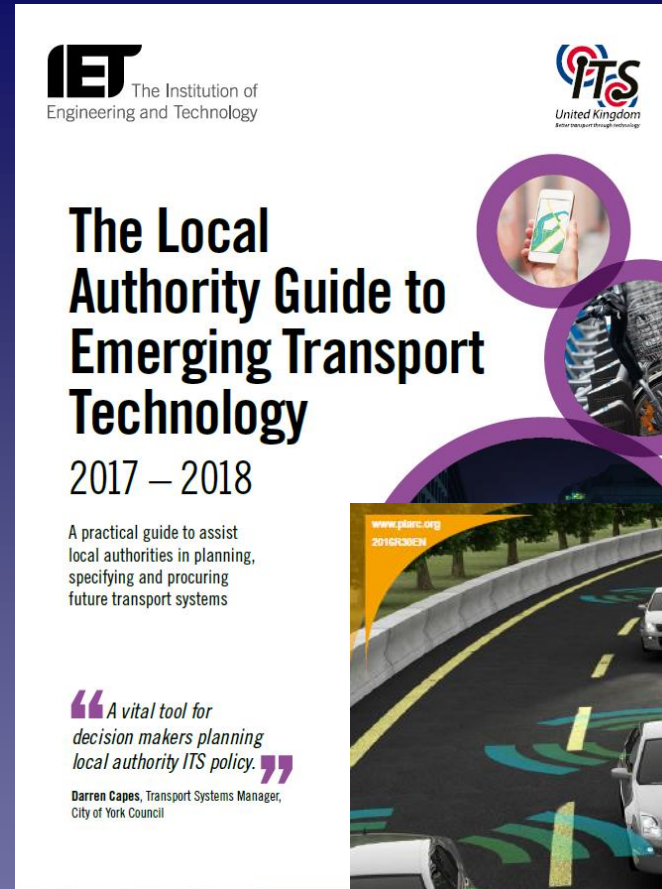
**A possible approach
for Scotland**

Next steps

Integration and storage

Key Approach

- Develop Standards
- Collect the data in the National Transport Data System
- Align our work with the ITS Strategy to inform traffic management decisions
- Link to other data storage projects such as the CONOX Project



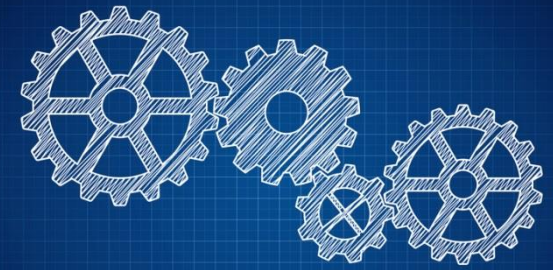
Next steps

- Joint research opportunities in Innovate UK, NERC, World Road Association, and other organisations.
- Partnership building important.
- Applying research to delivery and business development essential.

North Central Texas COG

Research applications

Universities' Transport Studies Group



COLLABORATION



Next steps - what others say



Why we need emission evidence.

- To give an accurate picture of the situation enabling the correct strategy to improve things.
- To enable arguments to be put forward with hard facts and confidence.
- Gain the public's trust.

What we are doing.

- Trying to improve AQ but still not doing it together (enough).

Collaboration.

- Improved coordination, TSC, U. Birmingham, U. Leeds, DFT, HEAT, Others.

Next Steps.

- Data analysis, building database, working with others.