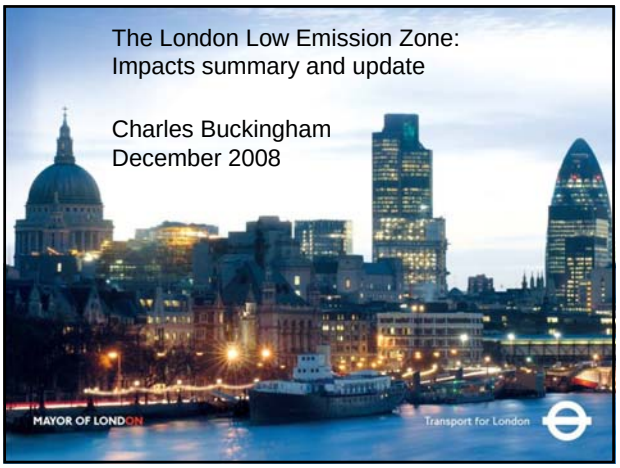


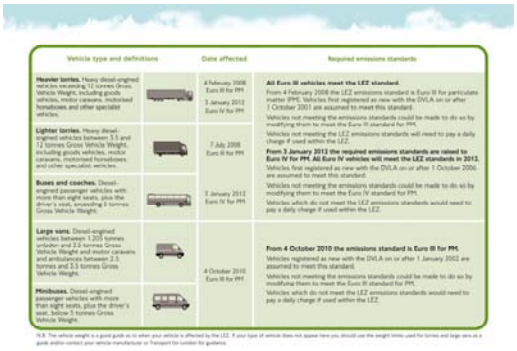
Why a London Low Emission Zone ?

- London's air quality among worst in UK.
- Exceedences of air quality objectives – PM_{10} and NO_2.
- Concentrated in central/inner London alongside busy roads.
- Mayor's Air Quality Strategy – range of measures.
- LEZ identified as potentially most effective.
- TfL developed a scheme to be introduced from early 2008.

Basis of scheme

- Operates 24/7 across Greater London.
- Minimum Euro emissions standards – or charge.
- Phased implementation – 2 phases in 2008.
- Targets higher-polluting diesel vehicles.
- Enforced by cameras.
- Comprehensive monitoring of effects.

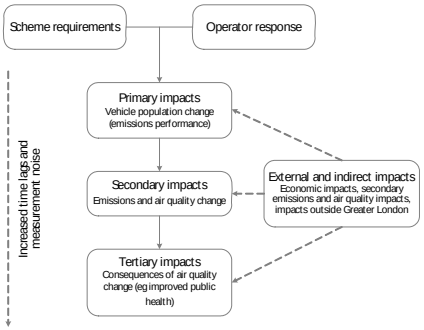
Guidelines for vehicle compliance with the requirements of the London Low Emission Zone scheme.



Expected impacts

- Targets reduced PM emissions to assist compliance with air quality objectives.
- But – PM very complex.
- And – path from 'intervention' to 'effect' also very complex.
- So, need to recognise complexity in interpreting scheme impacts.
- Range of other (non-PM) impacts.

Conceptual impacts hierarchy for the monitoring of the London LEZ.

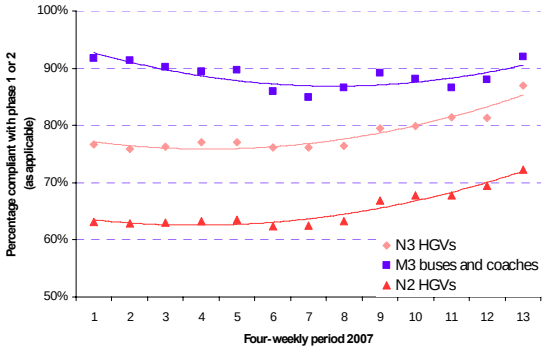


Measuring traffic change

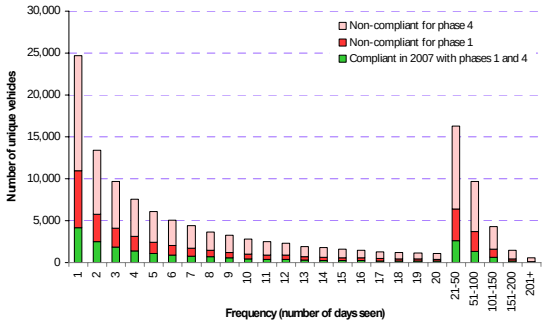
- Automatic NumberPlate Reading Cameras (ANPR).
- Statistically-representative sample of 100 cameras.
- Monitor vehicles continuously.
- Interface to TfL's Scheme Compliance Database.
- Ascribe Euro emissions class to in-scope vehicles.
- Therefore, derive 'observed' vehicle stock profile in terms of Euro Class for in-scope (and potentially) other vehicles.

A typical semi-permanent automatic number plate recognition camera installation on a traffic signal head.

Trend in scheme compliance during 2007. Vehicle activity based estimate, 13 four-week periods, phases 1 and 2 of the scheme. ANPR camera data.



Annual frequency distribution for 2007 calendar year, N3 heavy goods vehicles. Showing established compliance with requirements of phases 1 and 4 of the scheme.



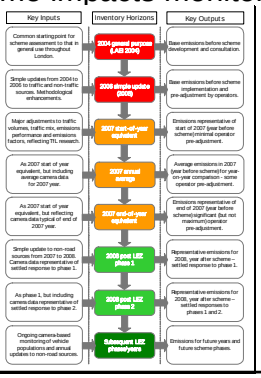
Estimates of change in compliance with the requirements of the scheme during 2007. Percentage point change, synthesis of various sources.

Data source/vehicle type	Gross annual change 2007	Estimated background change 2007	Estimated scheme-attributable change 2007
N3 HGVs			
- UK national fleet (licensing data)	7%	4%	3%
- London registered fleet (licensing data)	13%	4%	9%
- Camera data unique vehicles (annual)	10%	5%	5%
- Camera data vehicle-kilometres (annual)	10%	4%	6%
- LAEI projected (on national fleet turnover)	8%	n/a	n/a
N2 HGVs			
- UK national fleet (licensing data)	7%	6%	1%
- London registered fleet (licensing data)	10%	8%	3%
- Camera data unique vehicles (annual)	9%	6%	5%
- Camera data vehicle-kilometres (annual)	9%	6%	4%
- LAEI projected (on national fleet turnover)	8%	n/a	n/a
M3 buses and coaches			
- UK national fleet (licensing data)	5%	3%	-2%
- London registered fleet (licensing data)	2%	-4%	-5%
- Camera data unique vehicles (annual)	3%	-1%	3%
- Camera data vehicle-kilometres (annual)	0%	4%	-4%
- LAEI projected (on national fleet turnover)	c. +2%	n/a	n/a

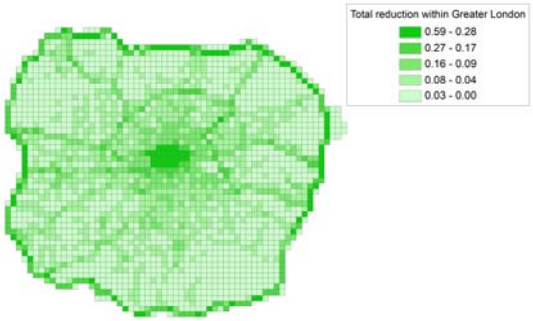
Estimating emissions/air quality impacts

- Manipulate Euro Class profiles in emissions inventory.
- Hold other things constant or vary in controlled way.
- Therefore, can isolate impact.
- But there are a few complications !
- Then, use before/after emissions scenarios to generate air quality concentrations.

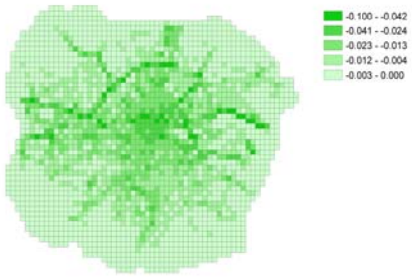
Emissions assessment horizons for scheme impacts monitoring.



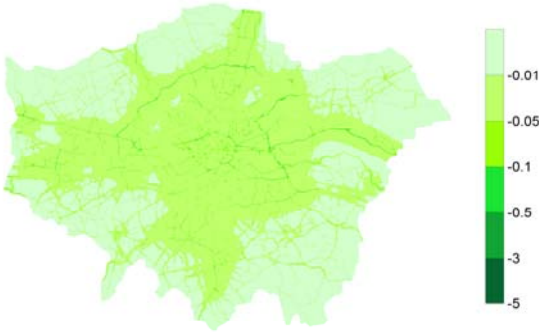
Reduction in emissions of PM_{10} during 2007. Road traffic sources only, total annual change (start vs. end of 2007). Tonnes per annum.



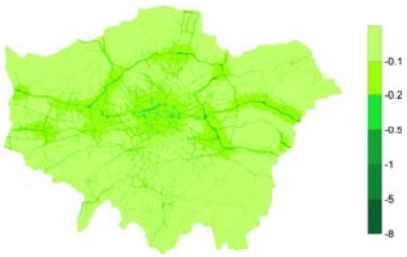
Reduction in emissions of PM_{10} during 2007. Road traffic sources only, scheme attributable change (start vs. end of 2007). Tonnes per annum.



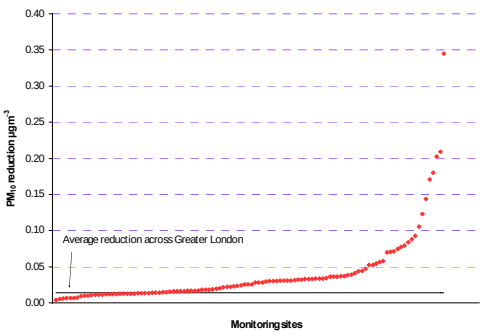
Observed scheme-attributable changes in PM_{10} annual mean concentrations (mg m-3). Start to end of 2007 with observed 2007 vehicle stock.



Observed scheme-attributable changes in PM_{10} annual mean concentrations (mg m-3). Start to end of 2007 with observed 2007 vehicle stock.



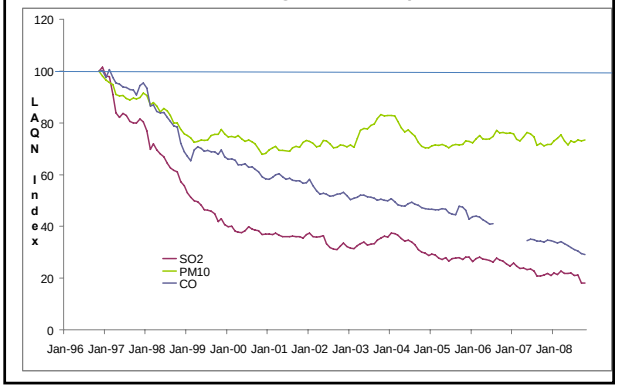
Estimated scheme-attributable reductions in PM_{10} at individual air quality monitoring sites, reflecting vehicle operator pre-compliance with requirements of phases 1 and 2 of the scheme during 2007 (mg m-3).



Detecting an air quality response

- So far, so good. But should we expect to see a visible air quality response following introduction of scheme ?
- Not necessarily !
- Small scale of scheme impacts compared to natural variability of PM.
- Differential impacts on components of PM.
- Confounding factors and still very 'early days'.
- Therefore, need to be quite smart as to how measure and interpret trends in concentrations.
- But can probably conclude that air quality is better in *relative* terms.

Long-run measured air quality (LAQN average values)

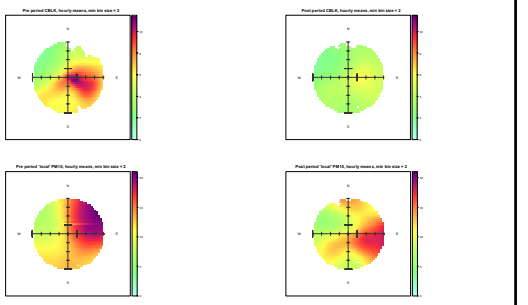


Long-run measured air quality (LAQN average values)

Available ambient monitoring data

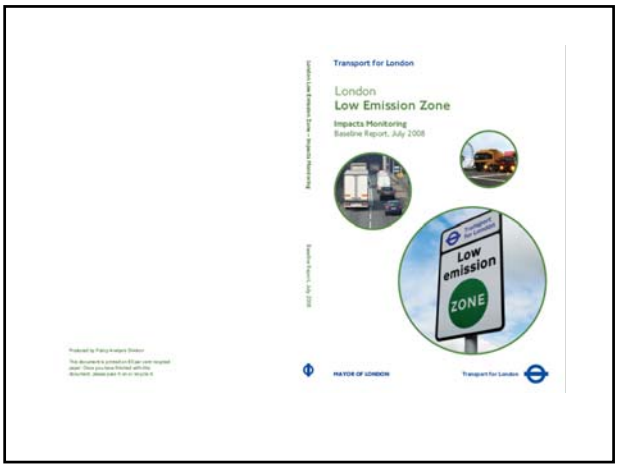
- LAQN resource – sub-divisions by site type.
- LAQN 'Supersites' – relationships at local scale.
- Co-located traffic and air quality measures.
- Object not to 'detect' a scheme effect, but to help understand developing trends.
- Short-run timescale of 'post' measurements – but some potentially interesting emerging findings at lower end of PM size range (2.5 and black carbon/smoke).
- Extensive 'control' site comparisons (London and other cities) to contextualise impact of 'regional' trends in London.

Some significant (?) changes in Black Smoke – Brent BT4



Other work packages

- Vehicle emissions testing.
- Health impacts assessment.
- Economic impacts on vehicle operators.
- Wider research using new ANPR data (eg CO_2 profiles).


Transport for London
London
Low Emission Zone
Impacts Monitoring
Baseline Report, July 2008
Low emission
ZONE
MAYOR OF LONDON
Transport for London