Proposed London Low Emission Zone

Impacts Monitoring Programme

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Background

- Proposed scheme being taken forward by TfL Congestion Charging Division
- History of CC Monitoring and Annual Reports
- Monitoring Strategy for Low Emission Zone
- But a quite different scheme requiring appropriate monitoring
- Purpose: Give an overview of the LEZ Monitoring Strategy

Projected air quality impacts

- 2008 proposals (HGVs, buses & coaches Euro III for PM) would reduce area of London exceeding:

  - *annual mean* PM_{10} objective by some 5.8%
  - *daily mean* PM_{10} objective by some 7.4%
  - *annual mean* NO_2 objective by some 5.2%

- 2012 proposals (HGVs, buses & coaches Euro IV for PM & heavier LGVs & minibuses at Euro III) would reduce area of London exceeding:

  - *annual mean* PM_{10} objective by some 16.2%
  - *24 hour mean* PM_{10} objective by some 14.7%
  - *annual mean* NO_2 objective by some 15.6%

Distinguishing challenges

- LEZ impacts small in measurement terms (but important) and evolutionary
- Other things going on at the same time
- No ‘visible’ effects on traffic volumes or flows (i.e. affects vehicle population composition)
- Key out-turn objectives (e.g. health benefits) can’t be readily measured
- Detection/expression of impact dependent on exogenous factors (weather, smoking ban)
- Many AQ relationships/science poorly understood, unlike traffic, where basic relationships well understood.

Impacts hierarchy

- Level 1: Vehicle population change (Obs)
- Level 2: Resulting changed emissions (Calc)
- Level 3: Resulting changed air quality (Calc/Obs)
- Level 4: Consequences of changed air quality (Est)

- Other: Economic impact of scheme (incl. operator behaviour)

Increased measurement abstraction

Approach

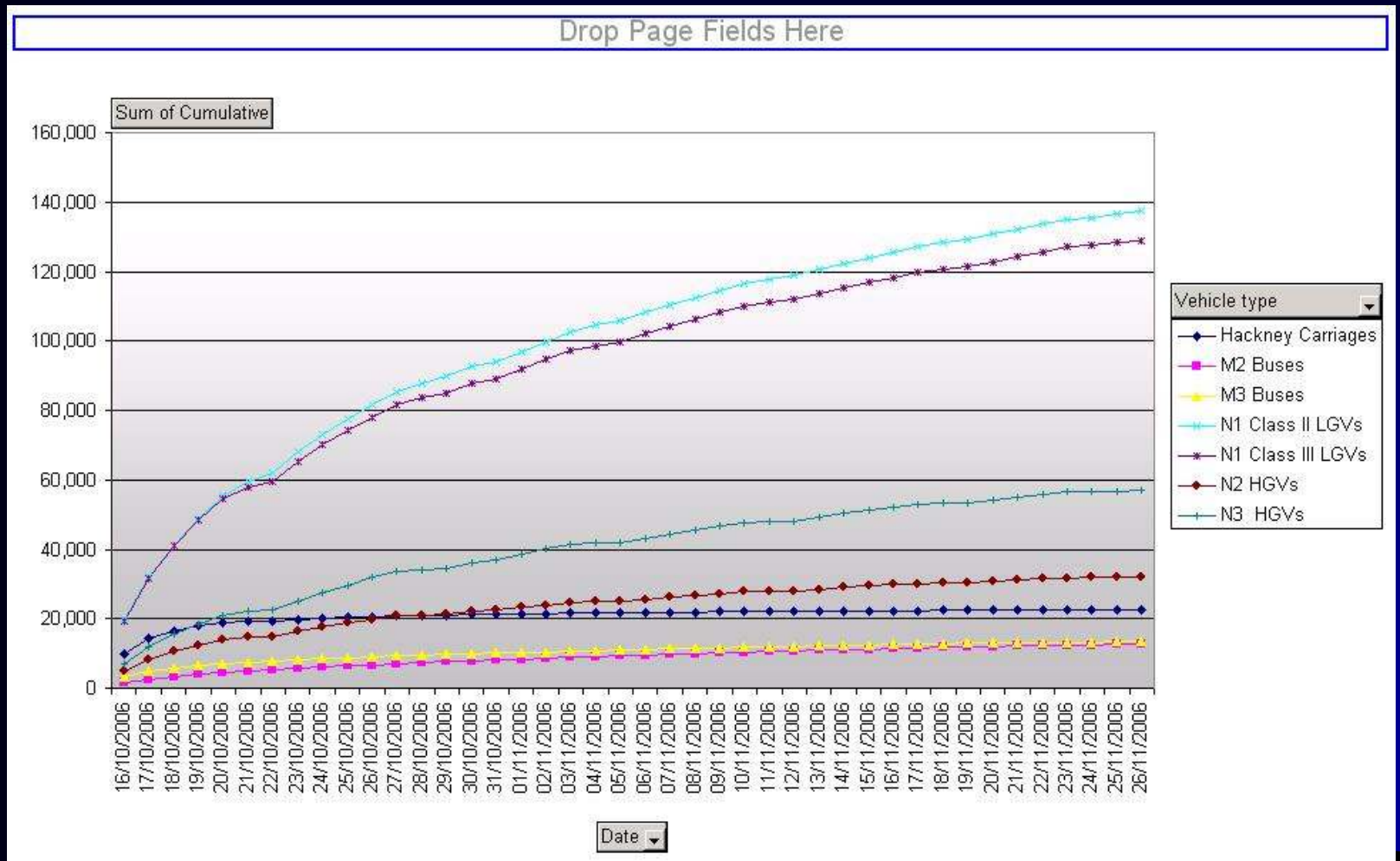
- Ensure robust measurement of vehicle population change
- Use this to calculate emissions change via LAEI
- Use this to calculate AQ change via AQ model
- Compare resultant changes with observed AQ data
- Use best assessment of attributable change to estimate consequent changes in, for example, health
- Separate work stream for economic/business issues
- Supporting scientific development where appropriate

Vehicle population change

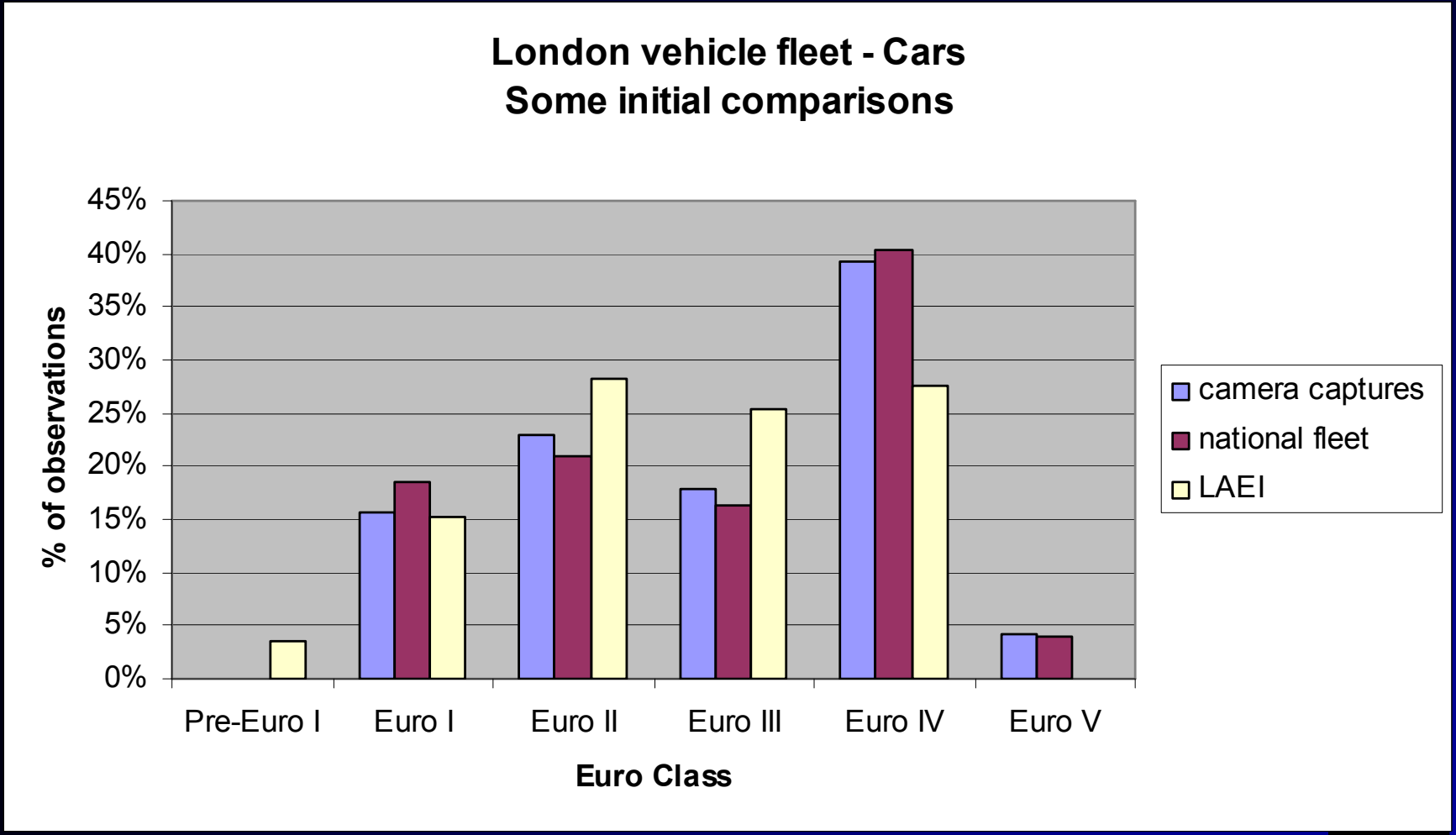
- Network of ANPR cameras (c. 100)
- Representative sample, stratified (33 strata)
- Match with supplemented DVLA database (Euro Class)
- 4 weekly rolling indicators of population composition for ALL vehicle types (4+ wheels)
- Now in place and generating data
- Output directly compatible with LAEI

ANPR ‘Spike’ cameras

Cumulative unique vehicle captures – very early and provisional data



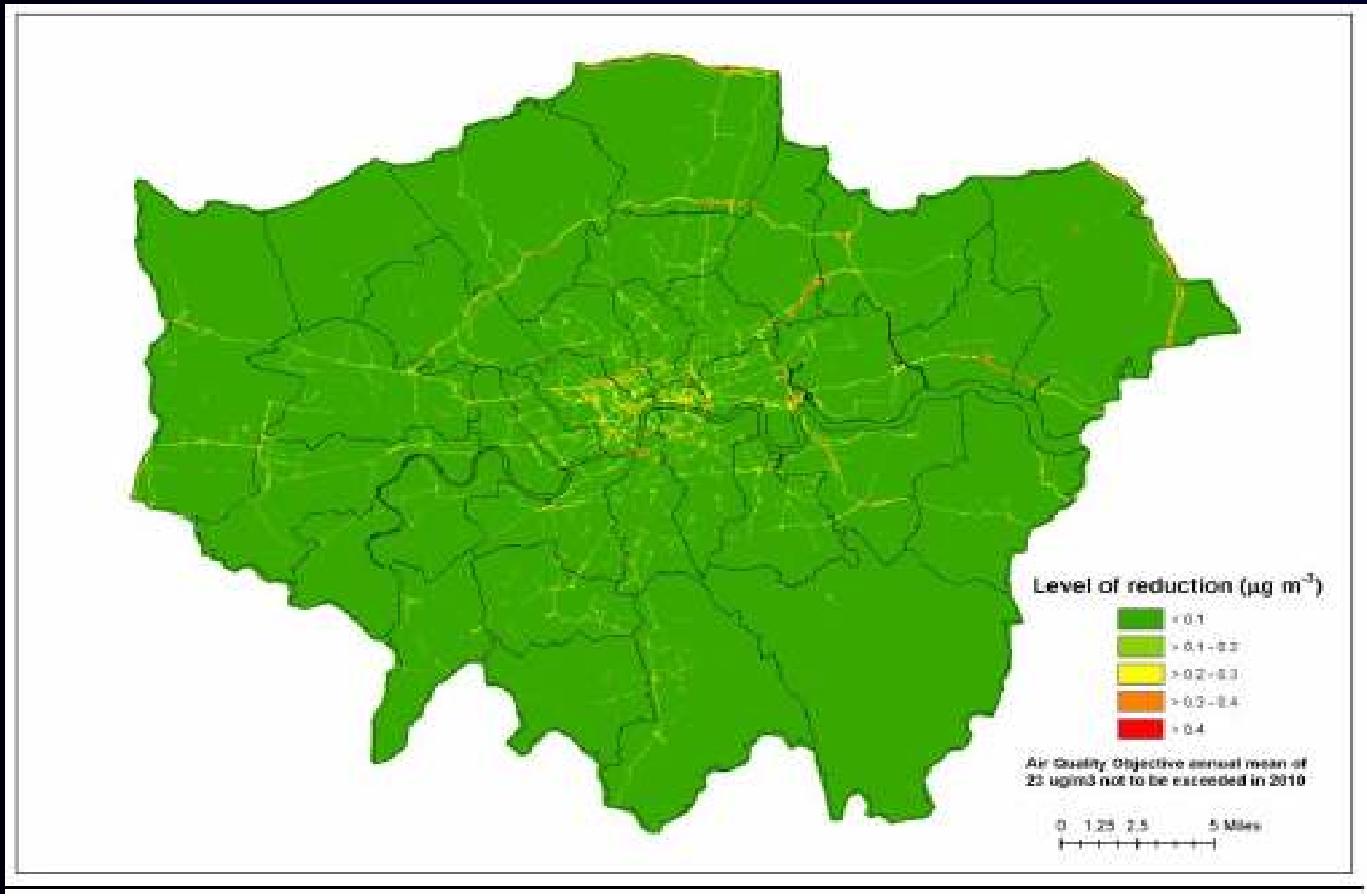
Concept – Euro Class tracking – very early and provisional data



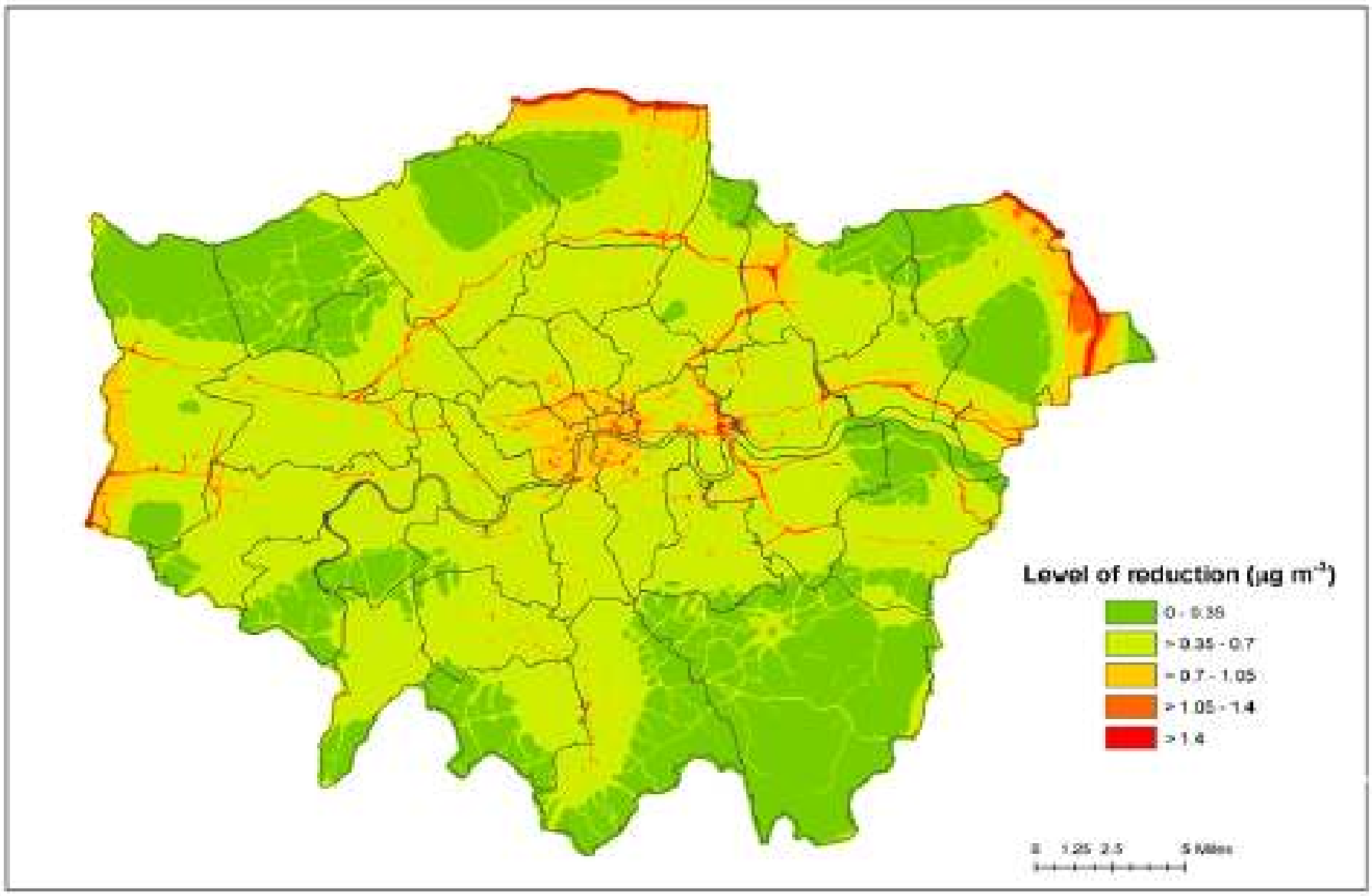
Estimating emissions change

- Updated LAEI baseline for 2006 (from 2004)
- ‘Do nothing’ 2007
- LEZ case(s) 2007 - 3, 6, 12 months on
- Repeated for subsequent LEZ horizons
- Calculate changed contribution from RT and LEZ affected vehicles for PM, NO_x/NO_2 (attribution)
- Necessary LAEI enhancements: emissions factors, primary NO_2, PM_{10}/$_{2.5}$
- Important by-product: observed measurements of London specific vehicle fleet characteristics

Reductions in concentration of PM_{10} in 2008



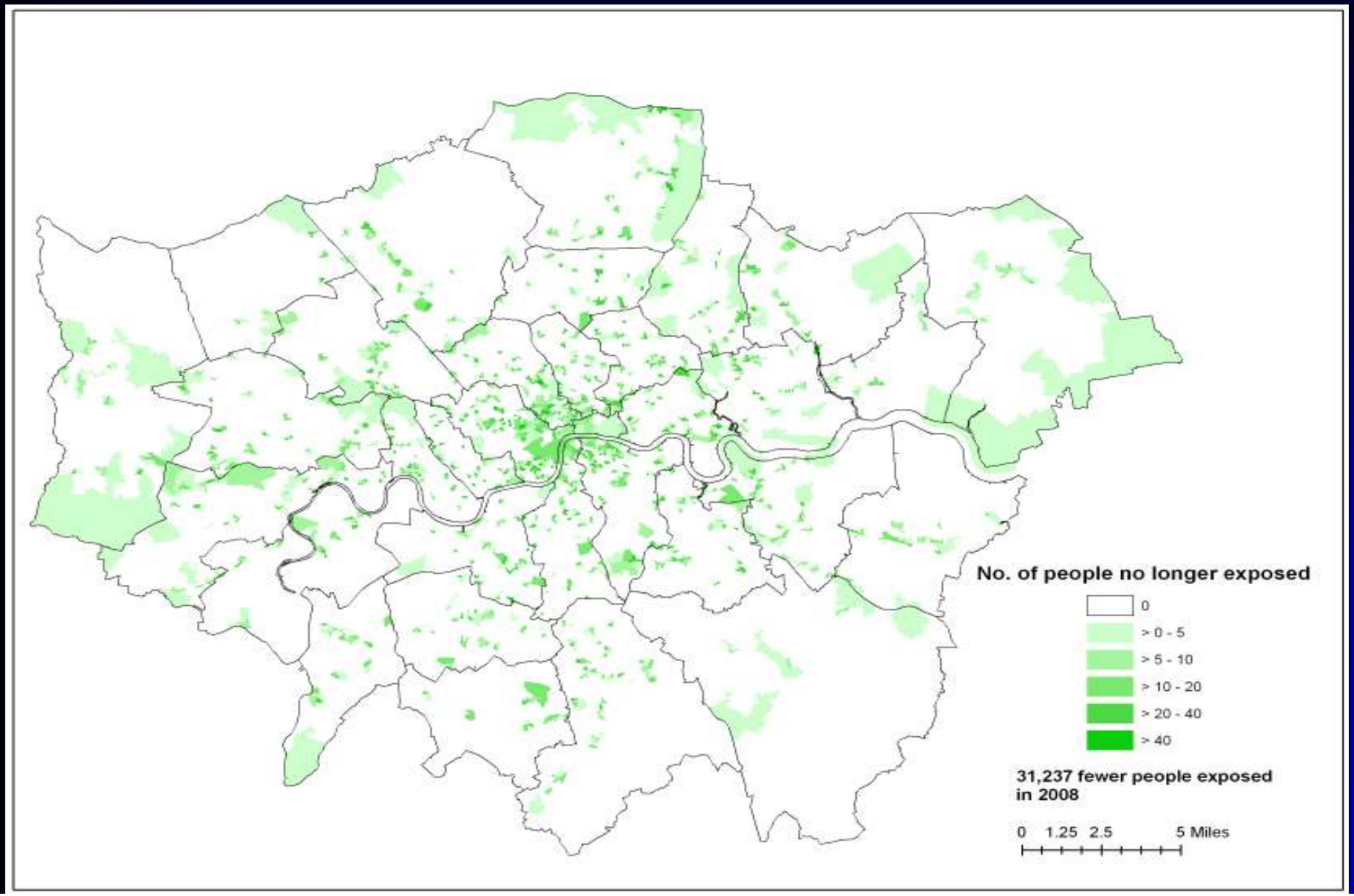
Reductions in concentrations of NO_2 in 2012



Calculating air quality change

- Use emissions scenarios as input to AQ model.
- Output concentrations under static meteorology provide indicators of change.
- Attribution possible from emissions datasets.
- Necessary model enhancements: NO_x chemistry, PM dispersion/reactivity by size and source.
- Compare model outputs with observed concentrations.
- Therefore, good (calculated) estimate of AQ change due to LEZ.
- Basis for estimation of ‘consequent’ impacts, e.g. on health.

Reduction in the number of people exposed to PM_{10} levels above the limit value in 2008



Measuring air quality change

- Paradox – first point of reference but least likely to demonstrate clear short term effects.
- LAQN – established (but TEOM problem and little PM speciation).
- LEZ (‘Supersites’) – primarily to understand relationships between traffic, pollutants and PM species at micro scale at high LEZ ‘signal’ sites => feed into inventory/model development and assist interpretation (Ben).
- Range of possible ‘outcomes’ for medium-term observed concentration trends.

Consequences of air quality change

- AQ Objective compliance.
- Health improvement – not amenable to direct measurement hence re-calibrate forecast model with observed AQ impacts.
- But first need to verify that existing method adequately reflects expression of observed AQ impacts (e.g. differential impact by PM size).
- Wider environment/amenity – again not amenable to direct measurement.
- Secondary gains – e.g. potentially noise, CO_2, other pollutants (by product of PM abatement): exploratory studies.

Economic Impacts

- LEZ accelerating an established process, ‘bringing forward’ a component of change that would in any case happen.
- Several complex effects around operator strategies and vehicle turnover (additional costs ‘brought forward’).
- Observed vehicle change dimensions scale of impact.
- 2 key elements: deviation from established trends across a range of indicators (largely 3rd party data), and an ongoing survey of operator behaviour.
- Potential +ve and –ve effects, widely spread.

Outside London

- Significant AQ benefits outside London.
- But prohibitive to measure in detail.
- NAEI framework using calculated UK/International fleet changes with sample measurements on UK motorways.
- Corresponding calculated emissions/AQ/health impacts assessment.
- Economy – London hauliers based country wide & abroad.

Developing the science

- London vehicle population => new baseline estimates
- PM characterisation (emissions, components)
- Secondary effects of PM abatement (e.g. primary NO_2)
- Health impact pathways (how does PM change affect health) – KCL work
- Intra-site relationships between traffic and pollutants
- Not going to solve all problems - but should realise useful, targeted improvements to methods

Further information

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