

Medium term effects of London's low emission zone

Richard Ellison, Stephen Greaves and David Hensher
Institute of Transport & Logistics Studies
University of Sydney



THE UNIVERSITY OF
SYDNEY



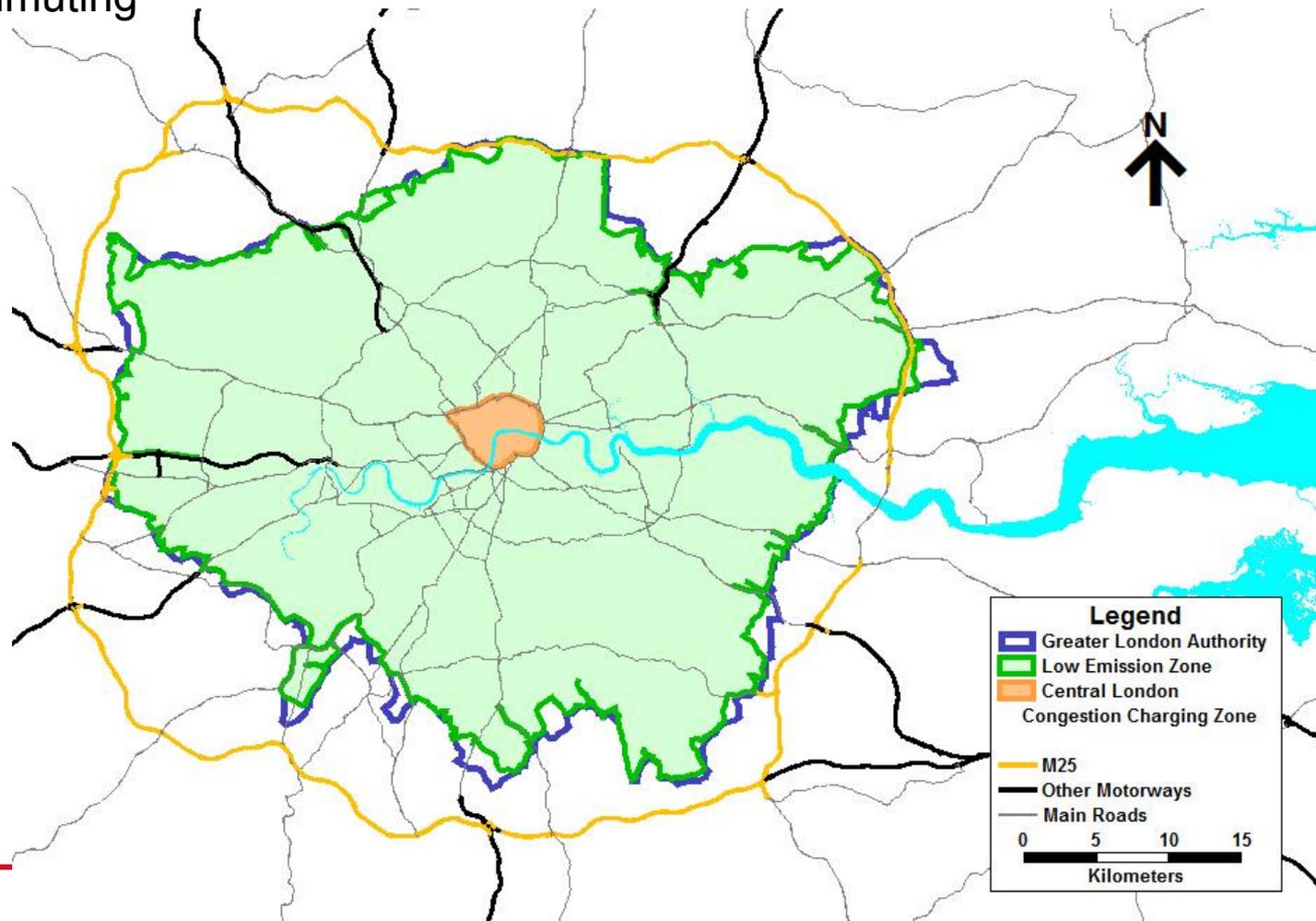
- › In the early 2000s London's air quality failed to meet both UK and European standards.
 - Levels of particulate matter less than 10 microns in diameter (PM_{10}) and nitrogen oxides (NO_x) were particularly high.
 - Potential health benefits of improving air quality are substantial.
- › London's low emission zone (LEZ) was intended to reduce emissions of these air pollutants by preventing older, more polluting, heavy vehicles from operating in London. **It was not designed to reduce the number of vehicles.**



- › What are Low Emission Zones?
 - Areas where vehicles which do not meet minimum emissions standards are restricted from entering or face heavy fines if they do enter.
 - First introduced in Sweden as an “environmental zone” which also covered other aspects including noise.
 - Since been adopted in cities in a number of countries, including:
 - Germany, Italy, Japan, The Netherlands
- › Primary objective of the study was to see how the LEZ affected vehicle use and ownership in London and if the change (if any) has been sustainable.

London Congestion Charge and LEZ

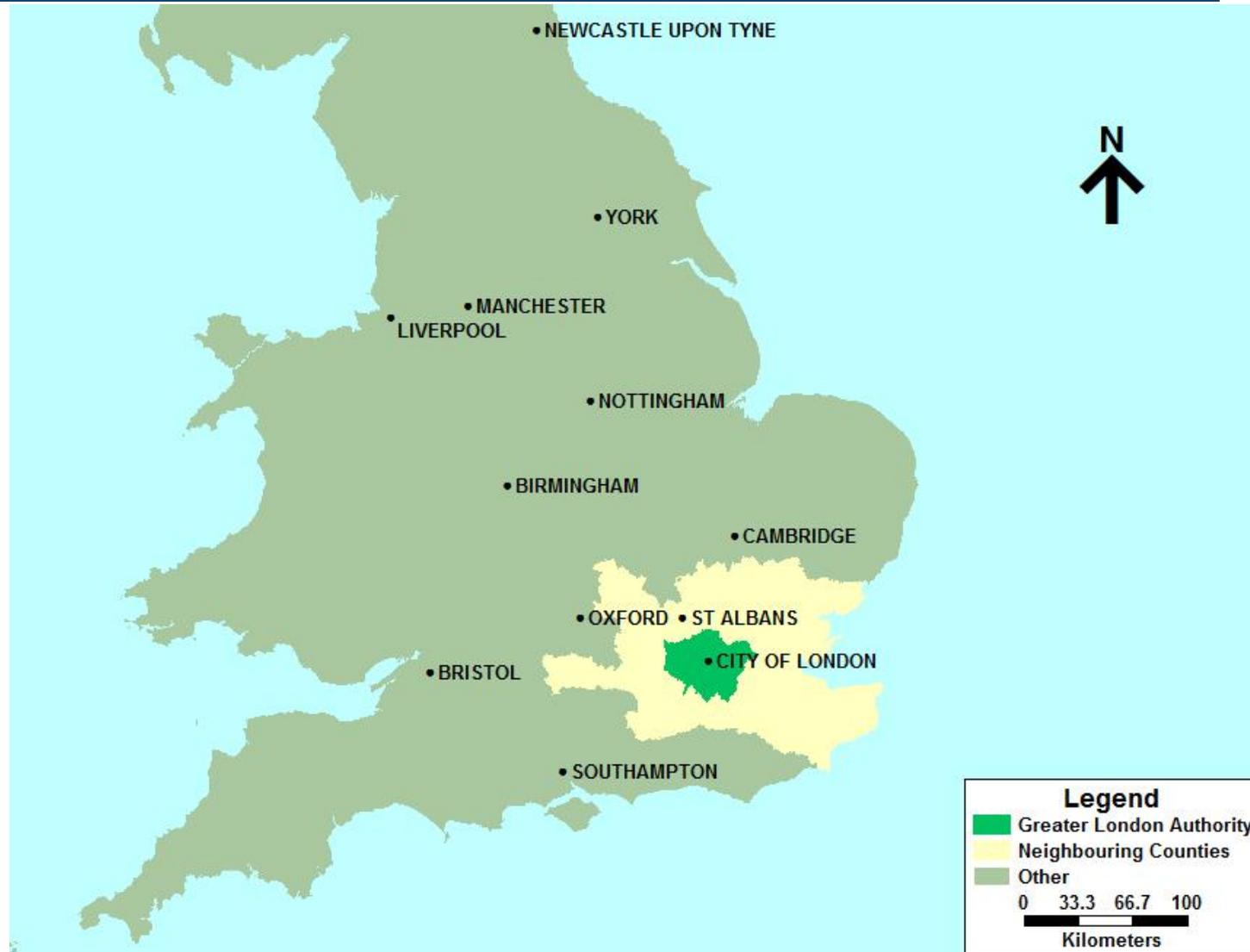
- London's population is approximately 7.8 million with many more commuting into London to work.



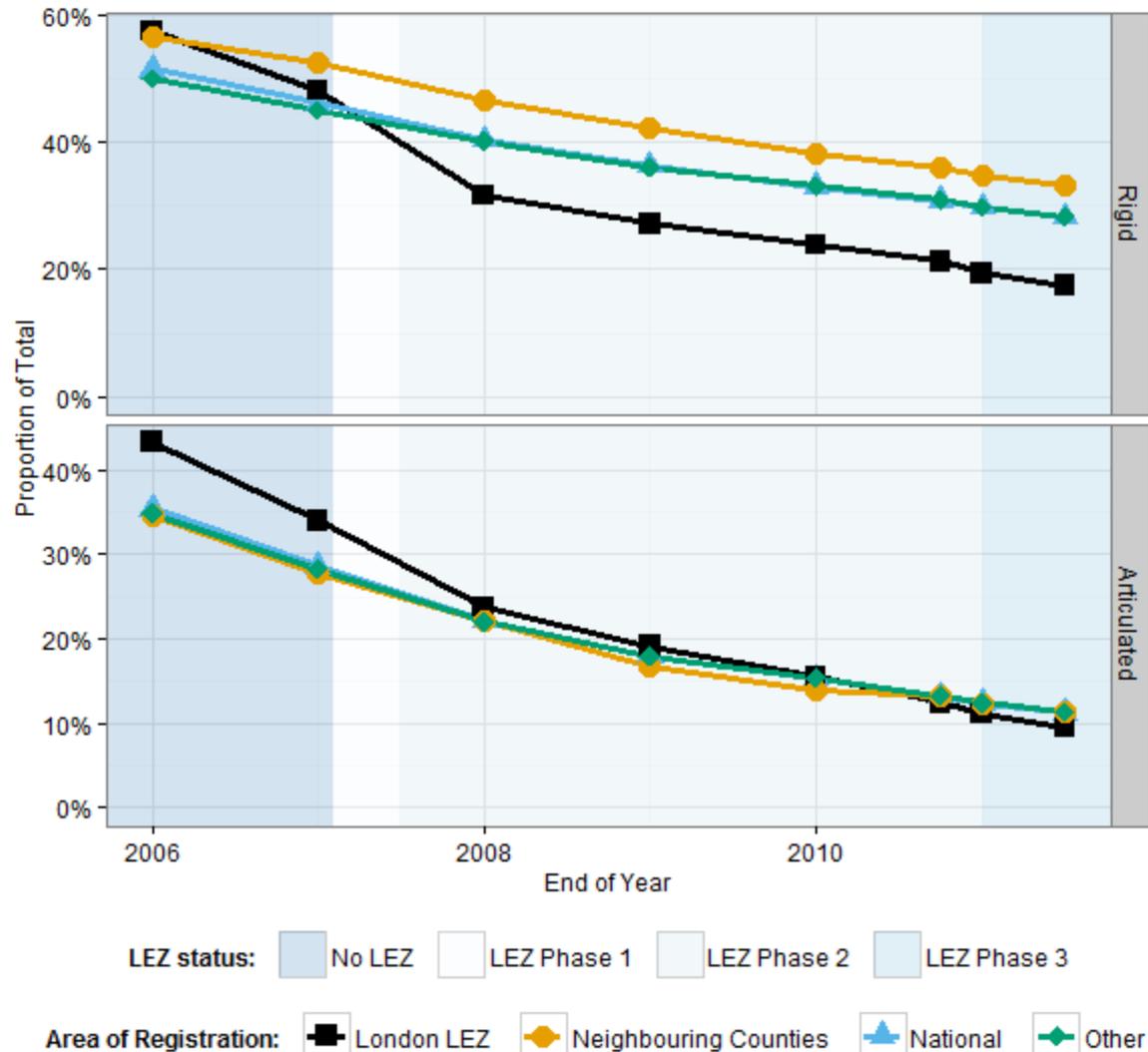
- › Came into force in February 2008 for vehicles with Gross Vehicle Weight (GVW) of more than 12 tonnes.
 - Minimum emission standard of Euro III required to operate in LEZ.
- › Came into force for Freight-carrying vehicles with GVW over 3.5 tonnes and buses over 5 tonnes in July 2008.
 - Third stage of implementation involving large vans delayed from 2010 to 2012.
- › Current charges of £200 (\$310) for heavy vehicles must be paid by midnight on the day of use.
 - Non-payment results in a fine of £1000.

- › Several sources of data:
 - Vehicle registration data from Driver and Vehicle Licensing Agency (DVLA).
 - Vehicles entering LEZ from Transport for London (TfL) from 2009 to 2011 (Freedom of Information request).
 - Air quality and meteorological data provided by King's College London.
- › EU vehicle classifications and emissions standards were determined for each vehicle using the same rules used by TfL for administering the LEZ.
- › OpenAir package for R used for conducting Theil-Sen regressions and generating pollution roses for air pollution.

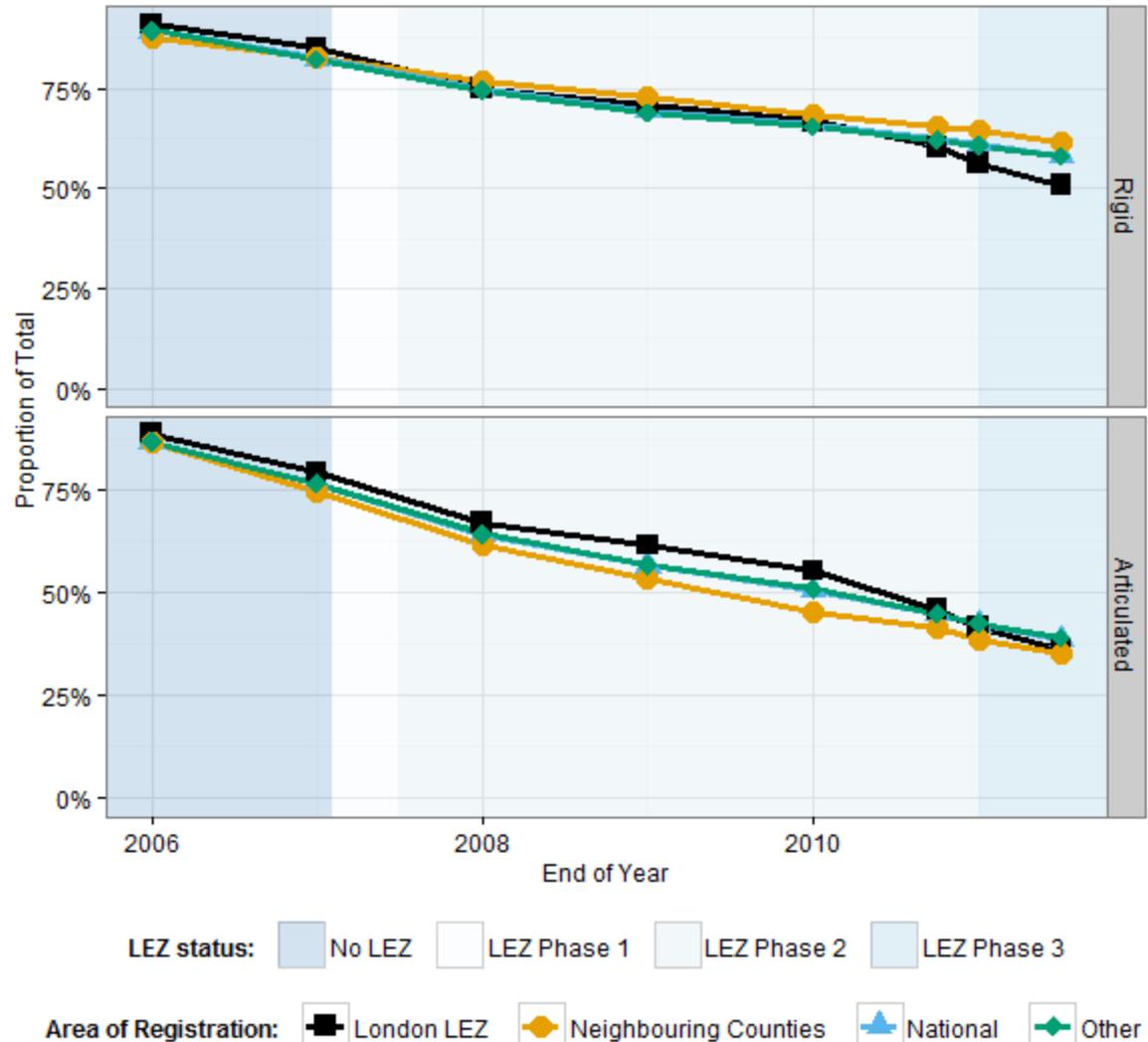
- Data from Transport for London and DVLA was provided by Postal Area.
- Postal Areas were grouped as Within LEZ/London, Neighbouring counties and Other.



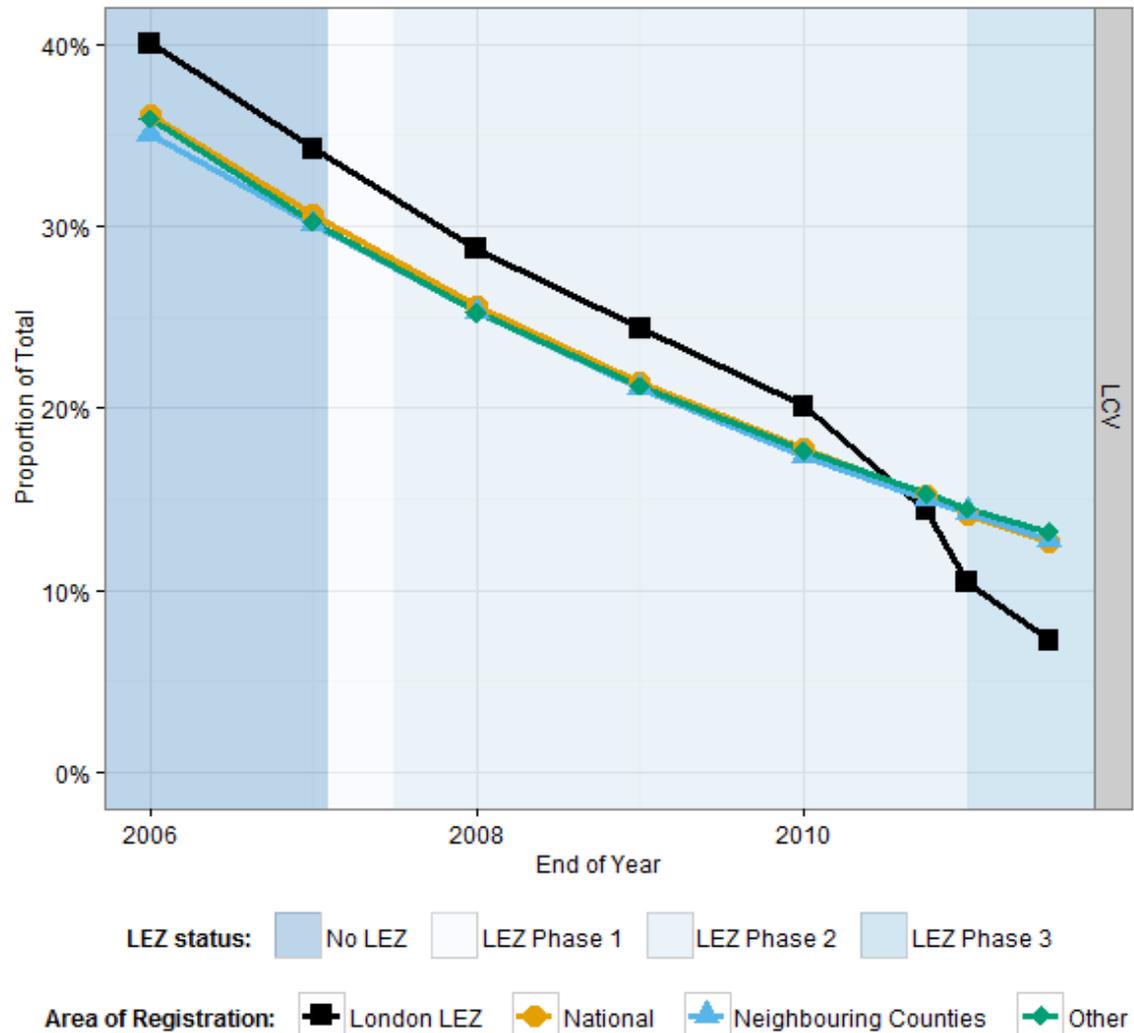
- Decrease of non-compliant rigid vehicles after LEZ introduced
- Turnover rate returns to its natural rate after 2008.
- Similar but less dramatic change occurred for articulated vehicles.



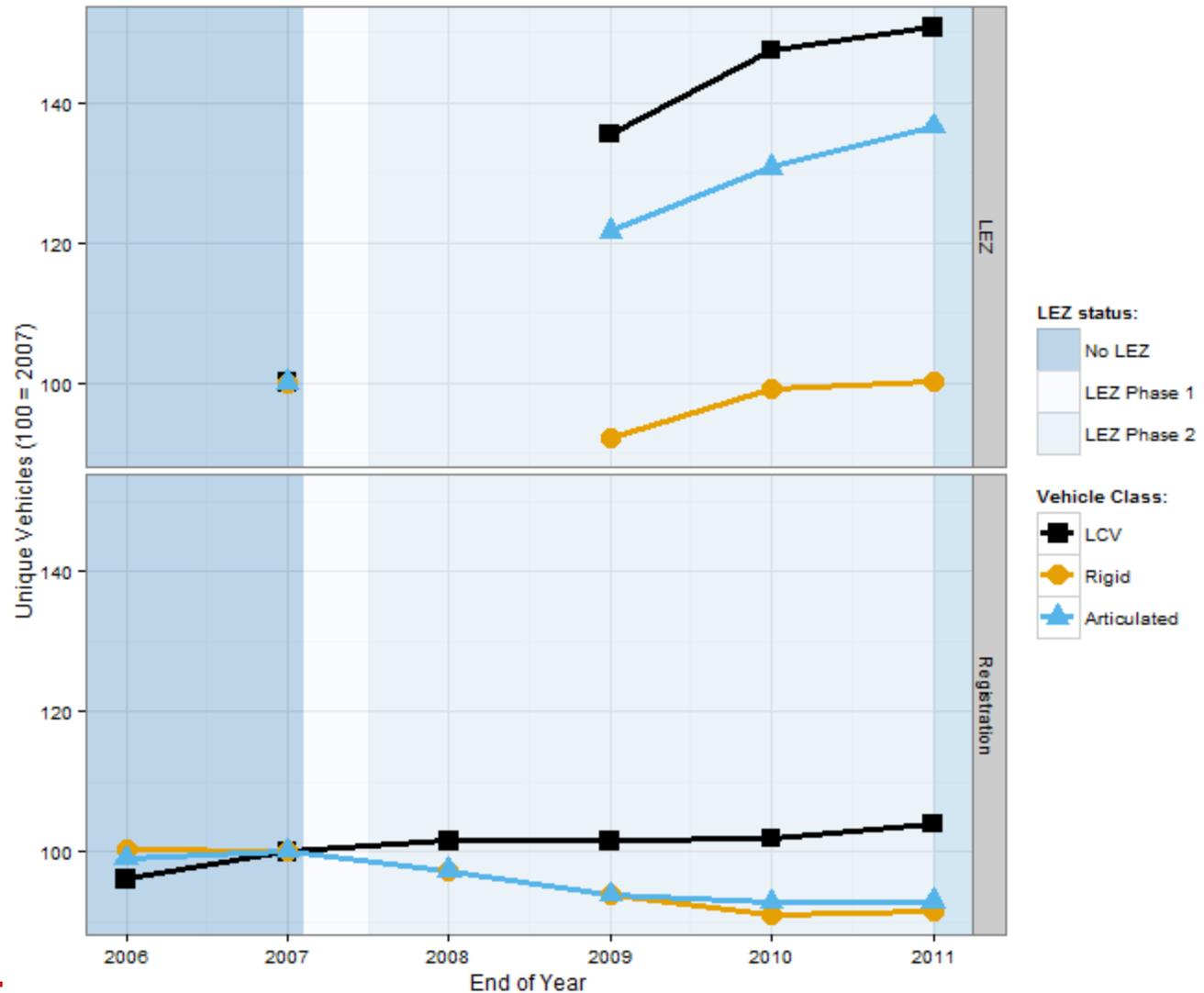
- Decrease of non-compliant rigid vehicles after LEZ introduced
- Turnover rate returns to its natural rate after 2008.
- Similar but less dramatic change occurred for articulated vehicles.



- Early evidence suggests similar increase in fleet turnover is occurring for larger LCVs (subject to LEZ since early 2012).
- No significant difference between regions until 2011 where London drops an extra 7 percent.

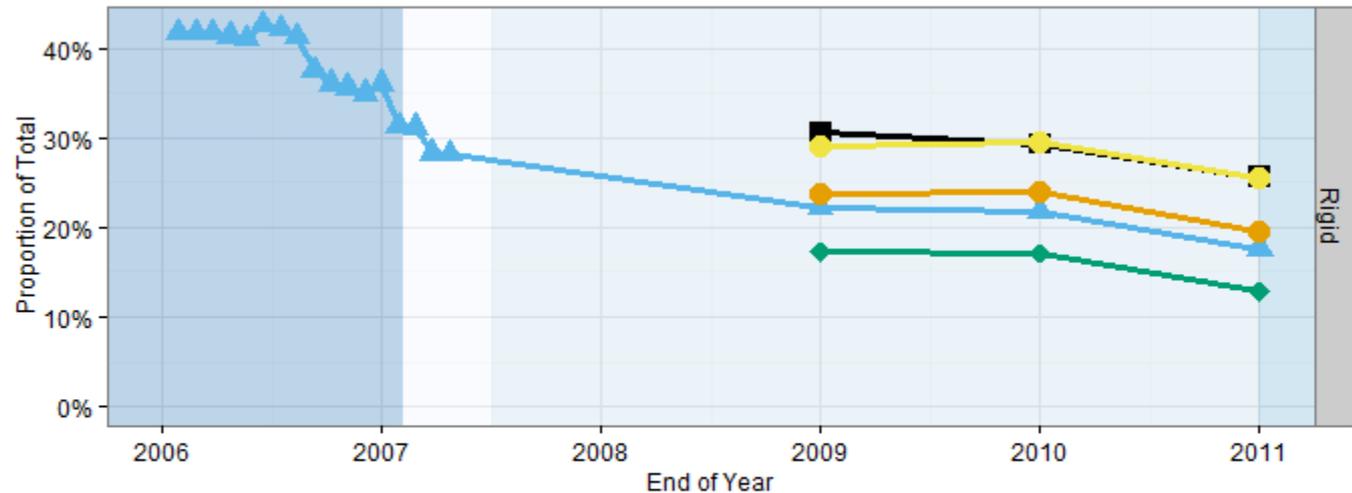


- The number of vehicles used within the LEZ increased more than the national registration rate.



Proportion of all freight-carrying vehicles in LEZ by class

	2007	2009	2010	2011
N1 (LCV)	77.9%	81.1%	81.3%	81.2%
N2 (Rigid)	8.0%	5.7%	5.6%	5.5%
N3 (Articulated)	14.1%	13.2%	13.1%	13.3%

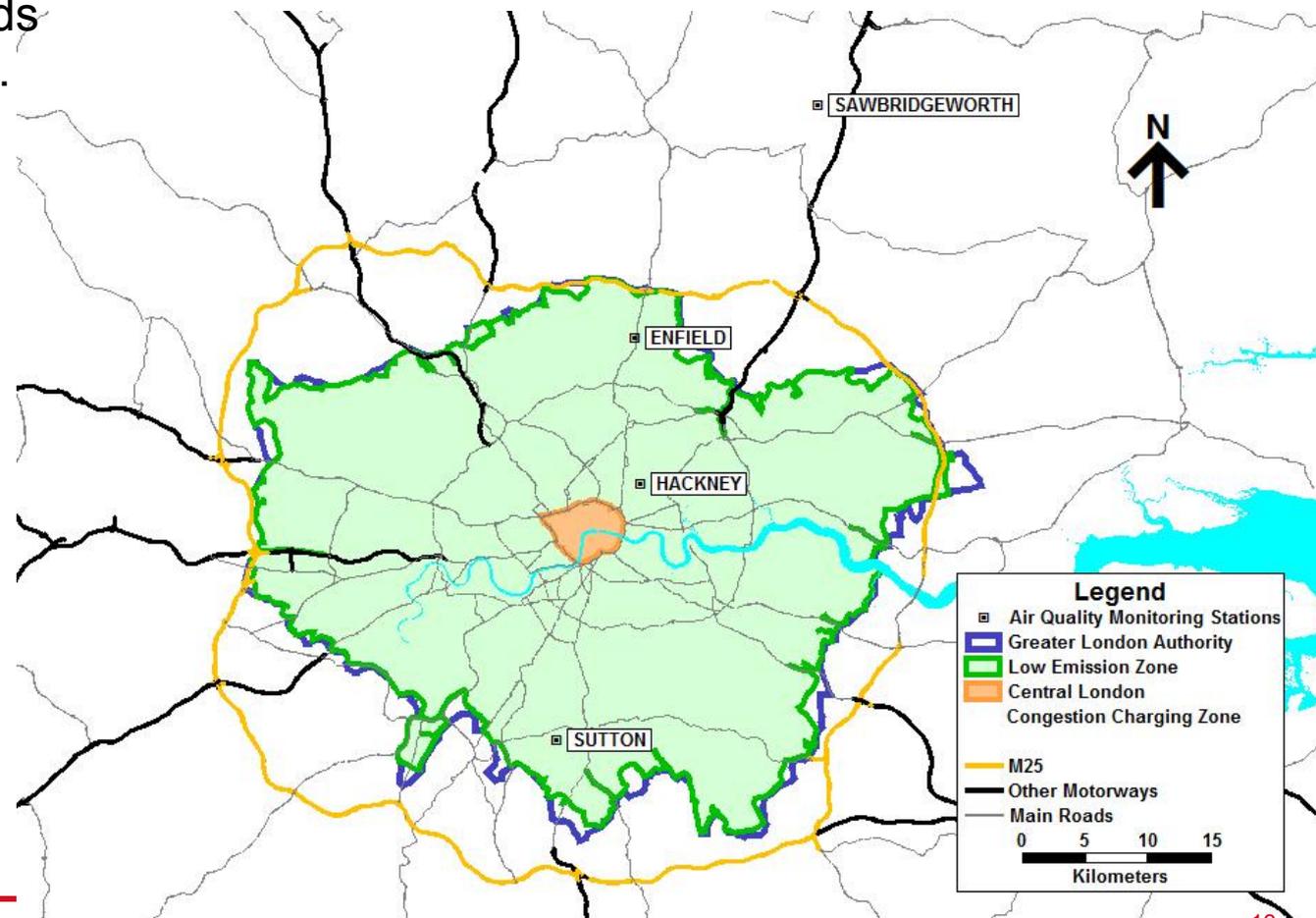


LEZ status: ■ No LEZ ■ LEZ Phase 1 ■ LEZ Phase 2

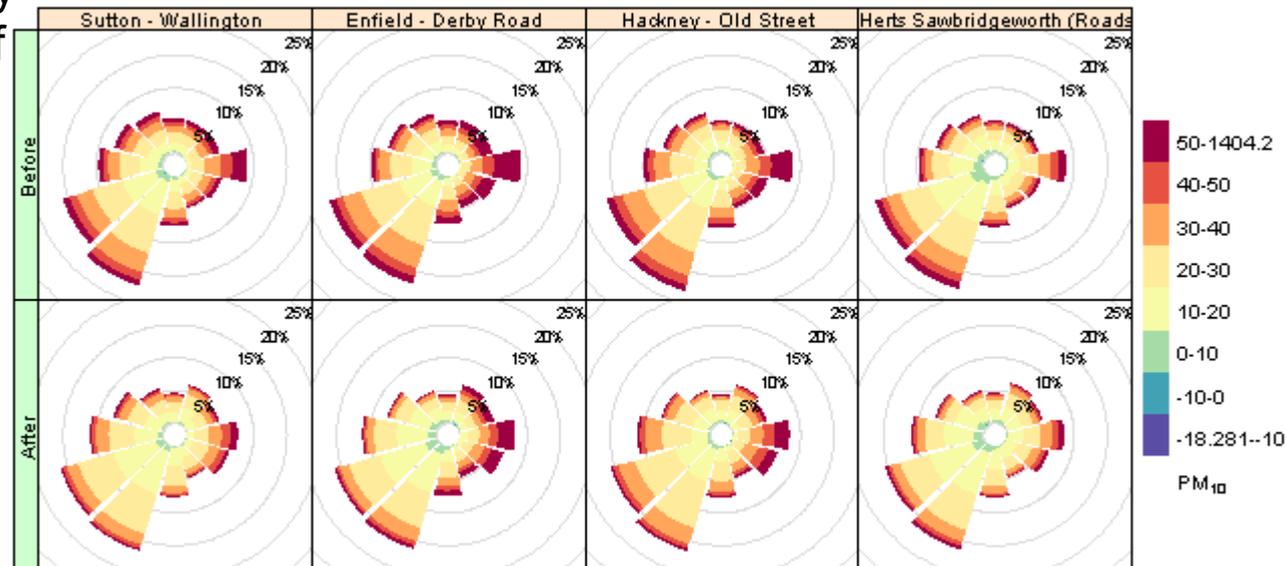
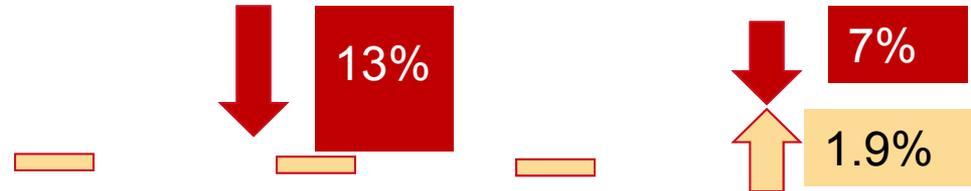
Area of Registration: ■ London LEZ ■ Neighbouring Counties ■ National ■ Other ■ Unknown

- Shift of vehicle types after 2007.
- Non-compliant rigid vehicles drops from 40% → 28%.
- Trend of decreasing number of non-compliant vehicles has since continued at a slower rate.
- Similar trend occurred for articulated vehicles (24% → 14%)

- Four air quality monitoring stations were used.
- Monitoring equipment is located next to main roads recording PM_{10} and NO_x .



- PM₁₀ levels have not increased along with the vehicle increase
- A reduction in the frequency of readings of high levels of PM₁₀ (above 30µg/m³).
- Small reductions in concentrations of NO_x are seen both within and outside the LEZ.



Frequency of counts by wind direction (%)

Changes in PM₁₀ emissions before and after the start of the LEZ.

- › London's low emission zone has had a substantial effect on the composition of the vehicle fleet in London.
 - Has mostly resulted in a shift to smaller and newer vehicles.
- › Air Quality has improved slightly despite a relatively large increase in freight vehicles entering the LEZ since it was introduced.
 - Suggests air quality may have deteriorated further without the LEZ.
- › Future work involves collecting updated data to assess full affects of the recent inclusion of LCVs in the LEZ and attempts to identify any redistribution of vehicles around the country.

Medium term effects of London's low emission zone

Richard Ellison, Stephen Greaves and David Hensher
Institute of Transport & Logistics Studies
University of Sydney



THE UNIVERSITY OF
SYDNEY

