

London's Approach to Assessing ULEZ including use of SATURN Software

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Greater London - Annual Mean NO₂ concentrations 2013

LAEI 2013



Emissions Inventory (LAEI) Taxi 3% 3% 9% 11% TfL Bus 5% 6% Rail 13% Diesel 15% 9% Car 18% 1% Petrol 17% Car 14% Van and 16% 23% Minibus Shipping Motorcy cle 22% 5% 6% 38% HGV 50% Road Non-TfL Bus and Coach *V*20 NO2 hourly mean (µg/m3) 100 80 60 40 20 13:00 18:00 00:61 00:00 00:10 02:00 03:00 04:00 02:00 00:90 07:00 08:00 00:60 00:00 00: I I 2:00 4:00 15:00 l6:00 7:00 20:00 21:00 22:00 23:00 Urban background average 2012 Roadside 2012

Understanding sources of pollution - the London Atmospheric



The Central London Ultra Low Emission Zone



Policy Options



ULEZ standards: Petrol - Euro 4; Diesel - Euro 6/VI, M/C; and L-Cat - Euro 3



Policy development: assessing the options



Mapping and presentation of results

How people might respond to the charge





Enforcement: assessing the options

Enforcement of Inner Zone

- New inner zone is 18 times the size of the Central ULEZ
- Very little enforcement equipment currently in place and potentially large costs to set up
- Need to determine the appropriate level of camera coverage to encourage compliance

	Boundary Only	Key Radial and Cordon Routes	Complete coverage
Vehicles captured	No intra-boundary trips captured – these are c.40 per cent of inner London trips	Avoiding is difficult – majority of traffic captured	Unable to avoid even on minor roads - c.100 per cent captured
Compliance and emissions savings	Low	High	Very High
Cost	Low	High	Very High

LoHAM Analysis – Scheme Impacts

- ULEZ specific LoHAM created
- 5UC to 9UC model to allow for Non-compliant UCs
 - Car OWT and LGV each split into 3UC
 - ULEZ Compliant (80%)
 - ULEZ Non-compliant (20%)
 - with one or more O or D inside ULEZ (captive)
 - with both O and D outside (routeing choice): UC4 and UC8
 - UC4 (car) and UC8 (lgv) subject to 'entry' and 'exit' tolls of £2 each.
 - No routeing impact on any other UCs



LoHAM Analysis – Enforcement / Camera Placement I

• Potential Very High Cost of Enforcement

- Only aimed at non-compliant vehicles
- Small proportion
- Natural decline over years
- Targeted to reduce proportion of non-compliant
- Use LoHAM to assess capture rates for camera placement strategies
 - Define series of Cordons and Screenlines to intercept major movements
 - Assumes Cameras on each road/ screenline intersection
 - Undertake Separate Select Link Analyses by User Class for each:
 - Cordon/ Screenline and Direction
 - P_{IJ}^a analysis
 - Proportion of trips from Origin I to Destination J intercepted by screenline
 - Matrix of P_{IJ} in range [0,1] for each screenline
 - Use MX for Max (P_{IJ}:over all cordon/ screenline matrices)
 - Multiply by relevant trip matrix to get 'trips captured'

Cordon and Screenline Locations



LoHAM Analysis – Enforcement / Camera Placement 2

- Auxiliary Matrix Sectoring Approach
 - Screenline/ cordon crossing movements from matrix analysis
 - MapInfo to Define sectors
 - Cordons
 - Screenlines
 - Automatic generation of MXM5 files
 - Sector Matrices
 - Inter-sector totals 'captured'
 - Combine with P_{IJ}^a analysis





SATURN ULEZ and CCZ

SATURN – LOHAM and Current Toll Modelling Methodology

LoHAM tolling of CCZ based on link based charges on cordon crossing points

- Charge is based on all movements so all crossings are charged impacting routeing
 - False impacts on routeing as a result of repeating charging.
- Charges are an estimated value at £0.80 based on propensity to make multiple crossings and accounting for residents discounts.
- No charges are applied if vehicles do not cross cordons:
 - A reduced level of accuracy on skimmed costs.
 - Trips with an O and D within the CCZ zone have no extra charge.
 - Impacts negatively on economic analysis.





SATURN – Limitations of Road User Charging

Current Limitations of Road User Charging in SATURN

- Co-ordination and interoperability between charging areas allowing for multiple charged areas i.e. CCZ is superimposed on ULEZ is not possible
- Charging regimes only possible on link and not groups of links thus impacting routeing
- No charge for trip if zone to zone movement does not cross cordon boundary
- Routeing is distorted at boundary because of 'phantom' charges made each time you cross a boundary
- Multiple crossings can create unrealistic routeing patterns if there is a 'zero charge corridor' through charged areas





EVERY JOURNEY MATTERS

SATURN – ULEZ and CCZ Charging Combinations





SATURN – LOHAM and Proposed Toll Modelling Methodology

- Potential improvements to SATURN software:
 - Multiple adjacent charging zones with different charges
 - Cumulative tolls when moving from one zone to another or paying the highest charge only
 - Free routes through a charging zone to be specified without incurring additional costs to pass across this free route
 - Layered/ additive charges for separate zones based on vehicle class
 - Define UCs flexibly by charging regime eg as a percent of a single UC or as a user-defined O-D
 - Apply charges for trips entirely within a charged area
 - Allow for a single charge for multiple passes
 - Skim post assignment costs reflecting the charges
 - Display graphically charging zone combinations





Conclusion / Next steps

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- Current assignment modelling methodology does not represent multiarea charging adequately
- Software upgrades can address this
 - to allow a greater analysis of the impact of routeing changes due to complex charging mechanisms across a wide urban area
 - to create a solid foundation to further develop and assess large urban areabased charging and demand management in the future
- **Next step** is to explore, implement and test new functionality

Any questions?

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